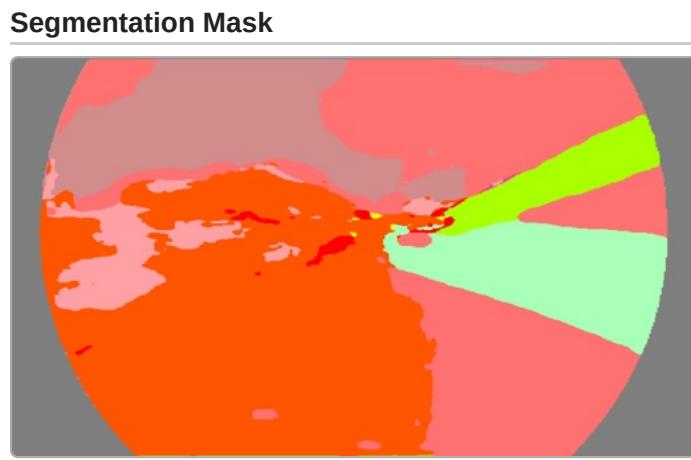


Context (LLM Input)	Conversational-1 (10 Qs) (\$0.0016)	Conversational-2 (10 Qs) (\$0.0013)	Complex Reasoning (2 Qs) (\$0.0028)	Concise (\$0.0007)
<p>Visible instruments: Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: right-top. - Liver: right-top, center-top. - Fat: center-right. - Grasper: right-top. - Connective Tissue: right-top, center-right. - L-hook Electrocautery: right-top, center-top. - Gallbladder: right-top.</p> <p>Relative Positions: - Abdominal Wall is to the right of Liver. - Liver is toward the bottom of Grasper. - Fat is to the right of Liver. - Grasper is towards the top of L-hook Electrocautery. - Connective Tissue is towards the top of Liver. - L-hook Electrocautery is to the right of Liver. - Gallbladder is towards the top of Liver.</p>	<p>Q1: Is the hook electrocautery present in the operative field? A1: Yes, the hook electrocautery is present.</p> <p>Q2: What is the hook currently doing in this image? A2: The hook is dissecting the gallbladder.</p> <p>Q3: Is the gallbladder visible in the frame? A3: Yes, the gallbladder is visible.</p> <p>Q4: Where is the gallbladder located in the image? A4: The gallbladder is located in the right-upper portion of the view.</p> <p>Q5: Where is the liver relative to the gallbladder? A5: The liver lies beneath and slightly inferior to the gallbladder in the upper region.</p> <p>Q6: Is connective tissue visible near the operative site? A6: Yes, connective tissue is visible toward the center-right of the field.</p> <p>Q7: Is fat visible in the operative field? A7: Yes, fatty tissue is visible on the center-right.</p> <p>Q8: Is there visible bleeding in this image? A8: No, there is no obvious bleeding visible.</p> <p>Q9: Where is the abdominal wall located in the frame? A9: The abdominal wall appears at the upper-right portion of the view.</p> <p>Q10: Is a grasper instrument visible in this image? A10: No, a grasper is not visible in this frame.</p>	<p>Q1: Which instrument is visible in this frame? A1: A single hook electrocautery (L-hook) is visible.</p> <p>Q2: What surgical phase is shown in this image? A2: Calot triangle dissection.</p> <p>Q3: What tissue is the hook actively working on in this view? A3: The hook is dissecting the gallbladder.</p> <p>Q4: Where is the gallbladder located within the image? A4: The gallbladder is in the right-top region of the field, positioned superior to the liver.</p> <p>Q5: Is a grasper visible in this frame? A5: No — only the hook electrocautery is visibly present.</p> <p>Q6: What anatomical structures are immediately adjacent to the hook? A6: The hook is adjacent to the gallbladder and is located to the right of the liver; connective tissue and fat are also nearby in the right/center region.</p> <p>Q7: Are fat and connective tissue visible in the operative field? A7: Yes — fat is visible toward the center-right and connective tissue appears in the right-top/center-right area.</p> <p>Q8: Is there any visible blood or active bleeding in the image? A8: No active blood or bleeding is visible in this frame.</p> <p>Q9: Relative to the liver, where is the hook located? A9: The hook is positioned to the right of the liver and toward the top of the liver region.</p> <p>Q10: What specific action is being performed by the hook in this scene? A10: The hook electrocautery is dissecting the gallbladder tissue.</p>	<p>Q1: Given that only the hook is actively dissecting the gallbladder while a grasper is present but not engaged, what is the most likely immediate procedural goal and why is the current instrument configuration appropriate for it? A1: The immediate goal is to develop the dissection plane around the gallbladder neck and Calot's triangle to expose and identify the relevant biliary and vascular structures safely. The hook is being used to sharply divide adhesions and connective tissue on the gallbladder surface to open tissue planes, while the grasper—though present—is currently idle or available to provide countertraction when needed. This configuration is appropriate because precise electrocautery division (hook) combined with intermittent, controlled traction (grasper when engaged) allows the surgeon to create tension on tissues, separate fat and connective tissue, and progressively expose the triangle without blind tearing. Keeping the grasper available but idle permits quick engagement for retraction, tamponade, or blunt dissection if visibility or control becomes insufficient during the hook's cutting motions.</p> <p>Q2: What specific risks are increased by continuing electrocautery dissection with the hook in this region, and how does the presence (but nonuse) of a grasper change risk mitigation options? A2: Electrocautery dissection with the hook near the gallbladder and liver increases the risk of thermal spread to adjacent liver parenchyma or biliary structures, inadvertent full-thickness gallbladder wall injury with bile leak, and injury to small vascular branches causing bleeding. Because the grasper is present but not actively retracting, one mitigation opportunity is currently underutilized: timely engagement of the grasper to provide controlled countertraction will open the plane and allow shorter, more precise electrocautery activations. If the grasper remains idle, the surgeon may rely more on the hook alone, which can lead to longer activations or less controlled tissue tension and thus greater thermal or mechanical injury risk. Therefore, actively coordinating brief energy bursts with intermittent grasper traction reduces these specific risks.</p>	<p>Concise (\$0.0007)</p> <p>A hook electrocautery is actively dissecting the gallbladder during Calot triangle dissection. The gallbladder and liver sit in the right/upper field with adjacent fat and connective tissue nearby.</p> <p>Detailed (\$0.0010)</p> <p>This is a close-up view of Calot's triangle in the right upper quadrant. The gallbladder occupies the right-upper/central portion of the field, lying directly above and adjacent to the liver which sits just inferiorly. A hook electrocautery (L-hook) is coming in from the right-upper/center-right and is actively dissecting the gallbladder along its plane with surrounding tissue. Connective tissue planes over the liver and some fat are present adjacent to the dissection site and are the likely targets being divided to expose the cystic structures. The abdominal wall is visible in the background toward the right-upper aspect. No other instruments are in the frame; the hook is the only active tool working in the field and there is no apparent suction or grasping device engaged.</p>



Context (LLM Input)

Visible instruments:
Grasper, Hook.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Liver)
- (Hook, Dissect, Gallbladder)

Spatial (extracted from model-generated segmentation mask):

Model-generated segmentation mask confidence is below threshold, so spatial context is not included.

Conversational-1 (9 Qs) (\$0.0019)

Q1: Is the grasper visible in this image?

A1: Yes. The grasper is visible.

Q2: Is the hook visible in this image?

A2: Yes. The hook is visible.

Q3: Is the grasper retracting the liver in this frame?

A3: Yes. The grasper is retracting the liver.

Q4: Is the hook dissecting the gallbladder in this frame?

A4: Yes. The hook is dissecting the gallbladder.

Q5: Is the gallbladder visible in the operative field?

A5: Yes. The gallbladder is visible.

Q6: Is the liver visible in the operative field?

A6: Yes. The liver is visible.

Q7: Is the hook tip contacting gallbladder tissue?

A7: Yes. The hook tip is in contact with gallbladder tissue.

Q8: Is the grasper holding the gallbladder?

A8: No. The grasper is retracting the liver, not holding the gallbladder.

Q9: Is there any other instrument besides the grasper and hook visible?

A9: No. Only the grasper and the hook are visible.

Conversational-2 (10 Qs) (\$0.0016)

Q1: Which instruments are visible in this frame?

A1: A grasper and a hook electrocautery are visible.

Q2: What phase of the procedure is shown in this image?

A2: This view corresponds to the gallbladder dissection phase.

Q3: Which instrument is retracting tissue, and which tissue is it retracting?

A3: The grasper is retracting the liver.

Q4: Which instrument is performing dissection, and what structure is it dissecting?

A4: The hook electrocautery is dissecting the gallbladder.

Q5: How are the grasper and hook positioned relative to the tissues they are working on?

A5: The grasper is in contact with and pulling the liver to provide exposure, while the hook is adjacent to and applied to the gallbladder surface performing dissection.

Q6: How many distinct tissue-instrument interactions are occurring in the scene, and what are they?

A6: Two interactions: the grasper retracting the liver, and the hook dissecting the gallbladder.

Q7: Is the grasper engaging the gallbladder itself in this frame?

A7: No. The grasper is engaged with the liver for retraction rather than grasping the gallbladder.

Q8: Are there any additional instruments visible beyond the grasper and hook?

A8: No. Only the grasper and the hook electrocautery are visible in this frame.

Q9: Based on the visible actions, what is the immediate goal of the instrument placement in this view?

A9: The immediate goal is exposure and mobilization: the grasper retracts the liver to expose the operative field while the hook dissects the gallbladder from its attachments.

Q10: Are both instruments actively in contact with tissue in this image?

A10: Yes. The grasper is in contact with and retracting the liver, and the hook is in contact with and dissecting the gallbladder.

Complex Reasoning (2 Qs) (\$0.0023)

Q1: Given that the grasper is actively retracting the liver while the hook is dissecting the gallbladder, what is the surgeon trying to achieve with this combination of maneuvers at this stage of gallbladder dissection?

A1: Retracting the liver with the grasper while applying the hook to the gallbladder is being used to expose and tension the dissection plane between the gallbladder and the liver bed. The upward or lateral traction on the liver opens the subhepatic space and places the gallbladder on stretch so the hook can take controlled, shallow strokes to separate gallbladder tissue from hepatic parenchyma. This combination improves visualization of the tissue plane, reduces the need for forceful tearing, and allows the energy device to coagulate small vessels as the dissection progresses. Both instruments are active here: the grasper provides countertraction and the hook performs the cutting/coagulating dissection; their coordinated use is intended to minimize uncontrolled tearing and bleeding while advancing the plane toward complete detachment of the gallbladder from the liver bed.

Q2: What intraoperative sign visible in the field would indicate the dissection is too deep into the liver parenchyma, and how should the surgeon immediately respond using only the instruments available?

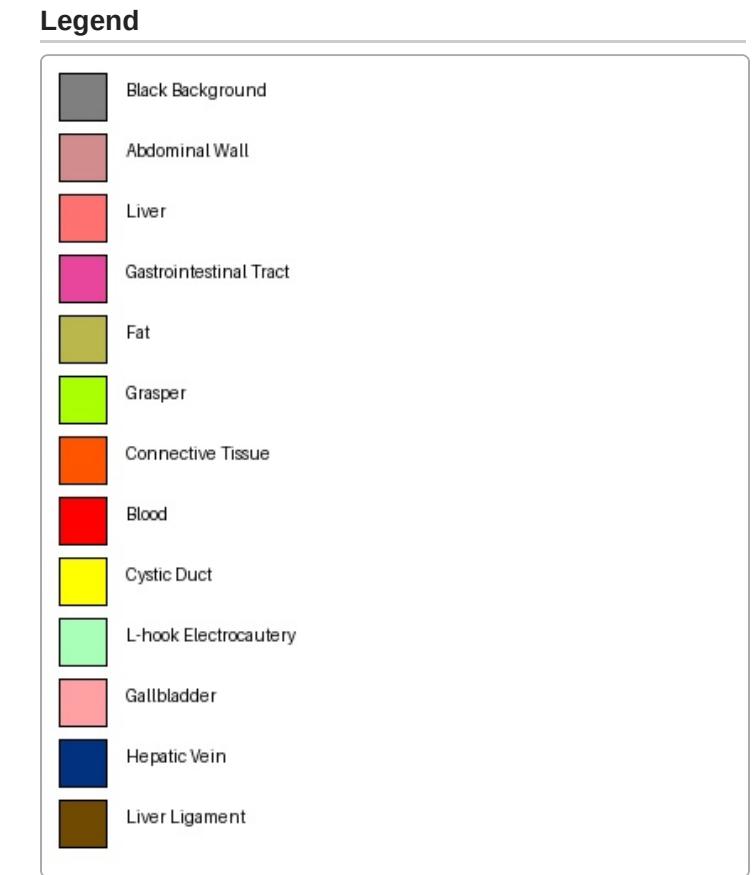
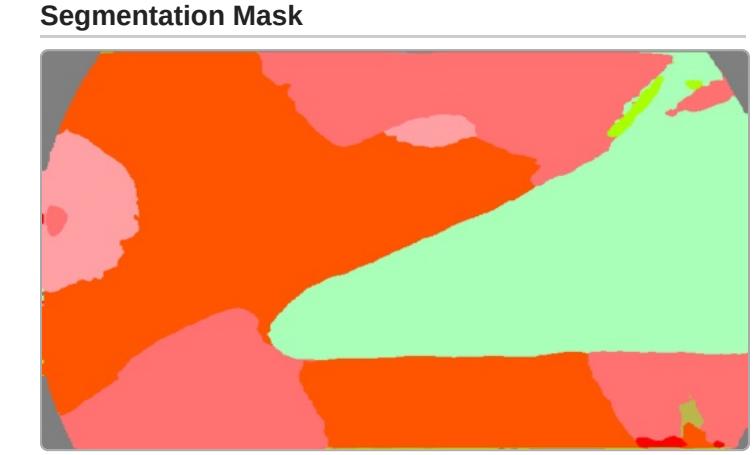
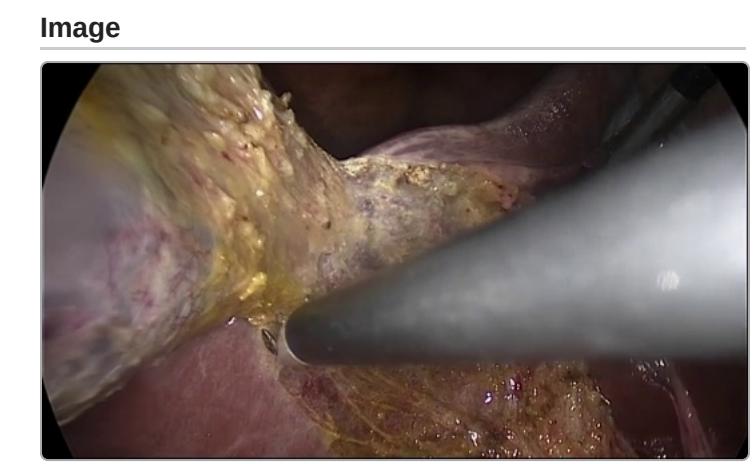
A2: A sign of overly deep dissection is brisk or persistent oozing/bleeding from a raw hepatic surface rather than a clean plane with only occasional pinpoint bleeding. If this appears, the immediate response with the available instruments is: (1) stop active energization with the hook, (2) use the grasper to apply direct, gentle compression over the bleeding area to tamponade and improve visualization, and (3) once partially controlled, resume very short, low-power coagulation bursts with the hook directed at the bleeding point while maintaining compression with the grasper to limit spread. If bleeding persists despite these measures, conversion to adjunctive hemostatic strategies (discussed with the team) is indicated, but initial control should rely on compression and targeted coagulation using the currently visible instruments.

Concise (\$0.0006)

A grasper retracts the liver to expose the field while a hook instrument actively dissects the gallbladder.

Detailed (\$0.0009)

The view shows the gallbladder being dissected off the liver bed. A grasper is actively retracting the liver to provide exposure and tension on the operative field. A hook electrocautery is actively dissecting the gallbladder, sweeping along its attachment to separate tissue planes. Both instruments are engaged in the dissection; no other instruments or additional maneuvers are apparent.



Context (LLM Input)

Visible instruments:
Hook.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Hook, Dissect, Gallbladder)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: center-top.
- Liver: right-top, right-bottom, center-left, top, left-bottom.
- Fat: right-bottom.
- Grasper: right.
- Connective Tissue: bottom, left, center-top, right-bottom.
- Blood: right-bottom.
- L-hook Electrocautery: right.
- Gallbladder: left.

Relative Positions:
- Abdominal Wall is to the right of Gallbladder.
- Liver is to the left of Fat.
- Fat is to the right of Connective Tissue.
- Grasper is to the right of Gallbladder.
- Connective Tissue is to the left of Blood.
- Blood is to the right of Gallbladder.
- L-hook Electrocautery is to the right of Gallbladder.
- Gallbladder is to the left of Liver.

Conversational-1 (9 Qs) (\$0.0020)

- Q1: Is a hook electrocautery present in this view?**
A1: Yes. A hook electrocautery is present.
- Q2: What structure is the hook dissecting?**
A2: The hook is dissecting the gallbladder.
- Q3: Where is the tip of the hook located in the frame?**
A3: The hook tip is on the right side of the view, adjacent to the gallbladder.
- Q4: Is a grasper visible in this image?**
A4: No. A grasper is not visible.
- Q5: Where is the gallbladder located in the operative field?**
A5: The gallbladder is located on the left side of the frame.
- Q6: Where is the liver located relative to the gallbladder?**
A6: The liver lies to the right of the gallbladder.
- Q7: Is there any visible blood in the field?**
A7: Yes. Blood is visible in the lower-right portion of the image.
- Q8: Where is the abdominal wall located in this view?**
A8: The abdominal wall is located toward the center-top of the frame.
- Q9: Where is fatty tissue visible in the field?**
A9: Fatty tissue is visible in the lower-right area of the view.

Conversational-2 (10 Qs) (\$0.0021)

- Q1: What instrument is visible in this frame?**
A1: A hook electrocautery (L-hook) is visible.
- Q2: What phase of the operation is shown in this image?**
A2: This image is during the gallbladder dissection phase.
- Q3: Which structure is the hook actively working on in this frame?**
A3: The hook is dissecting the gallbladder.
- Q4: Is any grasper visible in the field?**
A4: No — only the hook electrocautery is visible in this frame.
- Q5: Where is the gallbladder located within the frame?**
A5: The gallbladder is positioned on the left side of the image, toward the upper/central area.
- Q6: From which side is the hook approaching the gallbladder?**
A6: The hook is approaching from the right side toward the gallbladder.
- Q7: Where is the liver relative to the gallbladder in this view?**
A7: The liver lies to the right of the gallbladder.
- Q8: Is there any blood visible in the image, and if so where?**
A8: Yes. A region of blood is visible in the lower right portion of the field.
- Q9: What other tissue types or structures are visible near the gallbladder?**
A9: Adjacent to the gallbladder you can see portions of the abdominal wall (upper/central), connective tissue, and fatty tissue, with the liver to the right and a small blood collection in the lower right.
- Q10: Based on the current tool position and tissue relationships, where is the abdominal wall located relative to the gallbladder?**
A10: The abdominal wall appears toward the upper/central right of the frame, i.e., to the right and slightly above the gallbladder.

Complex Reasoning (2 Qs) (\$0.0019)

- Q1: Given the hook is actively dissecting the gallbladder and there is fresh blood visible to the right of the gallbladder near the liver, what is the most likely source of bleeding and what immediate maneuvers should be taken to control it while continuing gallbladder dissection?**
A1: The pattern—active dissection of the gallbladder with blood collecting on the side adjacent to the liver—most commonly indicates venous oozing from the liver bed or a small branch of the cystic bed rather than a major arterial or ductal injury. Immediate steps are: (1) stop further traction/active cutting to avoid enlarging the defect; (2) clear the field with suction (or irrigate then suction) so the bleeding source can be visualized; (3) apply targeted bipolar coagulation or brief, controlled activation of the hook/coag mode directly to the bleeding point to achieve hemostasis; (4) if bleeding persists or is diffuse, apply gentle compression with an atraumatic grasper or a gauze/patty; (5) consider lowering electrocautery power and using short, intermittent pulses to minimize thermal spread. These steps prioritize visualization and targeted control so the dissection can safely continue once the source is controlled.
- Q2: While dissecting the gallbladder from the liver bed with the hook, what technique adjustments reduce the risk of gallbladder wall perforation and bile spillage?**
A2: To avoid gallbladder perforation during hook dissection, the surgeon should maintain a close subserosal plane on the gallbladder wall rather than plunging into the liver parenchyma. Key adjustments: (1) apply steady countertraction to tense the gallbladder wall so the dissection plane is obvious; (2) use short, controlled activations of the hook and work tangentially along the surface rather than pushing tip-in; (3) keep the hook oriented parallel to the gallbladder surface to avoid deep bites; (4) periodically expose the dissected margin to confirm the plane and avoid creeping into the wall; (5) if tissue is friable or inflamed, consider switching to blunt dissection or a dissecting instrument (or reduce energy) to minimize tearing. These measures reduce mechanical and thermal injury that cause perforation and bile leakage.

Concise (\$0.0009)

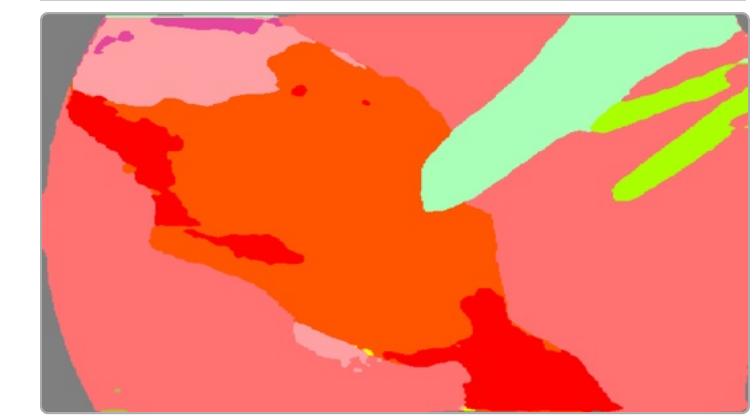
An L-hook electrocautery is actively dissecting the gallbladder. The gallbladder lies on the left with the liver to the right; the hook is positioned at the right side of the gallbladder. Connective tissue and some blood are visible inferior-right in the field.

Detailed (\$0.0009)

The view shows an active gallbladder dissection. The L-hook electrocautery is entering from the right side of the field and its tip is engaged with the gallbladder, actively dissecting along the gallbladder surface. The gallbladder lies toward the left/central portion of the image, with the liver occupying the right and background regions. Thin connective tissue and adhesions are present beneath and around the gallbladder, especially in the lower portion of the field, and fatty tissue appears toward the lower-right. A small area of blood is visible in the right-lower field adjacent to the dissection. No other instruments are visible or idle in this frame.



Segmentation Mask



Legend



FASL Prediction (Conf: 0.9069)

Context (LLM Input)

Visible instruments:
Grasper, Hook.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Liver)
- (Hook, Dissect, Gallbladder)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: left-top.
- Liver: right-top, right-bottom, right, center-top, center-bottom, left-top, left-bottom.
- Gastrointestinal Tract: left-top.
- Fat: left-bottom.
- Grasper: right-top.
- Connective Tissue: right-bottom, center-left, center-top, center-bottom, left-top.
- Blood: center-left, left-top, right-bottom, center-top.
- Cystic Duct: center-bottom.
- L-hook Electrocautery: right-top.
- Gallbladder: left-top.

Relative Positions:

- Abdominal Wall is to the left of Liver.
- Liver is to the right of Fat.
- Gastrointestinal Tract is to the left of L-hook Electrocautery.
- Grasper is to the right of Gallbladder.
- Connective Tissue is to the left of Grasper.
- Blood is to the right of Abdominal Wall.
- Cystic Duct is to the left of Grasper.
- L-hook Electrocautery is to the right of Gallbladder.
- Gallbladder is towards the top of Cystic Duct.

Conversational-1 (12 Qs) (\$0.0018)

Q1: Is the grasper visible in this image?

A1: Yes. The grasper is visible.

Q2: Where is the grasper located in the operative field?

A2: The grasper is in the right-upper portion of the view.

Q3: What is the grasper doing in this frame?

A3: The grasper is retracting the liver.

Q4: Is the hook electrocautery visible in this image?

A4: Yes. The hook electrocautery is visible.

Q5: Where is the hook electrocautery located in the view?

A5: The hook is positioned at the right-top of the field.

Q6: What is the hook electrocautery doing in this frame?

A6: The hook is dissecting the gallbladder.

Q7: Where is the gallbladder located in the image?

A7: The gallbladder is located in the left-upper portion of the view.

Q8: Is the cystic duct visible in the operative field?

A8: Yes. The cystic duct is visible.

Q9: Where is the cystic duct located in the frame?

A9: The cystic duct is in the center-bottom area of the view.

Q10: Is there visible blood in the operative field?

A10: Yes. Blood is present in the field.

Q11: Where is the liver located in this view?

A11: The liver occupies the right side of the operative field, extending through upper and lower right regions.

Q12: Is connective tissue visible in this image?

A12: Yes. Connective tissue is visible around the operative area.

Conversational-2 (9 Qs) (\$0.0020)

Q1: Which instruments are visible in this frame and where are they located relative to the gallbladder?

A1: A single grasper and a hook electrocautery (L-hook) are visible. Both instruments are positioned to the right of the gallbladder, with the grasper at the right-top and the hook also on the right side approaching the gallbladder.

Q2: What operative phase is shown in this image?

A2: This image shows the gallbladder dissection phase of the procedure.

Q3: Which instrument is retracting the liver, and how is it positioned relative to the gallbladder?

A3: The grasper is retracting the liver; it is positioned to the right of the gallbladder and appears at the right-top of the field, pulling tissue laterally.

Q4: Which instrument is dissecting the gallbladder, and from which side is it approaching?

A4: The hook electrocautery is dissecting the gallbladder, approaching from the right side toward the gallbladder margin.

Q5: Where is the cystic duct located relative to the gallbladder and the grasper?

A5: The cystic duct lies inferior to the gallbladder (center-bottom) and is positioned to the left of the grasper.

Q6: Is there visible blood in the operative field, and if so where?

A6: Yes. Blood is visible centrally and toward the left and lower portions of the field (areas around the center-left, left-top, and right-bottom).

Q7: What tissue appears between the grasper and the gallbladder?

A7: Connective tissue lies between the grasper and the gallbladder, adjacent to the dissection plane.

Q8: Are both instruments actively interacting with tissue in this frame? If so, what are they doing?

A8: Yes. The grasper is actively retracting liver tissue, and the hook electrocautery is actively dissecting the gallbladder.

Q9: How is the gallbladder positioned relative to the liver and abdominal wall in this view?

A9: The gallbladder is located toward the top-left of the field, with the liver occupying much of the right side and the abdominal wall visible toward the left-top. The gallbladder is superior and left relative to the liver.

Complex Reasoning (2 Qs) (\$0.0028)

Q1: Given that the hook is actively dissecting the gallbladder while the grasper is retracting the liver and there is visible bleeding near the dissection plane, what immediate maneuvers should be performed to control the bleeding and maintain a safe view so dissection can continue?

A1: First, prioritize immediate local control using the instruments that are engaged: apply gentle compression with the grasper against the bleeding point to tamponade oozing and improve visualization. While maintaining that pressure, use the hook in short, controlled coagulation bursts directed at the bleeding focus rather than long sweeping coagulation—this limits thermal spread. If the bleeding is from small vessels in the liver bed, aim the hook tip at the vessel and deliver brief energy until hemostasis is achieved while avoiding deep bites that would injure underlying liver parenchyma. Maintain consistent traction (the grasper retracting the liver) to expose the source; do not release traction prematurely. Only resume blunt or sharp dissection once bleeding is controlled and the field is clear enough to confidently identify tissue planes and the cystic structures.

Q2: How should traction be adjusted now to optimize the dissection plane between the gallbladder and liver and reduce the risk of gallbladder wall perforation?

A2: Safe dissection requires effective traction—countertraction to tension the gallbladder–liver interface. In this frame the grasper is elevating the liver to expose the gallbladder; to optimize the plane, the gallbladder itself should be tented away from the liver (if possible) so the hook can follow a subserosal plane. That means repositioning or adding a grasper to grasp the gallbladder fundus or body and pull it laterally and slightly cephalad while the liver is held up—this separates tissues and thins the dissection plane. Since only one grasper is present and it is retracting the liver, the surgeon should consider shifting the grasper to the gallbladder wall or adjust its vector so the combined effect is upward and lateral tension on the gallbladder. This controlled tension reduces the need for forceful hook passes and lowers the chance of perforating the gallbladder wall.

Concise (\$0.0006)

A grasper on the right is actively retracting the liver. An L-hook electrocautery on the right is dissecting the gallbladder located upper-left. The cystic duct lies inferior to the gallbladder. Connective tissue and small areas of blood are present.

Detailed (\$0.0010)

The view is a working-angle close-up of the gallbladder region during gallbladder dissection. The gallbladder itself sits in the upper-left portion of the field with the cystic duct projecting inferiorly from its base. The liver forms the dominant background on the right and central parts of the image.

A grasper is positioned to the right of the gallbladder (upper-right area) and is actively retracting the liver to expose the gallbladder–liver interface and the plane around the cystic duct. The L-hook electrocautery (hook) is also on the right side, slightly toward the top, and is actively dissecting the gallbladder — using electrocautery to separate gallbladder tissue from adjacent connective tissue and liver bed.

Surrounding the dissection site are connective tissue planes and some localized blood in the central and left areas, consistent with active dissection. Overall, the grasper provides traction by pulling the liver away to tension the tissues, while the hooked electrocautery works on the gallbladder margin to advance the dissection toward the cystic duct.



Context (LLM Input)
<p>Visible instruments: Hook.</p> <p>Current phase: Gallbladder Dissection</p> <p>Current action triplets (tool, verb, target): - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left-top. - Liver: right-top, right-bottom, center-right, left-top, left, left-bottom. - Gastrointestinal Tract: left-bottom. - Fat: bottom. - Grasper: left-top. - Connective Tissue: top. - L-hook Electrocautery: right-top. - Gallbladder: right-top.</p> <p>Relative Positions: - Abdominal Wall is to the left of L-hook Electrocautery. - Liver is toward the bottom of Grasper. - Gastrointestinal Tract is to the left of Liver. - Fat is toward the bottom of L-hook Electrocautery. - Grasper is to the left of Connective Tissue. - Connective Tissue is towards the top of Fat. - L-hook Electrocautery is to the right of Connective Tissue. - Gallbladder is towards the top of Liver.</p>

Conversational-1 (10 Qs) (\$0.0015)
Q1: Is the hook present in this view? A1: Yes. The hook electrocautery is visible in the operative field.
Q2: Where is the hook located in the frame? A2: The hook is positioned in the right-upper (right-top) portion of the view.
Q3: What is the hook doing in this image? A3: The hook is dissecting tissue on the gallbladder.
Q4: Which structure is the hook contacting? A4: The hook is contacting the gallbladder.
Q5: Is the gallbladder visible in this frame? A5: Yes. The gallbladder is visible.
Q6: Where is the gallbladder located in the operative view? A6: The gallbladder is in the right-upper (top-right) area of the frame.
Q7: Is a grasper visible in this image? A7: No. A grasper is not visibly present in this frame.
Q8: Is the liver visible in this view? A8: Yes. The liver is visible in the background.
Q9: Where is the abdominal wall located in the image? A9: The abdominal wall appears in the left-upper portion of the view.
Q10: Where is fatty tissue visible in the field? A10: Fatty tissue is visible toward the bottom of the image.

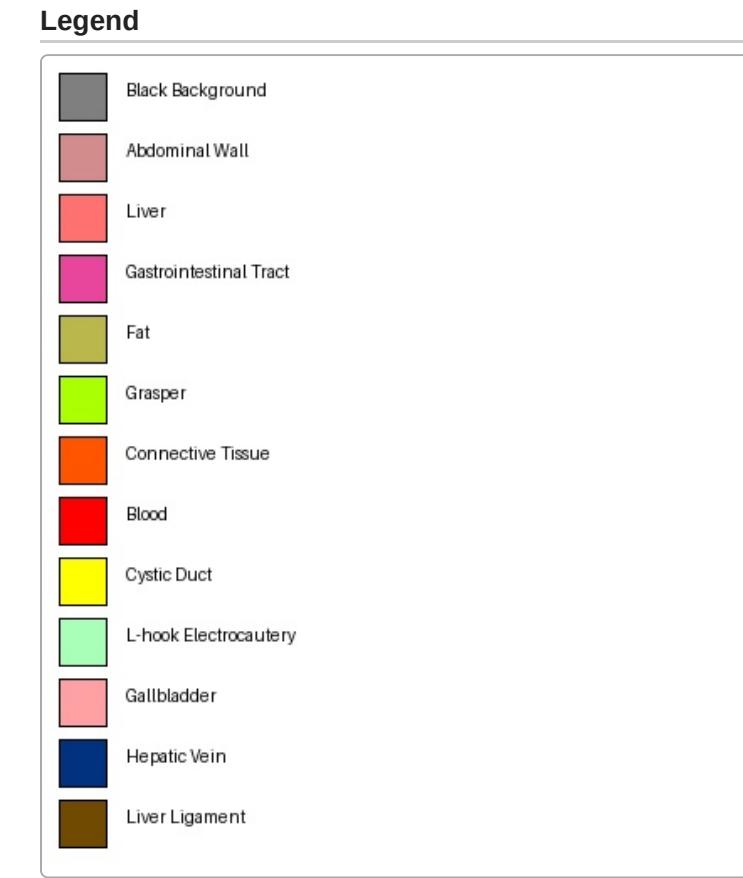
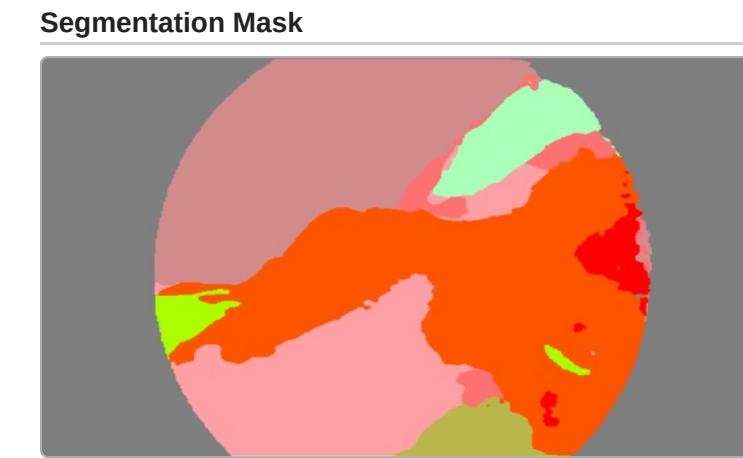
Conversational-2 (10 Qs) (\$0.0022)
Q1: Which instrument is visible in this frame? A1: Only the L-hook electrocautery (hook) is visible in this frame; no grasper is present.
Q2: What phase of the cholecystectomy is shown in this image? A2: This image is from the gallbladder dissection phase.
Q3: What action is the hook performing and on which structure? A3: The hook is dissecting the gallbladder, contacting tissue in the upper-right portion of the field.
Q4: Where is the gallbladder located relative to the liver in this view? A4: The gallbladder sits superior (toward the top) relative to the liver in the image.
Q5: Where is the abdominal wall located relative to the hook and gallbladder? A5: The abdominal wall is positioned to the left (upper-left) of the hook and gallbladder.
Q6: Is a grasper visible and actively retracting tissue in this frame? A6: No — a grasper is not visible in this frame.
Q7: Is there any visible bleeding in the operative field? A7: No visible blood is present in this image.
Q8: Which tissues lie adjacent to the dissection site? A8: Connective tissue appears superior to the working area and fatty tissue lies more inferiorly beneath the dissection region.
Q9: From which side is the hook approaching the gallbladder? A9: The hook is approaching the gallbladder from the right side of the image (upper-right direction).
Q10: Are any gastrointestinal structures visible, and if so where relative to the liver? A10: A segment of the gastrointestinal tract is visible toward the left-bottom and is located to the left of the liver.

Complex Reasoning (1 Qs) (\$0.0031)
Q1: Given that only the electrocautery hook is actively dissecting the gallbladder in this view, what immediate adjustments to instrument use and tissue handling would reduce the chance of iatrogenic injury while continuing the dissection? A1: With the hook as the sole active instrument, the primary risks are uncontrolled traction/torque and unopposed tissue movement that can lead to tearing, deep thermal injury, or loss of a clear dissection plane. Immediate adjustments that reduce those risks are: - Re-establish reliable countertraction: bring an atraumatic grasper into the field (or reactivate a previously placed grasper) to hold and tension the gallbladder away from the liver. Countertraction lets the hook work in short, controlled strokes along the intended plane rather than pulling tissue toward the energy source. - Use short, deliberate hook activations directed along the gallbladder–liver interface and keep the hook tip close to the gallbladder wall to avoid cutting into hepatic parenchyma. Avoid long sweeping activations. - Maintain continuous suction or intermittent irrigation to clear smoke and bile so visualization remains crisp; poor view increases the chance of misdirected energy. - If available, lower electrosurgical power or switch to coagulation modes appropriate for fine dissection to limit lateral thermal spread. These maneuvers explicitly separate the roles of active energy application (hook) and passive stabilization (grasper/suction), improving control and minimizing collateral damage.

Concise (\$0.0007)
A hook electrocautery at the right-superior field is actively dissecting the gallbladder. The gallbladder lies adjacent to the liver, with connective tissue superiorly and fat inferiorly.
Detailed (\$0.0009)
The view is focused on the right upper quadrant where the gallbladder sits near the top-right of the field. A single L-hook electrocautery is present at the right-upper area and is actively dissecting the gallbladder off its attachments—engaging in cutting/separation along the gallbladder surface.

The liver forms the background beneath and slightly medial to the gallbladder, serving as the dissection bed. Connective tissue layers lie immediately adjacent and slightly superior to the fatty tissue, with fat occupying the lower portion of the image. The abdominal wall is visible toward the upper-left, and portions of the gastrointestinal tract lie in the lower-left quadrant.

No other instruments are engaged in the field; the hook is the actively used tool performing gallbladder dissection while surrounding fat and connective tissue are being exposed.



Context (LLM Input)
<p>Visible instruments: Hook.</p> <p>Current phase: Gallbladder Dissection</p> <p>Current action triplets (tool, verb, target): - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left. - Liver: right-top. - Fat: center-bottom. - Grasper: left-bottom. - Connective Tissue: center-right, center-bottom, left-bottom. - Blood: center-right. - Cystic Duct: center-bottom. - L-hook Electrocautery: right-top. - Gallbladder: bottom.</p> <p>Relative Positions: - Abdominal Wall is towards the top of Fat. - Liver is to the right of Grasper. - Fat is toward the bottom of L-hook Electrocautery. - Grasper is to the left of Blood. - Connective Tissue is to the right of Grasper. - Blood is to the right of Abdominal Wall. - Cystic Duct is toward the bottom of L-hook Electrocautery. - L-hook Electrocautery is to the right of Grasper. - Gallbladder is to the left of Blood.</p>

Conversational-1 (9 Qs) (\$0.0016)
Q1: What instrument is visible in this image? A1: A hook electrocautery is visible.
Q2: What is the hook doing in this frame? A2: The hook is dissecting the gallbladder.
Q3: Where is the gallbladder located in the view? A3: The gallbladder is at the bottom of the frame.
Q4: Is a grasper visible in this view? A4: No. A grasper is not visible.
Q5: Where is the cystic duct located? A5: The cystic duct is in the center-bottom of the field.
Q6: Is there blood visible in the operative field? A6: Yes. Blood is visible in the center-right area.
Q7: Where is the liver located in this image? A7: The liver is toward the right-top of the view.
Q8: Where is the abdominal wall located? A8: The abdominal wall is on the left side of the image.
Q9: Where is connective tissue visible? A9: Connective tissue is present in the center-right and lower portions of the field.

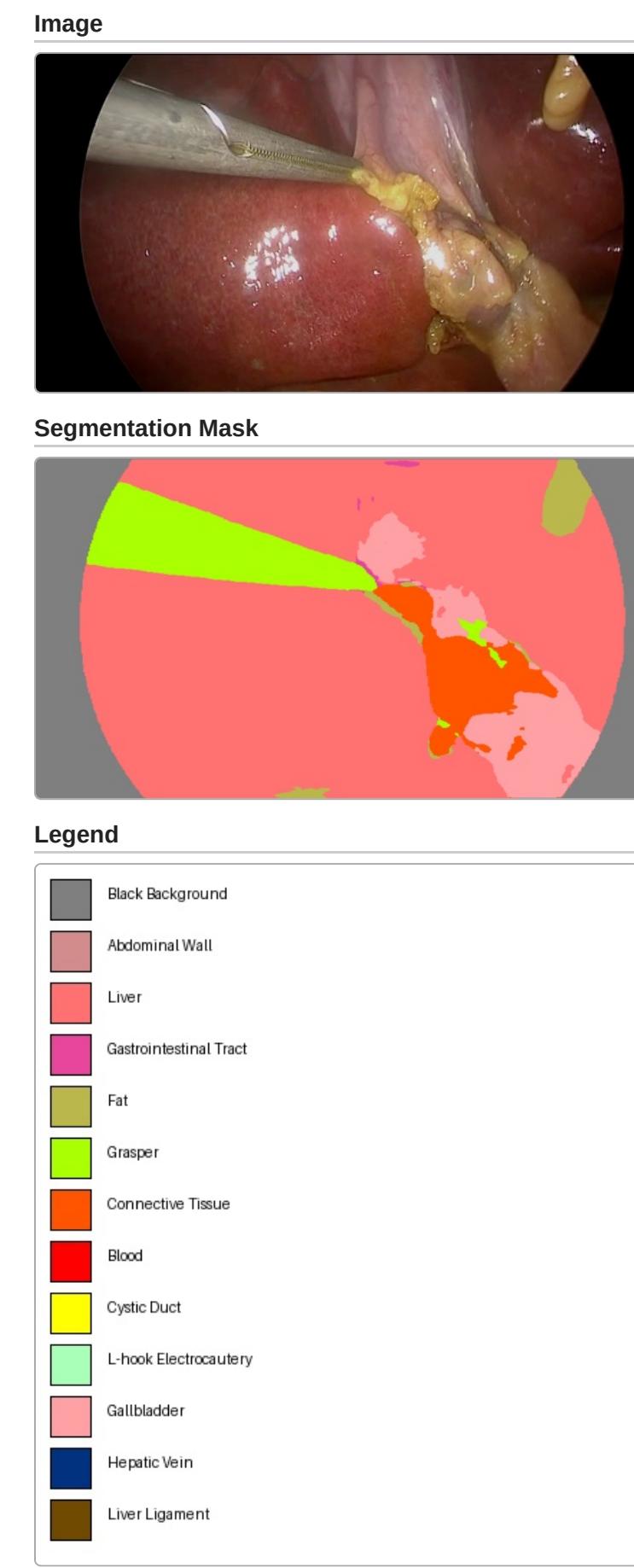
Conversational-2 (9 Qs) (\$0.0018)
Q1: What instrument is visible in this frame and where is it located? A1: I see a hook electrocautery (L-hook) visible near the upper-right portion of the image.
Q2: Which phase of the cholecystectomy is shown in this view? A2: This view corresponds to the gallbladder dissection phase.
Q3: What action is the hook performing in this image? A3: The hook is dissecting the gallbladder.
Q4: Where is the gallbladder located within the frame? A4: The gallbladder is located in the lower part of the image, toward the bottom/central-bottom area.
Q5: Is the cystic duct visible, and if so, where is it relative to the gallbladder? A5: Yes—the cystic duct is visible toward the center-bottom of the frame, adjacent to the inferior portion of the gallbladder.
Q6: Is there any blood visible in the operative field, and where is it located? A6: Yes, blood is visible in the center-right portion of the image.
Q7: Where is the liver located relative to the visible structures? A7: The liver appears in the upper-right region of the image, superior and to the right of the gallbladder.
Q8: What other tissues can you identify in the field and where are they positioned? A8: I can identify the abdominal wall on the left, fatty tissue toward the center-bottom, and areas of connective tissue concentrated center-right and center-bottom.
Q9: Do you see a grasper instrument in this frame? A9: No—there is no grasper visible in this frame; only the hook electrocautery is seen.

Complex Reasoning (1 Qs) (\$0.0031)
Q1: Given that the electrocautery hook is actively dissecting the gallbladder and a ductal structure and localized blood are visible nearby, what are the most likely sources of the bleeding and what immediate, targeted maneuvers should the surgeon perform to control hemorrhage while minimizing risk to the duct? A1: Most likely bleeding sources in this context are small cystic artery branches at the cystic pedicle, veins from the gallbladder bed bleeding from the liver parenchyma, or a nick in the gallbladder wall. Because the hook is the active instrument, immediate targeted maneuvers are: - Stop advancing the cut and assess the bleeding point visually to distinguish a focal arterial spurt from diffuse ooze. - Use the hook for brief, focal coagulation directly on the bleeding point rather than prolonged sweeping activation; apply short pulses and test effect, because prolonged energy near the duct risks thermal spread. - If the bleed appears to originate from the liver bed, take very conservative coagulation bites and limit depth to avoid parenchymal injury; use the tip to lift tissue slightly before coagulating so energy is concentrated in the vessel and not transmitted to deeper structures. - If the bleeding is at the cystic pedicle, skeletonize just enough to identify the vessel and control it with precise coagulation or secure it with ligation/clipping once clearly identified (do not blind-coagulate near the duct). - After achieving hemostasis, clear the field to confirm the anatomic relationships before resuming dissection. These steps emphasize focal control with the currently active tool and avoidance of broad, high-energy application that could injure the adjacent ductal structure.

Concise (\$0.0006)
A hook electrocautery is actively dissecting the gallbladder. Surrounding connective tissue and fat are present with some blood nearby. The cystic duct lies inferiorly and the liver is to the right.
Detailed (\$0.0011)
The image is a laparoscopic close-up of the gallbladder region during gallbladder dissection. A single L-hook electrocautery is visible entering from the right-upper quadrant and is actively dissecting the gallbladder tissue at the lower part of the field. The hook is working along the gallbladder margin, separating it from surrounding connective tissue and exposing the region of the cystic duct just inferior to the dissection plane.

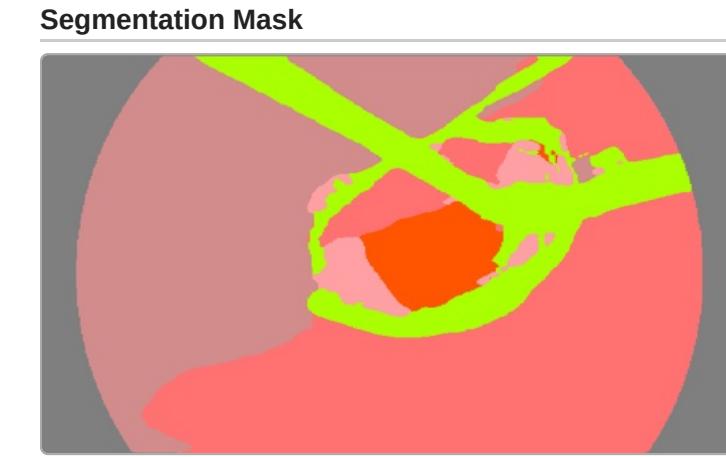
Anatomical landmarks: the liver lies in the right–upper background, while the abdominal wall is visible on the left. Fatty tissue occupies the central–inferior field beneath the gallbladder. Bands of connective tissue and adhesions surround the gallbladder, concentrated toward the center–right and lower portions of the view. A small area of blood is present in the center–right adjacent to the dissection site.

Active instrument use: the L-hook is actively dissecting the gallbladder. No other instruments are described as being actively engaged in this frame.



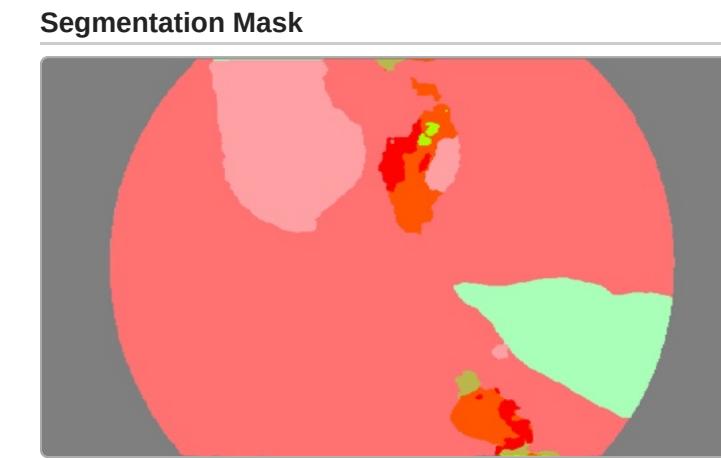
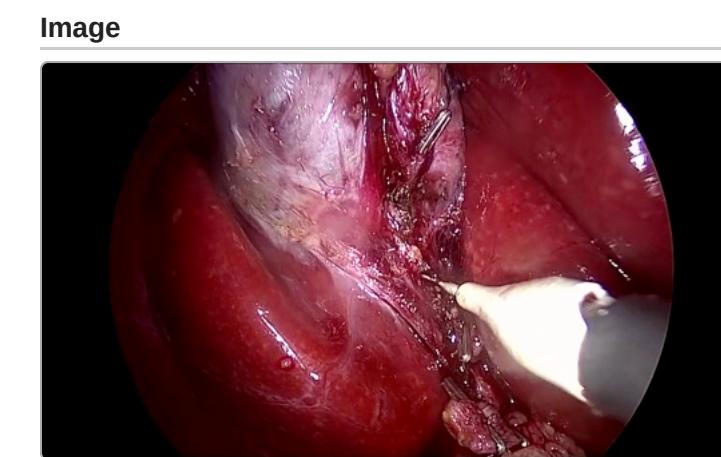
Context (LLM Input)
<p>Visible instruments: Grasper.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Grasp, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left. - Liver: right-bottom, center-right, center-top, bottom, left-top, right. - Gastrointestinal Tract: right-top. - Fat: right-top. - Grasper: left-top. - Connective Tissue: right-bottom. - Gallbladder: right.</p> <p>Relative Positions: - Abdominal Wall is to the left of Fat. - Liver is to the left of Fat. - Gastrointestinal Tract is to the right of Abdominal Wall. - Fat is to the right of Grasper. - Grasper is to the left of Gallbladder. - Connective Tissue is to the right of Abdominal Wall. - Gallbladder is to the right of Abdominal Wall.</p>

Conversational-1 (12 Qs) (\$0.0023)	Conversational-2 (8 Qs) (\$0.0014)	Complex Reasoning (3 Qs) (\$0.0027)	Concise (\$0.0007)
<p>Q1: Is the grasper visible in this image? A1: Yes. The grasper is visible.</p> <p>Q2: Where is the grasper located in the view? A2: The grasper is in the left-upper portion of the frame.</p> <p>Q3: Is the grasper currently grasping? A3: Yes. The grasper is grasping the gallbladder.</p> <p>Q4: Is a hook electrocautery visible in this image? A4: No. A hook electrocautery is not visible.</p> <p>Q5: Is the gallbladder visible in this image? A5: Yes. The gallbladder is visible.</p> <p>Q6: Where is the gallbladder located in the frame? A6: The gallbladder is located on the right side of the view.</p> <p>Q7: Is the liver visible in this image? A7: Yes. The liver is visible.</p> <p>Q8: Where is the liver located in the field? A8: The liver occupies the right/background portion of the operative view.</p> <p>Q9: Is fatty tissue visible in the image? A9: Yes. Fatty tissue is visible.</p> <p>Q10: Where is the fat located in the frame? A10: The fat is visible toward the right-upper area of the view.</p> <p>Q11: Is connective tissue visible in this image? A11: Yes. Connective tissue is visible.</p> <p>Q12: Where is the connective tissue located in the view? A12: The connective tissue is located in the right-lower portion of the field.</p>	<p>Q1: What instrument is visible in this frame? A1: A single laparoscopic grasper is visible.</p> <p>Q2: Is an electrocautery hook or other instrument visible alongside the grasper? A2: No. There is no electrocautery hook or any other instrument visible in this frame—only the grasper.</p> <p>Q3: Which structure is the grasper holding? A3: The grasper is holding the gallbladder.</p> <p>Q4: Where is the gallbladder located in the image relative to the grasper? A4: The gallbladder lies to the right of the grasper; the grasper is positioned toward the left-top while the gallbladder is on the right side of the field.</p> <p>Q5: What operative phase is being shown in this image? A5: This image shows the Calot triangle dissection phase.</p> <p>Q6: Are other abdominal structures visible, and if so where are they located? A6: Yes. The abdominal wall appears on the left side of the image, and the liver is visible on the right side; fatty and connective tissues are present toward the right/bottom.</p> <p>Q7: Is there visible bleeding in this frame? A7: No obvious blood or active bleeding is visible in this frame.</p> <p>Q8: Is the grasper actively retracting the gallbladder or simply holding it in place in this view? A8: The grasper is grasping the gallbladder; in this single frame it appears to be holding it in place rather than showing a clear ongoing retraction movement.</p>	<p>Q1: Given that only an atraumatic grasper is actively holding the target structure and no dissecting instrument is currently engaged, what is the safest immediate technical adjustment to facilitate continued Calot triangle dissection? A1: The safest immediate adjustment is to optimize directional traction rather than increase force. Specifically, reposition the grasper to apply cephalad and lateral tension on the gallbladder/infundibulum so the planes within the triangle open up and fatty/connective tissue falls away. This exposes the cystic plate margins and the plane between the gallbladder and surrounding structures without tearing fragile tissue. Maintain steady, atraumatic grip and avoid gripping too close to the presumed ductal junction; if the tissue is tense or friable, reduce traction and reposition more centrally on the fundus or infundibulum to distribute force. Only after exposure is improved should a controlled dissecting instrument be introduced to divide attachments.</p> <p>Q2: What specific risks are increased by proceeding with blind or forceful traction at this stage, and how would those risks manifest intraoperatively? A2: Forceful or misdirected traction increases the risk of tearing the gallbladder wall or avulsing the cystic duct/artery. Intraoperatively this would present as sudden loss of tension, frank bile spillage from a gallbladder perforation, or brisk bleeding if small vessels in the liver bed or cystic artery are torn. Both events rapidly degrade the view, complicate identification of biliary anatomy, and raise the likelihood of misidentifying and injuring the common bile duct or other nearby structures.</p> <p>Q3: What visual and tactile cues should the surgeon confirm before applying energy or dividing any structure in the triangle? A3: The surgeon should confirm (1) clear separation of fat and connective tissue so individual structures can be seen, (2) two separate tubular structures entering the gallbladder region consistent with a duct and an artery, (3) that both structures are coursing to the gallbladder and not the common bile duct (i.e., their orientation and entry point are consistent with cystic structures), and (4) absence of obscuring blood or bile. Tactile cues include a secure atraumatic hold without tissue slippage and minimal resistance when gentle blunt probing is performed. Only after these confirmations should energy be applied or clipping/division be contemplated.</p>	<p>During Calot triangle dissection, a single grasper at the left-top of the view is actively grasping the gallbladder on the right. The liver and surrounding fat/connective tissue lie to the right of the field. No other instruments are present.</p> <p>Detailed (\$0.0007)</p> <p>This laparoscopic view focuses on the gallbladder region during Calot triangle dissection. A single grasper is present in the left-upper part of the field and is actively grasping the gallbladder, stabilizing it for dissection. The gallbladder itself lies toward the right side of the image.</p> <p>The liver forms the background on the right/central side, while fatty tissue and portions of the gastrointestinal tract are visible toward the right-upper area. Connective tissue lies in the lower-right area of the field. The abdominal wall is visible on the left. No other instruments (for example, an electrocautery hook) are visible or active in this frame.</p>



Context (LLM Input)
<p>Visible instruments: Grasper, SpecimenBag.</p> <p>Current phase: Gallbladder Packaging</p> <p>Current action triplets (tool, verb, target): - (Grasper, Pack, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left. - Liver: bottom. - Fat: left-bottom. - Grasper: top. - Connective Tissue: center. - Gallbladder: center.</p> <p>Relative Positions: - Abdominal Wall is to the left of Liver. - Liver is to the right of Fat. - Fat is toward the bottom of Abdominal Wall. - Grasper is to the right of Abdominal Wall. - Connective Tissue is to the right of Abdominal Wall. - Gallbladder is to the right of Abdominal Wall.</p>

Conversational-1 (8 Qs) (\$0.0018)	Conversational-2 (9 Qs) (\$0.0018)	Complex Reasoning (3 Qs) (\$0.0023)	Concise (\$0.0005)
<p>Q1: Is the specimen bag visible in this frame? A1: Yes. The specimen bag is visible.</p> <p>Q2: What is the grasper doing in this image? A2: The grasper is packing the gallbladder into the specimen bag.</p> <p>Q3: Where is the grasper located in the operative view? A3: The grasper is positioned toward the top of the field.</p> <p>Q4: Where is the gallbladder located in the image? A4: The gallbladder is located in the center of the view.</p> <p>Q5: Is the liver visible in this frame? A5: Yes. The liver is visible at the bottom of the image.</p> <p>Q6: Where is the connective tissue located in the field? A6: Connective tissue appears in the central portion of the field.</p> <p>Q7: Is there visible bleeding in the operative field? A7: No obvious bleeding is visible in this frame.</p> <p>Q8: How many instruments are visible in this image? A8: Two instruments are visible: a grasper and a specimen bag.</p>	<p>Q1: What instruments can you see in this image? A1: I see a single grasper and a specimen retrieval bag.</p> <p>Q2: Which procedural phase is depicted in this view? A2: This image is during the gallbladder packaging phase.</p> <p>Q3: What is the grasper doing to the gallbladder in this frame? A3: The grasper is packing the gallbladder into the specimen bag — it is holding and guiding the gallbladder into the bag.</p> <p>Q4: Where is the gallbladder located in the image relative to the abdominal wall and the liver? A4: The gallbladder is centrally located; it lies to the right of the abdominal wall and superior to (above) the liver, which is positioned toward the bottom of the image.</p> <p>Q5: How is the grasper positioned relative to the gallbladder and the abdominal wall? A5: The grasper is positioned toward the top of the image and to the right of the abdominal wall, located superior to the centrally placed gallbladder as it packs it into the bag.</p> <p>Q6: Is any connective tissue visible near the gallbladder in this view? A6: Yes — connective tissue appears centrally near the gallbladder region.</p> <p>Q7: Are there any other instruments or bleeding visible in this frame? A7: No other instruments are visible besides the grasper and the specimen bag, and there is no obvious blood in this view.</p> <p>Q8: How many graspers are present and are multiple graspers used to manipulate tissues? A8: There is a single grasper visible and it is the only instrument manipulating the gallbladder in this image.</p> <p>Q9: Is the specimen bag positioned around the gallbladder or separate from it? A9: The specimen bag is present and the grasper is packing the gallbladder into it, so the bag is positioned around or immediately adjacent to the gallbladder during retrieval.</p>	<p>Q1: What is the primary purpose of placing the gallbladder into a specimen bag at this stage, and how does the observed instrument activity accomplish that purpose? A1: The primary purpose is containment — to prevent bile, stones, and any infected or inflamed contents from contaminating the peritoneal cavity or trocar sites during extraction. In the image the grasper is actively packing and retracting the gallbladder into the bag while the specimen bag serves as passive containment. By using the grasper to guide and compress the gallbladder into the bag mouth, the surgeon encloses the organ so that traction on the bag will pull the specimen out intact and minimize spillage and port-site contamination.</p> <p>Q2: Before attempting extraction through a trocar site, what immediate intra-abdominal checks should the surgeon perform while the bag is being secured? A2: With the grasper actively positioning the gallbladder in the bag, the surgeon should (1) inspect the bagged specimen for visible perforation or bile leakage into the peritoneum, (2) ensure no active bleeding or free stones remain adjacent to the bag, and (3) confirm the bag mouth is adequately closed around the specimen (e.g., drawn tight or twisted) so it will remain sealed during extraction. If any bile or stones are noted outside the bag, they should be suctioned/irrigated before extraction. These checks use the grasper for manipulation and the passive bag as containment.</p> <p>Q3: If resistance is encountered while pulling the bag out through the port, what are the safest immediate maneuvers and why? A3: If resistance is felt, the safest steps are: stop forceful traction to avoid tearing the bag or causing wound extension; withdraw the specimen partially to reassess orientation; consider reducing gallbladder volume (aspiration of bile inside the bag if available) to decrease bulk; if still obstructed, under direct vision enlarge the skin/fascial incision in a controlled fashion rather than tearing tissues. These measures reduce risk of bag rupture with spillage, uncontrolled enlargement of the wound, or trauma to surrounding tissues. The grasper should remain engaged to control the specimen while these maneuvers are performed.</p>	<p>A grasper is actively packing the centrally located gallbladder into a specimen retrieval bag. The liver is visible inferiorly and the abdominal wall lies to the left.</p> <p>Detailed (\$0.0011)</p> <p>The laparoscopic view is focused on the central gallbladder as it is being prepared for removal. The gallbladder sits centrally with surrounding connective tissue nearby; the liver forms the lower/background portion of the image and fatty tissue lies toward the left-lower field. The abdominal wall is visible along the left margin.</p> <p>A single grasper enters from the upper field and is actively manipulating the gallbladder—packing it toward a specimen retrieval bag that is visible in the operative field. The grasper is the engaged instrument performing the packaging maneuver; the specimen bag is present and currently acting as a passive receptacle. No other instruments are actively used in this frame.</p>



Context (LLM Input)

Visible instruments:
Hook.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Hook, Dissect, Gallbladder)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: right-top, center-left, center-right, left-top, left-bottom.
- Liver: center-top.
- Fat: right-bottom.
- Grasper: center-top.
- Connective Tissue: right.
- Blood: right.
- L-hook Electrocautery: left-top, right-bottom.
- Gallbladder: left-top.

Relative Positions:
- Abdominal Wall is to the left of L-hook Electrocautery.
- Liver is to the left of L-hook Electrocautery.
- Fat is toward the bottom of Gallbladder.
- Grasper is towards the top of L-hook Electrocautery.
- Connective Tissue is to the right of Gallbladder.
- Blood is to the right of Gallbladder.
- L-hook Electrocautery is to the right of Gallbladder.
- Gallbladder is to the left of Grasper.

Conversational-1 (10 Qs) (\$0.0017)

- Q1: Is a grasper visible in this image?**
A1: No, a grasper is not visible in this frame.
- Q2: What instrument is visible in the operative field?**
A2: An L-hook electrocautery (hook) is visible.
- Q3: What is the hook doing in this scene?**
A3: The hook is dissecting the gallbladder.
- Q4: Where is the gallbladder located in the view?**
A4: The gallbladder is in the left-upper portion of the frame.
- Q5: Where is the hook tip positioned relative to the gallbladder?**
A5: The hook tip is on the right side of the gallbladder, contacting its margin.
- Q6: Is there visible blood in the field?**
A6: Yes, blood is visible on the right side of the operative field.
- Q7: Where is the liver located in the image?**
A7: The liver is situated toward the center-top of the view.
- Q8: Is fatty tissue visible beneath the gallbladder?**
A8: Yes, fatty tissue is visible beneath and toward the lower portion under the gallbladder.
- Q9: Where is connective tissue located relative to the gallbladder?**
A9: Connective tissue is to the right of the gallbladder.
- Q10: Is the hook oriented toward the gallbladder?**
A10: Yes, the hook is oriented toward and engaging the gallbladder.

Conversational-2 (9 Qs) (\$0.0019)

- Q1: What instrument is visible and where is it located in the image?**
A1: A hook electrocautery (L-hook) is visible, located adjacent to the gallbladder in the upper-left portion of the field.
- Q2: What surgical phase is shown in this frame?**
A2: This frame is during the gallbladder dissection phase.
- Q3: What action is the hook performing in this view?**
A3: The hook electrocautery is actively dissecting the gallbladder.
- Q4: Where is the gallbladder located within the frame?**
A4: The gallbladder is in the upper-left region of the image.
- Q5: Which tissues or findings are located to the right of the gallbladder?**
A5: Connective tissue and a region of blood are present to the right of the gallbladder.
- Q6: Is any grasper visible in this frame?**
A6: No. Only the hook electrocautery is visible; no grasper is present in this view.
- Q7: How is fatty tissue situated relative to the gallbladder?**
A7: Fatty tissue lies inferior (toward the bottom) relative to the gallbladder.
- Q8: Where is the liver relative to the gallbladder in this image?**
A8: The liver is positioned more centrally and superiorly in the field, near the top center relative to the gallbladder.
- Q9: Is there evidence of blood in the operative field, and if so where?**
A9: Yes. A localized area of blood is visible to the right side of the gallbladder.

Complex Reasoning (2 Qs) (\$0.0028)

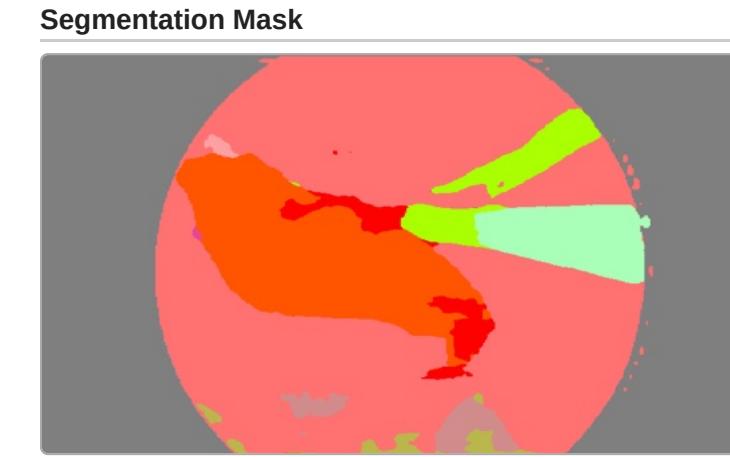
- Q1: Given the hook is actively dissecting the gallbladder while no other instrument is recorded as manipulating tissue, what is the immediate technical goal of the current maneuver and how should the hook be used to achieve it safely?**
A1: The immediate technical goal is controlled separation of the gallbladder from the liver bed (progressing the plane of dissection) while maintaining hemostasis and preserving the gallbladder wall. The hook should be used to expose and follow the avascular plane with short, deliberate strokes rather than long sweeping cuts: tease connective tissue attachments with light contact, apply brief coagulation to pinpoint bleeding only when necessary, and avoid deep bites that reach hepatic parenchyma. The active hook should act as a dissecting and focal coagulating tool, not as a broad cutting instrument; frequent repositioning to follow the natural plane and intermittent suction to clear smoke/blood will preserve visualization and reduce the risk of thermal or mechanical injury to the liver or gallbladder wall.
- Q2: How does the apparent absence of an active grasper affect risk and technique at this point, and what role should countertraction play if available?**
A2: Countertraction is critical during gallbladder dissection because it tensions tissue planes, exposes the correct dissection corridor, and prevents the hook from tearing tissue or engaging non-target structures. With only the hook actively dissecting, risks increase: the hook may inadvertently penetrate the gallbladder wall, create a false plane into the liver, or cause thermal spread to adjacent tissue. If a grasper is available (even if currently idle), it should be employed to apply steady, gentle traction—usually cephalad and lateral—on the gallbladder fundus/body to open the plane and stabilize the organ. This allows the hook to perform controlled, superficial dissection. If no grasper is available, the surgeon should slow down, use smaller hook movements, and consider repositioning the camera or adding an instrument to provide traction to maintain safety.

Concise (\$0.0008)

An L-hook electrocautery is actively dissecting the gallbladder at the upper-left. The liver lies centrally above; connective tissue and blood are to the right of the gallbladder, with fat beneath.

Detailed (\$0.0009)

The view focuses on the gallbladder in the upper-left/central field. An L-hook electrocautery is the only instrument visible and is actively dissecting the gallbladder: the hook is positioned to the right side of the gallbladder and is being used to separate the gallbladder from its attachments. Inferior to the gallbladder there is fatty tissue, while immediately to the right of the gallbladder there is connective tissue with a small amount of blood consistent with recent dissection. The liver lies more posterior/upper in the field, and portions of the abdominal wall are visible toward the left and peripheral areas. No other instruments are engaged in this frame.



FASL Prediction (Conf: 0.9450)

Context (LLM Input)

Visible instruments:
Grasper, Irrigator.

Current phase:
Cleaning Coagulation

Current action triplets (tool, verb, target):
- (Grasper, Retract, Liver)
- (Irrigator, Null Verb, Null Target)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: center-bottom.
- Liver: right-top, right-bottom, center-right, center-top, left-top.
- Gastrointestinal Tract: center-left.
- Fat: center-bottom.
- Grasper: right-top.
- Connective Tissue: left.
- Blood: center.
- L-hook Electrocautery: center-right.
- Gallbladder: left-top.

Relative Positions:

- Abdominal Wall is toward the bottom of Gallbladder.
- Liver is to the right of Gallbladder.
- Gastrointestinal Tract is to the left of L-hook Electrocautery.
- Fat is toward the bottom of Connective Tissue.
- Grasper is to the right of Gastrointestinal Tract.
- Connective Tissue is to the left of L-hook Electrocautery.
- Blood is to the right of Gallbladder.
- L-hook Electrocautery is to the right of Liver.
- Gallbladder is to the left of Grasper.

Conversational-1 (10 Qs) (\$0.0021)

Q1: What is the grasper doing in this image?

A1: The grasper is retracting the liver.

Q2: Where is the grasper located in the view?

A2: The grasper is located at the right-top of the field.

Q3: Is the irrigator actively irrigating in this frame?

A3: No. The irrigator is present but not actively irrigating.

Q4: Where is the gallbladder located in the image?

A4: The gallbladder is positioned in the left-top portion of the view.

Q5: Where is the blood located in the operative field?

A5: Blood is visible in the central area of the field.

Q6: Where is the abdominal wall located?

A6: The abdominal wall is at the center-bottom of the view.

Q7: Where is the gastrointestinal tract located?

A7: The gastrointestinal tract is toward the center-left of the image.

Q8: Where is the connective tissue located?

A8: Connective tissue is located on the left side of the field.

Q9: Is the grasper retracting the gallbladder?

A9: No. The grasper is retracting the liver, not the gallbladder.

Q10: Where is the liver located relative to the gallbladder?

A10: The liver lies to the right of the gallbladder.

Conversational-2 (7 Qs) (\$0.0014)

Q1: Which instruments are visible in this frame?

A1: A single grasper and an irrigator are visible.

Q2: Which structure is the grasper retracting, and where is that structure located in the image?

A2: The grasper is retracting the liver, which occupies the right side of the field (extending toward the right-top and right-bottom).

Q3: Where is the gallbladder located relative to the grasper and the liver?

A3: The gallbladder is located toward the left-top of the image; it lies to the left of the grasper and to the left of the liver.

Q4: Is the irrigator actively targeting tissue or delivering fluid in this view?

A4: No. The irrigator is present in the field but is not shown performing an active action on any target in this frame.

Q5: Where is the pooled blood relative to the gallbladder and the grasper?

A5: The blood is centralized in the image, positioned to the right of the gallbladder and beneath the area where the grasper is located.

Q6: Is an electrocautery hook instrument visible and in use in this frame?

A6: No. Only a grasper and an irrigator are visible; no electrocautery hook is shown as a visible instrument in this frame.

Q7: Which tissues or structures are immediately adjacent to the abdominal wall in this image?

A7: Fat and portions of the liver are adjacent to the abdominal wall; the abdominal wall is toward the top/center-bottom and the liver and fat lie just internal to it.

Complex Reasoning (2 Qs) (\$0.0023)

Q1: Given the current view with blood pooled centrally and the liver being retracted, what is the safest immediate sequence of actions to identify and control the bleeding source?

A1: First, use the irrigator (currently present but idle) to lavage the field so the pooled blood is cleared and the bleeding point can be visualized. Maintain the grasper's retraction of the liver while irrigating so the raw liver surface and gallbladder bed remain exposed and stationary; effective traction prevents obscuration of the source and reduces tissue movement during assessment. Once the site is visualized, apply targeted hemostasis: if the bleeding is from a small vessel on the liver bed or oozing raw surface, activate the L-hook electrocautery (currently present but not active) at low, controlled settings to coagulate the point while continuing gentle retraction. If the bleeding is focal on the gallbladder wall, consider temporary tamponade by gentle pressure with the grasper while irrigating to confirm the source before energy application. This sequence—irrigate to visualize, maintain retraction for exposure, then apply controlled coagulation—limits thermal spread and allows precise control of bleeding.

Q2: How does the current retraction of the liver with the grasper affect both visualization and the risk profile when attempting coagulation of a bleeding site?

A2: The active retraction of the liver creates counter-tension that separates the liver/gallbladder complex from surrounding structures, improving visualization of the bleeding point and stabilizing tissue for precise energy delivery. Improved exposure reduces the chance of misdirected coagulation that could damage adjacent tissue. However, retraction also places traction on the liver parenchyma; if the grasper is used to compress a bleeding surface while energy is applied, there is a risk of deeper thermal injury transmitted through compressed tissue. Therefore, retraction should be used to expose and steady the site, but energy application should be targeted and brief, avoiding excessive power or prolonged contact that could extend thermal damage into deeper liver tissue.

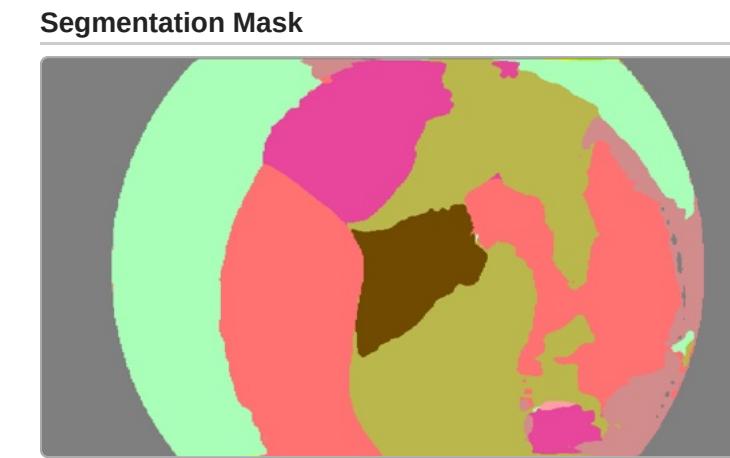
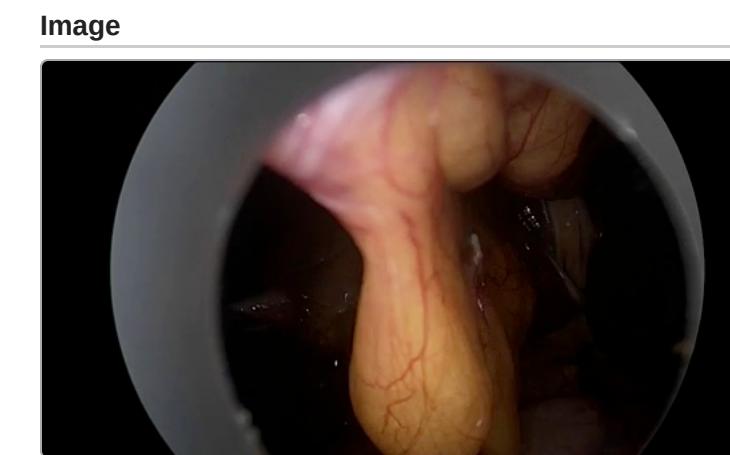
Concise (\$0.0008)

A grasper is actively retracting the liver to expose the field. An irrigator is present but not actively used. The gallbladder lies toward the left-top and blood is visible centrally.

Detailed (\$0.0011)

The view shows the hepatobiliary region with the liver dominating the right and upper portions of the field and the gallbladder positioned toward the upper-left. A small collection of blood is visible in the central field, consistent with active hemostasis/cleaning underway. Fatty and connective tissues lie in the lower/left areas, and portions of the gastrointestinal tract are seen toward the left-center.

A grasper is present in the upper-right quadrant and is actively retracting the liver to expose the operative site—this retraction creates tension and widens the working space near the gallbladder. An irrigator is also visible in the field but is not currently being used; its tip is present near the operative zone but there is no active irrigation or suction taking place at this moment. Overall the scene is consistent with cleaning/coagulation maneuvers: the liver is held out of the way by the grasper while the team addresses the central blood and prepares the dissection/hemostasis.



FASL Prediction (Conf: 0.9262)

Context (LLM Input)

Visible instruments:
No instruments are visible.

Current phase:
Calot Triangle Dissection

Current action triplets (tool, verb, target):
No actions are taking place.

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:

- Abdominal Wall: right.
- Liver: right-bottom, left-bottom, center-right, center-top, center, right.
- Gastrointestinal Tract: center-top.
- Fat: right.
- Grasper: right-top.
- Cystic Duct: right-top.
- L-hook Electrocautery: left.
- Gallbladder: right-bottom, center-top.
- Liver Ligament: center.

Relative Positions:

- Abdominal Wall is to the right of L-hook Electrocautery.
- Liver is toward the bottom of Grasper.
- Gastrointestinal Tract is towards the top of Gallbladder.
- Fat is toward the bottom of Grasper.
- Grasper is to the right of L-hook Electrocautery.
- Cystic Duct is to the right of L-hook Electrocautery.
- L-hook Electrocautery is to the left of Gallbladder.
- Gallbladder is to the right of Liver.
- Liver Ligament is to the left of Abdominal Wall.

Conversational-1 (9 Qs) (\$0.0016)

Q1: Is any surgical instrument visible in this image?

A1: No. No surgical instruments are visible in the field.

Q2: Where is the gallbladder located in the view?

A2: The gallbladder is on the right side of the image, occupying a central-to-lower region.

Q3: Where is the liver located relative to the image?

A3: The liver occupies much of the right and lower portions of the view.

Q4: Where is the abdominal wall seen in the image?

A4: The abdominal wall is visible along the right side of the frame.

Q5: Is the cystic duct visible in this frame?

A5: Yes. The cystic duct is visible in the upper-right region.

Q6: Where is the gastrointestinal tract located in the image?

A6: The gastrointestinal tract is visible toward the top-central area of the view.

Q7: Is fatty tissue visible in the operative field?

A7: Yes. Fatty tissue is present on the right side and lower portions of the field.

Q8: Where is the liver ligament located in this view?

A8: The liver ligament is visible near the central region of the image.

Q9: Is there any visible bleeding in the operative field?

A9: No obvious bleeding is visible in this frame.

Conversational-2 (9 Qs) (\$0.0025)

Q1: Are any surgical instruments visible in this image?

A1: No — there are no surgical instruments visible in this frame.

Q2: What anatomical structures are visible in this view?

A2: I can see the gallbladder, liver, abdominal wall, gastrointestinal tract (bowel), surrounding fat, and the liver ligament.

Q3: What surgical phase is shown in this image?

A3: This image corresponds to the Calot triangle dissection phase.

Q4: Where is the gallbladder located within the operative field?

A4: The gallbladder is on the right side of the field, spanning the upper-central toward the lower-right region of the image.

Q5: Is the cystic duct visible, and if so where is it located relative to the gallbladder?

A5: Yes — the cystic duct appears in the upper-right portion of the field, adjacent to the gallbladder neck region.

Q6: Where is the liver relative to the gallbladder in this image?

A6: The liver lies to the left of the gallbladder in the field.

Q7: Is any fatty tissue visible, and where is it located?

A7: Yes — fatty tissue is present, predominantly on the right side and toward the lower portion of the image.

Q8: Is the gastrointestinal tract (bowel) visible and how is it positioned relative to the gallbladder?

A8: The gastrointestinal tract is visible and lies superior (above) the gallbladder in this view.

Q9: Are there any active surgical actions occurring in the frame?

A9: No — there are no active instrument actions visible in this frame.

Complex Reasoning (2 Qs) (\$0.0033)

Q1: Why would the surgeon intentionally withdraw instruments from the field during Calot triangle dissection, and what should they confirm visually before reintroducing them?

A1: Withdrawing instruments in the middle of Calot dissection is often intentional to reassess and reorient. In the current view there are no instruments engaged, which suggests a deliberate pause to obtain a clearer, non-obstructed look at the gallbladder-infundibulum and the course of the cystic duct/artery. Before reintroducing grasping or energy instruments the team should confirm: that the triangle of Calot is exposed enough to identify the two structures entering the gallbladder, that fat and connective tissue obscuring landmarks have been cleared or are identifiable, and that there is no active bleeding or bile leakage that would compromise visualization. Only after these checks should a grasper be re-applied for traction and an energy device be reintroduced to continue dissection—to avoid misidentification and reduce the risk of thermal or mechanical injury.

Q2: Given the current instrument-free view showing the gallbladder and a nearby ductal structure, what immediate intraoperative objective minimizes the risk of bile duct injury before any further cutting or clipping?

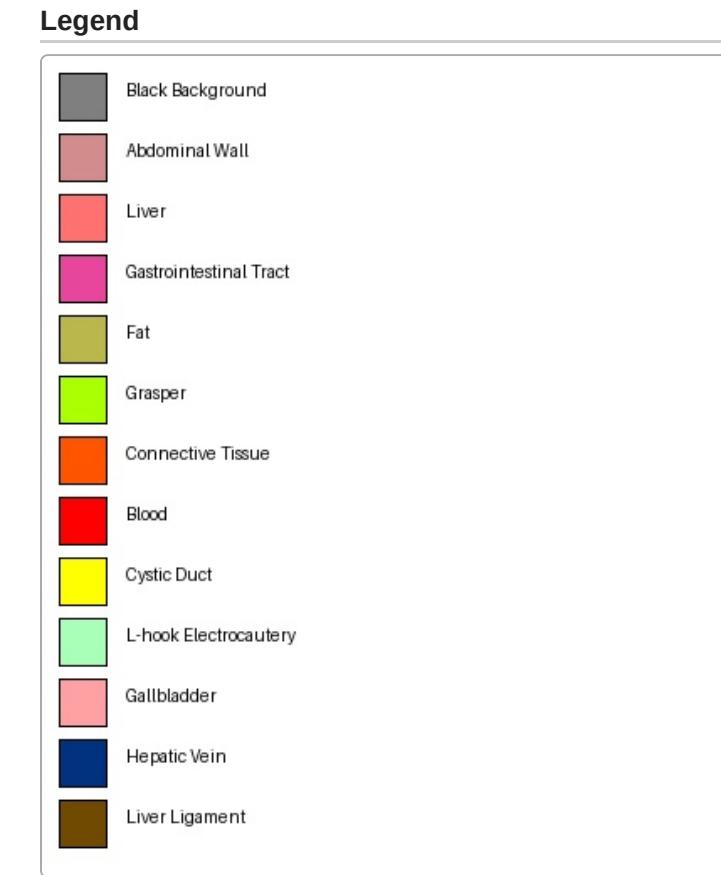
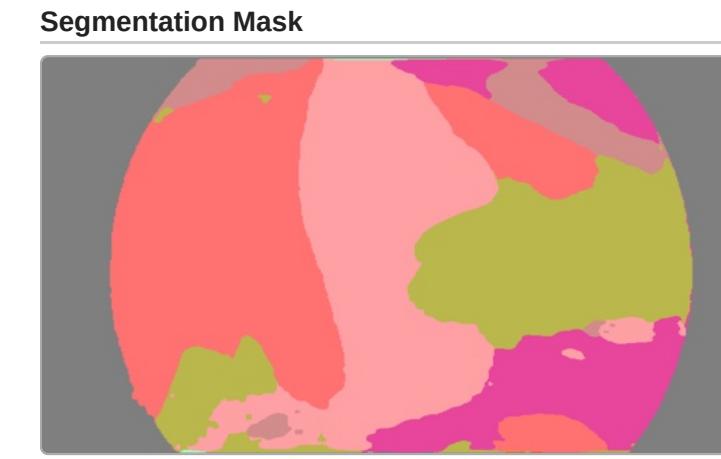
A2: The immediate objective is to achieve the critical view of safety while maintaining excellent visualization. Practically this means clearing fat/adhesions in the Calot region, separating the lower third of the gallbladder off the liver bed so only two structures enter the gallbladder, and confirming that those two structures are indeed the cystic duct and cystic artery. Because no instruments occupy the field now, the safest next maneuver is deliberate, controlled retraction of the gallbladder (using a grasper) to place tension on the infundibulum while careful blunt/energy dissection proceeds. The absence of instruments emphasizes the need to reintroduce them in a controlled fashion (traction first, then energy) so every tissue division is done under clear anatomic identification—this sequence directly reduces the chance of misclipping or transecting the common bile duct.

Concise (\$0.0007)

No instruments are visible and no actions are taking place. The gallbladder is on the right side of the field adjacent to a large area of liver. The cystic duct is seen toward the upper right. Gastrointestinal tract lies above the gallbladder. Abdominal wall, surrounding fat, and the liver ligament are also present.

Detailed (\$0.0010)

The view is a static exposure of the Calot's triangle region with no instruments present and no active dissection underway. The liver dominates much of the field, occupying large portions of the right and lower background. The gallbladder lies on the right side of the image, spanning from the central area down toward the lower right. The cystic duct is visible in the upper-right portion near the gallbladder neck. The gastrointestinal tract lies superior/central relative to the gallbladder, and fat is concentrated along the right side of the field. A portion of the liver ligament is seen centrally/left of the abdominal wall, and the abdominal wall itself forms the right-sided boundary of the image. Overall the anatomy is exposed for Calot triangle dissection but no instruments or tissue manipulation are occurring in this frame.



Context (LLM Input)

Visible instruments:
No instruments are visible.

Current phase:
Preparation

Current action triplets (tool, verb, target):
No actions are taking place.

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:

- Abdominal Wall: top.
- Liver: left.
- Gastrointestinal Tract: right.
- Fat: right.
- Connective Tissue: right-bottom.
- L-hook Electrocautery: left.
- Gallbladder: left-bottom, right-bottom, center-top, center-bottom.

Relative Positions:

- Abdominal Wall is towards the top of Connective Tissue.
- Liver is to the left of Connective Tissue.
- Gastrointestinal Tract is to the right of Liver.
- Fat is to the right of Liver.
- Connective Tissue is toward the bottom of L-hook Electrocautery.
- L-hook Electrocautery is to the left of Gastrointestinal Tract.
- Gallbladder is towards the top of Connective Tissue.

Conversational-1 (8 Qs) (\$0.0017)

Q1: Is the L-hook electrocautery visible in this frame?

A1: No, the L-hook electrocautery is not visible.

Q2: Where is the abdominal wall located in the image?

A2: The abdominal wall is at the top of the view.

Q3: Where is the liver located in the operative view?

A3: The liver is on the left side of the image.

Q4: Where is the gastrointestinal tract located in the image?

A4: The gastrointestinal tract is on the right side of the image.

Q5: Where is fatty tissue located in this frame?

A5: Fat is visible on the right side of the field.

Q6: Where is connective tissue located in the image?

A6: Connective tissue is toward the right-bottom of the view.

Q7: Is the gallbladder visible in this frame?

A7: Yes, the gallbladder is visible.

Q8: Where is the gallbladder relative to the connective tissue?

A8: The gallbladder lies superior (above) the connective tissue.

Conversational-2 (9 Qs) (\$0.0013)

Q1: What procedural phase does this image show?

A1: I observe the preparation phase of the procedure.

Q2: Are any surgical instruments visible in this frame?

A2: No instruments are visible in this frame.

Q3: Which major anatomical structures can be seen and where are they located in the field?

A3: The abdominal wall is at the top of the image, the liver is on the left side, and the gastrointestinal tract and surrounding fat are on the right side. Connective tissue lies toward the right-bottom.

Q4: Where is the gallbladder located relative to the other structures?

A4: The gallbladder appears toward the top of the connective tissue, occupying a central region of the field and extending inferiorly adjacent to the connective tissue.

Q5: Is any active tissue manipulation or dissection occurring in this image?

A5: No. There are no actions taking place in the field at this moment.

Q6: What structure lies to the right of the liver in this view?

A6: The gastrointestinal tract and fat are located to the right of the liver.

Q7: How is the abdominal wall positioned relative to the connective tissue?

A7: The abdominal wall is positioned toward the top relative to the connective tissue, which lies more inferiorly.

Q8: Do you see fatty tissue in the operative field, and if so where?

A8: Yes. Fatty tissue is visible on the right side of the image and also toward the right-bottom near the connective tissue.

Q9: Is there any visible blood or active bleeding in this frame?

A9: No active blood or bleeding is apparent in this view.

Complex Reasoning (1 Qs) (\$0.0030)

Q1: Given that no instruments are currently in the field and the camera shows the gallbladder with surrounding liver, fat, and bowel, what specific elements should the surgeon evaluate during this initial laparoscopic survey to anticipate how difficult Calot triangle dissection will be?

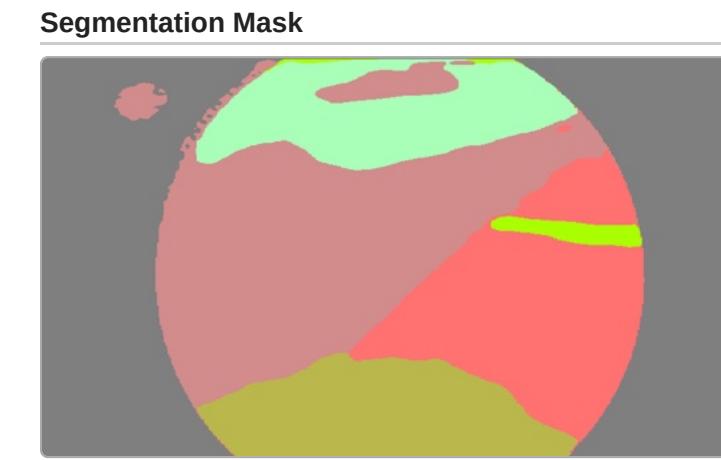
A1: With the field uninstrumented, the surgeon should perform a systematic visual assessment focused on features that predict dissection difficulty. Key elements are: - Degree of inflammation around the gallbladder: look for a tense, distended, thickened gallbladder or dense inflammatory adhesions to the liver surface that will obscure tissue planes. - Presence and extent of adhesions to adjacent bowel or omentum (the gastrointestinal tract and fat are visible laterally): extensive adhesions suggest time-consuming adhesiolysis and higher risk of inadvertent enterotomy. - Free fluid, bile, or purulence in the pelvis or subhepatic space, which implies acute inflammation or perforation and may alter strategy. - The relationship of the gallbladder infundibulum to the liver edge and the apparent exposure of the Calot area (is the gallbladder tucked high under the liver or hanging down): poor exposure means more retraction or additional ports will be needed. - Any anatomic anomalies suggested by the view (e.g., unusually medial or lateral gallbladder) that could affect port placement and instrument trajectories. This appraisal informs whether to proceed with standard antegrade cholecystectomy, add ports, perform fundus-first dissection, or plan for early conversion to open technique to avoid biliary injury. Because no instruments are active, the team should take time for this survey and adjust the operative plan before inserting working tools or energizing devices.

Concise (\$0.0008)

No instruments are visible and no active surgical actions are occurring. The abdominal wall is at the top of the field and the liver lies to the left. The gastrointestinal tract and fatty tissue are to the right, with connective tissue inferiorly. The gallbladder appears in the central–lower portion of the view.

Detailed (\$0.0008)

The laparoscopic view is in a preparatory state with no instruments visible and no active manipulation. The abdominal wall is seen in the superior portion of the image. The liver occupies the left side of the field, while gastrointestinal structures and fatty tissue lie to the right. Connective tissue is concentrated in the lower-right region. The gallbladder appears in the central-to-inferior area of the view, positioned just over the connective tissue and extending toward both lower regions of the image. No bleeding or instrument activity is apparent.



Context (LLM Input)

Visible instruments:
Irrigator.

Current phase:
Cleaning Coagulation

Current action triplets (tool, verb, target):
No actions are taking place.

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: right-top, center-right, center-top, left-top, left, left-bottom.
- Liver: right.
- Gastrointestinal Tract: center-right, right-bottom, left-bottom.
- Fat: center-bottom.
- Grasper: center-right.
- L-hook Electrocautery: top.

Relative Positions:

- Abdominal Wall is to the left of Grasper.
- Liver is toward the bottom of L-hook Electrocautery.
- Gastrointestinal Tract is toward the bottom of Grasper.
- Fat is to the left of Liver.
- Grasper is to the right of L-hook Electrocautery.
- L-hook Electrocautery is towards the top of Abdominal Wall.

Conversational-1 (7 Qs) (\$0.0022)

Q1: Is an irrigator instrument visible in this image?

A1: Yes. An irrigator is visible in the operative field.

Q2: Where is the abdominal wall located in this view?

A2: The abdominal wall occupies the upper and left portions of the image.

Q3: Is the liver visible in the operative view?

A3: Yes. The liver is visible on the right side of the field.

Q4: Where is fatty tissue located in the image?

A4: Fatty tissue is located in the lower-central portion of the view.

Q5: Is the irrigator currently being used in this frame?

A5: No. The irrigator appears idle with no active irrigation visible.

Q6: Where is the gastrointestinal tract located in this view?

A6: The gastrointestinal tract is visible in the lower part of the field, predominantly toward the lower-right and lower-central regions.

Q7: Is there visible bleeding in the operative field?

A7: No. There is no obvious bleeding visible in this frame.

Conversational-2 (8 Qs) (\$0.0021)

Q1: What instrument is visible in this frame?

A1: An irrigator is visible in the operative field.

Q2: Which phase of the cholecystectomy is shown in this image?

A2: This image is from the Cleaning Coagulation phase.

Q3: Are any instruments actively irrigating, suctioning, or coagulating in this frame?

A3: No. No instrument actions are taking place in this frame—the irrigator is present but not actively irrigating or coagulating.

Q4: Which major organ occupies the right side of the image?

A4: The liver is located on the right side of the image.

Q5: What tissues are visible in the lower portion of the image?

A5: The lower portion shows gastrointestinal tract structures and fat, with portions of the abdominal wall extending into the lower-left area.

Q6: Where is the abdominal wall located within the image?

A6: The abdominal wall is seen primarily in the superior and left portions of the image.

Q7: Is any grasper or electrocautery hook visible alongside the irrigator?

A7: No. Only the irrigator is visible; there are no graspers or electrocautery hooks visible in this frame.

Q8: Where is the visible fat located relative to the rest of the field?

A8: The fat is located toward the center-bottom of the image.

Complex Reasoning (2 Qs) (\$0.0027)

Q1: What immediate objectives are achieved by pausing dissection to irrigate and clean the field at this stage of the operation?

A1: Pausing to irrigate and clear coagulated blood accomplishes several concurrent goals: it restores a clear visual field so fine anatomy can be reassessed; it allows direct confirmation that any previously treated bleeding points remain hemostatic; it helps reveal occult bile leakage or small ongoing ooze that would be missed under clot; and it reduces the risk that residual blood obscures or mimics critical structures during subsequent steps. In this frame the irrigator is present and poised for lavage while the energy instrument and grasping tool appear present but not active, so the team can alternate irrigation/suction with brief instrument activation only if a definite target for control is identified.

Q2: During irrigation with no instruments actively cutting or coagulating, what stepwise assessment should the surgeon perform to decide whether further hemostatic intervention is required?

A2: First, irrigate broadly and immediately suction to expose the surfaces. Observe the cleaned surfaces for fresh pulsatile bleeding (suggests arterial source) versus slow oozing (venous or raw liver bed). Gently manipulate the area with the existing atraumatic grasper (idle in view) to expose recesses while repeating irrigation to ensure visualization is reproducible. If bleeding persists after visualization, apply the electrosurgical hook or other energy device (currently present but idle) in short bursts to cauterize a focal source, or apply pressure with the grasper to test if tamponade controls it. If bleeding is diffuse from the liver bed and not controlled by brief energy application or pressure, escalate to adjunctive measures (topical hemostats, targeted suturing consultation) and consider placing a drain. Each step should alternate irrigation/suction to verify hemostasis before finishing.

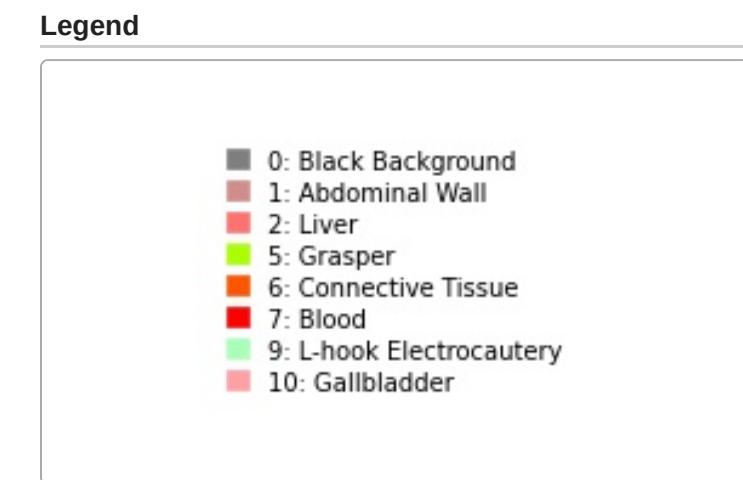
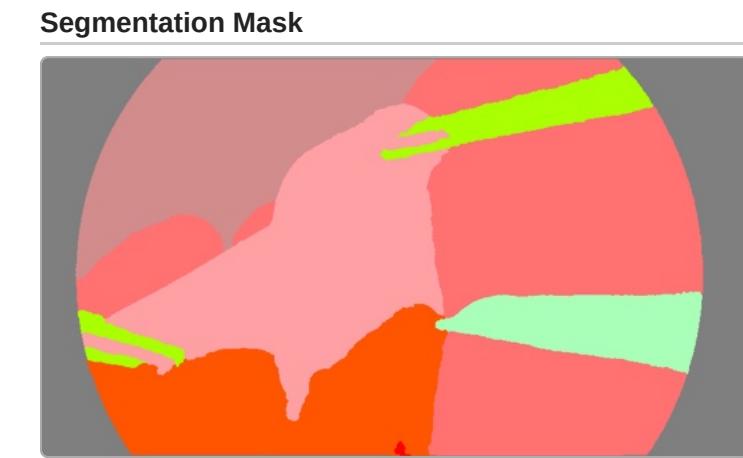
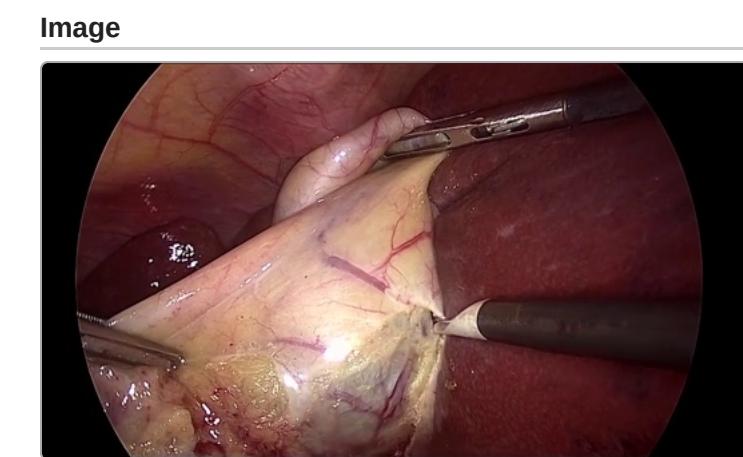
Concise (\$0.0008)

An irrigator is present but not actively in use. The liver is visible on the right. The abdominal wall occupies the upper and left regions. Gastrointestinal tract lies toward the lower center-right with fatty tissue at the center-bottom. No instruments are actively manipulating tissue.

Detailed (\$0.0011)

The view is a relatively wide field of the upper abdomen focused on the right upper quadrant. The liver occupies the right side of the image, while abdominal wall/fascia is visible across the upper and lateral margins. Portions of the gastrointestinal tract appear in the lower part of the field, with a layer of fatty tissue concentrated toward the center-bottom.

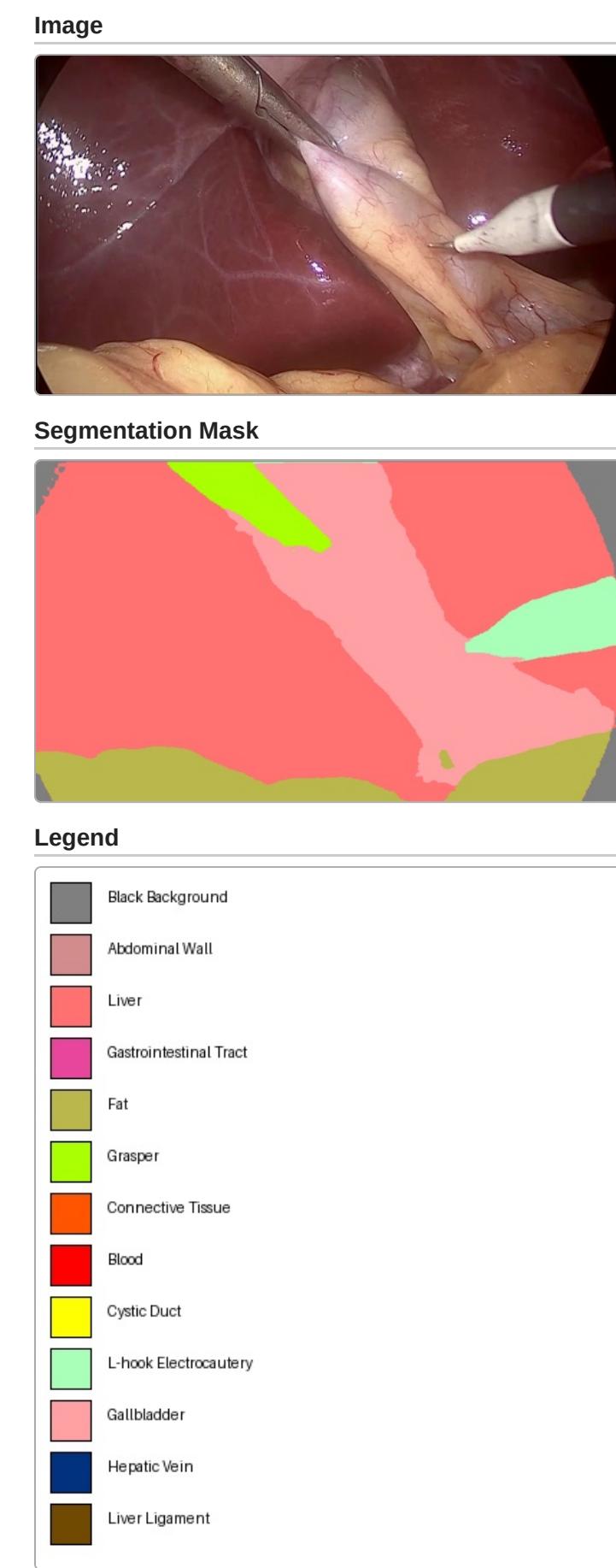
An irrigator instrument is present in the operative field but not currently being used — there are no irrigation or coagulation actions occurring at this moment. No other instruments are active, and there is no obvious fresh bleeding in the scene. The overall appearance is consistent with a cleaning/coagulation step where the team is paused or preparing to irrigate/clear the area.



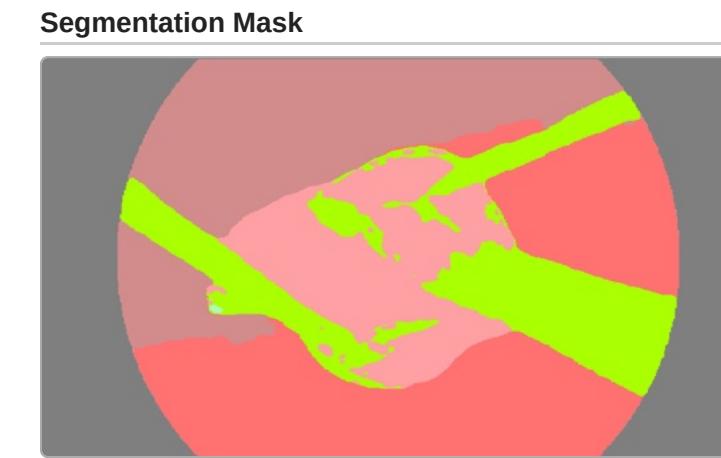
Ground Truth

Image	Context (LLM Input)
	<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Grasp, Gallbladder) - (Grasper, Retract, Gallbladder) - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from ground truth segmentation mask): Absolute Positions: - Abdominal Wall: left-top. - Liver: right. - Grasper: right-top, left-bottom. - Connective Tissue: left-bottom. - Blood: center-bottom. - L-hook Electrocautery: right-bottom. - Gallbladder: left.</p> <p>Relative Positions: - Abdominal Wall is to the left of Liver. - Liver is to the right of Connective Tissue. - Grasper is towards the top of Connective Tissue. - Connective Tissue is to the left of L-hook Electrocautery. - Blood is toward the bottom of Liver. - L-hook Electrocautery is to the right of Gallbladder. - Gallbladder is towards the top of Blood.</p>

Conversational-1 (10 Qs) (\$0.0017)	Conversational-2 (10 Qs) (\$0.0019)	Complex Reasoning (2 Qs) (\$0.0027)	Concise (\$0.0005)
<p>Q1: What structure is the grasper holding? A1: The grasper is holding the gallbladder.</p> <p>Q2: What is the grasper doing to the gallbladder? A2: The grasper is retracting the gallbladder.</p> <p>Q3: Where is the grasper located in the view? A3: The grasper is positioned toward the upper portion of the field, near the gallbladder.</p> <p>Q4: What is the hook doing in this frame? A4: The hook is dissecting tissue at the gallbladder margin.</p> <p>Q5: Where is the hook located in the image? A5: The hook is positioned at the right-lower part of the view.</p> <p>Q6: Is the hook contacting tissue? A6: Yes, the hook tip is contacting tissue adjacent to the gallbladder.</p> <p>Q7: Where is the gallbladder located in the operative view? A7: The gallbladder is toward the left-central/top area of the field.</p> <p>Q8: Where is the liver located relative to the gallbladder? A8: The liver lies to the right of the gallbladder, forming the background.</p> <p>Q9: Is there visible blood in the field? A9: Yes. A small amount of blood is visible in the lower-central portion of the field.</p> <p>Q10: Where is connective tissue visible in the image? A10: Connective tissue is visible toward the lower-left area of the view.</p>	<p>Q1: Which instruments are visible in this image? A1: I can see a grasper and an L-hook electrocautery (hook) in the operative field.</p> <p>Q2: Which instrument is grasping and retracting the gallbladder? A2: The grasper is grasping and retracting the gallbladder.</p> <p>Q3: Which instrument is performing dissection, and what is it dissecting? A3: The L-hook electrocautery is performing dissection, working on the gallbladder margin.</p> <p>Q4: Where is the hook positioned relative to the gallbladder? A4: The hook is positioned to the right of the gallbladder and slightly lower in the field (right-bottom relative to the gallbladder).</p> <p>Q5: Where is the grasper located relative to the gallbladder and other structures? A5: The grasper is positioned adjacent to and above the gallbladder (toward the top of the view), near the upper portion of the connective tissue.</p> <p>Q6: How are the liver, gallbladder, and abdominal wall arranged spatially in this view? A6: The liver occupies the right side of the image, the gallbladder is on the left side, and the abdominal wall is located toward the left-top of the field.</p> <p>Q7: Where is visible blood relative to the gallbladder and liver? A7: Blood is seen in the center-bottom of the image; it lies inferior to the gallbladder (the gallbladder is toward the top of the blood) and toward the lower portion of the liver.</p> <p>Q8: Is any connective tissue visible near the instruments, and if so where? A8: Yes. Connective tissue is visible in the left-bottom region, beneath and slightly medial to where the grasper is acting.</p> <p>Q9: Which instrument is higher (more superior) in the field, the grasper or the hook? A9: The grasper is more superior in the field; the hook is positioned more inferiorly and to the right.</p> <p>Q10: What procedural phase is shown, and what immediate tasks are visible in this frame? A10: This is the Calot triangle dissection phase. Immediately visible are the grasper retracting the gallbladder to provide exposure and the L-hook dissecting along the gallbladder margin.</p>	<p>Q1: Given the current manipulations, what is the immediate anatomical target the surgeon is trying to define and why is that important before any clipping or division? A1: The surgeon is actively applying traction to the gallbladder while using the hook to dissect its attachments; the immediate anatomical target is the elements within the Calot triangle (the cystic duct and cystic artery) and the plane between the gallbladder infundibulum and the liver bed. Defining these structures and clearing the surrounding connective/fatty tissue is essential so the surgeon can obtain the critical view of safety—i.e., clearly visualize only two tubular structures entering the gallbladder and separate the lower third of the gallbladder from the liver—before any clipping or division. This prevents misidentification injuries (particularly to the common bile duct or aberrant ducts) and ensures clips are applied to the correct structures.</p> <p>Q2: There is focal blood visible inferior to the dissection. What immediate steps should be taken to manage this and why, given the current instrument setup? A2: With a blood streak present, the first priorities are to clear the field and achieve hemostasis so dissection can continue safely. Practically: (1) Use suction to evacuate blood and reveal the exact source; (2) apply gentle compression with the atraumatic grasper to tamponade oozing if the source is uncertain; (3) once localized, control bleeding with short, targeted electrocautery activations from the hook or switch to bipolar cautery for more controlled coagulation of small vessels; and (4) maintain steady traction on the gallbladder to expose the bleeding point while avoiding blind energy application. These steps leverage the currently engaged instruments—traction by the grasper to expose and the hook for coagulation—while minimizing thermal spread and further obscuration.</p>	<p>A grasper actively grasps and retracts the gallbladder at the left. A hook electrocautery is actively dissecting the gallbladder near the liver on the right. Connective tissue lies inferiorly and a small amount of blood is visible centrally at the bottom.</p> <p>Detailed (\$0.0009)</p> <p>The operative field is focused on the gallbladder, which lies toward the left-central part of the image. The liver forms the right-sided background. The abdominal wall is visible at the upper-left margin.</p> <p>A single grasper is actively engaging the gallbladder and applying traction to expose Calot's triangle—its orientation ranges from the right-upper toward the left-lower aspect, providing upward/lateral retraction. Adjacent to the gallbladder's lower margin and left-lower field there is connective tissue being retracted away by the tension.</p> <p>An L-hook electrocautery enters from the right-lower side and is actively dissecting along the gallbladder margin, working to separate attachments. A small amount of blood is present in the central-lower field beneath the exposure, likely from the dissected tissue near the liver edge. No other instruments are engaged.</p>



Context (LLM Input)	Conversational-1 (10 Qs) (\$0.0020)	Conversational-2 (10 Qs) (\$0.0019)	Complex Reasoning (2 Qs) (\$0.0024)	Concise (\$0.0006)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder) - (Hook, Null Verb, Null Target)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Liver: right-top, right-bottom, center-right, left-top, left, left-bottom. - Gastrointestinal Tract: right-bottom. - Fat: bottom. - Grasper: left-top, center-top. - L-hook Electrocautery: center-right. - Gallbladder: right.</p> <p>Relative Positions: - Liver is to the left of Gastrointestinal Tract. - Gastrointestinal Tract is to the right of Fat. - Fat is to the left of L-hook Electrocautery. - Grasper is to the left of L-hook Electrocautery. - L-hook Electrocautery is to the right of Liver. - Gallbladder is to the left of Gastrointestinal Tract.</p>	<p>Q1: Is the grasper present in this frame? A1: Yes.</p> <p>Q2: Where is the grasper located in the view? A2: Upper-left to central-top of the image.</p> <p>Q3: What action is the grasper performing? A3: Retracting the gallbladder.</p> <p>Q4: Is the hook electrocautery visible in this frame? A4: Yes.</p> <p>Q5: Where is the hook electrocautery positioned? A5: Center-right of the view.</p> <p>Q6: Is the hook actively dissecting tissue in this frame? A6: No.</p> <p>Q7: Where is the gallbladder located in the operative field? A7: On the right side of the image.</p> <p>Q8: Is the liver visible in this image? A8: Yes.</p> <p>Q9: What tissue occupies the lower portion of the field? A9: Fatty tissue.</p> <p>Q10: Is the gastrointestinal tract visible in this frame? A10: Yes, at the right-bottom.</p>	<p>Q1: Which instruments are visible in this image? A1: A single grasper and an L-hook electrocautery (hook) are visible.</p> <p>Q2: What procedural phase is shown in this frame? A2: Calot triangle dissection.</p> <p>Q3: Which instrument is actively retracting the gallbladder, and how is it positioned relative to the gallbladder? A3: The grasper is retracting the gallbladder; it is positioned toward the top/left of the field, pulling the gallbladder superiorly.</p> <p>Q4: Is the hook electrocautery actively dissecting tissue in this frame? A4: No. The hook is present at center-right of the field but is not shown performing an active dissecting action.</p> <p>Q5: Where is the gallbladder located within the image relative to the overall field? A5: The gallbladder is located on the right side of the image, toward the central-right region.</p> <p>Q6: How is the hook positioned relative to the grasper? A6: The hook is located to the right of the grasper and sits in the center-right area of the operative field while the grasper is toward the top/left.</p> <p>Q7: Which other anatomical structures are visibly present besides the gallbladder? A7: The liver is visible (distributed on the right and central regions), the gastrointestinal tract appears in the lower-right, and fatty tissue is present along the lower portion of the field.</p> <p>Q8: Is there any evidence of another grasper or additional instruments in the frame? A8: No. Only one grasper and the hook electrocautery are visible; no additional instruments are present.</p> <p>Q9: What tissues is the grasper engaging apart from the gallbladder, if any? A9: The grasper is primarily engaging the gallbladder; no other distinct tissue engagement (e.g., separate organ) is visible.</p> <p>Q10: Describe the spatial relationship among the grasper, gallbladder, and liver in this view. A10: The grasper is superior-left in the field, retracting the gallbladder which lies central-right; the liver spans lateral/central regions and sits adjacent to these structures on the right side of the image.</p>	<p>Q1: With the grasper actively retracting the gallbladder and the electrocautery hook currently idle, what immediate maneuver using only the instruments visible in the field will best improve safety before energizing the hook? A1: Using the grasper, increase controlled cephalad and lateral traction on the gallbladder to place the infundibulum on stretch and open the Calot triangle. Maintain steady countertraction so the connective/fatty tissue is tensioned and can be swept aside rather than pushed. Keep the hook withdrawn and oriented with the tip clearly away from adjacent organs while you visually confirm a clear plane and the absence of interposed bowel or adherent fat. Only once the anatomy is exposed under this traction should the hook be advanced in short, deliberate strokes to divide well-tensioned tissue. This sequence minimizes the chance of inadvertent deep or lateral energy delivery to non-target structures.</p> <p>Q2: How does the current spatial relationship of the gallbladder, liver, and nearby gastrointestinal tissue change the risk profile for using the electrocautery hook, and how should that influence technique? A2: Because the liver and bowel lie in close proximity to the dissection zone, thermal energy from the hook has a higher likelihood of causing collateral thermal injury if not precisely targeted. This requires limiting energy activation to brief bursts, directing the active tip toward well-tensioned gallbladder attachments (not toward the liver surface or bowel), and maintaining a safe distance from adjacent viscera. Mechanically achieving clear exposure with the grasper first reduces the need for prolonged cautery and lowers the risk of unintended thermal spread to the liver or gastrointestinal tract.</p>	<p>The grasper holds and retracts the gallbladder on the right. The L-hook electrocautery is positioned center-right (to the right of the liver) and is currently idle. The liver is visible in the field.</p> <p>Detailed (\$0.0008)</p> <p>The laparoscopic view is focused on the gallbladder in the right-central field with the liver forming most of the background and upper/left-sided surfaces. A grasper enters from the upper-left/central-top region and is actively retracting the gallbladder to expose Calot's triangle. Fatty tissue layers fill the lower portion of the field. A hook electrocautery is present from the center-right, positioned lateral to the liver and just to the right of the gallbladder, but it is not currently being used (idle/poised). The gastrointestinal tract is visible in the lower-right corner, lying just lateral to the gallbladder. Overall, the grasper provides traction while the hook is held in place ready for dissection.</p>



Context (LLM Input)

Visible instruments:
Grasper, SpecimenBag.

Current phase:
Gallbladder Packaging

Current action triplets (tool, verb, target):
- (Grasper, Grasp, Gallbladder)
- (Grasper, Grasp, Specimen Bag)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: top.
- Liver: right-top, center-left, bottom, center-top.
- Grasper: right-top, right-bottom, center-right, center-top, center-bottom, center, left.
- L-hook Electrocautery: center-left.
- Gallbladder: center.

Relative Positions:

- Abdominal Wall is towards the top of Liver.
- Liver is to the right of L-hook Electrocautery.
- Grasper is to the right of L-hook Electrocautery.
- L-hook Electrocautery is toward the bottom of Abdominal Wall.
- Gallbladder is to the right of L-hook Electrocautery.

Conversational-1 (8 Qs) (\$0.0024)

Q1: Is a specimen bag visible in this image?

A1: Yes. A specimen bag is visible.

Q2: Is the grasper holding the gallbladder in this frame?

A2: Yes. The grasper is holding the gallbladder.

Q3: Is the grasper holding the specimen bag in this frame?

A3: Yes. The grasper is also holding the specimen bag.

Q4: Where is the gallbladder located in the view?

A4: The gallbladder is in the central portion of the image.

Q5: Where is the grasper located in the view?

A5: The grasper is in the right-central area of the field.

Q6: Where is the specimen bag located in the view?

A6: The specimen bag is in the central area of the view near the gallbladder.

Q7: Is the abdominal wall visible in this frame?

A7: Yes. The abdominal wall is visible at the top of the image.

Q8: Is the liver visible in this frame?

A8: Yes. The liver is visible on the right side of the view.

Conversational-2 (8 Qs) (\$0.0020)

Q1: What instruments are visible in this frame?

A1: A single laparoscopic grasper and a specimen retrieval bag (specimen bag) are visible.

Q2: What phase of the procedure is shown in this image?

A2: This image shows the gallbladder packaging phase.

Q3: Which objects is the grasper holding in this view?

A3: The grasper is holding the gallbladder and also holding/manipulating the specimen bag.

Q4: Where is the gallbladder located within the frame?

A4: The gallbladder is located centrally in the image.

Q5: How is the grasper positioned relative to the gallbladder?

A5: The grasper is adjacent to and contacting the gallbladder, positioned slightly to the right of center while grasping both the gallbladder and the specimen bag.

Q6: Is the specimen bag being moved relative to the gallbladder in this image?

A6: Yes. The grasper is holding both the bag and the gallbladder, indicating the specimen bag is being positioned around or alongside the gallbladder for retrieval.

Q7: Is the liver visible in this frame, and if so where relative to the central field?

A7: Yes. Liver tissue is visible and lies more toward the right and upper portions of the operative field relative to the central gallbladder.

Q8: Are any electrocautery or hook instruments visible in this frame?

A8: No. Only the grasper and the specimen bag are visible; no electrocautery or hook instrument is present in this view.

Complex Reasoning (2 Qs) (\$0.0027)

Q1: What is the most appropriate immediate next maneuver to ensure safe extraction of the specimen through the port site, and why?

A1: The priority now is to complete a controlled transfer of the specimen into the retrieval device and extract it under direct vision while minimizing contamination and tissue trauma. Practically this means: confirm the specimen is fully contained within the bag mouth, tighten or cinch the bag closure, and then withdraw the bag slowly while maintaining steady traction on the specimen with the grasper. Before traction-based extraction, verify hemostasis and that any ductal or vascular closures are secure so extraction does not distract from an ongoing bleed. Also avoid activating the nearby energy instrument while the bag is being manipulated—electrocautery can perforate or melt the bag and cause spillage. If resistance is met, pause and consider controlled enlargement of the incision or trocar site rather than forcing removal to prevent bag rupture or port-site trauma.

Q2: What specific contamination risks are present during this packaging step and which immediate maneuvers reduce those risks?

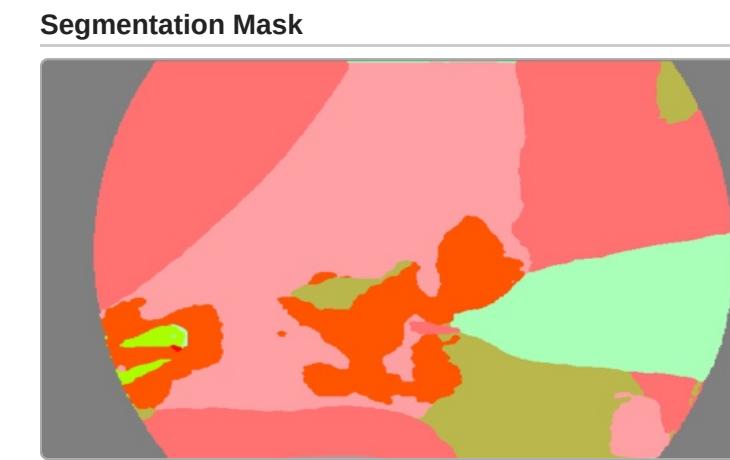
A2: The main contamination risks are bile or contents leaking from a perforated or overdistended specimen, stone spillage, and contamination of the port site or cavity if the retrieval device is breached. To reduce these risks: ensure the specimen is completely inside the bag before closure; inspect the bag for integrity; if the gallbladder appears tense, aspirate its contents into the bag before extraction; suction and irrigate the operative field to clear any blood or bile; and, if necessary, double-bag the specimen. All these actions should be performed under direct visualization with the grasper maintaining secure control so the specimen does not slip out during maneuvers.

Concise (\$0.0004)

The grasper actively holds the gallbladder and the specimen bag, packaging the gallbladder centrally for extraction.

Detailed (\$0.0012)

The image shows the gallbladder centered in the field being placed into a specimen retrieval bag. A laparoscopic grasper is actively engaged—positioned from the right/central area—firmly holding the gallbladder and also manipulating the rim of the specimen bag to guide the organ into the bag. The liver forms the background on the right side of the view, and the abdominal wall is visible along the top. The grasper is the active tool in this scene, performing both the grasp on the gallbladder and the simultaneous handling of the bag to complete packaging. The specimen bag itself is present and being opened/held around the gallbladder; there are no other instruments actively dissecting or cauterizing in this frame.



Context (LLM Input)

Visible instruments:
Hook.

Current phase:
Calot Triangle Dissection

Current action triplets (tool, verb, target):
- (Hook, Dissect, Cystic Duct)

Spatial (extracted from model-generated segmentation mask):

- Absolute Positions:
 - Abdominal Wall: center-bottom.
 - Liver: top.
 - Gastrointestinal Tract: right.
 - Fat: right-bottom.
 - Grasper: left-bottom.
 - Connective Tissue: bottom.
 - Blood: left-bottom.
 - L-hook Electrocautery: right-bottom.
 - Gallbladder: right-bottom, center-left, center-right, center-bottom, left-bottom.
- Relative Positions:
 - Abdominal Wall is to the left of L-hook Electrocautery.
 - Liver is to the left of Gastrointestinal Tract.
 - Gastrointestinal Tract is to the right of Gallbladder.
 - Fat is to the right of Grasper.
 - Grasper is to the left of L-hook Electrocautery.
 - Connective Tissue is to the left of L-hook Electrocautery.
 - Blood is to the left of L-hook Electrocautery.
 - L-hook Electrocautery is to the right of Gallbladder.
 - Gallbladder is to the right of Grasper.

Conversational-1 (10 Qs) (\$0.0019)

- Q1: Is a hook instrument visible in this image?**
A1: Yes. A hook electrocautery is visible.
- Q2: Is a grasper instrument visible in this image?**
A2: No. A grasper is not visible.
- Q3: What is the hook instrument doing in this scene?**
A3: The hook is dissecting the cystic duct.
- Q4: Where is the liver located in the operative view?**
A4: The liver is at the top of the image.
- Q5: Where is the gallbladder located in the operative view?**
A5: The gallbladder is in the lower portion of the field, slightly right of center.
- Q6: Is there visible blood in the field?**
A6: Yes. Blood is visible in the lower-left portion of the view.
- Q7: Where is the L-hook electrocautery positioned?**
A7: The L-hook electrocautery is at the right-lower quadrant of the image.
- Q8: Is the cystic duct being actively dissected in this frame?**
A8: Yes. The cystic duct is being actively dissected by the hook.
- Q9: Where is the gastrointestinal tract visible?**
A9: The gastrointestinal tract appears on the right side of the field.
- Q10: Where is fatty tissue located in the view?**
A10: Fatty tissue is located toward the right-lower portion of the image.

Conversational-2 (10 Qs) (\$0.0019)

- Q1: Which instrument is visible in this frame and what is it doing?**
A1: A single L-hook electrocautery is visible in the operative field, and it is actively dissecting the cystic duct.
- Q2: What surgical phase is depicted in this image?**
A2: This view corresponds to the Calot triangle dissection phase.
- Q3: Where is the hook located relative to the gallbladder in the image?**
A3: The hook is positioned to the right and slightly inferior in the field relative to the gallbladder, adjacent to the gallbladder's lower-right region.
- Q4: Is there any grasper visible in this frame?**
A4: No. Only the hook electrocautery is visible; there is no grasper present in this image.
- Q5: Where is the liver located within the frame relative to the hook?**
A5: The liver occupies the upper portion of the image and is superior to the hook.
- Q6: Is blood visible in the scene, and if so where?**
A6: Yes. Blood is visible in the lower-left portion of the image, separated from the hook which is on the right side.
- Q7: Are there any gastrointestinal structures visible, and where are they relative to the gallbladder?**
A7: Yes. The gastrointestinal tract is visible on the right side of the image, lateral to the gallbladder and near the hook.
- Q8: Is fatty tissue present near the dissection site, and where is it located?**
A8: Fatty tissue is present and is seen toward the right-bottom region adjacent to the gallbladder and hook.
- Q9: Describe the spatial relationship among the hook, the cystic duct, and the gallbladder as seen.**
A9: The hook is adjacent to the gallbladder's lower-right area and is directly dissecting the cystic duct, placing the cystic duct between the hook and the gallbladder's inferior aspect.
- Q10: Is the abdominal wall visible in this view, and where is it located?**
A10: Yes. The abdominal wall is visible near the center-bottom of the image, inferior to the operative field.

Complex Reasoning (1 Qs) (\$0.0030)

- Q1: Given that a hook electrocautery is actively dissecting the cystic duct in a field with nearby gastrointestinal structures to the right and a small amount of blood present inferiorly, what concrete steps should the surgeon take to confirm that the structure being taken is indeed the cystic duct before any clipping or transection?**

A1: First, continue careful skeletonization of the structure with the hook to expose its course from the gallbladder infundibulum toward the hepatobiliary pedicle, using short, controlled strokes and blunt spreading rather than large, deep sweeps. Ensure the hepatocystic triangle has been cleared of connective and fatty tissue so only two structures enter the gallbladder (the duct and the artery) — this visual clearance is the critical-view criterion for identification. Look for the tubular appearance of the duct, its continuity with the gallbladder, and absence of other ducts joining it in the field. Because adjacent bowel lies to the right, avoid lateral thermal spread by keeping the active electrode point directed away from that side and by maintaining traction-countertraction to place the duct on tension while dissection proceeds medially. Only after the duct is fully skeletonized, its proximal and distal courses are visualized, and the cystic artery is identified and protected, should clipping be considered. If any doubt remains, obtain an intraoperative cholangiogram or convert to an alternate safe strategy (e.g., further exposure or referral) rather than proceeding to clip based on an uncertain anatomy.

Concise (\$0.0007)

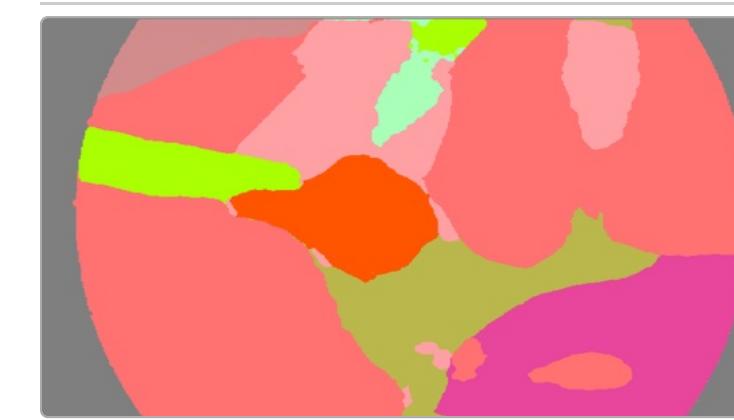
A hook electrocautery is actively dissecting the cystic duct to the right of the gallbladder. The liver is visible superiorly in the field.

Detailed (\$0.0008)

The view is focused on the hepatobiliary region during Calot triangle dissection. The liver forms the upper field background. The gallbladder occupies the central-right lower area of the image, and is actively dissecting at the cystic duct region adjacent to the gallbladder. Fatty and connective tissue layers lie in the lower field beneath the working area. The gastrointestinal tract is visualized to the right of the gallbladder. A small amount of blood is visible in the lower-left portion, and the abdominal wall is seen along the lower central portion of the frame. The hook is the sole active instrument in this frame, engaged in dissection of the cystic duct.



Segmentation Mask



Legend



FASL Prediction (Conf: 0.9432)

Context (LLM Input)

Visible instruments:
Grasper, Hook.

Current phase:
Calot Triangle Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)
- (Hook, Dissect, Gallbladder)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: left-top.
- Liver: right-top, right-bottom, center-top, center-bottom, left-top, left-bottom.
- Gastrointestinal Tract: right-bottom.
- Fat: right-bottom.
- Grasper: left-top.
- Connective Tissue: center.
- L-hook Electrocautery: center-top.
- Gallbladder: top.

Relative Positions:

- Abdominal Wall is to the left of Gastrointestinal Tract.
- Liver is to the right of Abdominal Wall.
- Gastrointestinal Tract is toward the bottom of Gallbladder.
- Fat is to the right of Abdominal Wall.
- Grasper is to the left of Fat.
- Connective Tissue is to the left of Gastrointestinal Tract.
- L-hook Electrocautery is to the right of Abdominal Wall.
- Gallbladder is to the right of Abdominal Wall.

Conversational-1 (10 Qs) (\$0.0024)

Q1: Is the grasper visible in the frame?
A1: Yes, the grasper is visible.

Q2: Where is the grasper located in the view?
A2: The grasper is in the upper-left portion of the frame.

Q3: What is the grasper doing?
A3: The grasper is retracting the gallbladder.

Q4: Is the hook visible in the frame?
A4: Yes, the hook (L-hook electrocautery) is visible.

Q5: What is the hook doing?
A5: The hook is dissecting the gallbladder.

Q6: Where is the gallbladder located in the image?
A6: The gallbladder is in the upper central portion of the view.

Q7: Is the liver visible in this image?
A7: Yes, the liver is visible.

Q8: Where is the liver located in the operative field?
A8: The liver occupies the right side of the field.

Q9: Is fatty tissue visible in the field?
A9: Yes, fatty tissue is visible.

Q10: Where is the L-hook electrocautery positioned?
A10: The L-hook is positioned in the upper-central area, slightly to the right.

Conversational-2 (10 Qs) (\$0.0015)

Q1: What instruments are visible in this frame?
A1: A single grasper (left-top) and an L-hook electrocautery (center-top) are visible.

Q2: Which instrument is retracting the gallbladder, and where is that instrument located in the image?
A2: The grasper is retracting the gallbladder; it is located at the left-top of the image, holding the gallbladder near the top.

Q3: Which instrument is performing dissection, and what is it dissecting?
A3: The L-hook electrocautery is performing dissection and is working on the gallbladder.

Q4: What major anatomical structures are visible and where are they located spatially?
A4: Visible structures include the gallbladder at the top/central area, the liver predominantly on the right side of the field, the abdominal wall at the left-top, connective tissue centrally, and portions of the gastrointestinal tract and fat at the right-bottom.

Q5: How are the grasper and L-hook positioned relative to each other?
A5: The grasper is at the left-top, holding the gallbladder superiorly, while the L-hook is more central-top and positioned toward the gallbladder from the right-central area.

Q6: Is there any visible blood in this frame?
A6: No; there is no visible blood in the current segmentation—no bleeding is seen.

Q7: During which phase of the procedure is this image taken?
A7: This image is from the Calot triangle dissection phase of the cholecystectomy.

Q8: Where is the connective tissue relative to the instruments and gallbladder?
A8: Connective tissue is located centrally, beneath or adjacent to the instruments; the grasper is superior-left of it and the L-hook is positioned centrally above or near it, with the gallbladder at the top contacting those tissues.

Q9: Are multiple graspers present, or a single grasper?
A9: A single grasper is present (at the left-top of the image).

Q10: Is the gastrointestinal tract visible, and if so, where?
A10: Yes—the gastrointestinal tract is visible at the right-bottom of the image.

Complex Reasoning (2 Qs) (\$0.0021)

Q1: Given that the grasper is holding and retracting the gallbladder while the hook is actively dissecting it, what is the immediate anatomical goal of this maneuver and how does the instrument positioning support achieving it?

A1: The immediate goal is to open and define the Calot triangle by separating the gallbladder infundibulum/cystic plate from surrounding fat and connective tissue so the cystic duct and cystic artery can be identified. The grasper provides steady traction on the gallbladder to create tension and countertraction, which stretches the tissue planes and exposes the tissue planes medially. The hook, coming in from the opposite side, uses that tension to divide adhesions and connective tissue precisely. This traction-dissection pairing reduces the amount of blind force needed and progressively unveils the structures that must be skeletonized before any clipping or division.

Q2: How should the direction and degree of traction be adjusted now to optimize exposure of the Calot triangle while minimizing the risk of tearing the gallbladder wall?

A2: Traction should be firm but controlled and directed so that the infundibulum is pulled laterally and slightly cephalad (upward and away from the liver), which opens the triangle between the gallbladder, cystic duct, and common hepatic duct. Excessive traction or a dorsal pull risks thin-wall tearing or avulsion at the gallbladder neck; insufficient traction flattens the plane and obscures anatomy. Given the hook is dissecting from the opposite side, maintain steady countertraction with small incremental repositioning of the grasper as dissection progresses so the hook can take small precise bites rather than large forced cuts. If the grasping force appears to bunch tissue, adjust grasp location more laterally on the fundus/infundibulum to distribute force and protect the wall.

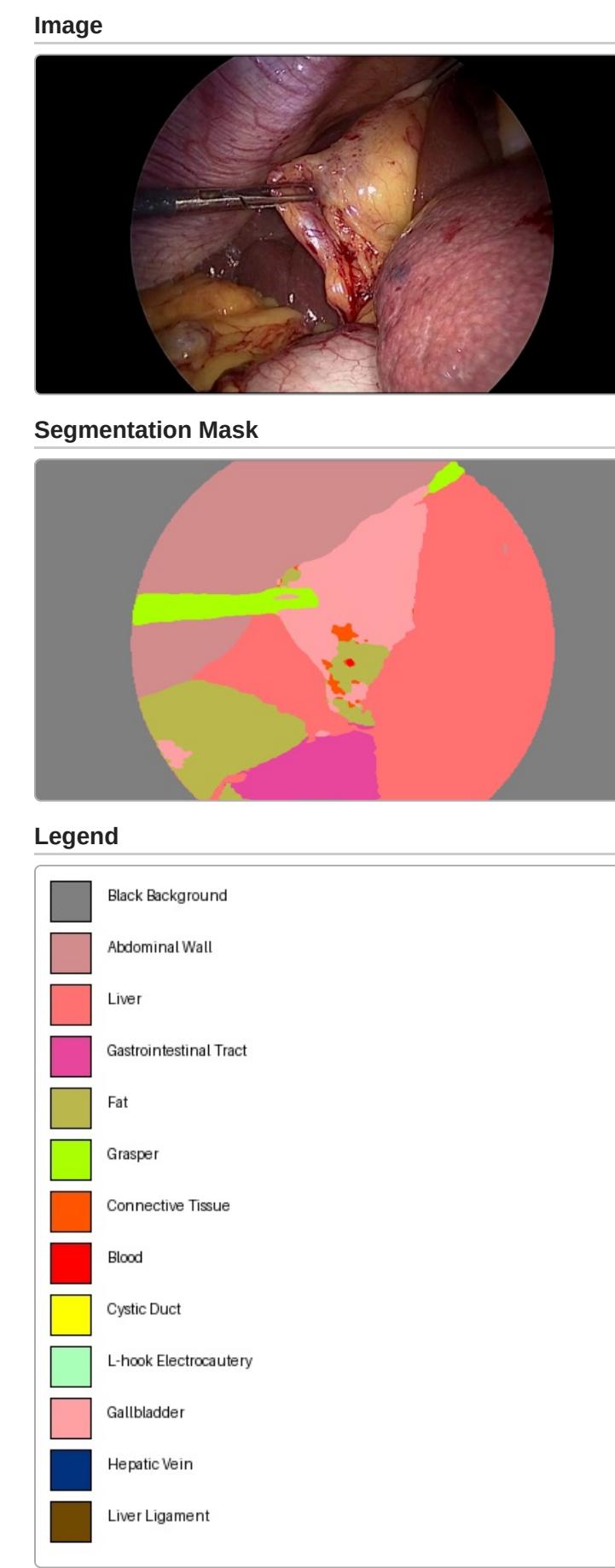
Concise (\$0.0006)

During Calot triangle dissection, a grasper at the left-top retracts the gallbladder.

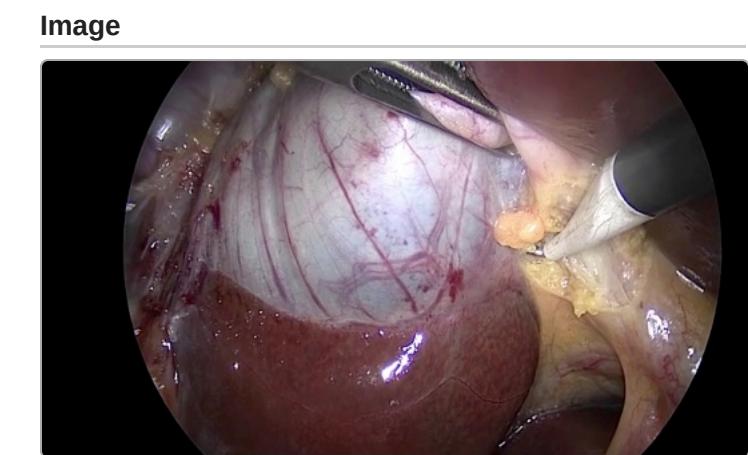
An L-hook electrocautery at the top/center actively dissects the gallbladder near the liver, with connective tissue centrally.

Detailed (\$0.0007)

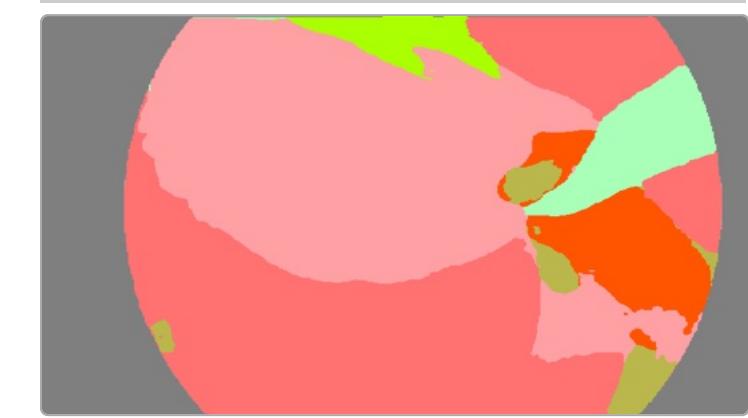
The view is focused on the superior aspect of the gallbladder, which sits centrally toward the top of the image. A laparoscopic grasper enters from the left-upper field and is actively holding and retracting the gallbladder to provide tension and exposure of the Calot's triangle. An L-hook electrocautery approaches from a more central-right/top position and is actively dissecting along the gallbladder margin, using electrocautery to free adhesions and connective tissue immediately adjacent to the gallbladder. The liver forms the right/background of the field. Connective tissue lies between the working instruments and the deeper viscera, while omental/fatty and gastrointestinal structures are positioned more toward the lower-right portion of the image.



Context (LLM Input)	Conversational-1 (10 Qs) (\$0.0016)	Conversational-2 (10 Qs) (\$0.0017)	Complex Reasoning (2 Qs) (\$0.0021)	Concise (\$0.0005)
<p>Visible instruments: Grasper.</p> <p>Current phase: Preparation</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left. - Liver: right. - Gastrointestinal Tract: center-bottom. - Fat: left-bottom. - Grasper: left-top. - Connective Tissue: center. - Blood: center. - Gallbladder: top.</p> <p>Relative Positions: - Abdominal Wall is towards the top of Gastrointestinal Tract. - Liver is to the right of Abdominal Wall. - Gastrointestinal Tract is toward the bottom of Grasper. - Fat is to the left of Liver. - Grasper is to the left of Liver. - Connective Tissue is toward the bottom of Abdominal Wall. - Blood is to the right of Grasper. - Gallbladder is towards the top of Gastrointestinal Tract.</p>	<p>Q1: Is a grasper instrument visible in this frame? A1: Yes. A grasper is visible at the upper-left area of the view.</p> <p>Q2: Is a hook instrument visible in this frame? A2: No. A hook is not visible in this image.</p> <p>Q3: What is the grasper doing in this scene? A3: The grasper is retracting the gallbladder.</p> <p>Q4: Where is the gallbladder located in the image? A4: The gallbladder is located at the top of the operative field.</p> <p>Q5: Where is the liver located in the image? A5: The liver is on the right side of the view.</p> <p>Q6: Is there visible blood in the operative field? A6: Yes. There is blood visible centrally in the field.</p> <p>Q7: Where is the connective tissue located in the image? A7: Connective tissue is located in the central portion of the field.</p> <p>Q8: Where is the gastrointestinal tract located in the image? A8: The gastrointestinal tract appears in the lower-central portion of the view.</p> <p>Q9: Is fatty tissue visible in this frame? A9: Yes. Fatty tissue is visible toward the lower-left portion of the field.</p> <p>Q10: Where is the abdominal wall located in the image? A10: The abdominal wall is visible on the left side of the view.</p>	<p>Q1: What instrument is visible in this frame? A1: A single grasper is visible.</p> <p>Q2: What phase of the procedure does this image correspond to? A2: This image is during the preparation phase of the operation.</p> <p>Q3: What is the grasper doing in this view? A3: The grasper is grasping and retracting the gallbladder.</p> <p>Q4: Which organs and tissues are visible, and where are they located in the field? A4: I can see the gallbladder in the upper part of the field, the liver on the right, the gastrointestinal tract in the central-to-lower area, fat toward the left-bottom, connective tissue centrally, blood in the center, and the abdominal wall toward the left.</p> <p>Q5: Relative to the grasper, where is the blood observed? A5: The blood collection is located to the right of the grasper.</p> <p>Q6: Where is the grasper positioned relative to the liver and the gastrointestinal tract? A6: The grasper is positioned to the left of the liver and superior to the gastrointestinal tract.</p> <p>Q7: Is any electrocautery or other instrument visible in the frame? A7: No. There are no electrocautery instruments or other tools visible—only the grasper.</p> <p>Q8: Is the grasper pulling the gallbladder toward a particular direction in the frame? A8: Yes. The grasper is retracting the gallbladder upward and toward the upper-left region of the image.</p> <p>Q9: Are there surrounding tissues immediately adjacent to the gallbladder that are visible? A9: Yes. Fat and connective tissue are visible adjacent to the gallbladder in the central and lower parts of the field.</p> <p>Q10: Is there evidence that the grasper is manipulating any structure other than the gallbladder? A10: No. The visible action is focused on grasping and retracting the gallbladder; other structures are adjacent but not being actively manipulated.</p>	<p>Q1: Given that the grasper is actively retracting the gallbladder while there is visible blood and connective tissue nearby, what immediate steps should the surgeon take to safely continue the operation and why? A1: The priority is to restore and maintain a clear, stable operative field before further manipulation. Immediate steps: (1) Introduce suction and evacuate the blood to identify its source; pooled blood obscures anatomy and can mask ongoing bleeding. (2) Lighten or adjust traction on the gallbladder if the wall appears tense—excessive traction can avulse small vessels or cause perforation and bile spillage. (3) Inspect the exposed area after suction to determine whether the bleeding is from the liver bed, an avulsed cystic branch, or superficial connective tissue. (4) If bleeding is ongoing and from a discrete vessel, apply targeted hemostasis (direct pressure with suction or a grasper, bipolar or hook cautery, or a clip as appropriate). These steps reduce the risk of misidentifying anatomy, prevent obscured dissection that could injure biliary structures, and allow safe continuation of preparation and dissection.</p> <p>Q2: How should the direction and quality of traction on the gallbladder be adjusted now to optimize later identification of the cystic pedicle anatomy, and what is the rationale? A2: Traction should be applied cephalad and slightly lateral (upward and toward the patient's right when viewing the typical laparoscopic view) with gentle, sustained tension on the infundibulum rather than the fundus. This orientation rotates and exposes the hepatocystic triangle while placing the cystic duct and artery on tension, facilitating safe dissection later. The quality of traction should be steady but not excessive—intermittent relaxation allows assessment of tissue laxity and avoids tearing fragile connective tissue or the gallbladder wall. Proper directional traction converts obscured planes into defined ones, minimizing blind dissection and decreasing the risk of bile duct or vascular injury when the surgeon proceeds to isolate and identify the pedicle.</p>	<p>A grasper at the upper-left actively retracts the gallbladder in the upper field. The liver lies to the right, with connective tissue and a small blood area centrally.</p> <p>Detailed (\$0.0006)</p> <p>The view is a preparatory exposure of the upper abdomen focused on the gallbladder. The gallbladder lies in the upper portion of the image, being actively retracted by a single grasper that enters from the left–upper quadrant. The grasper is holding and elevating the gallbladder to create tension and improve visualization.</p> <p>The liver forms the right-side background. The abdominal wall is visible toward the left side of the field, with fatty tissue located in the left–lower area. Central structures include connective tissue overlying the operative site and a small amount of blood near the center. The gastrointestinal tract lies in the lower–central portion of the view beneath the gallbladder. No other instruments are present.</p>



Segmentation Mask



Legend



FASL Prediction (Conf: 0.9455)

Context (LLM Input)

Visible instruments:
Grasper, Hook.

Current phase:
Calot Triangle Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)
- (Hook, Dissect, Gallbladder)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: right-top, center-left, center-right, left-top, left-bottom.
- Liver: bottom.
- Gastrointestinal Tract: bottom.
- Fat: right.
- Grasper: center-top.
- Connective Tissue: right-bottom.
- L-hook Electrocautery: right-top, left-top.
- Gallbladder: center-top, center-right, right-bottom, top.

Relative Positions:
- Abdominal Wall is to the left of L-hook Electrocautery.
- Liver is to the left of L-hook Electrocautery.
- Gastrointestinal Tract is to the left of Connective Tissue.
- Fat is toward the bottom of Grasper.
- Grasper is to the left of Connective Tissue.
- Connective Tissue is to the right of Gallbladder.
- L-hook Electrocautery is to the right of Gallbladder.
- Gallbladder is to the left of Fat.

Conversational-1 (13 Qs) (\$0.0023)

- Q1: Is the grasper visible in this frame?**
A1: Yes.
- Q2: Where is the grasper located in the view?**
A2: Center-top of the operative field.
- Q3: What is the grasper doing in this image?**
A3: Retracting the gallbladder.
- Q4: Is the hook electrocautery visible in this frame?**
A4: Yes.
- Q5: Where is the hook electrocautery located?**
A5: Right side of the view, toward the upper-right region.
- Q6: What is the hook electrocautery doing in this image?**
A6: Dissecting the gallbladder.
- Q7: Is the gallbladder visible in this frame?**
A7: Yes.
- Q8: Where is the gallbladder located in the view?**
A8: Central and toward the upper-right portion of the field.
- Q9: Is the liver visible in this frame?**
A9: Yes.
- Q10: Where is the liver located in the view?**
A10: Along the bottom of the field.
- Q11: Where is connective tissue located in the view?**
A11: Right-bottom region.
- Q12: Where is the abdominal wall located in the view?**
A12: Across the upper and lateral portions of the view.
- Q13: Is fatty tissue visible in this frame?**
A13: Yes, on the right side of the field.

Conversational-2 (10 Qs) (\$0.0015)

- Q1: What instruments are visible in this frame and how many of each?**
A1: There is one grasper and one hook electrocautery (L-hook) visible.
- Q2: Which instrument is retracting the gallbladder and which is performing dissection?**
A2: The grasper is retracting the gallbladder; the hook electrocautery is dissecting the gallbladder.
- Q3: Where is the gallbladder located in the image relative to the frame and other organs?**
A3: The gallbladder is located in the upper-central portion of the field (top/center-top). The liver lies inferior (toward the bottom) of the gallbladder.
- Q4: What tissues or structures are immediately to the right of the gallbladder?**
A4: To the right of the gallbladder are connective tissue, fatty tissue, and the L-hook electrocautery instrument.
- Q5: How is the grasper positioned relative to the gallbladder and the connective tissue?**
A5: The grasper is at the upper center and is left of the connective tissue; it is grasping and retracting the gallbladder upward/centrally.
- Q6: Is the liver visible in this frame, and if so, where is it located?**
A6: Yes. The liver is visible and occupies the lower portion of the image (toward the bottom).
- Q7: During this Calot triangle dissection view, which structures are being manipulated versus which are passive?**
A7: Manipulated: the gallbladder is being retracted by the grasper and dissected by the hook. Passive: the liver, surrounding fat, and connective tissue are present but not actively instrumented in this frame.
- Q8: Is there evidence of multiple abdominal wall regions visible, and where are they positioned?**
A8: Yes. Abdominal wall is visible in multiple areas, primarily toward the left and upper parts of the image, as well as some portions toward the center.
- Q9: Is the fat layer visible relative to the gallbladder, and where is it located?**
A9: Yes. Fatty tissue is visible to the right of the gallbladder and generally toward the right side of the field.
- Q10: Based on what is visible, is the hook currently in contact with the gallbladder?**
A10: Yes. The hook electrocautery is positioned at the right side of the gallbladder and is actively dissecting tissue along the gallbladder margin.

Complex Reasoning (2 Qs) (\$0.0023)

- Q1: Given that the gallbladder is under traction by a grasper while a hook is actively dissecting the gallbladder, what is the immediate anatomical and procedural goal the surgeon is trying to accomplish in this moment?**

A1: With the grasper applying sustained retraction and the hook dividing tissues adjacent to the gallbladder, the immediate goal is to open and define the hepatocystic (Calot) triangle by developing the correct dissection plane around the infundibulum. Traction on the gallbladder creates tension that separates tissue layers, while the hook is used to divide connective/fatty tissue and adhesions so that the cystic duct and artery can be visualized as discrete structures. Achieving this exposure is a prerequisite for safe identification (and later clipping/dividing) of the ductal and vascular structures.

- Q2: What specific adjustments to electrocautery technique and instrument positioning would minimize the risk of thermal injury to adjacent liver tissue during this step?**

A2: To reduce thermal spread when the hook is dissecting close to the liver/gallbladder interface, the surgeon should (1) keep the hook tip in direct contact with the target tissue and oriented parallel to the tissue plane to avoid stray current, (2) use short, intermittent coagulation pulses rather than prolonged activation, (3) maintain firm, countertraction with the grasper so the target tissue is taut and clearly separated from the liver parenchyma, and (4) limit power settings to the minimum effective level. Additionally, blunt dissection with the grasper or scissors can be used to free tissue before any cutting current is applied, and suction/irrigation should be immediately available to clear char or smoke that can obscure landmarks.

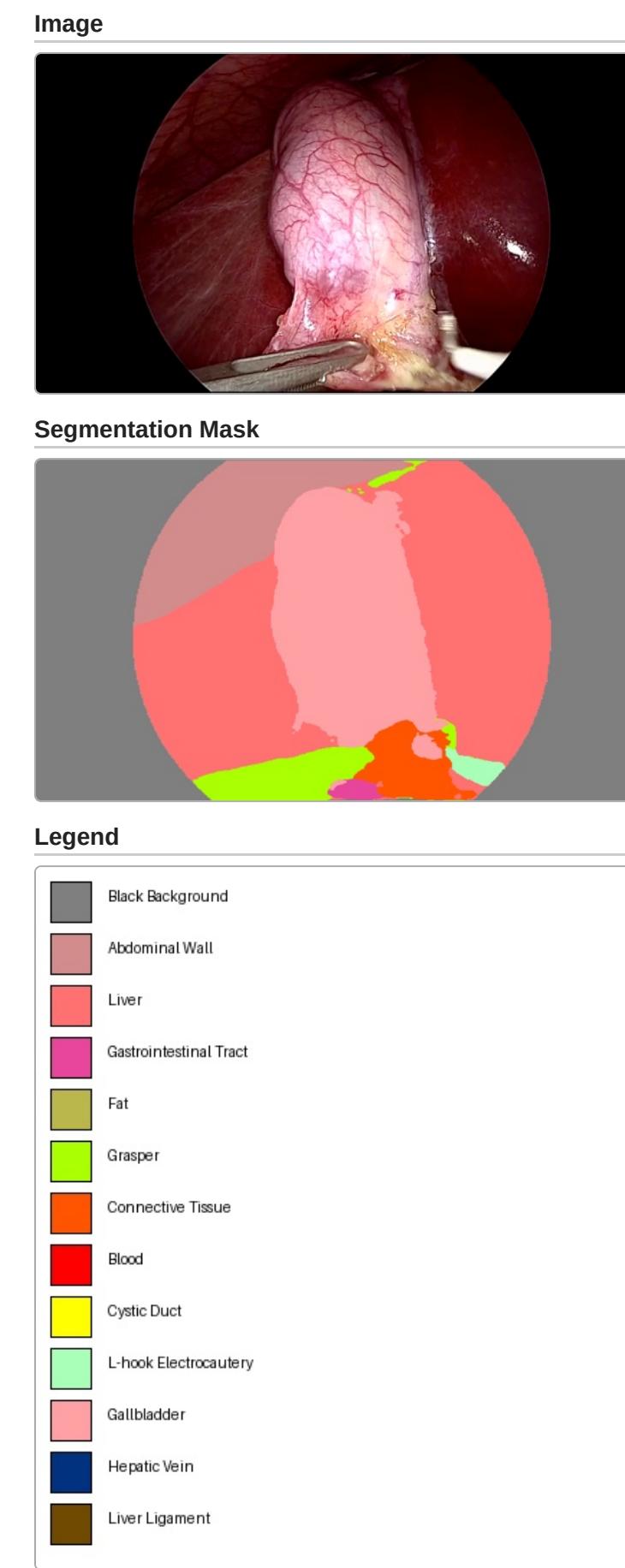
Concise (\$0.0006)

A grasper at the central top retracts the gallbladder while the hook electrocautery actively dissects the gallbladder to its right. Connective tissue lies lateral to the gallbladder, fat is inferior, and the liver is located inferiorly.

Detailed (\$0.0009)

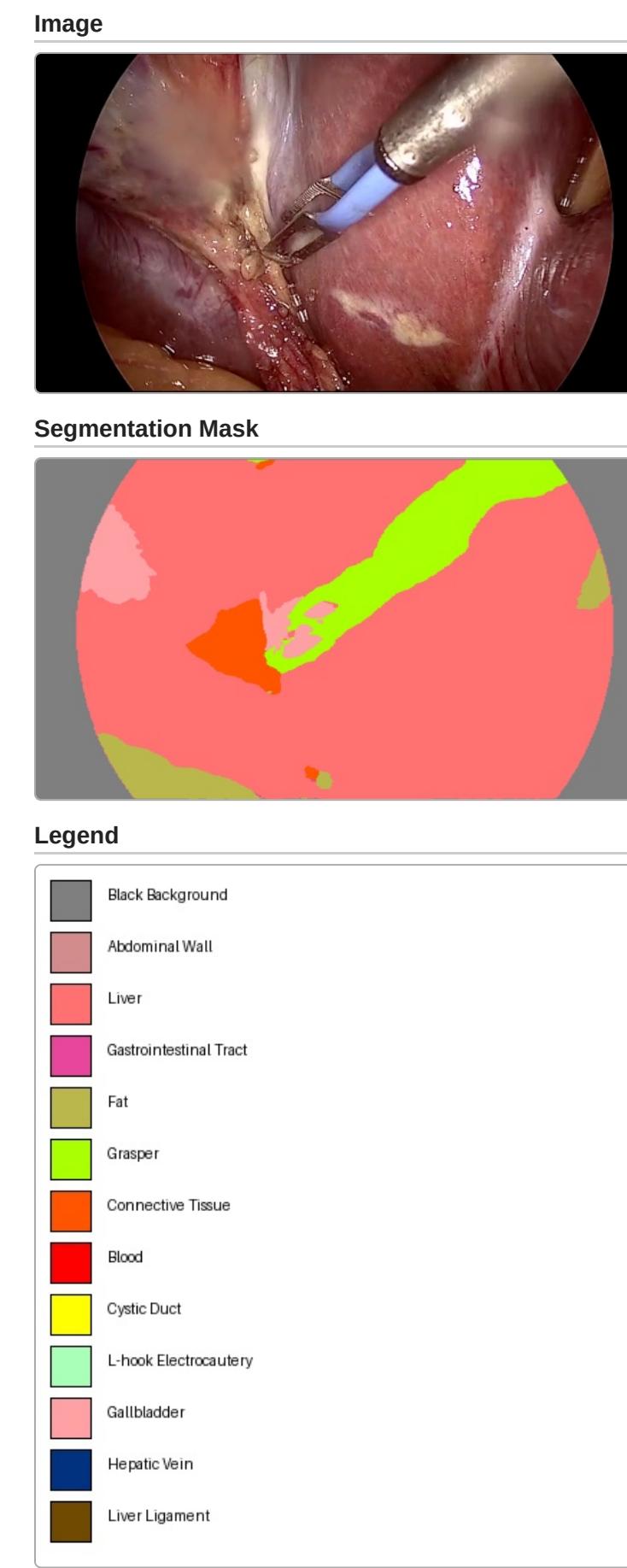
The image is a close-up of the gallbladder occupying the upper-central portion of the field. The liver forms the deeper background toward the lower part of the view. Fatty tissue lies to the right side of the operative field, and a band of connective tissue is present along the right-lower margin adjacent to the gallbladder.

A laparoscopic grasper is positioned at the upper/central-left area and is firmly holding and retracting the gallbladder upward and slightly leftward to expose Calot's triangle. An L-hook electrocautery approaches from the right/top and is positioned at the gallbladder margin; it is actively dissecting tissue off the gallbladder (working toward the connective tissue on the gallbladder's right side). Both instruments are engaged: the grasper providing traction, the hook performing dissection.



Context (LLM Input)
<p>Visible instruments: Grasper.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left-top. - Liver: right-bottom, right, center-top, center-bottom, left-bottom. - Gastrointestinal Tract: center-bottom, right-bottom. - Fat: right-bottom. - Grasper: left-bottom. - Connective Tissue: center-bottom. - L-hook Electrocautery: right-bottom. - Gallbladder: center-bottom.</p> <p>Relative Positions: - Abdominal Wall is towards the top of Fat. - Liver is towards the top of Fat. - Gastrointestinal Tract is toward the bottom of Abdominal Wall. - Fat is toward the bottom of Gallbladder. - Grasper is toward the bottom of Abdominal Wall. - Connective Tissue is toward the bottom of Abdominal Wall. - L-hook Electrocautery is toward the bottom of Abdominal Wall. - Gallbladder is towards the top of L-hook Electrocautery.</p>

Conversational-1 (10 Qs) (\$0.0016)	Conversational-2 (8 Qs) (\$0.0017)	Complex Reasoning (2 Qs) (\$0.0019)	Concise (\$0.0008)
<p>Q1: Is a grasper instrument visible in this image? A1: Yes, a grasper is visible.</p> <p>Q2: Where is the grasper located in the operative view? A2: The grasper is located in the lower-left portion of the frame.</p> <p>Q3: What is the grasper doing in this frame? A3: The grasper is retracting the gallbladder.</p> <p>Q4: Is the gallbladder visible in this image? A4: Yes, the gallbladder is visible.</p> <p>Q5: Where is the gallbladder located in the frame? A5: The gallbladder is in the central lower portion of the view.</p> <p>Q6: Is the liver visible in this image? A6: Yes, the liver is visible.</p> <p>Q7: Is fatty tissue visible in this image? A7: Yes, fatty tissue is visible.</p> <p>Q8: Where is the abdominal wall located in the view? A8: The abdominal wall is in the upper-left area of the field.</p> <p>Q9: Is an L-hook electrocautery instrument visible in this frame? A9: No, an L-hook electrocautery is not visible.</p> <p>Q10: Is there obvious active bleeding visible in the operative field? A10: No obvious active bleeding is visible.</p>	<p>Q1: Which instrument is visible in this frame and where is it located? A1: A single laparoscopic grasper is visible, positioned in the left-bottom portion of the image.</p> <p>Q2: What operative phase is shown in this view? A2: This image depicts the Calot triangle dissection phase.</p> <p>Q3: What structure is the grasper interacting with and what is it doing? A3: The grasper is grasping and retracting the gallbladder.</p> <p>Q4: Where is the gallbladder located in the frame relative to other anatomy? A4: The gallbladder is located centrally toward the bottom of the field, lying above fatty tissue.</p> <p>Q5: Which other anatomical structures are visible around the gallbladder? A5: The liver appears on the right and lower parts of the field, fatty tissue is beneath and to the right of the gallbladder, and connective tissue is present near the center-bottom adjacent to the gallbladder. The abdominal wall is seen toward the top.</p> <p>Q6: Is any electrocautery or other instrument besides the grasper visible? A6: No. Only the grasper is visibly present in this frame; no electrocautery instrument is seen.</p> <p>Q7: How is the grasper positioned relative to the abdominal wall and the fatty tissue? A7: The grasper sits toward the bottom of the abdominal wall and is positioned above the fatty tissue, retracting the gallbladder upward from that area.</p> <p>Q8: Is the gastrointestinal tract visible in this image, and if so where? A8: Yes; portions of the gastrointestinal tract are visible in the center-bottom to right-bottom regions of the image.</p>	<p>Q1: What should the surgeon do immediately before activating the electrosurgical hook to continue dissection in the Calot region? A1: Before energizing the hook, the surgeon should optimize exposure and confirm tissue separation so that energy is applied only to the intended attachments. Concretely: maintain or adjust the current traction with the grasper so the gallbladder is pulled away from the liver and fatty/connective tissue, clearly tenting the plane to be divided; use suction/irrigation if any blood or debris is obscuring the field; ensure the hook tip is visible and oriented away from the liver surface and any tubular structures; and verify that no non-target tissue (bowel, omentum, or fat) lies between the hook and the dissection plane. Only after these steps should brief, precise coagulation/cutting bursts be used to divide adhesions, minimizing thermal spread.</p> <p>Q2: What specific complication is most likely if the electrocautery is activated while adjacent fatty tissue or bowel is not adequately retracted, and how can this be minimized? A2: If the hook is fired while fat or bowel remains close to the working zone, unintended thermal injury (serosal or full-thickness burn) to that non-target tissue is the most likely complication. To minimize this risk: ensure those tissues are mobilized away with the grasper and remain out of the line of fire; use the lowest effective power setting and short activations; keep the hook tip in direct contact only with the target tissue while watching tip position; and have suction ready to remove smoke so visualization remains crisp. If bowel or tenuous tissues cannot be safely moved out of the area, postpone energy application and perform further blunt dissection or repositioning instead.</p>	<p>During Calot triangle dissection, a grasper retracts the gallbladder. The grasper is positioned in the left-lower field, pulling the gallbladder located centrally in the lower field, with liver, fat, and connective tissue nearby.</p> <p>Detailed (\$0.0008)</p> <p>The view focuses on the lower-central operative field where the gallbladder lies near the bottom center of the image. A single grasper enters from the left-lower quadrant and is firmly holding and retracting the gallbladder, providing upward/medial traction to expose the Calot's triangle region.</p> <p>The liver occupies the right and lower background, bordering the gallbladder on the right. Surrounding fatty tissue and connective tissue lie beneath and around the gallbladder, predominantly toward the right-lower field. Portions of the gastrointestinal tract are visible in the lower-central to right-lower area, inferior to the gallbladder. The abdominal wall appears toward the upper-left of the frame.</p> <p>No other instruments are actively engaged in this view; the grasper is the active tool creating tension on the gallbladder to facilitate dissection of the Calot triangle.</p>

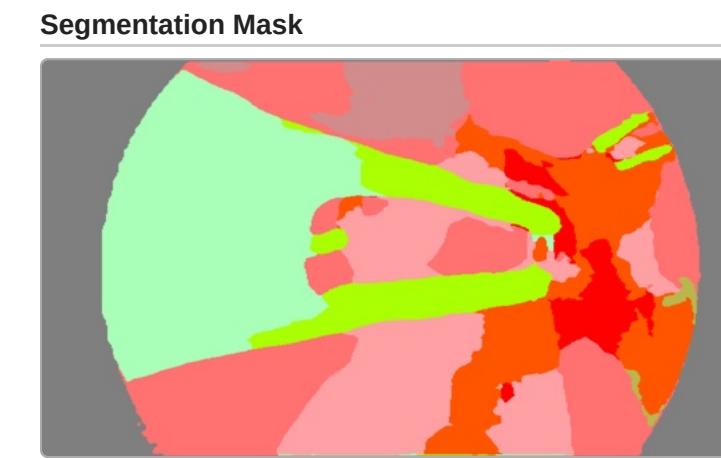
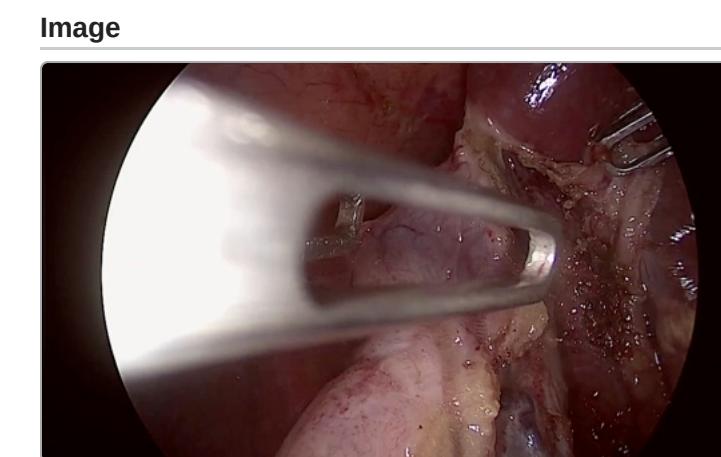


Context (LLM Input)
<p>Visible instruments: Bipolar.</p> <p>Current phase: Gallbladder Dissection</p> <p>Current action triplets (tool, verb, target): - (Bipolar, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left. - Liver: right-top, center-right, left-bottom, center. - Gastrointestinal Tract: left-bottom. - Fat: left-bottom. - Grasper: right-top. - Connective Tissue: left. - Gallbladder: left-top.</p> <p>Relative Positions: - Abdominal Wall is to the left of Grasper. - Liver is to the right of Abdominal Wall. - Gastrointestinal Tract is toward the bottom of Grasper. - Fat is toward the bottom of Grasper. - Grasper is to the right of Gallbladder. - Connective Tissue is to the left of Grasper. - Gallbladder is to the left of Liver.</p>

Conversational-1 (9 Qs) (\$0.0016)	Conversational-2 (10 Qs) (\$0.0019)	Complex Reasoning (2 Qs) (\$0.0021)
Q1: Is a bipolar instrument visible in this frame? A1: Yes. A bipolar instrument is visible.	Q1: What instrument is visible in this frame? A1: A bipolar electrosurgical instrument is visible.	Q1: Why is bipolar energy a sensible choice for the current dissection on the gallbladder surface compared with an active monopolar hook?
Q2: What is the bipolar instrument doing in this scene? A2: The bipolar is dissecting the gallbladder.	Q2: What phase of the procedure is being performed in this image? A2: This image is in the gallbladder dissection phase.	A1: Bipolar energy confines current flow between the instrument jaws, so thermal spread is more localized than with a monopolar hook. In a situation where the energy device is being applied directly at the gallbladder–liver interface, this reduces the chance of unintended thermal injury to adjacent liver parenchyma and surrounding tissues. Bipolar also provides reliable coagulation of small bleeding points in the liver bed while allowing controlled tissue division with less charring and smoke. Given that a grasper is present in the field but not actively cutting, the team can use bipolar to dissect and coagulate while the assistant provides steady retraction; this combination minimizes collateral thermal damage compared with uncontrolled monopolar activation in a crowded operative window.
Q3: Where is the gallbladder located in the view? A3: The gallbladder is in the upper-left central portion of the frame.	Q3: Which structure is the bipolar instrument actively working on? A3: The bipolar instrument is dissecting the gallbladder.	Q2: What specific assistant retraction would best optimize the dissection plane for the bipolar instrument at this moment?
Q4: Where is the bipolar instrument tip relative to the gallbladder? A4: The bipolar tip is adjacent to and contacting the gallbladder, on its right side.	Q4: Where is the gallbladder located in the image relative to the liver? A4: The gallbladder is in the upper-left portion of the field, while the liver occupies the right side of the image; the gallbladder is left of the liver.	A2: The assistant should apply gentle, sustained traction that elevates and slightly abducts the gallbladder away from the liver surface to tension the tissue plane. Traction that lifts the fundus or body away from the liver exposes the hepatocystic plane, allowing the bipolar tips to be introduced into the exact cleavage plane rather than through the gallbladder wall. Importantly, retraction should be steady rather than forceful—this improves visualization for pinpoint coagulation and reduces risk of tearing the gallbladder wall during energy application. The grasper in the field appears available to perform this retraction and should be coordinated with the operator's bipolar activation.
Q5: Where is the liver located in the operative field? A5: The liver is located to the right of the gallbladder, occupying much of the right and central background.	Q5: Are any grasping instruments visible holding the gallbladder? A5: No grasping instruments are visible in this frame; only the bipolar instrument is seen.	
Q6: Is connective tissue visible in the operative field? A6: Yes. Connective tissue is visible on the left side of the field.	Q6: What other anatomical structures are visible near the gallbladder?	
Q7: Where is the abdominal wall located in this view? A7: The abdominal wall is along the left side of the image.	Q7: Is the gastrointestinal tract visible in this frame? A8: Yes. The gastrointestinal tract is visible toward the lower-left portion of the view.	
Q8: Is the gastrointestinal tract visible in this frame? A8: Yes. The gastrointestinal tract is visible toward the lower-left portion of the view.	Q7: Is there visible bleeding in this view? A7: No obvious blood is visible in this image.	
Q9: Is there obvious active bleeding visible in this frame? A9: No. There is no obvious active bleeding visible.	Q8: Is the bipolar in contact with the gallbladder or positioned away from it? A8: The bipolar is in contact with the gallbladder, engaged in dissection along its surface.	
	Q9: How are the abdominal wall, gallbladder, and liver arranged spatially in the field? A9: The abdominal wall appears on the left side of the image, the gallbladder lies in the upper-left region near that abdominal wall, and the liver is positioned on the right side of the field.	
	Q10: Is fatty tissue visible, and if so where is it located? A10: Yes—fatty tissue is visible toward the bottom portion of the image, below and somewhat lateral to the gallbladder.	

Concise (\$0.0007)
A bipolar instrument is actively dissecting the gallbladder in the left-upper field. The liver is visible to the right and the abdominal wall lies on the left.
Detailed (\$0.0011)

The view is focused on the superior-left portion of the operative field where the gallbladder lies at the left-top. A bipolar instrument is present and actively dissecting the gallbladder, working along its surface to separate it from surrounding attachments. The liver occupies the right and right-background of the image, providing the posterior backdrop to the dissection. Connective tissue is adjacent on the left side of the field, and fatty tissue and portions of the gastrointestinal tract lie in the lower-left region beneath the gallbladder. The abdominal wall appears toward the left side of the scene. No other instruments are visible; the bipolar is the active tool performing the dissection.



FASL Prediction (Conf: 0.8827)

Context (LLM Input)

Visible instruments:
Grasper.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)
- (Grasper, Retract, Liver)

Spatial (extracted from model-generated segmentation mask):
Model-generated segmentation mask confidence is below threshold, so spatial context is not included.

Conversational-1 (10 Qs) (\$0.0018)

Q1: Is a grasper visible in this image?

A1: Yes, a grasper is visible.

Q2: Is the gallbladder visible in this image?

A2: Yes, the gallbladder is visible.

Q3: What structure is the grasper holding?

A3: The grasper is holding the gallbladder.

Q4: Is the grasper actively retracting the gallbladder?

A4: Yes, the grasper is retracting the gallbladder.

Q5: Are the grasper jaws closed around tissue?

A5: Yes, the grasper jaws are closed around tissue.

Q6: Is the liver visible in the operative field?

A6: Yes, the liver is visible.

Q7: Is the grasper retracting the liver?

A7: Yes, the grasper is applying retraction that involves the liver region.

Q8: Is any other instrument visible in the frame?

A8: No, no other instrument is visible.

Q9: Is there visible bleeding in the field?

A9: No obvious bleeding is visible.

Q10: Where is the gallbladder located in the view?

A10: The gallbladder is in the upper-central portion of the operative view.

Conversational-2 (9 Qs) (\$0.0018)

Q1: What instrument(s) are visible in this frame?

A1: I see a single laparoscopic grasper in the operative field.

Q2: How many graspers are present?

A2: One grasper is present.

Q3: What phase of the procedure is being shown?

A3: This image corresponds to the gallbladder dissection phase.

Q4: Which structures is the grasper interacting with in this view?

A4: The grasper is retracting the gallbladder and also providing retraction of the liver to expose the dissection plane.

Q5: Is any electrocautery hook or other energy instrument visible?

A5: No. There is no electrocautery hook or other energy instrument visible in this frame.

Q6: Are the cystic duct or cystic artery visible in this image?

A6: They are not visible in this frame.

Q7: Are any surgical clips, sutures, or drains visible?

A7: No surgical clips, sutures, or drains are visible in this image.

Q8: Is the gallbladder being elevated away from the liver bed?

A8: Yes. The grasper is retracting the gallbladder away from the liver surface to facilitate dissection.

Q9: Is there visible active cutting or energy use occurring in this frame?

A9: No active cutting or energy use is visible; only retraction by the grasper is apparent.

Complex Reasoning (2 Qs) (\$0.0027)

Q1: Given that a single grasping instrument is providing traction on the gallbladder and adjacent liver tissue while no energy device is currently active, what is the most likely immediate operative objective and why?

A1: The immediate objective is to establish and maintain optimal countertraction to expose the dissection plane between the gallbladder and the liver bed so the surgeon can safely continue dissecting the gallbladder off the liver. With only a grasper engaged, the operator is creating tension on the tissue plane (by elevating and/or lateralizing the gallbladder relative to the liver) which helps separate connective tissue fibers, reduces the thickness of the tissue to be divided, and improves visualization. Because no energy instrument is active in the field, the team is likely pausing to confirm exposure, adjust traction angles, or allow an energy device or suction to be introduced under controlled conditions before proceeding with division of attachments.

Q2: How does simultaneous retraction of both the gallbladder and a portion of liver parenchyma change the technical approach to dissection compared with retracting only the gallbladder?

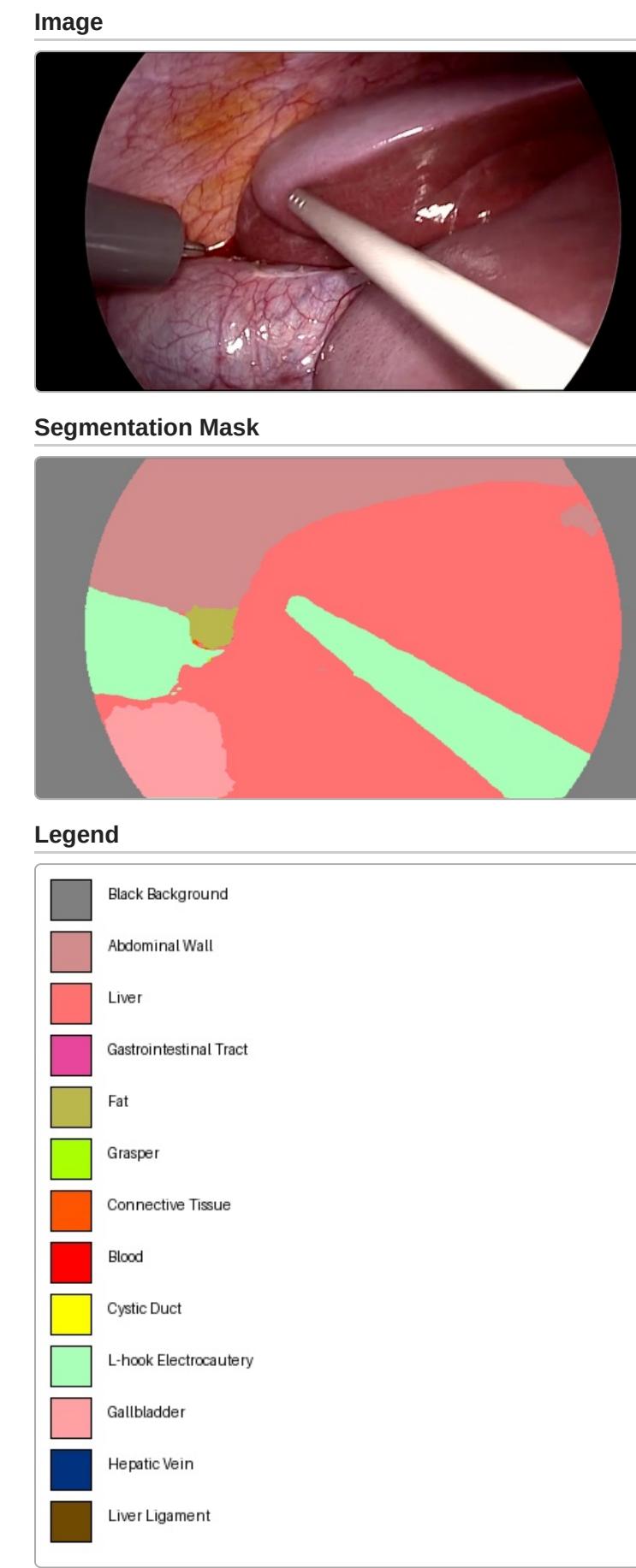
A2: Retracting both structures creates countertraction that flattens and tensions the interface between the gallbladder and liver, making the avascular cleavage plane easier to identify and follow. This approach reduces blind force on the gallbladder wall and concentrates shearing forces along the intended plane, lowering the need for deep energy application. However, it requires gentler, more controlled instrument handling because traction placed on liver parenchyma can increase the risk of capsular tears and bleeding. The surgeon will therefore use short, precise divided strokes with an energy device (when introduced) or blunt dissection while maintaining steady traction to avoid tearing the liver surface.

Concise (\$0.0005)

Only a grasper is visible and is actively retracting the gallbladder and the liver during gallbladder dissection.

Detailed (\$0.0007)

The view is focused on the gallbladder dissection field. A single grasper is actively engaged: it is holding and retracting the gallbladder to provide tension and exposure, and is also retracting the adjacent liver to open the dissection plane between the gallbladder and the liver bed. No other instruments are present or idle in the field. The retraction is creating a clear working space for continued separation of the gallbladder from the hepatic surface.

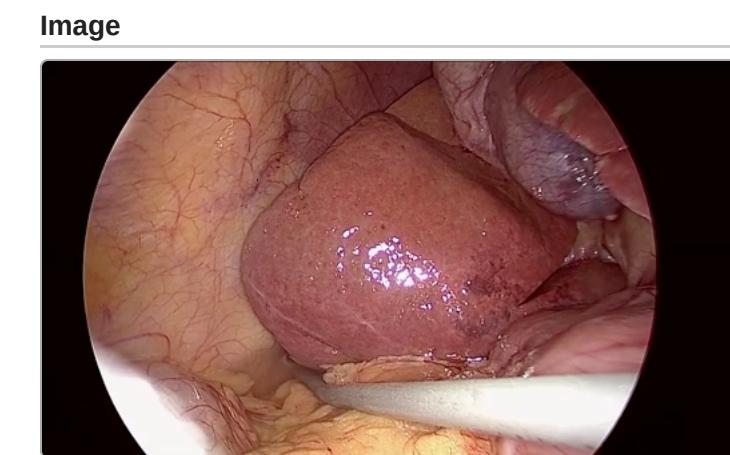


Context (LLM Input)
<p>Visible instruments: Irrigator.</p> <p>Current phase: Gallbladder Dissection</p> <p>Current action triplets (tool, verb, target): - (Irrigator, Aspirate, Fluid)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left-top. - Liver: right-top, center-left. - Gastrointestinal Tract: center-left. - Fat: center-left. - Grasper: center-left. - Connective Tissue: center-left. - L-hook Electrocautery: bottom. - Gallbladder: left-bottom.</p> <p>Relative Positions: - Abdominal Wall is towards the top of Gallbladder. - Liver is to the right of Gallbladder. - Gastrointestinal Tract is to the left of Liver. - Fat is to the left of Liver. - Grasper is to the left of Liver. - Connective Tissue is to the left of Liver. - L-hook Electrocautery is toward the bottom of Abdominal Wall. - Gallbladder is to the left of L-hook Electrocautery.</p>

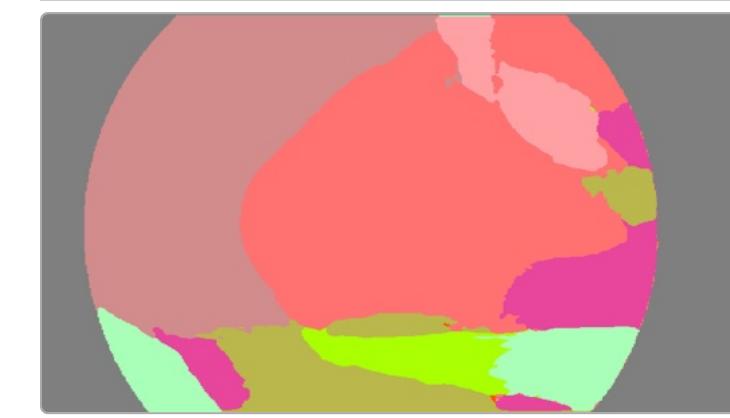
Conversational-1 (10 Qs) (\$0.0022)	Conversational-2 (6 Qs) (\$0.0017)	Complex Reasoning (2 Qs) (\$0.0025)	Concise (\$0.0006)
<p>Q1: Is the irrigator visible in this frame? A1: Yes. The irrigator is visible.</p> <p>Q2: What is the irrigator doing in this image? A2: The irrigator is aspirating fluid from the operative field.</p> <p>Q3: Where is the gallbladder located in the operative view? A3: The gallbladder is located in the left-bottom portion of the frame.</p> <p>Q4: Where is the liver relative to the gallbladder? A4: The liver is to the right of the gallbladder.</p> <p>Q5: Is fluid being removed from the field? A5: Yes. Fluid is being aspirated from the field.</p> <p>Q6: Where is the abdominal wall located in the image? A6: The abdominal wall is at the top of the view.</p> <p>Q7: Where is the gastrointestinal tract located in the view? A7: The gastrointestinal tract is in the center-left of the frame.</p> <p>Q8: Is fatty tissue visible in this image? A8: Yes. Fatty tissue is visible in the center-left area.</p> <p>Q9: Is connective tissue visible in the operative field? A9: Yes. Connective tissue is visible in the center-left region.</p> <p>Q10: How many instruments are visible in this frame? A10: One instrument is visible: the irrigator.</p>	<p>Q1: Which instrument is visible in this frame and what is it doing? A1: A single irrigator (suction/irrigation device) is visible, and it is aspirating fluid from the operative field.</p> <p>Q2: What procedural phase is shown in this image? A2: This image shows the gallbladder dissection phase.</p> <p>Q3: Where is the gallbladder located relative to the liver and the abdominal wall in the image? A3: The gallbladder sits in the lower-left portion of the field; the liver is to the right of the gallbladder, and the abdominal wall is superior (toward the top) relative to the gallbladder.</p> <p>Q4: Are any graspers or electrocautery instruments visible alongside the irrigator? A4: No. Only the irrigator is visible in this frame; no grasper or electrocautery device is seen.</p> <p>Q5: From which part of the operative field is the irrigator removing fluid? A5: The irrigator is aspirating pooled fluid from the area adjacent to the gallbladder in the lower-left/central-lower portion of the field.</p> <p>Q6: Is the irrigator interacting with any other visible tissue structures, and if so, which ones? A6: Yes—the irrigator is acting in the immediate vicinity of the gallbladder and the surrounding connective/fatty tissue, removing fluid from that area.</p>	<p>Q1: Why is suction being applied at this point in the dissection, and what immediate benefits does it provide for the surgeon's next maneuvers? A1: Suction is being applied to evacuate pooled fluid (blood, irrigation, or bile) from the dependent space around the gallbladder so the operating field is clear. The irrigator is actively aspirating while the grasper and energy device remain present but not in use. Clearing this fluid immediately improves visualization of the gallbladder–liver interface and Calot's region, allows accurate identification of tissue planes, and reduces obscuration that could lead to misdirected dissection. It also reduces the risk that electrocautery energy will be dissipated through pooled fluid or produce steam and thermal spread; once the field is dry, the surgeon can safely resume controlled hook dissection or apply energy for hemostasis with better precision.</p> <p>Q2: How should the presence of residual fluid influence the timing and mode of use of electrocautery for continued gallbladder dissection? A2: Residual fluid should delay activation of monopolar electrocautery until the pooled fluid is controlled. In this frame the irrigator is actively aspirating and the L-hook electrocautery is present but currently idle. Activating the hook while fluid remains can shunt current, cause unintended tissue heating, steam formation, or spread of thermal injury. Therefore the correct sequence is to aspirate dependent fluid to create a dry working surface, confirm tissue planes under direct vision, and then intermittently use short, targeted bursts of electrocautery for dissection or hemostasis. If bleeding is present, suction first, then apply energy under direct visualization rather than coagulating blindly through fluid.</p>	<p>The irrigator is actively aspirating fluid from the gallbladder region during gallbladder dissection. The gallbladder is located lower-left with the liver to the right and the abdominal wall superiorly. No other instruments are active.</p> <p>Detailed (\$0.0011)</p> <p>The image shows the gallbladder located in the left-lower portion of the field with the liver situated to its right and forming the right/background. The abdominal wall is visible toward the top of the image. Central-left areas contain fatty and connective tissue and portions of the gastrointestinal tract adjacent to the liver.</p> <p>A single irrigator is present and actively aspirating pooled fluid from the lower working area adjacent to the gallbladder. No other instruments are currently engaged in the frame. The irrigator's active suction is clearing fluid around the gallbladder during the gallbladder dissection phase to improve visualization of the surgical field.</p>



Context (LLM Input)	Conversational-1 (7 Qs) (\$0.0026)	Conversational-2 (7 Qs) (\$0.0016)	Complex Reasoning (2 Qs) (\$0.0026)	Concise (\$0.0005)
<p>Visible instruments: Grasper.</p> <p>Current phase: Gallbladder Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Grasp, Gallbladder) - (Grasper, Null Verb, Null Target)</p> <p>Spatial (extracted from model-generated segmentation mask): Model-generated segmentation mask confidence is below threshold, so spatial context is not included.</p>	<p>Q1: Is a grasper instrument visible in this frame? A1: Yes. A grasper is visible.</p> <p>Q2: Is the grasper holding any tissue? A2: Yes. The grasper is holding tissue.</p> <p>Q3: Which structure is the grasper holding? A3: The grasper is holding the gallbladder.</p> <p>Q4: Is the grasper closed around the tissue it is holding? A4: Yes. The grasper is closed around the gallbladder.</p> <p>Q5: Is a hook electrocautery visible in this image? A5: No. A hook electrocautery is not visible.</p> <p>Q6: Is the gallbladder present in the operative field? A6: Yes. The gallbladder is present and visible.</p> <p>Q7: Is the gallbladder being manipulated in this frame? A7: Yes. The gallbladder is being manipulated by the grasper.</p>	<p>Q1: What instruments are visible in this frame? A1: A single laparoscopic grasper is visible.</p> <p>Q2: What phase of the cholecystectomy is shown in this image? A2: The procedure is in the gallbladder dissection phase.</p> <p>Q3: Which anatomical structure is the grasper holding? A3: The grasper is grasping the gallbladder.</p> <p>Q4: How many instruments are in contact with the gallbladder? A4: One instrument—the grasper—is in contact with the gallbladder.</p> <p>Q5: Is any electrocautery or hook instrument visible or active in this frame? A5: No. There is no electrocautery or hook instrument visible or active in this frame.</p> <p>Q6: Is the grasper also engaging any other tissue besides the gallbladder? A6: No. The grasper is holding only the gallbladder in this view.</p> <p>Q7: Is the grasper visibly applying traction/retraction, or is it simply holding without other instrument interaction? A7: The grasper is holding the gallbladder; no other instrument is visible performing dissection or manipulation in this image.</p>	<p>Q1: With the grasper currently holding the gallbladder and no active dissecting instrument visible, what immediate maneuvers should the surgeon perform to optimize the field for safe continuation of gallbladder bed dissection? A1: When only the grasper is engaged, the priority is to use controlled traction to expose the correct plane between the gallbladder and the liver. Practical maneuvers include: adjust the vector of traction (for example, elevate the fundus or rotate the gallbladder to put tension on the attachment being dissected) to open tissue planes; intermittently release and re-place the grasp to change the bite if the current grip is causing tenting or thinning of the wall; and use the grasper to retract adjacent omental/fatty tissue away from the interface so the working area is clear. These steps improve visualization and create countertraction that will make the subsequent dissection more precise and reduce the risk of inadvertent tearing or deep bites into the liver bed. Distinguish active (holding and manipulating) from idle periods (when the grasper is left in place without adjustment) and avoid prolonged static tension that may thin the gallbladder wall.</p> <p>Q2: What immediate signs should the operator look for that would indicate the gallbladder wall is at increased risk of perforation from continued traction? A2: While grasping, watch for loss of normal tissue turgor, progressive thinning or translucency of the gallbladder wall, focal blanching or stretching at the grasp site, or progressive enlargement of the grasped area despite gentle traction. A sudden relaxation of tension accompanied by bile on adjacent tissue would also indicate a perforation has just occurred. If any of these signs appear, the surgeon should reduce traction force, change the grasping point to a firmer portion of the gallbladder (or a more posterior bite), and proceed with more delicate manipulation to avoid spillage and enlarge the working bite to distribute forces.</p>	<p>A single grasper firmly holds the gallbladder during gallbladder dissection. No other instruments are visible or active.</p> <p>Detailed (\$0.0007)</p> <p>The view focuses on the gallbladder, which is being actively held by a laparoscopic grasper. The grasper is applying traction to the gallbladder to expose the dissection plane during the gallbladder dissection phase. No other instruments are visible or actively engaged in this frame.</p>



Segmentation Mask



Legend



FASL Prediction (Conf: 0.9528)

Context (LLM Input)

Visible instruments:
Irrigator.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Irrigator, Aspirate, Fluid)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: left.
- Liver: right-top, right-bottom, center-right, center-top, center-bottom, center, left-bottom.
- Gastrointestinal Tract: right.
- Fat: bottom.
- Grasper: center-bottom.
- Connective Tissue: center-bottom.
- L-hook Electrocautery: bottom.
- Gallbladder: right-top, center-bottom.

Relative Positions:
- Abdominal Wall is to the left of Gastrointestinal Tract.
- Liver is to the right of Abdominal Wall.
- Gastrointestinal Tract is toward the bottom of Gallbladder.
- Fat is toward the bottom of Gallbladder.
- Grasper is to the right of Abdominal Wall.
- Connective Tissue is toward the bottom of Gallbladder.
- L-hook Electrocautery is toward the bottom of Gallbladder.
- Gallbladder is to the right of Abdominal Wall.

Conversational-1 (9 Qs) (\$0.0020)

- Q1: What is the irrigator doing in this frame?**
A1: The irrigator is aspirating fluid from the operative field.
- Q2: Where is the gallbladder located in the view?**
A2: The gallbladder is on the right side, occupying the upper to central portion of the field.
- Q3: Where is the liver located in the view?**
A3: The liver is on the right side, forming much of the background.
- Q4: Is there visible fluid in the operative field?**
A4: Yes. Fluid is present and is being aspirated.
- Q5: Where is the abdominal wall located in the image?**
A5: The abdominal wall is on the left side of the frame.
- Q6: Where is the L-hook electrocautery positioned?**
A6: The L-hook electrocautery is located at the bottom of the field.
- Q7: Is fatty tissue visible in this image?**
A7: Yes. Fatty tissue is visible in the lower portion of the field.
- Q8: Where is connective tissue visible?**
A8: Connective tissue is visible toward the bottom-center of the view.
- Q9: Is the gastrointestinal tract visible in this frame?**
A9: Yes. The gastrointestinal tract is visible on the right side.

Conversational-2 (8 Qs) (\$0.0022)

- Q1: What instrument is visible in this frame?**
A1: An irrigator (suction/irrigation device) is the only instrument visible.
- Q2: What is the irrigator doing in this image?**
A2: The irrigator is aspirating fluid from the operative field.
- Q3: Are any electrocautery or hook instruments visible in this frame?**
A3: No. There are no electrocautery or hook instruments visible—only the irrigator is seen.
- Q4: Where is the gallbladder located relative to the abdominal wall and liver in this view?**
A4: The gallbladder is on the right side of the field, lateral to the abdominal wall and adjacent to the liver which also occupies the right/central region.
- Q5: Which structures lie inferior (below) the gallbladder in this image?**
A5: The gastrointestinal tract and fatty tissue lie below the gallbladder.
- Q6: Is there visible fluid in the operative field, and where is the irrigator directed?**
A6: Yes. Fluid is present in the lower/central portion of the field, and the irrigator tip is directed toward that area to aspirate it.
- Q7: Which major anatomical structure occupies much of the right and central portion of the image?**
A7: The liver occupies much of the right and central portion of the image.
- Q8: What is the primary activity visible during this gallbladder dissection phase?**
A8: The primary visible activity is irrigation/aspiration of fluid from the operative field with the irrigator during gallbladder dissection.

Complex Reasoning (2 Qs) (\$0.0029)

- Q1: A suction-irrigation device is actively removing fluid while dissection of the gallbladder is underway. What are the most likely sources of that fluid, and what intraoperative clues would help you distinguish among them?**
A1: The main possibilities are (1) irrigant fluid introduced intentionally, (2) blood from the liver bed or small vessel injury, and (3) bile from gallbladder perforation or a clipped/undistal cystic duct leak. Clues to distinguish them: - Color and clarity: irrigant is clear; fresh arterial bleeding is bright red and pulsatile; venous/liver oozing is darker and slower; bile is greenish or yellow and more translucent. - Flow character: continuous pooling or increasing volume suggests ongoing bleeding or bile leak; transient splashes after a cut suggest a one-off bleed. - Odor: bile has a characteristic smell compared with blood or saline. - Location under suction: fluid originating from the liver bed will appear as oozing from the dissection plane; bile will often be seen tracking from the gallbladder wall or cystic duct region. - Temporal association: appearance immediately after using energy near the liver suggests thermal injury/bleeding; appearance after traction or grasping of the gallbladder suggests wall perforation. Using these features while holding suction steady lets the team rapidly determine whether the priority is hemostasis, repair of a bile leak, or simply clearing irrigant to resume dissection.
- Q2: Given that suction is running and clearing the field, what immediate technical steps should the operating surgeon take before resuming active electrosurgical dissection?**
A2: First, pause energy activation until the source is identified and visualization is restored. Keep continuous suction to maintain a dry field while inspecting the dissection plane. Adjust traction with the grasper (if present) to expose the suspected source—pulling the gallbladder away can reveal whether fluid is coming from the liver bed or gallbladder wall. If a bleeding point is identified, apply targeted hemostasis (short bursts of coagulation with the hook or use bipolar/soft coagulation) or tamponade with a swab/grasper and then apply topical hemostatic agents. If bile is identified, locate the perforation or leak (gallbladder wall or cystic duct stump) and consider repair strategies (suture, clip, or controlled drainage). Only once the source is controlled and anatomy is clear should electrocautery be reactivated to continue dissection.

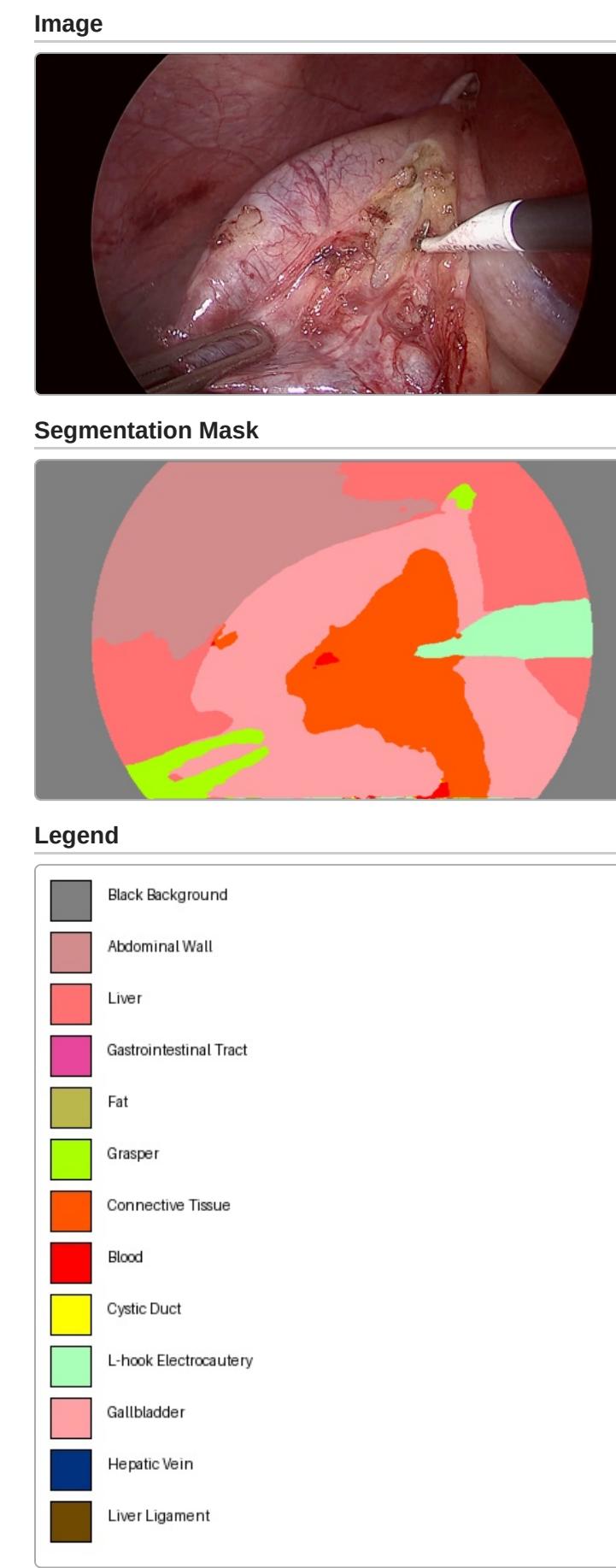
Concise (\$0.0006)

An irrigator is actively aspirating fluid from the operative field during gallbladder dissection. The gallbladder lies to the right with the liver adjacent, and surrounding fat and connective tissue are visible inferiorly.

Detailed (\$0.0014)

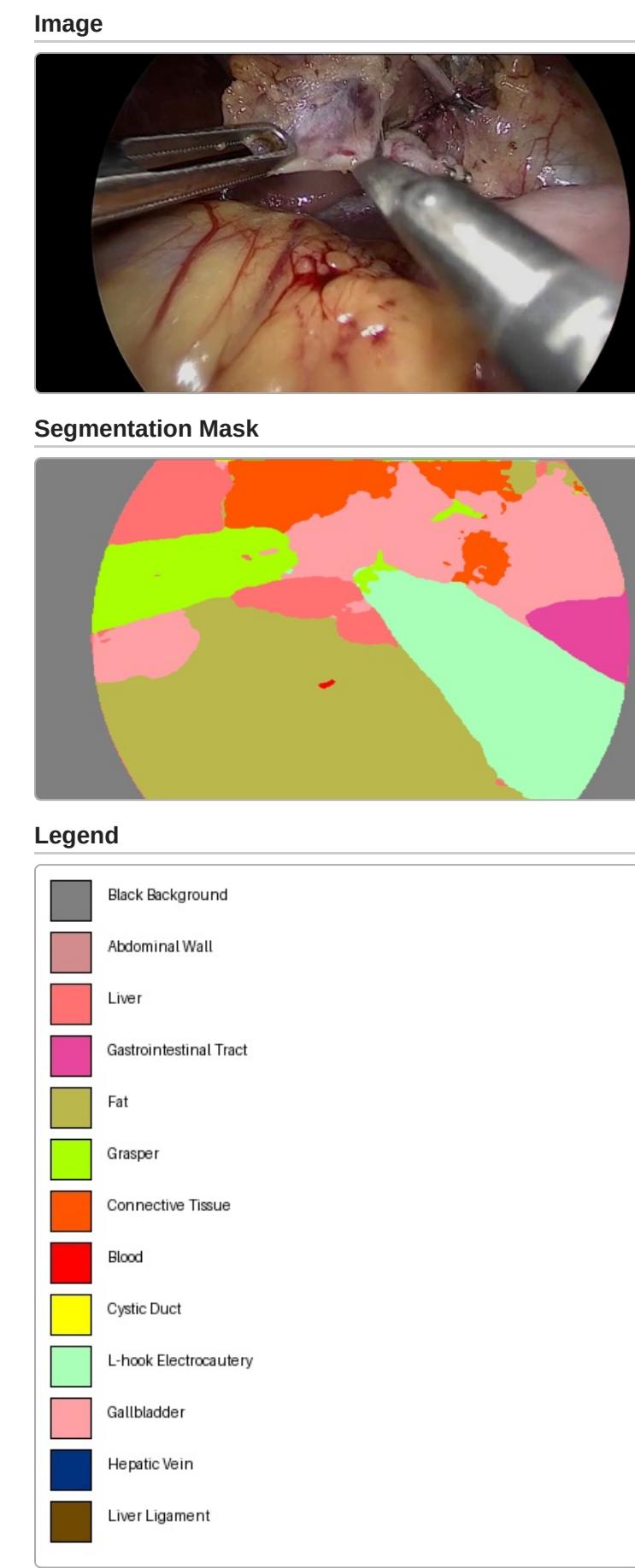
The view focuses on the gallbladder located on the right side of the field, with the liver occupying much of the right/background region. The abdominal wall is seen on the left. Below the gallbladder there is fatty tissue and portions of the gastrointestinal tract and connective tissue forming the lower field.

A single irrigator is visible and actively aspirating fluid that has collected around the lower aspect of the gallbladder and adjacent fat/viscera, clearing the operative field during gallbladder dissection. No other instruments are actively engaged in this frame.



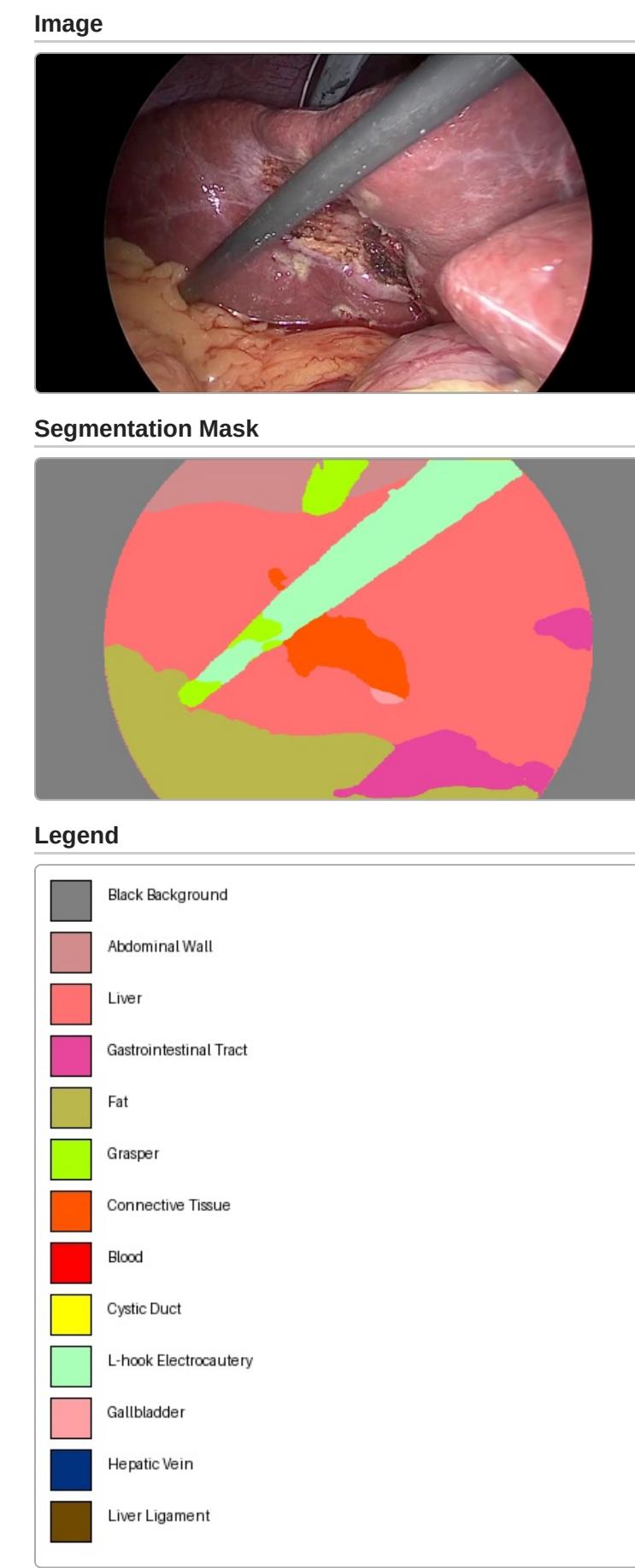
Context (LLM Input)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder) - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left-top. - Liver: right-top, right-bottom, center-left, center-right, center-top, center, left-bottom. - Grasper: left-bottom. - Connective Tissue: right. - Blood: bottom. - Cystic Duct: right-bottom. - L-hook Electrocautery: center-right. - Gallbladder: center-right, right-bottom, left-bottom.</p> <p>Relative Positions: - Abdominal Wall is to the left of L-hook Electrocautery. - Liver is to the right of Grasper. - Grasper is to the left of L-hook Electrocautery. - Connective Tissue is to the right of Abdominal Wall. - Blood is toward the bottom of Abdominal Wall. - Cystic Duct is to the right of Grasper. - L-hook Electrocautery is towards the top of Cystic Duct. - Gallbladder is to the right of Abdominal Wall.</p>

Conversational-1 (10 Qs) (\$0.0023)	Conversational-2 (10 Qs) (\$0.0017)	Complex Reasoning (2 Qs) (\$0.0028)	Concise (\$0.0006)
<p>Q1: Is the grasper retracting the gallbladder in this image? A1: Yes. The grasper is retracting the gallbladder.</p> <p>Q2: Where is the grasper located in the frame? A2: Left-bottom of the operative field.</p> <p>Q3: Is the hook electrocautery dissecting the gallbladder in this frame? A3: Yes. The hook is dissecting the gallbladder.</p> <p>Q4: Where is the hook electrocautery located in the view? A4: Center-right of the image.</p> <p>Q5: Where is the gallbladder located in the operative field? A5: Central to the right-lower portion of the view.</p> <p>Q6: Is the liver visible in this image? A6: Yes. The liver is visible.</p> <p>Q7: Where is the liver located within the frame? A7: Predominantly on the right side of the operative field.</p> <p>Q8: Is there visible blood in the field? A8: Yes. Blood is present at the bottom of the view.</p> <p>Q9: Is the cystic duct visible in this image? A9: Yes. The cystic duct is visible.</p> <p>Q10: Where is connective tissue located in the image? A10: On the right side of the operative field.</p>	<p>Q1: What surgical phase is depicted in this image? A1: This view corresponds to the Calot triangle dissection phase.</p> <p>Q2: Which instruments are visible and where are they located in the field? A2: A grasper is visible in the left-bottom portion of the field, and an L-hook electrocautery (hook) is visible in the center-right portion of the field.</p> <p>Q3: What is the grasper doing and which structure is it acting on? A3: The grasper is retracting the gallbladder; it is positioned at the left-bottom and pulling the gallbladder to improve exposure.</p> <p>Q4: What is the hook doing and what is its target? A4: The L-hook electrocautery is dissecting the gallbladder, located on the center-right approaching the gallbladder margin.</p> <p>Q5: Describe the spatial relationship among the grasper, the L-hook, and the cystic duct. A5: The grasper is to the left of the L-hook. The cystic duct is located in the right-bottom and is to the right of the grasper; the L-hook sits superior/central relative to the cystic duct.</p> <p>Q6: Which major organ occupies the right side of the image, and where is it relative to the grasper? A6: The liver occupies the right side of the image and lies to the right of the grasper.</p> <p>Q7: Is any blood visible in the operative field, and if so where? A7: Yes. Blood is visible toward the bottom of the image.</p> <p>Q8: What tissue lies immediately to the right of the abdominal wall in this view? A8: Connective tissue lies immediately to the right of the abdominal wall.</p> <p>Q9: Where is the gallbladder located within the image overall? A9: The gallbladder is situated in the central to right portion of the field, extending toward the bottom (center-right/right-bottom).</p> <p>Q10: Are there any other instruments present besides the grasper and the hook? A10: No. Only the grasper and the L-hook electrocautery are visible in this frame.</p>	<p>Q1: Given that the grasper is actively retracting the gallbladder while the hook is dissecting its attachments, what immediate anatomical objective is the surgeon accomplishing and why is the direction of traction critical for safe progress? A1: The immediate objective is to open and define the Calot triangle by applying traction on the gallbladder (infundibulum) so that tissue planes and the cystic structures are tensioned and exposed for precise dissection with the hook. Direction of traction is critical because cephalad and lateral pull on the gallbladder moves the infundibulum away from the hepatoduodenal structures, straightens the cystic duct/artery, and creates counter-tension that allows the hook to dissect in a controlled plane. Incorrect traction (for example, inferior or medial pull) can fold tissues, obscure the cystic duct, and increase the risk of cutting or thermally injuring the wrong structure. The grasper is the active retraction tool providing that necessary counter-traction while the hook performs stepwise energy dissection under tension.</p> <p>Q2: The energy hook appears close to a ductal structure in the operative field. What specific intraoperative precautions should be taken now to avoid thermal injury to the cystic or common bile duct? A2: Several precautions should be applied immediately: 1) Confirm the identity of the ductal structure visually before any sustained activation—do not proceed if anatomy is ambiguous. 2) Use short, low-power coagulation bursts with the hook rather than prolonged activation to limit lateral thermal spread. 3) Keep the active tip of the hook oriented away from the duct and dissect from lateral to medial with traction so energy is applied to the correct tissue plane. 4) Favor blunt dissection or mechanical division when close to the duct if visualization is poor. 5) Maintain continuous suction and clear the field of blood or smoke so the relationship of the hook to the duct is always obvious. If uncertainty persists, stop and consider intraoperative cholangiography or further dissection to obtain the critical view before clipping or dividing any structure.</p>	<p>A grasper (left-inferior) retracts the gallbladder while an L-hook electrocautery (center-right) actively dissects the gallbladder. The cystic duct lies to the right-inferior. The liver occupies the right side and a small amount of blood is visible inferiorly.</p> <p>Detailed (\$0.0008)</p> <p>The view is focused on the gallbladder region during Calot triangle dissection. The gallbladder occupies the central-to-right portion of the field and extends toward the lower area; the liver forms the background predominantly on the right side. The abdominal wall is visible toward the upper-left.</p> <p>A grasper is positioned on the left/lower side of the operative field and is actively retracting the gallbladder to provide tension and exposure. The L-hook electrocautery approaches from the center-right and is actively dissecting the gallbladder wall/attachments. The hook lies just superior to the cystic duct region, so the dissection is occurring close to the cystic duct and adjacent connective tissue on the right. There is a small amount of blood pooled in the inferior field. Overall, the grasper provides retraction while the hook performs focused dissection near the gallbladder–cystic duct interface.</p>



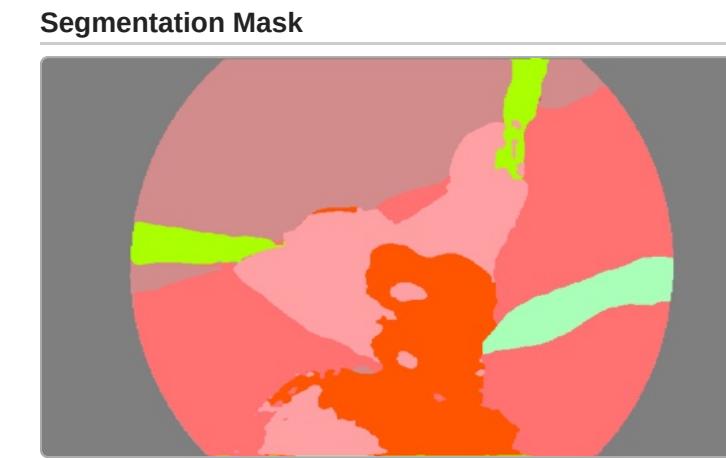
Context (LLM Input)
Visible instruments: Scissors.
Current phase: Clipping Cutting
Current action triplets (tool, verb, target): - (Scissors, Cut, Cystic Duct)
Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: top. - Liver: left-top. - Gastrointestinal Tract: center-right. - Fat: bottom. - Grasper: left-top. - Connective Tissue: top. - Blood: center. - Cystic Duct: left-top. - L-hook Electrocautery: right-bottom. - Gallbladder: right-top.
Relative Positions: - Abdominal Wall is to the left of Gastrointestinal Tract. - Liver is to the left of Gastrointestinal Tract. - Gastrointestinal Tract is to the right of Grasper. - Fat is to the left of Gastrointestinal Tract. - Grasper is to the left of L-hook Electrocautery. - Connective Tissue is to the left of Gastrointestinal Tract. - Blood is to the left of L-hook Electrocautery. - Cystic Duct is to the left of L-hook Electrocautery. - L-hook Electrocautery is to the right of Liver. - Gallbladder is to the right of Grasper.

Conversational-1 (10 Qs) (\$0.0019)	Conversational-2 (10 Qs) (\$0.0020)	Complex Reasoning (2 Qs) (\$0.0032)	Concise (\$0.0009)
<p>Q1: Is the scissors visible in this frame? A1: Yes, the scissors are visible.</p> <p>Q2: What is the scissors doing in this view? A2: The scissors are cutting.</p> <p>Q3: What structure is being cut by the scissors? A3: The cystic duct is being cut.</p> <p>Q4: Where is the cystic duct located in the frame? A4: The cystic duct is at the left-top of the frame.</p> <p>Q5: Is the gallbladder visible in this image? A5: Yes, the gallbladder is visible.</p> <p>Q6: Where is the gallbladder located in the frame? A6: The gallbladder is at the right-top of the frame.</p> <p>Q7: Is there visible blood in the operative field? A7: Yes, blood is visible in the center of the field.</p> <p>Q8: Where is the liver located in the frame? A8: The liver is at the left-top of the frame.</p> <p>Q9: Is the gastrointestinal tract visible in this image? A9: Yes, the gastrointestinal tract is visible.</p> <p>Q10: Where is the abdominal wall located in the view? A10: The abdominal wall is at the top of the frame.</p>	<p>Q1: Which instrument is visible in this frame? A1: A pair of surgical scissors is the only instrument visible.</p> <p>Q2: What procedural phase is depicted in this image? A2: This image shows the clipping and cutting phase of the cholecystectomy.</p> <p>Q3: What structure are the scissors acting on in this view? A3: The scissors are cutting the cystic duct.</p> <p>Q4: Where is the cystic duct located in the frame relative to the gallbladder? A4: The cystic duct is located to the left-top of the frame, while the gallbladder is to the right-top, so the cystic duct is left of the gallbladder.</p> <p>Q5: Are any clips visible on the cystic duct in this image? A5: No clips are visible on the cystic duct in this frame.</p> <p>Q6: Are any other instruments, such as a grasper or hook, visible alongside the scissors? A6: No. Only the scissors are visible; no grasper or hook is seen in the operative field.</p> <p>Q7: Is bleeding present in the field, and if so, where? A7: Yes. There is blood visible centrally in the field.</p> <p>Q8: Which major anatomical structures can you identify in this image? A8: Visible structures include the abdominal wall (top), liver (left-top), gastrointestinal tract (center-right), fat (bottom), connective tissue (top), central blood, the cystic duct (left-top), and the gallbladder (right-top).</p> <p>Q9: Where is the liver positioned relative to the gastrointestinal tract in this view? A9: The liver is located to the left of the gastrointestinal tract.</p> <p>Q10: What is the spatial relationship between the cystic duct and the L-hook electrocautery in this frame? A10: The cystic duct is positioned to the left of the L-hook electrocautery.</p>	<p>Q1: What immediate confirmation should the surgeon perform before completing transection to ensure the duct being cut is indeed the cystic duct and not a major biliary conduit? A1: Before completing division the surgeon should re-confirm the anatomy visually and functionally. Specifically, they should verify the critical view of safety has been achieved (clear hepatocystic triangle with only two structures entering the gallbladder), inspect the ductal course relative to the liver edge to ensure it tapers toward the gallbladder, and look for previously placed secure clips on the intended cystic duct segment. If there is any doubt, intraoperative cholangiography or a pause for further dissection to expose the ductal junction should be performed rather than proceeding. In this frame the scissors are actively transecting a ductal structure; therefore ensuring clips are correctly positioned and that the duct does not continue medially toward the biliary tree is essential to avoid catastrophic bile duct injury.</p> <p>Q2: What technical error during clipping and cutting in this moment would most likely lead to a postoperative bile leak, and how should it be avoided? A2: Cutting too close to or through an inadequately secured clip, or transecting a duct that has not been occluded with sufficient clips, is the most likely technical cause of a postoperative bile leak. To avoid this, the surgeon should place secure clips on both sides of the intended transection site (typically double clips on the gallbladder side and at least one secure clip on the hepatic side as per local practice), verify clip purchase and orientation, and leave a short residual stump on the hepatic side rather than placing the cut immediately adjacent to a clip. After transection, the transected ends should be inspected for bile leakage and cleaned; if leakage is seen, additional clips or sutures should be applied immediately.</p>	<p>Scissors are actively cutting the cystic duct during the clipping/cutting phase. The gallbladder and liver are adjacent in the field, with connective tissue and some blood visible.</p> <p>Detailed (\$0.0013)</p> <p>This is a close laparoscopic view during the clipping/cutting step. A single pair of scissors is actively transecting the cystic duct located in the upper-left quadrant of the field. The gallbladder lies in the upper-right area, adjacent to the transection site. The liver occupies the left/upper background, and the gastrointestinal tract is visible toward the center-right. Connective tissue lies along the top of the field and fatty tissue collects in the lower portion. A small amount of blood is present in the central field consistent with the duct transection. No other instruments are visible or engaged.</p>



Context (LLM Input)
Visible instruments: No instruments are visible.
Current phase: Cleaning Coagulation
Current action triplets (tool, verb, target): No actions are taking place.
Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left-top. - Liver: right-top, right-bottom, center-left, left-bottom, center-right, center-top, center, left-top, right. - Gastrointestinal Tract: right-bottom. - Fat: right-bottom, left-bottom. - Grasper: left. - Connective Tissue: left-top, center. - Cystic Duct: right-top, center-top. - L-hook Electrocautery: top. - Gallbladder: center-bottom. Relative Positions: - Abdominal Wall is towards the top of Gastrointestinal Tract. - Liver is toward the bottom of Cystic Duct. - Gastrointestinal Tract is toward the bottom of Grasper. - Fat is toward the bottom of Abdominal Wall. - Grasper is to the left of Cystic Duct. - Connective Tissue is toward the bottom of Abdominal Wall. - Cystic Duct is to the right of Abdominal Wall. - L-hook Electrocautery is towards the top of Fat. - Gallbladder is to the right of Fat.

Conversational-1 (10 Qs) (\$0.0022)	Conversational-2 (8 Qs) (\$0.0016)	Complex Reasoning (2 Qs) (\$0.0030)	Concise (\$0.0006)
<p>Q1: Are any instruments visible in this frame? A1: No instruments are visible.</p> <p>Q2: Where is the gallbladder located in the operative view? A2: The gallbladder is in the lower-central part of the frame.</p> <p>Q3: Where is the abdominal wall located in the view? A3: The abdominal wall is in the upper-left region of the image.</p> <p>Q4: Which side of the view is the liver located on? A4: The liver is on the right side of the view.</p> <p>Q5: Is the cystic duct visible in this frame? A5: Yes. The cystic duct is visible near the upper-right/central-top area.</p> <p>Q6: Where is fatty tissue located in the field? A6: Fat is present in the lower portions, especially the lower-right and lower-left areas.</p> <p>Q7: Where is the gastrointestinal tract located in the view? A7: The gastrointestinal tract is in the lower-right portion of the frame.</p> <p>Q8: Is connective tissue visible in this frame? A8: Yes. Connective tissue is visible in the upper-left and central regions.</p> <p>Q9: Where is the gallbladder located relative to the fat? A9: The gallbladder lies to the right of the fatty tissue.</p> <p>Q10: Is there visible bleeding in this frame? A10: No obvious bleeding is visible.</p>	<p>Q1: Which instruments are visible in this frame? A1: No instruments are visible in this frame.</p> <p>Q2: What operative phase is shown in this image? A2: This view corresponds to the cleaning/coagulation phase.</p> <p>Q3: Is the gallbladder visible, and if so where is it located in the field? A3: Yes — the gallbladder is visible and lies centrally toward the lower portion of the image (center-bottom).</p> <p>Q4: Can you identify the cystic duct and describe its position relative to the gallbladder? A4: The cystic duct is visible in the upper-right portion of the field (right-top/center-top) and is located to the right of the gallbladder.</p> <p>Q5: Is any instrument currently retracting or manipulating tissue? A5: No — there are no instruments visible and no tissue is being actively manipulated in this frame.</p> <p>Q6: Is there any active bleeding visible in the image? A6: No active bleeding is visible.</p> <p>Q7: Which major anatomical structures occupy the upper versus lower parts of the image? A7: The upper part of the image shows the abdominal wall and superior structures, while the lower part contains fat and the gallbladder centrally; portions of the gastrointestinal tract appear toward the right-bottom.</p> <p>Q8: Is an electrocautery hook or other energy device present in the view? A8: No electrocautery hook or other energy device is visible in this frame.</p>	<p>Q1: What immediate checks and maneuvers should be performed now to confidently end the cleaning/coagulation pause and proceed to the next step of the procedure? A1: First, obtain a fully clear view of the operative field by irrigating and suctioning any residual blood, bile, or clot; this reveals whether there is ongoing oozing or an active leak. With the grasper present but not actively manipulating, use it to reapply gentle traction to expose the dissection bed while the energy device (the hook) remains available but inactive until needed. Inspect the cystic stump region and the liver bed closely for any streaming bile or pulsatile/continuous bleeding. If a focal bleeding point is seen, address it with targeted coagulation; if a bile leak is suspected, irrigate and observe the stump while lowering pneumoperitoneum and suctioning to confirm. Only when the field is dry, no bile is observed leaking, and any bleeding points have been controlled should the team consider progressing to specimen removal or port closure. If uncertainty persists about ductal integrity, obtain adjunctive evaluation (for example, cholangiography) before concluding.</p> <p>Q2: Given that the energy instrument is present but currently idle, how should the surgical team apply electrocautery to treat small bleeding points while minimizing risk to nearby biliary structures? A2: Use brief, low-power, controlled bursts of monopolar energy with the hook directed at the specific bleeding point under direct vision rather than prolonged activation. Maintain an appropriate distance from the cystic duct and common bile duct regions—avoid sweeping or large-area coagulation that could transmit thermal energy to these structures. Where available and appropriate, consider using bipolar coagulation for small vessels (less lateral thermal spread) or mechanical control (clips or sutures) for larger oozing. Keep traction steady via the grasper to tension the tissue, which helps create a clear target and reduces the need for deeper coagulation. Frequently irrigate and suction to confirm that coagulation achieved haemostasis and did not cause unrecognized collateral damage.</p>	<p>No instruments are visible and no actions are taking place. The case is in the Cleaning/Coagulation phase. The gallbladder sits centrally toward the lower field. The liver occupies the right side of the view. Cystic duct is located toward the right-upper field, with surrounding fat and connective tissue and portions of the gastrointestinal tract visible inferiorly.</p> <p>Detailed (\$0.0010)</p> <p>The view shows an exposed gallbladder occupying the lower-central portion of the field. The liver forms the dominant background, extending across much of the image toward the right and central areas. The cystic duct is visible toward the upper-right/central-top region adjacent to the gallbladder. Fatty tissue collects in the lower portions of the frame on both sides, and connective tissue is present toward the left and center of the field. The gastrointestinal tract lies in the lower-right quadrant, and the abdominal wall appears along the upper-left margin.</p> <p>No surgical instruments are visible in this frame and there are no active instrument actions taking place; the scene is consistent with a pause during the cleaning/coagulation phase.</p>



Context (LLM Input)

Visible instruments:
Grasper, Hook.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)
- (Hook, Dissect, Gallbladder)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: top.
- Liver: right-top, right-bottom, center-top, center-bottom, center, left-bottom.
- Gastrointestinal Tract: right-top.
- Grasper: top.
- Connective Tissue: bottom.
- L-hook Electrocautery: center-right, center-bottom.
- Gallbladder: center.

Relative Positions:
- Abdominal Wall is to the left of L-hook Electrocautery.
- Liver is toward the bottom of Gastrointestinal Tract.
- Gastrointestinal Tract is towards the top of Gallbladder.
- Grasper is to the left of L-hook Electrocautery.
- Connective Tissue is toward the bottom of Abdominal Wall.
- L-hook Electrocautery is to the right of Gallbladder.
- Gallbladder is toward the bottom of Abdominal Wall.

Conversational-1 (10 Qs) (\$0.0016)

- Q1: Is the grasper visible in this image?**
A1: Yes.
- Q2: Where is the grasper located in the field?**
A2: At the top of the operative field.
- Q3: What is the grasper doing to the gallbladder?**
A3: Retracting the gallbladder.
- Q4: Is the hook instrument visible in this image?**
A4: Yes.
- Q5: Where is the hook positioned relative to the gallbladder?**
A5: To the right of the gallbladder, toward the center-right of the view.
- Q6: What is the hook doing in this frame?**
A6: Dissecting the gallbladder.
- Q7: Where is the gallbladder located in the image?**
A7: In the center of the frame.
- Q8: Where is the liver located in the view?**
A8: On the right side of the view, forming much of the background.
- Q9: Is connective tissue visible in this image?**
A9: Yes, at the bottom of the field.
- Q10: Where is the abdominal wall located in the image?**
A10: At the top of the frame.

Conversational-2 (10 Qs) (\$0.0019)

- Q1: What instruments are visible in this frame?**
A1: A grasper and an L-hook electrocautery (hook) are visible.
- Q2: Which instrument is retracting the gallbladder?**
A2: The grasper is retracting the gallbladder.
- Q3: Which instrument is performing dissection on the gallbladder?**
A3: The L-hook electrocautery is dissecting the gallbladder.
- Q4: Where is the grasper located relative to the gallbladder and the abdominal wall?**
A4: The grasper is positioned superiorly (toward the top of the frame), above the centrally located gallbladder and adjacent to the abdominal wall at the top.
- Q5: Where is the hook electrocautery in relation to the gallbladder and the liver?**
A5: The hook is on the right side of the gallbladder (center-right of the image) and lies on the side of the operative field toward the liver, which occupies the right side of the image.
- Q6: Which other anatomical structures are clearly visible in this image?**
A6: The liver (right side), the abdominal wall (top), the gastrointestinal tract (upper right), and connective tissue (lower part of the field) are visible in addition to the gallbladder.
- Q7: Is the gastrointestinal tract located above or below the gallbladder in this view?**
A7: The gastrointestinal tract is located above (toward the top of) the gallbladder.
- Q8: How many instruments are actively engaged with tissue, and what are their actions?**
A8: Two instruments are actively engaged: the grasper is retracting the gallbladder, and the hook electrocautery is dissecting the gallbladder.
- Q9: During this snapshot, what procedural phase is being shown?**
A9: This image shows the gallbladder dissection phase.
- Q10: Is connective tissue located above or below the grasper in the operative field?**
A10: The connective tissue is below the grasper (toward the bottom of the field).

Complex Reasoning (2 Qs) (\$0.0024)

- Q1: What specific dissection technique should be used now to separate the gallbladder from the liver bed while minimizing bleeding and hepatic injury?**
A1: With the grasper actively retracting the gallbladder and the hook dissecting, the safest technique is coordinated traction–countertraction with sharp, superficial electrocautery strokes directed along the gallbladder wall rather than into the liver parenchyma. The grasper should lift and slightly rotate the gallbladder to tension the subserosal plane so the hook can make short, sweeping strokes that gently peel the gallbladder off the liver bed. Maintain the hook tip close to the gallbladder surface and use brief coagulation bursts rather than prolonged contact to limit thermal spread. If small vessels in the liver bed are encountered, seize them with the hook's coagulating strokes at low power and continue blunt sweeping to stay in the correct plane. This approach reduces oozing, preserves hepatic tissue, and limits deep thermal injury.
- Q2: What intraoperative signs in this view would indicate that the dissection is penetrating too deeply into the liver parenchyma, and what immediate corrective actions should be taken?**
A2: Signs of too-deep dissection include persistent brisk oozing or bleeding from a friable surface, loss of the clear plane between gallbladder and liver (appearance of raw hepatic tissue instead of a smooth gallbladder wall), and sudden disappearance of the usual glistening gallbladder margin. If these occur, immediately stop aggressive hook strokes, increase upward traction with the grasper to re-tension the correct plane, and switch to more superficial sweeping of the hook to tease the gallbladder off rather than cutting deeper. Apply short, targeted coagulation to any bleeding points rather than continuous energy, and if bleeding persists, temporize by compressing with the grasper to identify and control the source before resuming dissection.

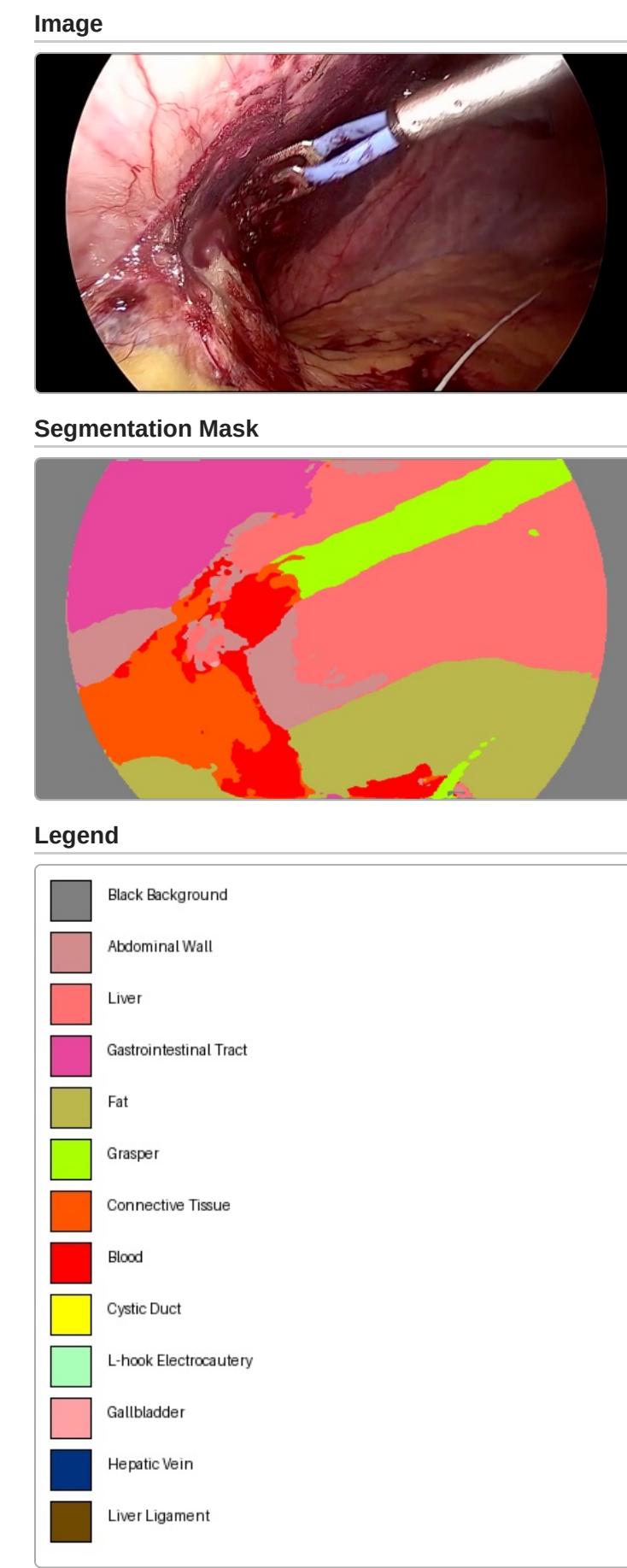
Concise (\$0.0005)

A grasper (from above/left) retracts the centrally located gallbladder while an L-hook electrocautery positioned to the right actively dissects the gallbladder. The liver lies to the right and the abdominal wall is superior.

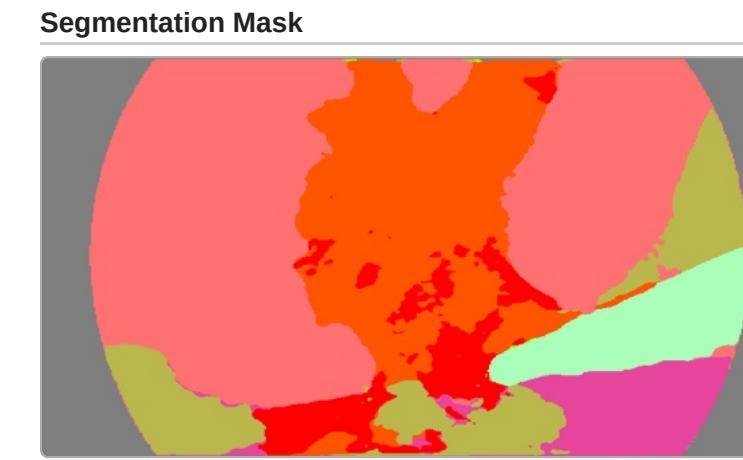
Detailed (\$0.0010)

The image shows a central gallbladder under active dissection. A grasper enters from the upper/left portion of the field and is firmly retracting the gallbladder downward and/or laterally to expose the dissection plane. An L-hook electrocautery approaches from the center-right and is actively dissecting the gallbladder along its attachment, working against the traction provided by the grasper.

The liver forms the dominant background anatomy, occupying much of the right and central field. A portion of the gastrointestinal tract lies superior to the gallbladder, while connective tissue is visible inferiorly. The abdominal wall is seen at the top of the image. Spatially, the grasper is positioned to the left of the electrocautery hook, and the hook is on the right side of the gallbladder as it performs the dissection. Both instruments are actively engaged with the gallbladder—grasper for retraction, hook for cutting/separation.



Context (LLM Input)	Conversational-1 (6 Qs) (\$0.0021)	Conversational-2 (8 Qs) (\$0.0016)	Complex Reasoning (2 Qs) (\$0.0025)	Concise (\$0.0004)
<p>Visible instruments: Bipolar.</p> <p>Current phase: Cleaning Coagulation</p> <p>Current action triplets (tool, verb, target): - (Bipolar, Dissect, Adhesion)</p> <p>Spatial (extracted from model-generated segmentation mask): Model-generated segmentation mask confidence is below threshold, so spatial context is not included.</p>	<p>Q1: Is the bipolar instrument visible in this frame? A1: Yes. The bipolar instrument is visible.</p> <p>Q2: How many instruments are visible in this frame? A2: One instrument is visible.</p> <p>Q3: What is the bipolar instrument doing in this image? A3: The bipolar is dissecting an adhesion.</p> <p>Q4: What structure is the bipolar contacting? A4: The bipolar is contacting an adhesion.</p> <p>Q5: Is an adhesion present in the operative field? A5: Yes. An adhesion is present and being worked on.</p> <p>Q6: Is any other instrument besides the bipolar visible? A6: No. No other instruments are visible.</p>	<p>Q1: What instrument is visible in this frame? A1: A bipolar electrosurgical instrument (bipolar forceps) is visible.</p> <p>Q2: What phase of the procedure is shown in this image? A2: The procedure is in the cleaning/coagulation phase.</p> <p>Q3: Which instrument is actively interacting with tissue, and what tissue is it acting on? A3: The bipolar instrument is actively dissecting an adhesion.</p> <p>Q4: Is any other instrument visible in the operative field? A4: No. The bipolar instrument is the only instrument visible in this frame.</p> <p>Q5: Is the bipolar in contact with the adhesion or merely positioned nearby? A5: It is in contact with the adhesion and engaged in dissecting it.</p> <p>Q6: Is the bipolar being used for retraction or for tissue dissection/coagulation in this view? A6: It is being used for tissue dissection/coagulation of the adhesion, not for retraction.</p> <p>Q7: How is the bipolar related spatially to the targeted adhesion? A7: The bipolar tips are applied directly to the adhesion site, with the instrument positioned against the adhesion to perform dissection/coagulation.</p> <p>Q8: Are there visible signs of any other tissues being grasped or retracted by instruments in this image? A8: No. There are no graspers or other instruments visible grasping or retracting tissue in this image.</p>	<p>Q1: Why is a bipolar instrument being used to dissect adhesions during the cleaning/coagulation phase rather than the monopolar hook that is commonly used earlier in cholecystectomy? A1: The bipolar is actively engaged in dissecting an adhesion in this frame, and that choice reflects a procedural need to coagulate and divide tissue with very localized thermal effect. Unlike monopolar energy delivered from a hook, bipolar energy passes only between the two jaws of the instrument, allowing simultaneous compression and coagulation of the targeted adhesion with reduced lateral thermal spread. That makes it advantageous during "cleaning/coagulation" when small bleeding points or vascularized adhesions need controlled division without risking thermal injury to immediately adjacent bile ducts or liver parenchyma. The bipolar's ability to grasp/compress the adhesion while applying energy also improves hemostasis for low-flow oozing compared with sweeping monopolar cuts, which can spray energy and cause more collateral damage.</p> <p>Q2: What technique modifications should the surgeon apply while using the bipolar here to minimize the risk of thermal injury to nearby biliary structures? A2: Because the bipolar is actively coagulating adhesions close to critical structures, the surgeon should minimize activation time (short, controlled bursts), ensure firm but gentle compression of only the target tissue between the bipolar jaws, and avoid grasping or coagulating tissue that includes identifiable biliary duct or thin-walled gallbladder wall. Continuous visual confirmation that the jaws enclose only the adhesion (not ductal tissue) is crucial. Lower power settings appropriate for coagulation rather than cutting should be chosen, and the device should be released and inspected frequently rather than leaving prolonged continuous current. If anatomy is ambiguous, convert to blunt dissection or cold scissors rather than increasing energy use.</p>	<p>A bipolar instrument is actively dissecting an adhesion during the cleaning/coagulation phase.</p> <p>Detailed (\$0.0008)</p> <p>The view is focused on an area of adhesive tissue being treated with bipolar forceps. The bipolar instrument is actively engaged — its jaws are in contact with the adhesion and delivering bipolar energy to dissect and coagulate the fibrous tissue, both dividing the adhesion and achieving hemostasis of any small bleeding points. This is consistent with the Cleaning/Coagulation phase: the instrument is performing active tissue dissection/coagulation rather than simply holding or retracting. No other instruments are noted in the field, and the working goal appears to be controlled separation of the adhesion with concurrent coagulation.</p>



Legend



FASL Prediction (Conf: 0.8949)

Context (LLM Input)

Visible instruments:
Irrigator.

Current phase:
Cleaning Coagulation

Current action triplets (tool, verb, target):
- (Irrigator, Aspirate, Fluid)

Spatial (extracted from model-generated segmentation mask):
Model-generated segmentation mask confidence is below threshold, so spatial context is not included.

Conversational-1 (8 Qs) (\$0.0021)

- Q1: Is an irrigator present in the frame?**
A1: Yes. An irrigator is visible in the operative field.
- Q2: What is the irrigator doing in this image?**
A2: The irrigator is aspirating fluid.
- Q3: Is pooled fluid visible in the operative field?**
A3: Yes. Pooled fluid is visible and being removed.
- Q4: Is the irrigator tip positioned inside the body cavity?**
A4: Yes. The irrigator tip is within the operative cavity.
- Q5: Is the irrigator tip contacting tissue?**
A5: No. The tip is positioned within the fluid and not contacting tissue.
- Q6: Is a grasper visible in this frame?**
A6: No. A grasper is not visible.
- Q7: Is a hook electrocautery visible in this frame?**
A7: No. A hook electrocautery is not visible.
- Q8: Is fluid actively being drawn into the irrigator tip?**
A8: Yes. Fluid is visibly being drawn into the irrigator tip.

Conversational-2 (6 Qs) (\$0.0011)

- Q1: Which instrument is visible in this frame?**
A1: I can see an irrigator (suction/irrigation) instrument in the operative field.
- Q2: What surgical phase does this image correspond to?**
A2: This view corresponds to the Cleaning Coagulation phase of the procedure.
- Q3: What action is the irrigator performing and what is it targeting?**
A3: The irrigator is aspirating (suctioning) fluid from the operative field.
- Q4: Is the irrigator contacting fluid or directly manipulating tissue in this view?**
A4: The irrigator is in contact with and removing fluid; there is no evidence of it grasping or directly manipulating tissue.
- Q5: Are any other instruments visible in the image besides the irrigator?**
A5: No. No other instruments are visible in this frame.
- Q6: Is there any active instrument applying cautery visible here?**
A6: No electrocautery or cautery-active instrument is visible in this image.

Complex Reasoning (3 Qs) (\$0.0020)

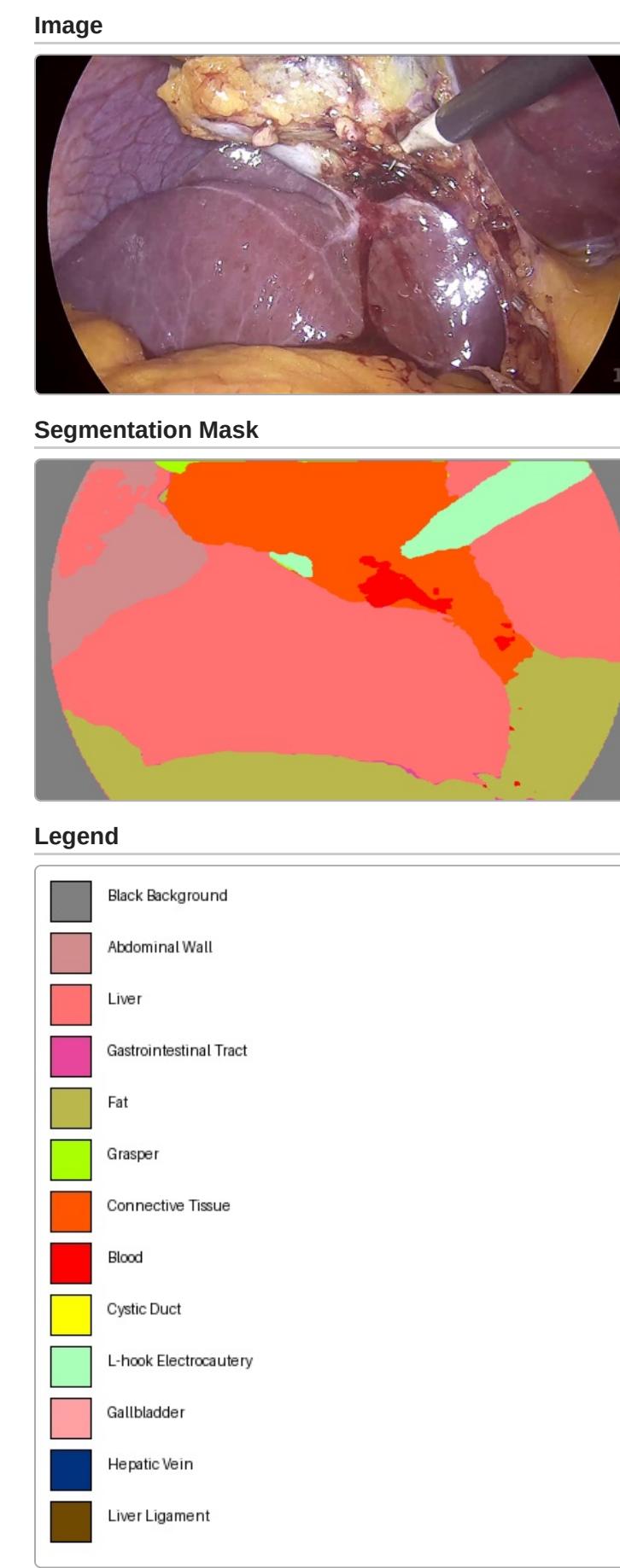
- Q1: What is the primary clinical goal of actively aspirating fluid at this stage of cleaning after coagulation?**
A1: The active aspiration is being used to clear the field so the surgeon can directly inspect the coagulated area and confirm hemostasis and absence of bile leak. By removing pooled blood, irrigation solution, and loosened clots the team regains a clear view of the tissue surfaces where coagulation was performed. This permits detection of any ongoing oozing or a persistent source that requires further energy, clipping, or topical hemostatic agents before the case is advanced.
- Q2: How should the irrigator tip be handled during aspiration to avoid converting a minor oozing site into a larger bleed?**
A2: The irrigator should be used with the tip kept slightly off of or just above the tissue surface rather than suctioning directly against friable tissue. Intermittent aspiration combined with gentle irrigation loosens and evacuates clots without pulling on vessel ends. Using low-to-moderate suction settings, sweeping motions to collect fluid, and avoiding prolonged focal suction at one spot minimizes avulsion of fragile tissue and prevents enlargement of a hemostatic defect.
- Q3: What intraoperative findings during or immediately after aspiration would indicate that coagulation was inadequate and further hemostatic measures are required?**
A3: If the cleared field rapidly reaccumulates bright red blood, if bleeding is pulsatile, or if a discrete point of flow appears when irrigation is paused, these indicate an arterial or larger venous source not controlled by surface coagulation. Persistent oozing that does not slow with pressure or time also suggests inadequate hemostasis. In those cases the appropriate next steps are targeted bipolar or monopolar coagulation at the bleeding point, placement of clips or sutures on identifiable bleeders, or application of topical hemostatic agents; if visualization remains poor, further suction/irrigation and exposure maneuvers are warranted before definitive control.

Concise (\$0.0005)

An irrigator is actively aspirating fluid to clear the operative field during the cleaning/coagulation phase.

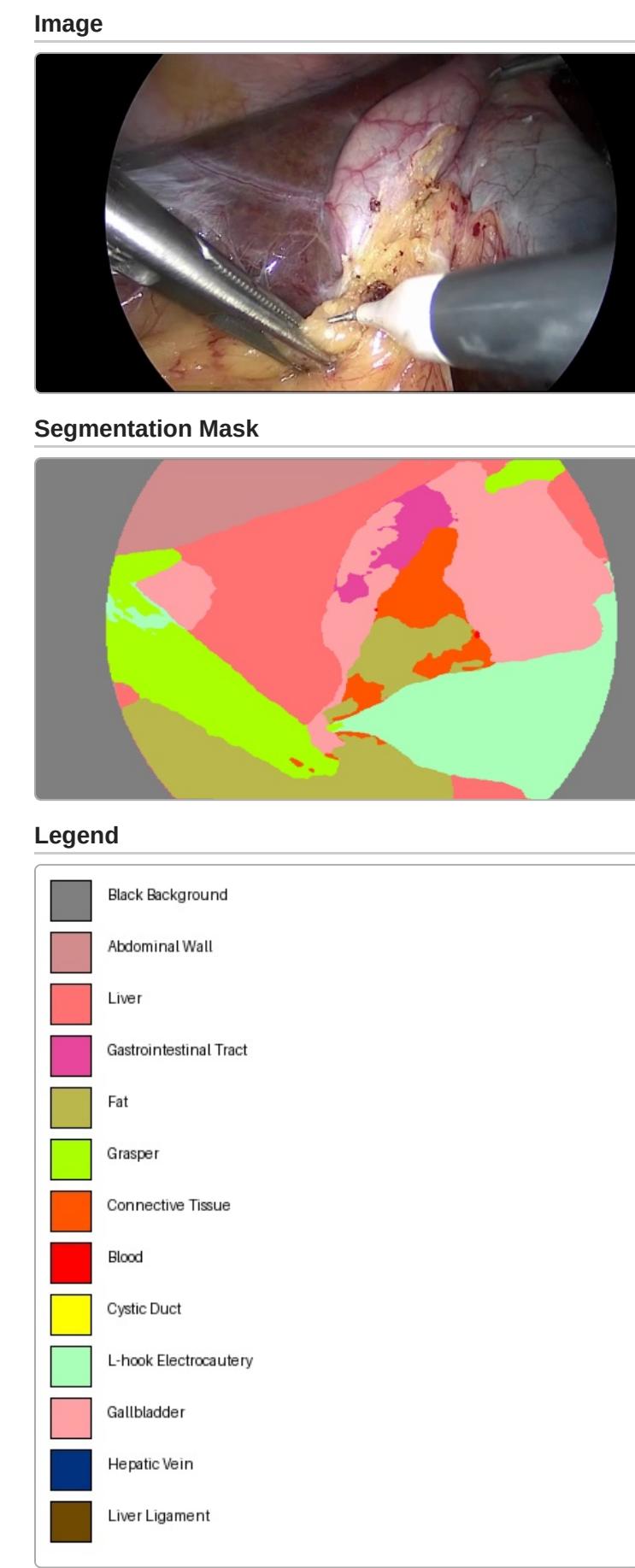
Detailed (\$0.0007)

The view is focused on a single irrigator instrument, which is actively engaged and aspirating fluid from the operative field. This corresponds with the Cleaning Coagulation phase—the irrigator is clearing pooled fluid (irrigation or blood) to restore visualization of the site. No other instruments are present or interacting in this frame.



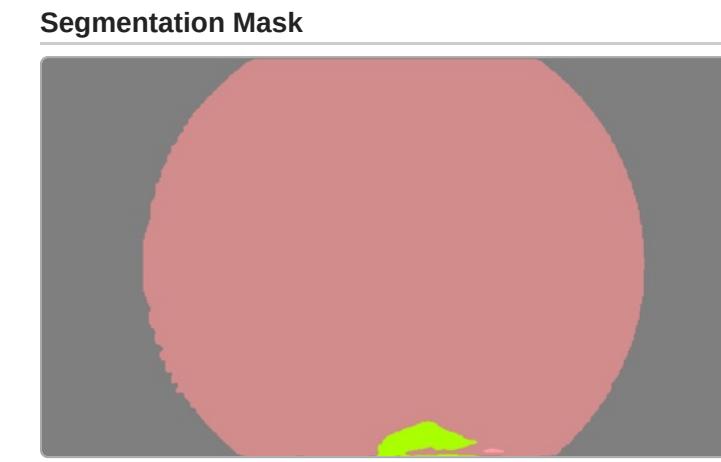
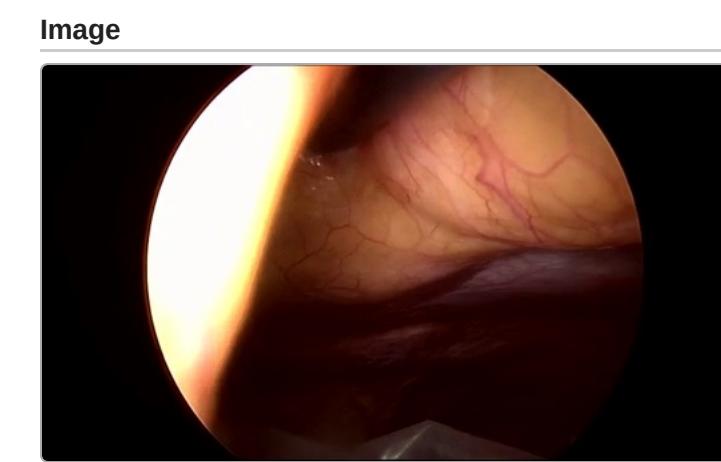
Context (LLM Input)
Visible instruments: Grasper, Hook.
Current phase: Gallbladder Dissection
Current action triplets (tool, verb, target): - (Grasper, Grasp, Gallbladder) - (Hook, Dissect, Gallbladder)
Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left-top. - Liver: right-top, center-left, bottom, left-top, left-bottom. - Gastrointestinal Tract: bottom. - Fat: bottom. - Grasper: left-top. - Connective Tissue: top. - Blood: right-top. - L-hook Electrocautery: right-top, left-top. Relative Positions: - Abdominal Wall is to the left of L-hook Electrocautery. - Liver is to the right of Abdominal Wall. - Gastrointestinal Tract is to the right of Abdominal Wall. - Fat is to the right of Abdominal Wall. - Grasper is towards the top of Fat. - Connective Tissue is to the right of Abdominal Wall. - Blood is to the right of Abdominal Wall. - L-hook Electrocautery is to the right of Grasper.

Conversational-1 (10 Qs) (\$0.0016)	Conversational-2 (8 Qs) (\$0.0017)	Complex Reasoning (2 Qs) (\$0.0021)	Concise (\$0.0005)
<p>Q1: Is the grasper visible in this frame? A1: Yes. The grasper is visible in the left-upper portion of the field.</p> <p>Q2: What is the grasper doing in this image? A2: The grasper is holding and retracting the gallbladder.</p> <p>Q3: Where is the hook electrocautery located? A3: The hook is positioned at the right-top region of the operative view.</p> <p>Q4: Is the hook actively dissecting tissue in this frame? A4: Yes. The hook is dissecting the gallbladder.</p> <p>Q5: Where is the gallbladder located in the image? A5: The gallbladder is in the central to upper-central area of the view.</p> <p>Q6: Where is the liver located relative to the operative field? A6: The liver lies to the right and forms the background behind the gallbladder.</p> <p>Q7: Is there visible blood in the operative field? A7: Yes. A small amount of blood is visible in the right-upper portion of the field.</p> <p>Q8: Where is connective tissue visible in the frame? A8: Connective tissue is present in the top-central area near the gallbladder.</p> <p>Q9: Is fatty tissue visible in this image? A9: Yes. Fatty tissue is visible in the lower portion of the field.</p> <p>Q10: From which side is the grasper approaching the gallbladder? A10: The grasper approaches from the left-upper side toward the gallbladder.</p>	<p>Q1: Which instruments are present in this image and where are they located spatially? A1: I see a grasper located in the left-upper part of the field and an L-hook electrocautery positioned to the right of the grasper (upper/right area).</p> <p>Q2: What operative phase is shown and what are the instruments doing to the gallbladder? A2: This is the gallbladder dissection phase. The grasper is grasping and retracting the gallbladder, while the hook electrocautery is dissecting the gallbladder.</p> <p>Q3: Where is the grasper relative to the gallbladder and what purpose does that position serve? A3: The grasper is applied on the superior/left aspect of the gallbladder, holding and retracting it upward to expose the dissection plane.</p> <p>Q4: How is the hook electrocautery positioned relative to the grasper and relative to the liver? A4: The hook is to the right of the grasper, approaching the gallbladder from the right side; it is also positioned closer to the liver, which lies on the right side of the field.</p> <p>Q5: Is there visible blood in the operative field, and if so where? A5: Yes. Blood is visible in the upper-right portion of the field.</p> <p>Q6: What other anatomical structures are visible and where are they located? A6: The abdominal wall is seen in the upper/left area, the liver occupies the right side, gastrointestinal tract and surrounding fat are toward the bottom, and some connective tissue is visible near the top of the field.</p> <p>Q7: Is the hook currently contacting any tissue other than the gallbladder in this view? A7: The hook is focused on the gallbladder region for dissection; there is no definite separate instrument contact with another named structure visible in this frame.</p> <p>Q8: Is the gallbladder being retracted superiorly in this view? A8: Yes. The gallbladder is being retracted upward/superiorly by the grasper to facilitate dissection.</p>	<p>Q1: What technique should the surgeon use right now to minimize the chance of creating a hole in the gallbladder wall while the hook is actively dissecting and the grasper is providing traction? A1: With the grasper actively retracting the gallbladder to create countertraction, the safest technique is to use short, controlled dissecting strokes with the hook, keeping the tip oriented tangentially to the gallbladder wall and working in the subserosal plane rather than taking deep bites toward the lumen. Continuous gentle tension from the grasper separates the layers and exposes the correct plane; the hook should make shallow sweeping motions along that plane and be activated only in brief bursts of energy. If visualization is compromised, pause dissection, suction the field, and, if needed, readjust the grasper to improve exposure rather than increasing force or depth of the hook pass. These steps reduce mechanical tearing and thermal penetration through the gallbladder wall.</p> <p>Q2: A small amount of blood is visible in the field adjacent to the liver bed. What immediate sequence of actions should be taken to control bleeding without compromising the dissection? A2: First, clear the blood promptly with suction to restore visualization and identify the precise bleeding source. If the bleeding is oozing from the liver bed, apply gentle compression with the grasper to tamponade and assess whether it stops. For persistent oozing, use the hook to deliver focal coagulation in short, low-energy pulses directed at the bleeding point while the grasper maintains exposure; avoid prolonged continuous activation to limit thermal spread. If the spot is diffuse or does not respond, convert to a bipolar device or apply an absorbable topical hemostatic agent or suture ligation as appropriate. Throughout, maintain traction-countertraction to avoid blind energy application and prevent worsening the bleed.</p>	<p>Concise (\$0.0005)</p> <p>A grasper at the upper-left firmly grasps the gallbladder. An L-hook electrocautery at the upper-right actively dissects the gallbladder adjacent to the liver on the right.</p> <p>Detailed (\$0.0010)</p> <p>Close-up laparoscopic view during gallbladder dissection. The gallbladder lies in the upper-central field and is being held by a grasper entering from the left-upper side—the grasper is actively grasping the gallbladder and providing counter-traction to expose the dissection plane. An L-hook electrocautery approaches from the right-upper side, lateral to the grasper, and is actively dissecting the gallbladder off its attachments with electrosurgical energy.</p> <p>The liver forms the background, mainly to the right/posterior, while connective tissue is visible near the superior margin of the field. Fatty tissue and portions of the gastrointestinal tract lie in the lower field, below the working area. A small amount of blood is present near the right-upper dissection site. Both instruments are engaged in the procedure (grasping and active dissection); there are no idle instruments in view.</p>



Context (LLM Input)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Omentum) - (Hook, Dissect, Omentum)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left-top. - Liver: right-top, right-bottom, center-left, center-bottom, left, left-bottom. - Gastrointestinal Tract: right-top. - Fat: bottom. - Grasper: left-bottom. - Connective Tissue: right. - Blood: center-right, center. - L-hook Electrocautery: right-bottom. - Gallbladder: right.</p> <p>Relative Positions: - Abdominal Wall is to the left of L-hook Electrocautery. - Liver is to the left of L-hook Electrocautery. - Gastrointestinal Tract is towards the top of Fat. - Fat is toward the bottom of Abdominal Wall. - Grasper is to the left of L-hook Electrocautery. - Connective Tissue is to the right of Abdominal Wall. - Blood is to the right of Fat. - L-hook Electrocautery is toward the bottom of Gastrointestinal Tract. - Gallbladder is to the right of Grasper.</p>

Conversational-1 (11 Qs) (\$0.0018)	Conversational-2 (10 Qs) (\$0.0018)	Complex Reasoning (2 Qs) (\$0.0023)	Concise (\$0.0005)
<p>Q1: Is the grasper visible in this frame? A1: Yes. The grasper is visible.</p> <p>Q2: Where is the grasper located in the operative view? A2: The grasper is located in the left-bottom portion of the field.</p> <p>Q3: What is the grasper doing in this image? A3: The grasper is retracting omental tissue.</p> <p>Q4: Is the hook electrocautery visible in this frame? A4: Yes. The hook electrocautery is visible.</p> <p>Q5: Where is the hook electrocautery positioned in the view? A5: The hook is positioned at the right-bottom of the field.</p> <p>Q6: What is the hook doing in this image? A6: The hook is dissecting omental tissue.</p> <p>Q7: Is the gallbladder visible in this frame? A7: Yes. The gallbladder is visible.</p> <p>Q8: Where is the gallbladder located in the image? A8: The gallbladder is on the right side of the operative field.</p> <p>Q9: Is blood visible in the operative field? A9: Yes. Blood is visible in the central to center-right portion of the field.</p> <p>Q10: Is fatty tissue visible in this frame? A10: Yes. Fatty tissue is visible along the lower portion of the view.</p> <p>Q11: Where is the abdominal wall located in the image? A11: The abdominal wall is seen at the left-top of the field.</p>	<p>Q1: Which instruments are visible in this frame? A1: A single grasper and a hook electrocautery (L-hook) are visible.</p> <p>Q2: What operative phase is shown in this image? A2: Calot triangle dissection.</p> <p>Q3: Which tissue structures are the instruments acting on in this view? A3: Both instruments are interacting with the omentum: the grasper is retracting omental tissue and the hook is dissecting the omentum.</p> <p>Q4: Where is the grasper located relative to the hook and the gallbladder? A4: The grasper is positioned left-bottom in the field and is to the left of the hook; the gallbladder appears to the right of the grasper.</p> <p>Q5: Is the gallbladder being directly grasped in this frame? A5: No — the gallbladder is visible on the right but the grasper is retracting omental tissue rather than directly grasping the gallbladder.</p> <p>Q6: Which instrument is closer to the visible blood collection in the operative field? A6: The hook electrocautery is closer to the blood, which is located centrally to the right; the grasper is farther to the left.</p> <p>Q7: What tissues occupy the inferior portion of the image? A7: Fat occupies the lower portion of the field, with some blood present toward the central-right inferior area.</p> <p>Q8: Where is the abdominal wall and how does it relate to the hook electrocautery? A8: The abdominal wall is visible toward the left-top of the field and is situated to the left of the hook electrocautery.</p> <p>Q9: Is connective tissue visible, and if so, where is it relative to the hook? A9: Yes — connective tissue is present on the right side of the field and lies near the hook electrocautery.</p> <p>Q10: How are the instruments positioned to facilitate dissection during this phase? A10: The grasper is retracting omental tissue from the left-bottom to provide exposure, while the hook approaches from the right-bottom to dissect the omentum adjacent to the gallbladder.</p>	<p>Q1: Given that one instrument is actively retracting omental fat while the electrocautery hook is dissecting that same tissue, what is the immediate procedural goal and why is that sequencing (traction then dissection) important here? A1: The immediate goal is to clear the overlying omental/fatty tissue to expose and delineate the underlying gallbladder and Calot's triangle so that the surgeon can safely identify the cystic structures. Retracting the omentum first places the tissue under tension and creates a safe, predictable plane for the hook to divide. Traction—countertraction improves visualization, reduces the chance of the hook grabbing or burning unstabilized tissue, and allows more precise, incremental application of energy. In short, active retraction focuses and isolates the target tissue while the hook performs controlled dissection, minimizing inadvertent damage to deeper structures.</p> <p>Q2: What are the most relevant immediate hazards when dissecting omentum with an energized hook in close proximity to bowel and liver, and how do the instruments' roles influence those risks? A2: Two main hazards are thermal injury to adjacent viscera (especially bowel) and bleeding from omental or liver-parenchymal vessels. Because the hook is energized and actively dividing tissue, unintended contact or prolonged activation against non-target tissue can produce thermal spread to adjacent bowel or serosa. Concurrently, omental vessels or small capsular vessels from the liver can be avulsed or thermally injured, producing bleeding that may obscure the field. The grasper's role in maintaining tension helps reduce these risks by stabilizing the target and keeping non-target tissues displaced, but if retraction is inadequate or the hook is activated while tissue is not well-isolated, those risks increase.</p>	<p>A grasper on the left retracts omental/fatty tissue while an L-hook electrocautery on the right actively dissects the omentum. The gallbladder and liver are visible on the right, with some blood and connective tissue present.</p> <p>Detailed (\$0.0012)</p> <p>Laparoscopic view of the right upper quadrant focused on Calot triangle dissection. The liver forms much of the left/background field while the abdominal wall is visible toward the upper-left. The gallbladder lies on the right side of the field, with fatty/omental tissue and connective tissue occupying the lower and right portions and some gastrointestinal structures visible toward the upper-right.</p> <p>A grasper enters from the left-lower region and is actively retracting omental/fatty tissue to expose the operative window and tension the area around the gallbladder. An L-hook electrocautery approaches from the right-lower side and is actively dissecting omental attachments—using electrosurgical dissection to separate the omentum/connective tissue from the gallbladder region. The grasper and hook are working in opposition to create exposure and allow controlled dissection. A small amount of blood is present centrally/right, consistent with minor oozing during dissection. No other instruments are present or idle in this view.</p>



Legend

	Black Background
	Abdominal Wall
	Liver
	Gastrointestinal Tract
	Fat
	Grasper
	Connective Tissue
	Blood
	Cystic Duct
	L-hook Electrosurgery
	Gallbladder
	Hepatic Vein
	Liver Ligament

FASL Prediction (Conf: 0.9944)

Context (LLM Input)

Visible instruments:
SpecimenBag.

Current phase:
Gallbladder Retraction

Current action triplets (tool, verb, target):
No actions are taking place.

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: [x_min: 14, y_min: 0, x_max: 85, y_max: 99]
- Grasper: center-bottom.
- Gallbladder: center-bottom.

Relative Positions:
- Abdominal Wall is towards the top of Gallbladder.
- Grasper is toward the bottom of Abdominal Wall.
- Gallbladder is to the right of Grasper.

Conversational-1 (8 Qs) (\$0.0020)

- Q1: Is a specimen bag visible in this frame?**
A1: Yes, a specimen bag is visible.
- Q2: Is a grasper visible in this frame?**
A2: Yes, a grasper is visible.
- Q3: Where is the grasper located in the view?**
A3: The grasper is at the center-bottom of the image.
- Q4: Is the gallbladder visible in this frame?**
A4: Yes, the gallbladder is visible.

- Q5: Where is the gallbladder located in the view?**
A5: The gallbladder is at the center-bottom of the image, slightly to the right of the grasper.
- Q6: Is the grasper actively retracting tissue in this frame?**
A6: No, the grasper is not actively retracting; no actions are taking place.
- Q7: Where is the abdominal wall located in the view?**
A7: The abdominal wall is toward the top of the image.
- Q8: Is the gallbladder positioned below the abdominal wall?**
A8: Yes, the gallbladder is positioned below the abdominal wall.

Conversational-2 (6 Qs) (\$0.0020)

- Q1: What instruments are visible in this frame?**
A1: A specimen retrieval bag is the only instrument visible in the operative field.
- Q2: What phase of the procedure is shown in this image?**
A2: This view corresponds to the gallbladder retraction phase.
- Q3: Are any instruments actively manipulating tissue in this image?**
A3: No. There are no active instrument actions visible in this frame.
- Q4: Where is the gallbladder located within the view relative to the abdominal wall?**
A4: The abdominal wall is at the top of the image; the gallbladder appears centrally in the lower half (center-bottom), below the abdominal wall.
- Q5: Is the gallbladder contained within the specimen bag in this view?**
A5: Yes. The gallbladder is positioned at the center-bottom of the field and is contained within the specimen bag.
- Q6: Is a grasper visible or present in this frame?**
A6: No. A grasper is not visible in this frame; only the specimen bag and the gallbladder within it are apparent.

Complex Reasoning (2 Qs) (\$0.0029)

- Q1: Given that a specimen retrieval bag is present in the field and no instruments are actively manipulating tissue, what is the most likely immediate step the surgeon will take and why?**

A1: The most likely immediate step is retrieval of the gallbladder inside the specimen bag through a port site. The presence of a retrieval bag with no active instruments suggests the specimen has already been placed in the bag and the team is pausing to extract it. Extraction is performed now to remove the infected or removed organ from the peritoneal cavity, prevent intra-abdominal contamination, and clear the operative field. Before pulling the bag, the surgeon will typically confirm the bag mouth is closed around the specimen, ensure adequate visualization, and that there is no ongoing bleeding or bile leak that would be dragged out with the specimen.

- Q2: What specific precautions should be taken during extraction to minimize port-site contamination and prevent intra-abdominal spillage?**

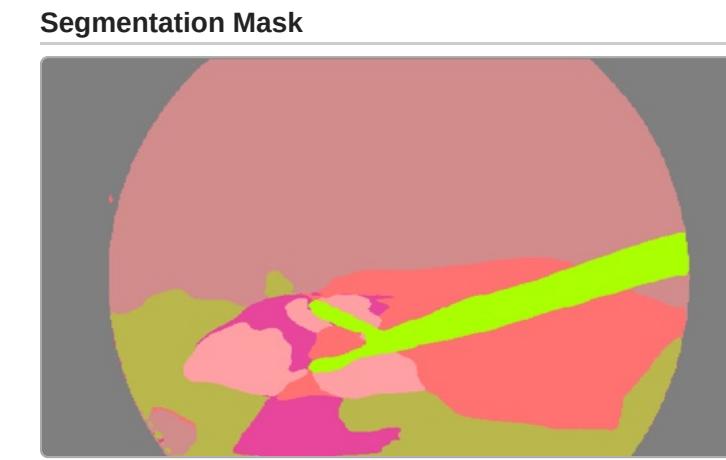
A2: Key precautions include: (1) Confirm the specimen is fully enclosed and the bag mouth is securely closed so no bile or stones can escape during withdrawal. (2) Withdraw the bag under direct camera vision so any resistance or bag rupture is recognized immediately. (3) If the bag appears tight or the specimen bulky, enlarge the extraction incision slightly rather than force the bag through a small port—this reduces the chance of tearing the bag and port-site soft tissue trauma. (4) Suction and irrigate the cavity before and after extraction if there is any suspicion of spillage. (5) Inspect the extraction path and the port site for contamination and remove any visible debris or stones laparoscopically before closure. These steps are chosen because the bag is the only visible retrieval device and no instruments are currently active, indicating the team is preparing for a controlled exit rather than a rapid or inadvertent removal.

Concise (\$0.0006)

A specimen retrieval bag is present near the gallbladder in the lower-central field. The gallbladder lies beneath the abdominal wall (top of frame). No instruments are actively manipulating tissue.

Detailed (\$0.0010)

The image shows the gallbladder occupying the lower-central portion of the field and contained within a specimen retrieval bag. The abdominal wall is visible superiorly (upper field) above the bag and gallbladder. The specimen bag is present around the gallbladder but is not being actively manipulated at this moment—no instruments are performing actions. Overall the scene appears quiescent with the gallbladder secured in the bag and no visible bleeding or ongoing dissection.



Context (LLM Input)

Visible instruments:
Grasper.

Current phase:
Preparation

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: top.
- Liver: right-bottom.
- Gastrointestinal Tract: left-bottom.
- Fat: bottom.
- Grasper: right.
- L-hook Electrocautery: left-bottom.
- Gallbladder: left-bottom.

Relative Positions:
- Abdominal Wall is towards the top of L-hook Electrocautery.
- Liver is to the right of L-hook Electrocautery.
- Gastrointestinal Tract is to the left of Grasper.
- Fat is toward the bottom of Abdominal Wall.
- Grasper is to the right of L-hook Electrocautery.
- L-hook Electrocautery is to the left of Fat.
- Gallbladder is to the left of Grasper.

Conversational-1 (9 Qs) (\$0.0020)

- Q1: Is a grasper present in the image?**
A1: Yes.
- Q2: Where is the grasper located in the operative field?**
A2: On the right side of the view.
- Q3: What is the grasper doing in this frame?**
A3: Retracting the gallbladder.
- Q4: Where is the gallbladder located in the frame?**
A4: Toward the left-bottom of the field.
- Q5: Where is the liver located in the frame?**
A5: On the right-bottom side of the field.
- Q6: Where is fatty tissue located in this view?**
A6: Along the bottom of the image.
- Q7: Where is the gastrointestinal tract located in the frame?**
A7: At the left-bottom of the view.
- Q8: Is an electrocautery hook visible in this image?**
A8: No.
- Q9: Is there visible bleeding in the operative field?**
A9: No.

Conversational-2 (9 Qs) (\$0.0016)

- Q1: Which surgical instrument is visible in this frame?**
A1: A single laparoscopic grasper is visible.
- Q2: What procedural phase does this image correspond to?**
A2: This view corresponds to the preparation phase of the operation.
- Q3: What tissue is the grasper currently interacting with?**
A3: The grasper is retracting the gallbladder.
- Q4: Where is the gallbladder located relative to the grasper in the image?**
A4: The gallbladder lies to the left and slightly inferior (lower) of the grasper.
- Q5: Is an electrocautery hook visible and active in this frame?**
A5: No. There is no electrocautery hook visibly present or active in this frame.
- Q6: Which other anatomical structures are visible and where are they positioned?**
A6: The abdominal wall is in the superior (top) region, the liver is on the right and lower portion, the gastrointestinal tract is toward the left lower field, and fatty tissue occupies the lower part of the view.
- Q7: Is the grasper retracting any adjacent fatty tissue or only the gallbladder?**
A7: The grasper is retracting the gallbladder; there is no clear evidence it is actively retracting adjacent fatty tissue in this image.
- Q8: What is the spatial relationship between the liver and the gallbladder in this view?**
A8: The liver is positioned to the right of the gallbladder.
- Q9: Does the operative field show any additional instruments or trocars entering the scene?**
A9: No additional instruments or trocars are visible; only the grasper is present in the field.

Complex Reasoning (2 Qs) (\$0.0025)

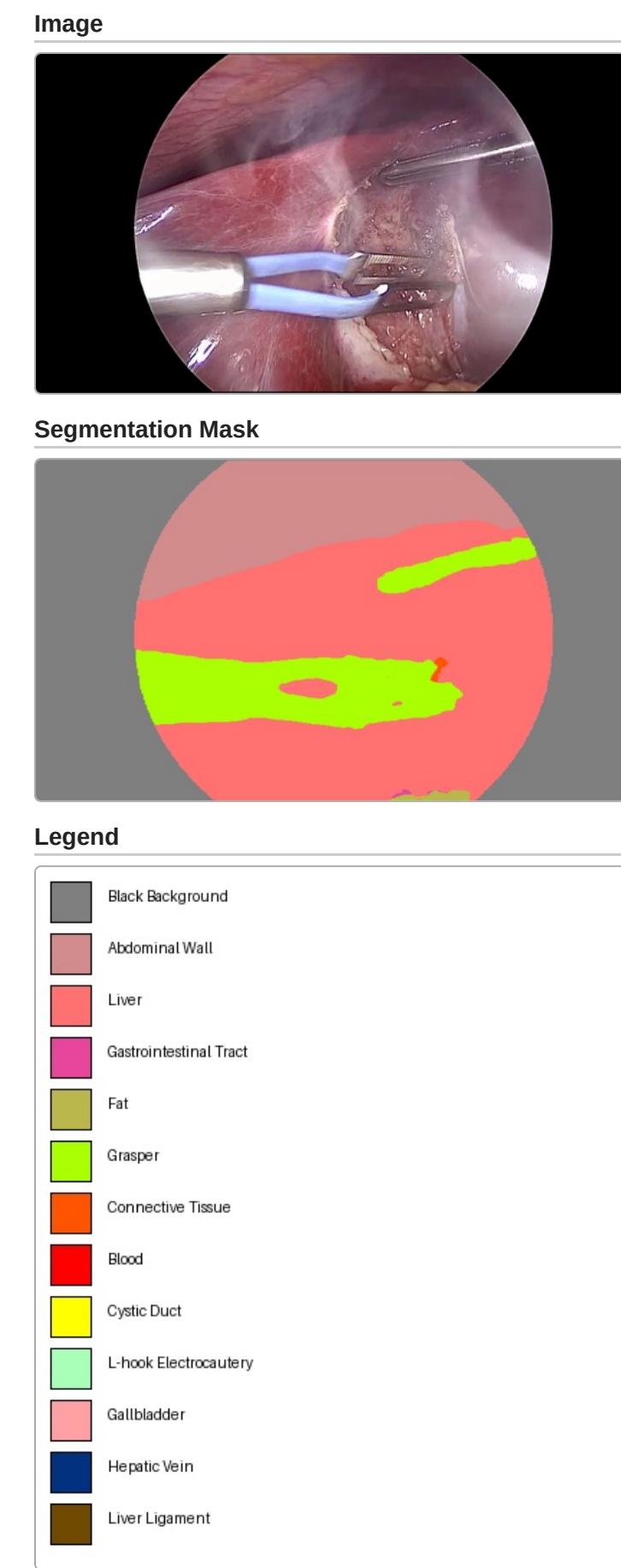
- Q1: What specific exposure objectives are being achieved by the current retraction, and how does that preparation facilitate the immediate next dissection maneuver?**
A1: The active retraction is applying sustained tension to evert and lateralize the gallbladder so that the infundibulum and cystic-hepatic interface are pulled away from the liver and adjacent viscera. This accomplishes three preparatory goals: (1) it opens the plane between the gallbladder and liver bed, (2) it brings the infundibulum into a more anterior and accessible position for safe identification of the cystic structures, and (3) it moves nearby fat and bowel away from the intended energy application zone. With this traction maintained by the grasper, the next step—introducing the hook for precise dissection—can be performed with improved visualization and a predictable traction–countertraction vector that exposes tissue planes and reduces the chance of inadvertent contact with non-target structures.
- Q2: What are the principal risks created by continuing firm traction at this preparatory stage, and what maneuvers should the operator use to mitigate those risks?**
A2: Excessive or poorly directed traction risks avulsion or tearing of delicate structures (for example, the cystic duct or small cystic artery branches), gallbladder wall perforation with bile spillage, and distortion of the anatomy that can mask the true course of biliary structures. To mitigate these risks, the operator should use gentle, steady traction rather than intermittent forceful pulls; reposition the grasper to a more distal bite on the fundus or body if the current hold is near the infundibulum; provide countertraction with another instrument if available; avoid torsional forces; and reassess anatomy frequently. If the field flickers with tension or tissue blanching is seen, relax traction and re-evaluate before permitting energy instruments to proceed.

Concise (\$0.0006)

A single grasper is actively retracting the gallbladder (left-lower field) for exposure. The liver lies to the right-lower side with abdominal wall at the top. No other instruments are active in this preparation phase.

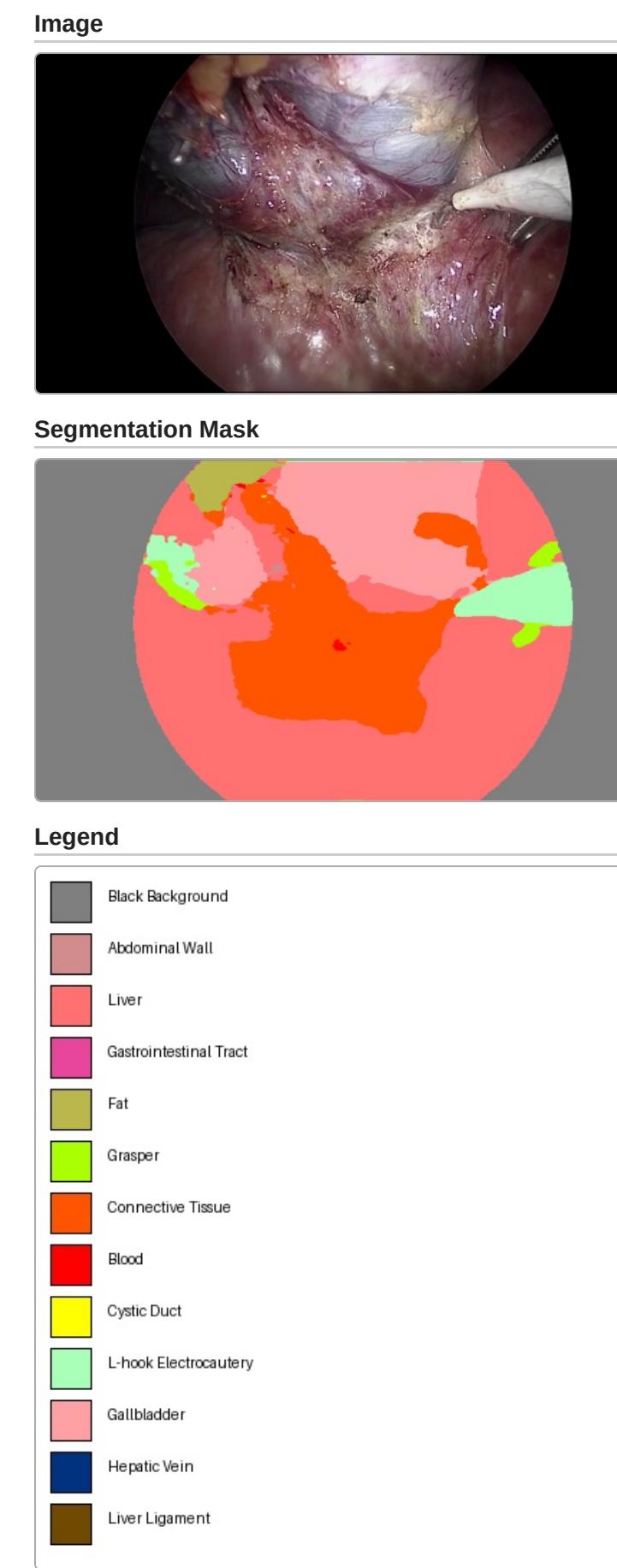
Detailed (\$0.0015)

The view is focused on the gallbladder in the left-lower portion of the field, with the abdominal wall forming the upper margin of the image. A single grasper is visible on the right side of the view; it is actively engaging and retracting the gallbladder to expose the operative area. Fatty tissue and portions of the gastrointestinal tract lie in the lower field beneath the gallbladder, while the liver occupies the right-lower background. An L-hook electrocautery instrument appears in the left-lower region but is not actively being used at this moment. The scene is consistent with preparation for dissection, with the grasper providing traction to optimize exposure.

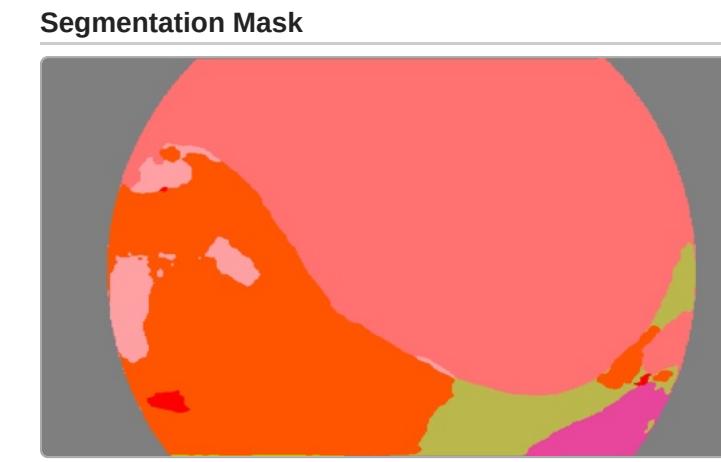
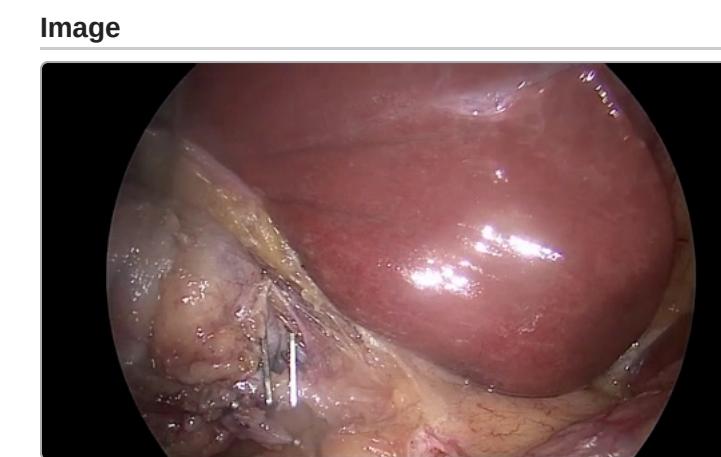


Context (LLM Input)
<p>Visible instruments: Grasper, Bipolar.</p> <p>Current phase: Cleaning Coagulation</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Liver) - (Bipolar, Coagulate, Liver)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: top. - Liver: left-bottom, center-bottom, center-left, center. - Gastrointestinal Tract: center-bottom, right-bottom. - Fat: right-bottom. - Grasper: bottom. - Connective Tissue: right-bottom.</p> <p>Relative Positions: - Abdominal Wall is towards the top of Fat. - Liver is toward the bottom of Abdominal Wall. - Gastrointestinal Tract is toward the bottom of Abdominal Wall. - Fat is toward the bottom of Grasper. - Grasper is toward the bottom of Abdominal Wall. - Connective Tissue is toward the bottom of Abdominal Wall.</p>

Conversational-1 (9 Qs) (\$0.0012)	Conversational-2 (9 Qs) (\$0.0015)	Complex Reasoning (2 Qs) (\$0.0019)	Concise (\$0.0005)
<p>Q1: Is the bipolar instrument visible in the frame? A1: Yes. The bipolar instrument is visible.</p> <p>Q2: What is the grasper doing in this image? A2: The grasper is retracting the liver.</p> <p>Q3: Where is the grasper positioned in the operative view? A3: The grasper is located toward the bottom of the image.</p> <p>Q4: What action is the bipolar instrument performing? A4: The bipolar is coagulating liver tissue.</p> <p>Q5: Where is the liver located in the image? A5: The liver occupies the central to left lower portion of the view.</p> <p>Q6: Is the abdominal wall visible in this frame? A6: Yes. The abdominal wall is visible at the top of the image.</p> <p>Q7: Is fatty tissue visible in the field? A7: Yes. Fat is visible toward the right-lower portion of the field.</p> <p>Q8: Is the gastrointestinal tract visible in this frame? A8: Yes. Gastrointestinal tract structures are visible in the lower-central to right-lower area.</p> <p>Q9: Is connective tissue visible in the image? A9: Yes. Connective tissue is visible toward the right-lower part of the view.</p>	<p>Q1: Which instruments are visible in this frame? A1: A grasper and bipolar forceps are visible.</p> <p>Q2: What procedural phase is shown in this image? A2: This image shows the cleaning/coagulation phase.</p> <p>Q3: Which organ is the grasper retracting, and where is the grasper located in the image? A3: The grasper is retracting the liver; the grasper tip is located in the lower portion of the image engaging the liver.</p> <p>Q4: What is the bipolar instrument doing and what tissue is it targeting? A4: The bipolar is coagulating liver tissue; its action is focused on the liver in the central to left-bottom region.</p> <p>Q5: Are both instruments interacting with the same organ in this view? A5: Yes. Both the grasper and the bipolar are interacting with the liver—the grasper retracts it while the bipolar coagulates it.</p> <p>Q6: Where is the abdominal wall located in the frame relative to the other structures? A6: The abdominal wall is visible toward the top of the image, above the liver and other intra-abdominal structures.</p> <p>Q7: Is there visible gastrointestinal tract or fat, and where are they located relative to the liver? A7: Yes. The gastrointestinal tract appears in the center-bottom to right-bottom area, and fat is present toward the right-bottom; both lie inferior and/or to the right of the liver.</p> <p>Q8: Is there any visible connective tissue in the operative field, and where is it located? A8: Yes. Connective tissue is visible at the right-bottom of the image, adjacent to the fat and gastrointestinal tract.</p> <p>Q9: Is there any obvious active bleeding visible in this frame? A9: No obvious active bleeding or pooled blood is visible in this frame.</p>	<p>Q1: Given that one instrument is providing sustained retraction on the liver while the bipolar forceps are actively coagulating the liver surface, what is the most likely immediate surgical objective and why is this combination of maneuvers appropriate? A1: The immediate objective is focused hemostasis of oozing from the liver surface and cleaning the operative field. Retracting the liver exposes the bleeding surface and creates a stable, tensioned target; the bipolar forceps then deliver localized coagulation between their jaws to seal small bleeding points without spreading current through distant tissues. This combination is appropriate because bipolar energy confines the current path to tissue grasped between the forceps, allowing precise sealing of small vessels in the liver parenchyma while the grasper maintains exposure and countertraction to stabilize the tissue for effective contact and controlled energy delivery.</p> <p>Q2: What specific instrument-related risk is increased when coagulating tissue that is simultaneously held by a grasper, and how should the team mitigate it? A2: Coagulating tissue that is compressed or held by a grasper increases the risk of thermal crush injury and delayed tissue necrosis at the compression-site because heat concentrates where tissue is compressed and vascular supply is already compromised. Additionally, if the grasper's jaws or shaft are in close contact with the coagulation site, there is risk of unintended thermal conduction or coupling. To mitigate this, the operator should avoid direct coagulation of tissue that is trapped inside another instrument's jaws, release or slightly relax traction when applying energy so only the bipolar forceps contact the target, use short activation intervals at the lowest effective power, and visually confirm blanching/sealing rather than prolonged char. If needed, reposition the grasper to retract adjacent tissue rather than grasp the bleeding point itself.</p>	<p>A grasper retracts the liver inferiorly. Bipolar forceps actively coagulate the liver surface for hemostasis.</p> <p>Detailed (\$0.0007)</p> <p>The view is focused on the inferior abdomen with the liver occupying the lower-center to lower-left portion of the field. A grasper is positioned in the lower part of the image and is actively retracting the liver upward/antero-superiorly to expose the area. A bipolar instrument is also in the lower field and is actively applying coagulation to the liver surface to control oozing or secure hemostasis. To the right-lower quadrant there is fatty and connective tissue and portions of the gastrointestinal tract are visible along the lower center/right. The abdominal wall is seen anteriorly at the top of the view.</p>



Context (LLM Input)	Conversational-1 (10 Qs) (\$0.0021)	Conversational-2 (8 Qs) (\$0.0013)	Complex Reasoning (2 Qs) (\$0.0025)	Concise (\$0.0006)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Gallbladder Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Liver) - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left. - Liver: right-top, center-right, center-top, bottom, center, left-top. - Gastrointestinal Tract: left-top. - Fat: left-top. - Grasper: top. - Connective Tissue: center. - Blood: left-top, center-top, center. - Cystic Duct: center-top. - L-hook Electrocautery: top. - Gallbladder: top.</p> <p>Relative Positions: - Abdominal Wall is to the left of L-hook Electrocautery. - Liver is toward the bottom of Gastrointestinal Tract. - Gastrointestinal Tract is to the left of L-hook Electrocautery. - Fat is to the left of L-hook Electrocautery. - Grasper is to the right of Gastrointestinal Tract. - Connective Tissue is toward the bottom of Gastrointestinal Tract. - Blood is to the right of Gastrointestinal Tract. - Cystic Duct is towards the top of Liver. - L-hook Electrocautery is to the right of Cystic Duct. - Gallbladder is to the right of Gastrointestinal Tract.</p>	<p>Q1: Is the grasper present in this frame? A1: Yes. The grasper is visible.</p> <p>Q2: Is the hook electrocautery present in this frame? A2: Yes. The hook electrocautery is visible.</p> <p>Q3: Is the grasper retracting in this frame? A3: Yes. The grasper is retracting.</p> <p>Q4: Is the hook dissecting in this frame? A4: Yes. The hook is dissecting.</p> <p>Q5: Where is the gallbladder located in the operative view? A5: The gallbladder is at the top of the frame.</p> <p>Q6: Where is the liver located in the operative view? A6: The liver is on the right side of the frame.</p> <p>Q7: Is there visible blood in this image? A7: Yes. Blood is visible.</p> <p>Q8: Is fatty tissue visible in this image? A8: Yes. Fatty tissue is visible.</p> <p>Q9: Where is the grasper positioned in the frame? A9: The grasper is positioned at the top of the frame.</p> <p>Q10: Where is the hook positioned in the frame? A10: The hook is positioned toward the top of the frame.</p>	<p>Q1: Which instruments are visible in this image? A1: A grasper and an L-hook electrocautery (hook) are visible.</p> <p>Q2: What phase of the cholecystectomy is depicted? A2: This image is during the gallbladder dissection phase.</p> <p>Q3: Which structure is the hook currently dissecting, and where is it located in the frame? A3: The hook is dissecting the gallbladder, which is located toward the top of the image.</p> <p>Q4: What is the grasper retracting, and where is the grasper positioned relative to other anatomy? A4: The grasper is retracting the liver; it is positioned near the top of the frame, to the right of the gastrointestinal tract.</p> <p>Q5: Is the cystic duct visible, and how is it positioned relative to the liver and hook? A5: Yes. The cystic duct is visible at the top-center and is located toward the top of the liver; the L-hook electrocautery is to the right of the cystic duct.</p> <p>Q6: Are there any signs of blood or fluid in the operative field, and where are they located? A6: Blood is visible in the image, primarily in upper and central regions of the field.</p> <p>Q7: Where is connective tissue and fat located relative to the gallbladder in this view? A7: Connective tissue appears centrally beneath the upper structures, while fatty tissue appears toward the left-top; the gallbladder is located at the top above these tissues.</p> <p>Q8: How are the grasper and L-hook positioned relative to each other around the gallbladder? A8: Both instruments are in the upper field; the grasper is slightly left/central at the top holding tissues, while the L-hook is positioned more to the right-top approaching the gallbladder for dissection.</p>	<p>Q1: Given the current maneuvers and the presence of a ductal structure nearby, what is the safest strategy for continued dissections to avoid inadvertent biliary injury? A1: The safest strategy is to maintain controlled traction-countertraction to expose the plane and perform short, deliberate energy activations while displacing critical ductal structures away from the energy source. Practically, this means the retractor should hold the liver/gallbladder to tension the dissection plane and the hook should be used to tease tissue away from the duct rather than sweeping or tunneling toward it. Use low to moderate power setting with brief intermittent activations (avoid prolonged contact), lift tissue into the hook tip before firing, and pause to reassess anatomy after each small increment of division. If any structure remains ambiguous, stop further division, clear blood/ebrys, and obtain additional confirmation (further dissection to expose the triangle fully or intraoperative imaging) before clipping or cutting. These steps minimize thermal spread and misidentification that lead to bile duct injury.</p> <p>Q2: There is some blood in the field while dissection continues. What immediate steps should be taken to restore a safe operative view, and how should the instruments' roles change during that process? A2: First, arrest active bleeding and restore a clear view. Assign the grasper to maintain steady retraction to keep the field open while introducing suction/irrigation to evacuate blood and clots. If the bleeding source is pinpoint oozing from small vessels in the liver bed, use brief, targeted electrocautery with the hook while the tissue is lifted and separated from critical structures; if suction is keeping the field clear, alternate suction and coagulation in short cycles. For more brisk bleeding, apply pressure with the grasper or a laparoscopic swab to tamponade, then identify the vessel and control it with focused coagulation or clips. Throughout this, avoid sweeping the hook blindly—only apply energy under direct vision once the area is suctioned and anatomy reassessed.</p>	<p>Concise (\$0.0006)</p> <p>A grasper retracts the liver while an L-hook electrocautery actively dissects the gallbladder. The cystic duct and connective tissue lie nearby, with minor blood visible.</p> <p>Detailed (\$0.0011)</p> <p>The image is focused on the gallbladder region at the top/central portion of the field with the liver occupying the right side and upper background. A grasper is positioned at the top of the view and is actively retracting the liver to expose the gallbladder and the hepatocystic triangle. An L-hook electrocautery is located to the right/top of the cystic duct area and is actively dissecting the gallbladder from surrounding connective tissue along its bed. Central connective tissue is being divided and there is some scattered blood seen in the central and upper-left field. The abdominal wall, fatty tissue and part of the gastrointestinal tract lie to the left of the working area. Both instruments are engaged—the grasper providing retraction and exposure, and the hook performing dissection.</p>



FASL Prediction (Conf: 0.9592)

Context (LLM Input)

Visible instruments:
No instruments are visible.

Current phase:
Clipping Cutting

Current action triplets (tool, verb, target):
No actions are taking place.

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: right-top, center-left, center-right, left-top, left-bottom.
- Liver: left-top, center-right, left-bottom, right-bottom.
- Gastrointestinal Tract: right-bottom.
- Fat: right-bottom.
- Grasper: center-bottom, left-bottom.
- Connective Tissue: left.
- Blood: left-bottom.
- Gallbladder: left.

Relative Positions:

- Abdominal Wall is towards the top of Grasper.
- Liver is towards the top of Grasper.
- Gastrointestinal Tract is to the right of Gallbladder.
- Fat is to the right of Gallbladder.
- Grasper is to the left of Fat.
- Connective Tissue is to the left of Gastrointestinal Tract.
- Blood is to the left of Gastrointestinal Tract.
- Gallbladder is to the left of Liver.

Conversational-1 (10 Qs) (\$0.0021)

Q1: Is a grasper visible in this frame?

A1: No, a grasper is not visible.

Q2: Is a hook electrocautery visible in this frame?

A2: No, a hook electrocautery is not visible.

Q3: Where is the gallbladder located in the view?

A3: The gallbladder is on the left side of the image, in the central-left region.

Q4: Is the gallbladder being grasped by an instrument?

A4: No, the gallbladder is not being grasped by any instrument in this frame.

Q5: Is there any blood visible in the operative field?

A5: Yes. There is blood visible in the lower-left portion of the field.

Q6: Where is the liver located relative to the gallbladder?

A6: The liver is located to the right of the gallbladder, forming the background on the right side.

Q7: Where is fatty tissue located in the image?

A7: Fat is present in the right-lower portion of the field.

Q8: Is the gastrointestinal tract visible in this frame?

A8: Yes. The gastrointestinal tract is visible in the right-lower area.

Q9: Is the abdominal wall visible at the top of the image?

A9: Yes. The abdominal wall is visible along the top of the field.

Q10: Are any surgical clips visible in the operative field?

A10: No surgical clips are visible.

Conversational-2 (10 Qs) (\$0.0015)

Q1: What operative phase does this image show?

A1: This image corresponds to the clipping and cutting phase of the procedure.

Q2: Are any instruments visible in the field right now?

A2: No instruments are visible in this frame.

Q3: Are any operative actions being performed in this image?

A3: No. There are no actions taking place in this view.

Q4: Where is the gallbladder located in the image, and what is it adjacent to?

A4: The gallbladder is located on the left side of the image and is positioned left of the liver.

Q5: Where is the gastrointestinal tract relative to the gallbladder?

A5: The gastrointestinal tract is to the right and inferior (lower-right) of the gallbladder.

Q6: Is there visible fat in the field, and if so where is it relative to the gallbladder?

A6: Yes. Fat is visible toward the right-bottom of the image and lies to the right of the gallbladder.

Q7: Is there any blood visible, and where is it located?

A7: Yes. Blood is visible in the lower-left portion of the image.

Q8: Where is connective tissue visible in the operative field?

A8: Connective tissue is visible on the left side of the image, positioned left of the gastrointestinal tract.

Q9: Is the liver visible, and how is it distributed in the frame?

A9: Yes. The liver is visible and spans regions toward the left and lower portions of the image, adjacent to the gallbladder.

Q10: Are any surgical clips or other devices visible on the gallbladder or surrounding structures?

A10: No surgical clips or other devices are visible in this frame.

Complex Reasoning (3 Qs) (\$0.0023)

Q1: What immediate checks and actions should the surgeon perform before attempting to clip and divide any structures from this view?

A1: Before any clipping or transection, the team should (1) re-establish a clear operative field—suction away the visible blood and irrigate if needed so tissue planes are not obscured; (2) restore appropriate instruments and traction if none are currently in the field (ensure a retractor/grasper is in place to provide counter-traction); (3) clear connective tissue and fat from the hepatocystic triangle until the cystic duct and artery can be clearly identified and the critical view of safety is obtained; and (4) confirm the relationship of the gallbladder to the liver and adjacent bowel so that clips will be applied to the intended pedicle. These steps reduce the chance of misidentification or blind clipping when the actual clipping/cutting step resumes.

Q2: Given that no instruments are visible and there is some blood in the field, how should the team prioritize hemostasis versus proceeding with clip application?

A2: Priority should be hemostasis and visualization before clipping. Blood in the operative window can mask anatomy and lead to incorrect clip placement. The appropriate sequence is to suction the blood, apply gentle pressure or topical hemostatic agents to control oozing, identify the bleeding source (hepatic bed, small vessel, or gallbladder wall), and if necessary use targeted coagulation once the source is isolated. Only after bleeding is controlled and the anatomy is clearly defined should clipping and division be attempted. Attempting to clip while the field is bloody and instruments are not optimally positioned increases the risk of clipping the wrong structure or having clips slip.

Q3: What specific risks arise from attempting to clip and cut now, and how are those risks linked to the current visual cues?

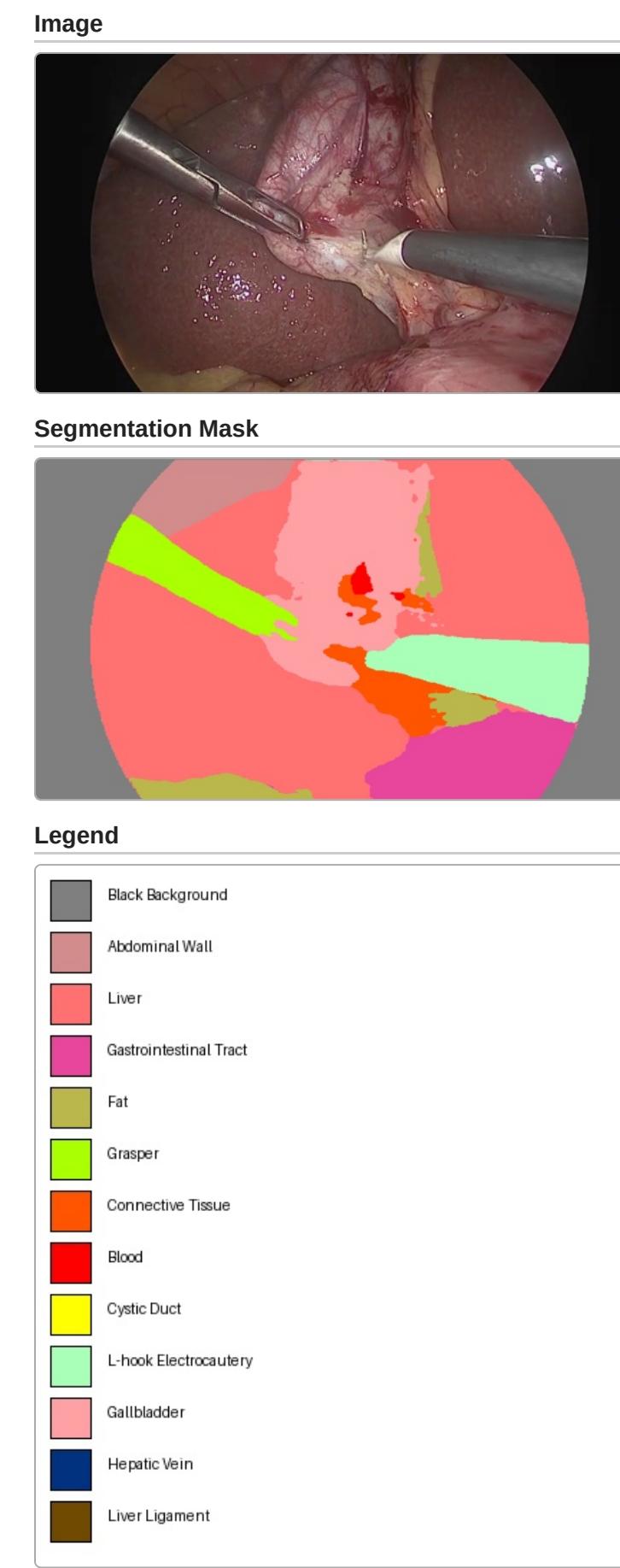
A3: The main risks are misidentification of structures (leading to cystic duct vs common bile duct injury), incomplete or slipped clips (if applied through fatty or bloody tissue), and inadvertent injury to adjacent organs (notably the bowel visible nearby). These risks are tied to the observed cues: obscured anatomy due to blood, residual fat/connective tissue around the gallbladder, and proximity of gastrointestinal structures. Additionally, absence of instruments in view suggests traction and exposure may not be optimized, making precise clip placement less reliable.

Concise (\$0.0007)

No instruments are visible and no actions are taking place despite being in the clipping/cutting phase. The gallbladder lies on the left adjacent to the liver. Fat and the gastrointestinal tract are positioned to the right. A small amount of blood and connective tissue are visible in the lower field, with the abdominal wall surrounding the operative view.

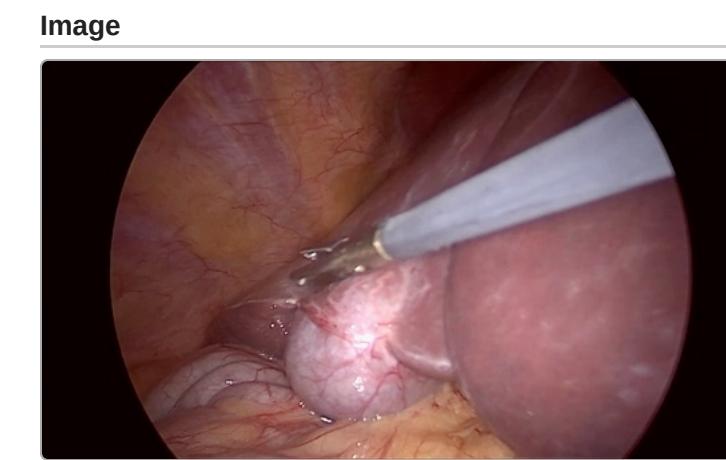
Detailed (\$0.0009)

No instruments are visible or engaged in this frame. The gallbladder occupies the left portion of the view with the liver situated immediately to its right/back. The gastrointestinal tract and surrounding fatty tissue appear toward the lower-right of the field. Connective tissue lies more medially/leftward, and a small area of blood is present in the lower-left quadrant. Portions of the abdominal wall form the peripheral margins of the image. Although the procedure phase is clipping/cutting, there is no clipping or cutting activity visible in this moment.



Context (LLM Input)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder) - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left-top. - Liver: right-top, right-bottom, center-right, center-top, center-bottom, center, left-top, left-bottom. - Gastrointestinal Tract: right-bottom. - Fat: bottom. - Grasper: left-top. - Connective Tissue: right-bottom. - Blood: center. - L-hook Electrocautery: right-bottom, center-top. - Gallbladder: top.</p> <p>Relative Positions: - Abdominal Wall is to the left of Gastrointestinal Tract. - Liver is to the left of Gastrointestinal Tract. - Gastrointestinal Tract is toward the bottom of Gallbladder. - Fat is toward the bottom of Abdominal Wall. - Grasper is to the left of L-hook Electrocautery. - Connective Tissue is to the right of Grasper. - Blood is to the right of Grasper. - L-hook Electrocautery is to the right of Abdominal Wall. - Gallbladder is to the left of L-hook Electrocautery.</p>

Conversational-1 (10 Qs) (\$0.0019)	Conversational-2 (9 Qs) (\$0.0015)	Complex Reasoning (2 Qs) (\$0.0027)	Concise (\$0.0005)
<p>Q1: What structure is the grasper holding in this image? A1: The grasper is holding the gallbladder.</p> <p>Q2: Is the hook actively dissecting tissue in this frame? A2: Yes, the hook is dissecting tissue at the gallbladder.</p> <p>Q3: Where is the gallbladder located in the operative view? A3: The gallbladder is in the upper portion of the image.</p> <p>Q4: Where is the grasper located in the frame? A4: The grasper is positioned at the left-upper portion of the view.</p> <p>Q5: Where is the hook positioned relative to the gallbladder? A5: The hook is to the right of the gallbladder.</p> <p>Q6: Is there visible blood in the operative field? A6: Yes, blood is visible centrally in the field.</p> <p>Q7: Where is the liver located in the image? A7: The liver occupies the right and central background of the view.</p> <p>Q8: Is connective tissue visible in this frame? A8: Yes, connective tissue is visible toward the right-lower portion of the field.</p> <p>Q9: Is fatty tissue visible in the image? A9: Yes, fatty tissue is visible in the lower portion of the field.</p> <p>Q10: Where is the blood located relative to the grasper? A10: The blood is to the right of the grasper, in a central position.</p>	<p>Q1: Which instruments are visible in this frame and where are they located? A1: A grasper is visible in the left-top of the field, and a hook (L-hook electrocautery) is visible on the right side/center-right of the field.</p> <p>Q2: Which instrument is retracting the gallbladder and where is that gallbladder located in the image? A2: The grasper at the left-top is retracting the gallbladder, which lies toward the top/central portion of the image.</p> <p>Q3: Which instrument is performing dissection and what tissue is it contacting? A3: The hook electrocautery on the right/center-right is dissecting the gallbladder tissue.</p> <p>Q4: What major organ(s) are visible and where are they relative to the instruments? A4: The liver occupies much of the right side of the field (right and center-right), positioned to the right of both the grasper and the hook.</p> <p>Q5: Is there any blood visible in the operative field and where is it located? A5: Yes—blood is visible centrally within the field.</p> <p>Q6: Where is connective tissue relative to the grasper and hook? A6: Connective tissue is located to the right-bottom of the field, positioned to the right of the grasper and near the region of the hook.</p> <p>Q7: What other tissue layers are visible beneath the gallbladder and where are they located? A7: Fatty tissue is visible toward the bottom of the image beneath the gallbladder, and the gastrointestinal tract is located toward the right-bottom below the gallbladder.</p> <p>Q8: What operative phase is shown and which actions are taking place with the two instruments? A8: This is the Calot triangle dissection phase: the grasper is retracting the gallbladder for exposure, while the hook electrocautery is dissecting the gallbladder area.</p> <p>Q9: Are there any other instruments present besides the grasper and hook? A9: No. Only the grasper and the hook electrocautery are visible in this frame.</p>	<p>Q1: Which specific anatomic landmark should be conclusively exposed and identified before proceeding to ligation, and how do the current instrument interactions facilitate reaching that milestone? A1: Before any clipping or division, the cystic duct and cystic artery must be reliably identified so that only those structures are controlled. In this frame the grasping instrument is actively retracting the gallbladder to create tension and the electrocautery hook is being used to take down attachments. That traction—countertraction helps open the Calot's triangle and peel away peritoneum and fat to reveal the ductal and vascular structures. Continuing with short, precise hook dissections while maintaining steady retraction will progressively clear the fat and connective tissue between the gallbladder and the liver until the cystic duct and artery are seen as distinct tubular structures entering the gallbladder. Only once those two structures are separated from surrounding tissue and their course is clear should definitive ligation or clipping be attempted.</p> <p>Q2: Given that there is focal bleeding visible in the field, what immediate instrument maneuvers should be used to control it while minimizing further tissue damage? A2: The safest immediate maneuvers are those available with the instruments in use. The grasper, currently providing retraction, can be used to apply direct, gentle pressure against the bleeding site to tamponade oozing and improve visualization. While the grasper maintains pressure or stabilizes the tissue, the hook can be used for brief, targeted coagulation strokes at low power directly on the bleeding point—avoiding prolonged activation or deep coagulation into the liver parenchyma. These steps control bleeding without wide thermal spread. After hemostasis, reassess the plane and continue with small, controlled dissections rather than sweeping energy applications.</p>	<p>A grasper at the left-superior retracts the gallbladder. An L-hook electrocautery on the right is actively dissecting the gallbladder near the liver. Small blood is visible centrally and connective tissue lies to the right of the grasper.</p> <p>Detailed (\$0.0010)</p> <p>The image is a laparoscopic close-up of the gallbladder region during Calot triangle dissection. The gallbladder sits in the upper/central field with the liver occupying the right background. Fatty tissue and portions of the gastrointestinal tract lie inferiorly, and the abdominal wall is visible toward the upper-left.</p> <p>A grasper is positioned at the left-upper aspect of the field and is actively retracting the gallbladder to provide tension and exposure. To the right (slightly lower/central), an L-hook electrocautery is present and is actively dissecting the gallbladder margin—working from the right side toward the retracted gallbladder. Connective tissue is concentrated toward the right-lower area adjacent to the dissection plane. There is a small amount of blood centrally near the instruments. Overall, the grasper provides traction from the left while the hook performs electrocautery dissection on the gallbladder from the right.</p>



Segmentation Mask



Legend



FASL Prediction (Conf: 0.9637)

Context (LLM Input)

Visible instruments:
Grasper.

Current phase:
Preparation

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: left.
- Liver: right.
- Gastrointestinal Tract: left-bottom.
- Fat: bottom.
- Grasper: top.
- L-hook Electrocautery: right-top.
- Gallbladder: left-bottom.

Relative Positions:
- Abdominal Wall is to the left of Liver.
- Liver is to the right of Gastrointestinal Tract.
- Gastrointestinal Tract is to the left of Grasper.
- Fat is toward the bottom of Grasper.
- Grasper is to the right of Gallbladder.
- L-hook Electrocautery is to the right of Abdominal Wall.
- Gallbladder is to the left of Liver.

Conversational-1 (10 Qs) (\$0.0019)

- Q1: Is the grasper visible in this frame?**
A1: Yes.
- Q2: What is the grasper doing?**
A2: Retracting the gallbladder.
- Q3: Where is the grasper located in the image?**
A3: Toward the top of the frame.
- Q4: Where is the gallbladder located in the image?**
A4: In the left-lower portion of the view.
- Q5: Where is the liver located in the image?**
A5: On the right side of the field.
- Q6: Is the electrocautery hook visible in this frame?**
A6: No.
- Q7: Is fatty tissue visible in the field?**
A7: Yes, along the lower portion of the view.
- Q8: Is there visible bleeding in the operative field?**
A8: No.
- Q9: Where is the abdominal wall located in the image?**
A9: Toward the left side of the image.
- Q10: Is the grasper positioned to the right of the gallbladder?**
A10: Yes.

Conversational-2 (8 Qs) (\$0.0015)

- Q1: What instrument is visible in this frame?**
A1: A single grasper is visible.
- Q2: What operative phase is this image from?**
A2: This view is from the preparation phase.
- Q3: What is the grasper doing in this image?**
A3: The grasper is retracting the gallbladder.
- Q4: Where is the gallbladder located relative to the grasper in the frame?**
A4: The gallbladder is positioned lower and to the left in the image, while the grasper is higher and to the right of the gallbladder.
- Q5: Which major anatomical structures are visible and where are they located?**
A5: The abdominal wall is toward the left, the liver is on the right, the gastrointestinal tract is in the left-lower part of the field, and fatty tissue is along the bottom.
- Q6: Is there any electrocautery instrument visible in the operative field?**
A6: No electrocautery instrument is visible; only the grasper is seen.
- Q7: Is the gastrointestinal tract close to the working instruments, and where is it positioned relative to the grasper?**
A7: The gastrointestinal tract lies left and slightly below the grasper, placing it near but not above the instrument in the lower-left portion of the field.
- Q8: Which organ lies to the right of the gallbladder in this view?**
A8: The liver is located to the right of the gallbladder.

Complex Reasoning (2 Qs) (\$0.0023)

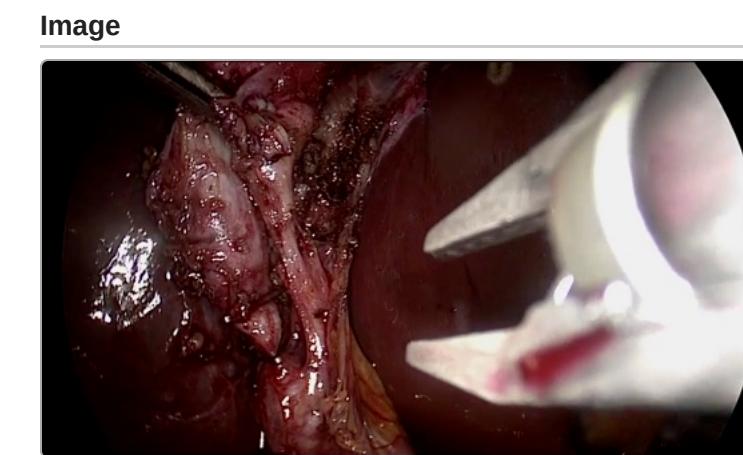
- Q1: What is the immediate operative objective during this preparation frame where the gallbladder is being held under traction?**
A1: The immediate objective is to obtain optimal exposure and orientation of the gallbladder and surrounding tissues so the team can safely proceed to dissection. With the grasper actively retracting the gallbladder, the surgeon is likely assessing tissue planes, clearing intervening fat or omental attachments, and judging how much traction and which vector (upward/cephalad and slightly lateral) will best present the infundibulum and cystic triangle. Any electrocautery instrument visible in the field appears idle at this moment; it is being staged but not activated until exposure and the target plane are secure. Achieving this exposure minimizes the chance of misidentifying structures once active dissection begins.
- Q2: Which nearby structures and tissue conditions in this view most increase the risk of an intraoperative complication, and why?**
A2: Two features raise concern here. First, there is gastrointestinal/mesenteric tissue positioned inferiorly in the field; if traction or any energy use is misdirected toward that area, there is a risk of thermal or mechanical injury to bowel. Second, the liver lies opposite the gallbladder—vigorous traction or blunt tearing can avulse liver parenchyma or cause oozing from the gallbladder bed. Additionally, if the gallbladder wall is being stretched thin by the grasper, there is an increased chance of perforation with bile spill. Because the grasper is actively retracting while the electrocautery is present but not in use, the main hazards are mechanical (traction-induced tears) and, once energy is used, thermal spread to adjacent bowel or liver unless tissues are clearly separated and protected.

Concise (\$0.0005)

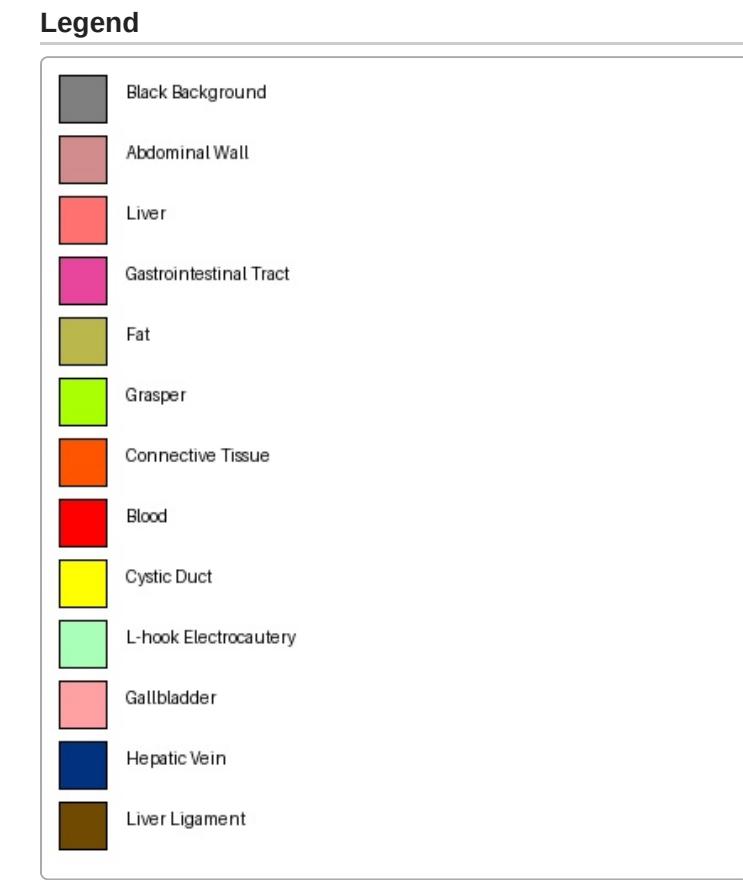
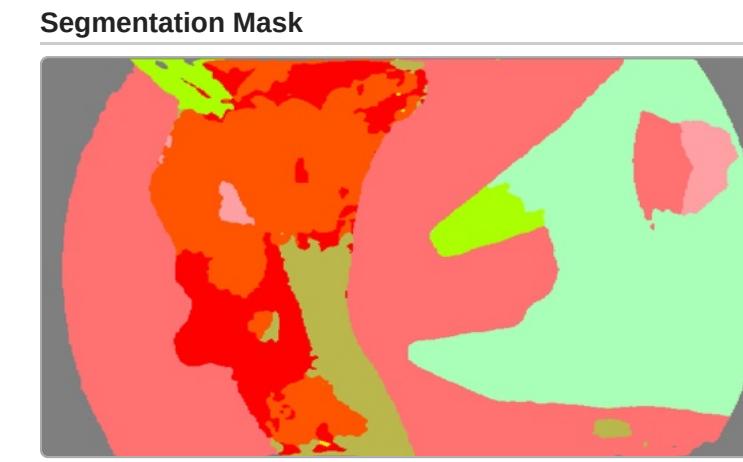
A grasper (active) at the top of the field retracts the gallbladder, which lies in the left lower area. The liver is on the right and the abdominal wall on the left.

Detailed (\$0.0011)

The view is focused on the left lower quadrant of the operative field where the gallbladder sits and is being actively retracted by a grasper. The grasper enters from the top of the image and is positioned slightly to the right of the gallbladder, applying traction to lift and expose its surface. The liver occupies the right side/background of the field, lying adjacent to the gallbladder. The abdominal wall is visible along the left side, and a segment of gastrointestinal tract/viscera appears in the lower-left portion beneath the working area. Fatty tissue collects in the lower part of the field beneath the instruments. Only the grasper is engaged here (active retraction); there are no other instruments currently manipulating tissue in this frame.



Context (LLM Input)
Visible instruments: Grasper, Clipper.
Current phase: Clipping Cutting
Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder) - (Clipper, Clip, Cystic Artery)
Spatial (extracted from model-generated segmentation mask): Model-generated segmentation mask confidence is below threshold, so spatial context is not included.



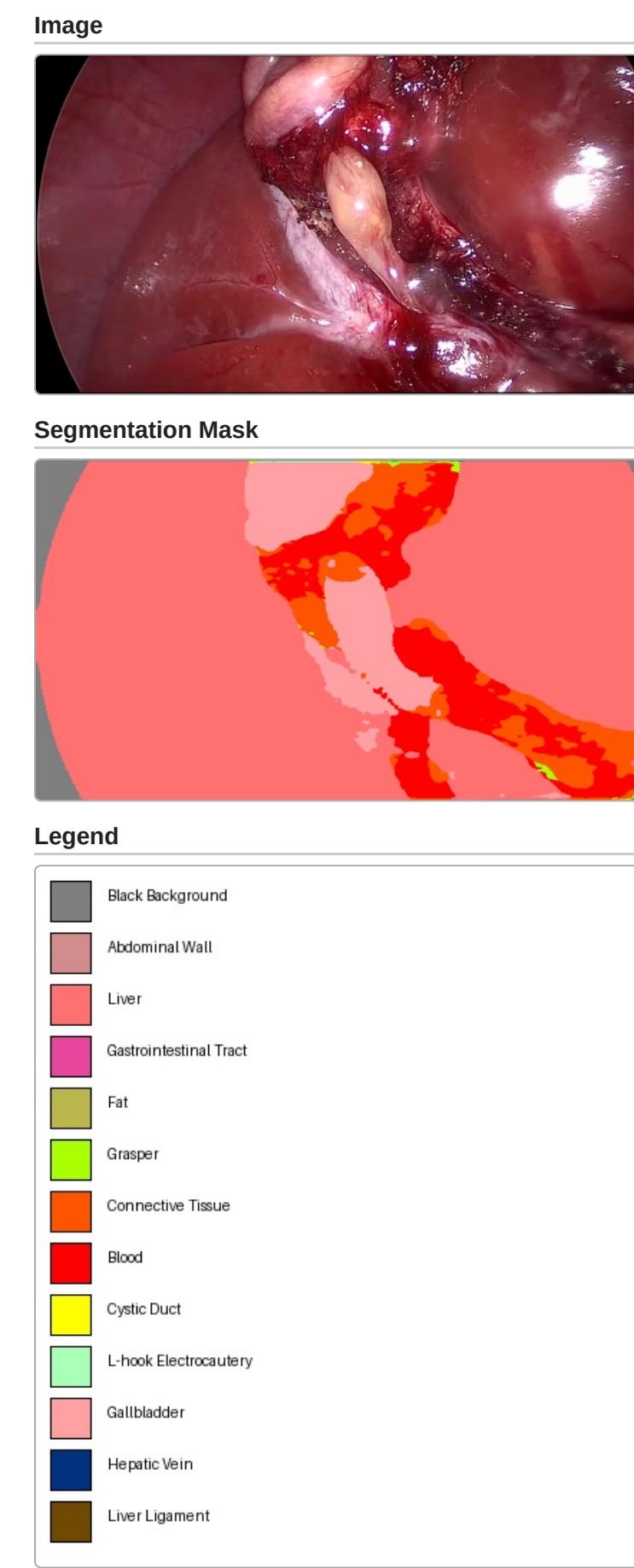
FASL Prediction (Conf: 0.8838)

Conversational-1 (8 Qs) (\$0.0022)
Q1: Is the grasper visible in this image? A1: Yes. The grasper is visible.
Q2: Is the clipper visible in this image? A2: Yes. The clipper is visible.
Q3: What is the grasper doing? A3: The grasper is retracting the gallbladder.
Q4: What is the clipper doing? A4: The clipper is applying a clip to the cystic artery.
Q5: Is the cystic artery visible in this frame? A5: Yes. The cystic artery is visible and is being clipped.
Q6: Where is the clipper positioned relative to the gallbladder? A6: The clipper is on the right side of the gallbladder near the cystic pedicle.
Q7: Is the gallbladder being retracted in this view? A7: Yes. The gallbladder is under traction and retracted by the grasper.
Q8: Where is the gallbladder located within the operative view? A8: The gallbladder is located centrally in the frame.

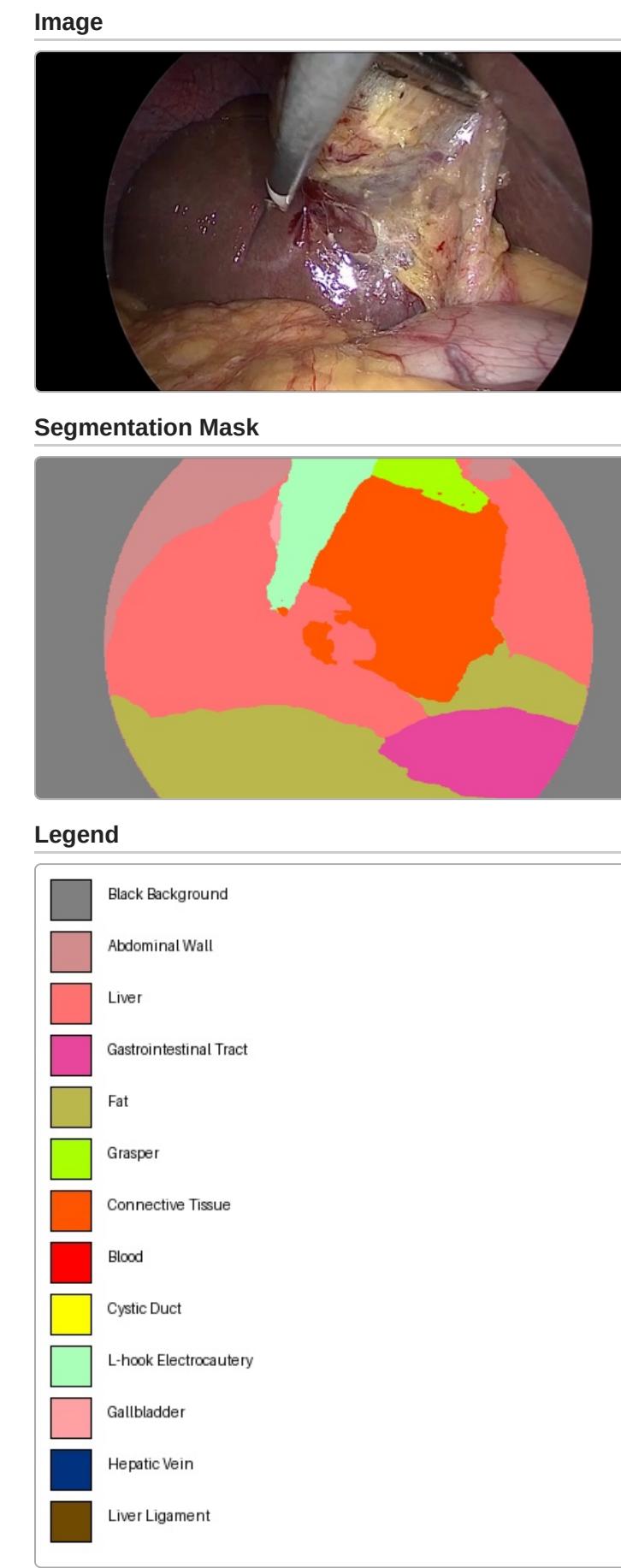
Conversational-2 (8 Qs) (\$0.0011)
Q1: Which instruments are visible in this image? A1: A grasper and a clipper are visible.
Q2: What operative phase is shown in this frame? A2: This frame is during the clipping/cutting phase.
Q3: What is the grasper doing in this view? A3: The grasper is retracting the gallbladder.
Q4: What is the clipper doing in this view? A4: The clipper is applying a clip to the cystic artery.
Q5: Which anatomical structures are being manipulated right now? A5: The gallbladder is being retracted and the cystic artery is being clipped.
Q6: Are both instruments actively engaged with tissue? A6: Yes. The grasper is actively retracting the gallbladder and the clipper is actively clipping the cystic artery.
Q7: Is any other instrument besides the grasper and clipper visible? A7: No. Only the grasper and the clipper are visible in this image.
Q8: Is the clipper positioned in contact with its target structure? A8: Yes. The clipper is positioned at the cystic artery and is engaged in placing a clip.

Complex Reasoning (2 Qs) (\$0.0025)
Q1: What observable conditions in the field justify applying clips to the cystic artery at this moment? A1: The decision to place clips is justified when the arterial structure is clearly isolated and identifiable, and the gallbladder is held under consistent traction to expose the vessel. In this frame the grasper is actively retracting the gallbladder, which tensions the infundibulum and pulls adjacent tissues away, exposing the vascular pedicle. The clipper is actively engaging the target (cystic artery), indicating the surgeon believes the vessel has been skeletonized from surrounding fat and connective tissue and is separated from other structures. These conditions—isolated vessel, clear visualization, and maintained traction—reduce the risk of including non-target tissue in the clip and make clipping an appropriate next step before division.
Q2: How does active retraction of the gallbladder by the grasper contribute to safe clip placement on the artery? A2: Active retraction creates tension that both straightens and stabilizes the vascular pedicle, which improves visualization and provides a predictable plane for clipping. By pulling the gallbladder away, the grasper separates the artery from adjacent fatty tissue and the gallbladder wall, minimizing the chance that the clip will encompass extraneous tissue. Retraction also reduces vessel mobility so the clipper can be applied perpendicular to the vessel with adequate purchase. In short, the grasper's continuous traction is an enabling action that increases precision and decreases the risk of misplacement or slippage of clips.

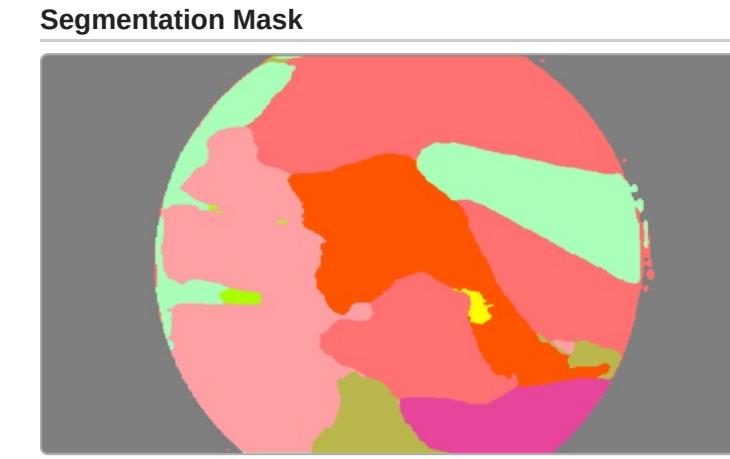
Concise (\$0.0004)
A grasper retracts the gallbladder. A clipper is actively applying clips to the cystic artery for the clipping/cutting step.
Detailed (\$0.0009)
The view focuses on the cystic region with the gallbladder being held under traction by a grasper—this instrument is actively retracting the gallbladder to expose the cystic pedicle. A clipper is engaged at the cystic artery and is applying a vascular clip as part of the clipping-and-cutting step. The grasper's retraction creates the working tension needed for safe clip placement; the clipper is the active instrument securing the artery for subsequent division. Both instruments are actively involved in this step: the grasper for exposure and the clipper for vascular control.



Context (LLM Input)	Conversational-1 (8 Qs) (\$0.0019)	Conversational-2 (8 Qs) (\$0.0016)	Complex Reasoning (2 Qs) (\$0.0025)	Concise (\$0.0005)
<p>Visible instruments: No instruments are visible.</p> <p>Current phase: Gallbladder Dissection</p> <p>Current action triplets (tool, verb, target): No actions are taking place.</p> <p>Spatial (extracted from model-generated segmentation mask): Model-generated segmentation mask confidence is below threshold, so spatial context is not included.</p>	<p>Q1: Are any instruments visible in this frame? A1: No instruments are visible.</p> <p>Q2: Is the gallbladder visible in this frame? A2: Yes.</p> <p>Q3: Where is the gallbladder located in the operative view? A3: Central in the frame, slightly toward the upper central area.</p> <p>Q4: Is the gallbladder being manipulated by an instrument? A4: No, it is not being manipulated.</p> <p>Q5: Is the liver visible in this image? A5: Yes, the liver is visible behind and below the gallbladder.</p> <p>Q6: Is there active bleeding visible in the field? A6: No active bleeding is seen.</p> <p>Q7: Is peritoneal fat present in the operative field? A7: Yes, fatty tissue is present, especially toward the lower part of the view.</p> <p>Q8: Is the electrocautery hook visible in this frame? A8: No, the electrocautery hook is not visible.</p>	<p>Q1: What surgical instruments can you see in this image? A1: No surgical instruments are visible in the image.</p> <p>Q2: How many instruments are present in the operative field in this frame? A2: Zero — there are no instruments present in the field of view.</p> <p>Q3: What procedural phase is depicted in this view? A3: The view corresponds to the gallbladder dissection phase.</p> <p>Q4: Are any instruments actively manipulating tissue in this frame (for example grasping or cutting)? A4: No. There are no active instrument-tissue interactions visible and no actions are taking place in this frame.</p> <p>Q5: Is the gallbladder visible and unobstructed by instruments in the image? A5: Yes — the operative view is focused on gallbladder dissection and the gallbladder is visible without instruments obstructing it.</p> <p>Q6: Are there any clips, sutures, or energy devices visible in the field? A6: No — there are no clips, sutures, or energy devices visible in this frame.</p> <p>Q7: Does the image show any instruments positioned just outside the field that might be about to engage tissue? A7: No. The frame does not show any instruments at the margins; there are simply no instruments visible within the view.</p> <p>Q8: Summarize the visual scene in this frame in one sentence. A8: The image shows the operative field during gallbladder dissection with the gallbladder visible and no instruments or active actions present.</p>	<p>Q1: At this stage of gallbladder dissection, what are the most important immediate steps the team should take before resuming active tissue division? A1: Before resuming active dissection the team should (1) confirm a clear and stable view of the operative field — remove any pooled fluid or blood with suction/irrigation and adjust camera/lighting if needed; (2) re-establish secure traction on the gallbladder to expose the dissection plane (introduce or reposition a grasper if it is not currently engaged); (3) verify that the correct dissection instruments and energy settings are ready (e.g., monopolar hook or blunt dissector, suction-irrigator, bipolar for hemostasis) and that the assistant is prepared; and (4) mentally reassess the anatomy and the extent of the remaining attachment to the liver to minimize surprise when energy is next applied. These steps reduce the chance of inadvertent thermal injury, loss of orientation, or uncontrolled bleeding when dissection resumes.</p> <p>Q2: Which complications are most likely during detachment of the gallbladder from the liver bed, and how should instrument choice and technique be adapted to mitigate them? A2: The two most likely problems are bleeding from the liver bed and gallbladder wall perforation with bile spillage. To mitigate bleeding, use gentle, tensioned traction to define tissue planes and employ a combination of sharp dissection with a low-power monopolar hook and targeted bipolar coagulation for small oozing vessels. Have the suction-irrigator immediately available to expose the source of bleeding quickly. To avoid gallbladder perforation, avoid aggressive grasping on inflamed or friable tissue; use atraumatic graspers for traction and prefer blunt/cold dissection where tissue is thin. If the gallbladder is densely inflamed, consider switching to partial (subtotal) cholecystectomy techniques rather than forcing full mobilization.</p>	<p>No instruments are visible. The procedure is in the gallbladder dissection phase, and no instrument actions are occurring.</p> <p>Detailed (\$0.0009)</p> <p>The frame corresponds to the gallbladder dissection phase but contains no visible instruments and no ongoing instrument-tissue interactions. The operative field appears static—there are no grasping, retraction, dissection, or suction actions visible. Because no tools are present, nothing is actively manipulating or cauterizing tissue in this view.</p>



Context (LLM Input)	Conversational-1 (10 Qs) (\$0.0018)	Conversational-2 (10 Qs) (\$0.0023)	Complex Reasoning (2 Qs) (\$0.0022)	Concise (\$0.0005)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder) - (Hook, Coagulate, Liver)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left-top. - Liver: right-top, right-bottom, center-top, center, left, left-bottom. - Gastrointestinal Tract: right-bottom. - Fat: bottom. - Grasper: right-top, center. - Connective Tissue: right. - L-hook Electrocautery: center-top. - Gallbladder: center-top.</p> <p>Relative Positions: - Abdominal Wall is to the left of Gastrointestinal Tract. - Liver is to the left of Gastrointestinal Tract. - Gastrointestinal Tract is toward the bottom of Connective Tissue. - Fat is toward the bottom of Grasper. - Grasper is to the right of Abdominal Wall. - Connective Tissue is to the right of Abdominal Wall. - L-hook Electrocautery is towards the top of Fat. - Gallbladder is towards the top of Fat.</p>	<p>Q1: Is the grasper visible in this image? A1: Yes, the grasper is visible.</p> <p>Q2: Where is the grasper located in the frame? A2: The grasper is positioned toward the right and upper-central area of the field.</p> <p>Q3: What is the grasper doing to the gallbladder? A3: The grasper is retracting the gallbladder.</p> <p>Q4: Is the hook electrocautery visible in this image? A4: Yes, the hook electrocautery is visible.</p> <p>Q5: Where is the hook electrocautery located? A5: The hook is located near the center-top of the operative view.</p> <p>Q6: What is the hook doing in this frame? A6: The hook is coagulating liver tissue.</p> <p>Q7: Where is the gallbladder located in the view? A7: The gallbladder is located at the center-top of the image.</p> <p>Q8: Where is the liver located in the view? A8: The liver occupies the central and right portions of the field, extending toward the top and bottom.</p> <p>Q9: Where is fatty tissue visible in the image? A9: Fatty tissue is visible in the lower portion of the field.</p> <p>Q10: Where is the abdominal wall located in the frame? A10: The abdominal wall is visible toward the left-top area of the image.</p>	<p>Q1: Which instruments are visible in this frame? A1: A single grasper and an L-hook electrocautery (hook) are visible.</p> <p>Q2: What operative phase is shown in this image? A2: This image is from the Calot triangle dissection phase.</p> <p>Q3: Which instrument is retracting the gallbladder, and where is that instrument located relative to the gallbladder? A3: The grasper is retracting the gallbladder. The grasper is positioned to the right/top of the field and contacts the gallbladder at its center-top region.</p> <p>Q4: Which instrument is applying coagulation and to which tissue is it applied? A4: The L-hook electrocautery is performing coagulation on liver tissue; the hook is located toward the center-top of the image adjacent to liver.</p> <p>Q5: List the anatomical structures visible in the image and their general locations. A5: - Gallbladder: center-top. - Liver: occupying the right and central regions adjacent to the gallbladder. - Abdominal wall: toward the top/left. - Fat: predominantly inferior (bottom) to the gallbladder. - Connective tissue: on the right side. - Gastrointestinal tract: toward the right-bottom.</p> <p>Q6: How are the grasper and hook positioned relative to each other and to the gallbladder? A6: The grasper is positioned more to the right and slightly superior, holding the gallbladder at center-top. The hook is at center-top near the gallbladder and adjacent to the liver; thus the two instruments are close to one another around the gallbladder/liver interface.</p> <p>Q7: Is there visible blood or active bleeding in this frame? A7: No active blood or pooling of blood is visible in this image.</p> <p>Q8: Where is the fatty tissue relative to the gallbladder and grasper? A8: Fatty tissue is located inferiorly (toward the bottom) relative to both the gallbladder and the grasper.</p> <p>Q9: Which structure lies immediately adjacent to the area the hook is targeting for coagulation? A9: The liver lies immediately adjacent to the area the hook is targeting for coagulation; the hook is contacting or very close to liver tissue.</p> <p>Q10: Are there any other instruments present besides the grasper and hook? A10: No. Only the grasper and the L-hook electrocautery are visible in this frame.</p>	<p>Q1: What is the immediate surgical objective being accomplished by applying coagulation to the liver while the gallbladder is held under traction? A1: The surgeon is controlling superficial oozing from the liver/gallbladder interface to restore and maintain a clear operative field so safe dissection of Calot's triangle can continue. With the grasper providing steady retraction of the gallbladder (creating tension and exposing tissue planes), the monopolar hook is being used in coagulation mode on the adjacent liver surface to stop bleeding or seal small vessels in the liver bed. This hemostatic step improves visualization of critical anatomy and prevents blood from pooling around the cystic structures, which would otherwise obscure landmarks and increase the risk of misidentification during subsequent clipping and division.</p> <p>Q2: What specific technique adjustments should the operator make when using a monopolar hook to coagulate liver tissue so as to minimize collateral thermal injury to nearby biliary structures? A2: When coagulating liver adjacent to the gallbladder the operator should use short, intermittent activations at the lowest effective power setting and avoid prolonged continuous contact. Maintain purposeful orientation so the active hook tip contacts only the bleeding point on the liver surface, not the gallbladder wall or presumed locations of the cystic duct/artery. Continuous gentle traction on the gallbladder with the grasper should keep biliary structures tented away from the activation site. Suction or irrigation should be used to clear blood so the coagulation target is visualized precisely. Finally, limit the area of energy application, allow tissue to cool between activations, and inspect the area after coagulation for persistent oozing rather than escalating power unnecessarily—these maneuvers reduce thermal spread to ducts and surrounding liver parenchyma.</p>	<p>The view is centered on the gallbladder region with the liver occupying much of the background and right/central field. A grasper is positioned from the right/central area and is actively holding and retracting the gallbladder upward to expose the Calot triangle. An L-hook electrocautery is located at the upper-central field adjacent to the gallbladder and is actively applying coagulation to the liver surface (hemostatic/dissection energy directed at liver tissue).</p> <p>Surrounding anatomy: the abdominal wall is seen toward the upper-left, fatty tissue lies in the lower field, and connective tissue is present to the right. The gastrointestinal tract is visible in the lower-right. Both instruments are engaged in the operative task — the grasper providing traction and exposure, the hook delivering coagulative energy to the liver adjacent to the gallbladder.</p>



Context (LLM Input)

Visible instruments:
Grasper, Scissors, Irrigator.

Current phase:
Cleaning Coagulation

Current action triplets (tool, verb, target):
- (Grasper, Retract, Liver)
- (Irrigator, Retract, Liver)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: right-bottom.
- Liver: right-top, right-bottom, center-left, center-right, top, bottom, left-top, left-bottom.
- Gastrointestinal Tract: right-bottom.
- Fat: center-bottom.
- Grasper: left-top, center-left.
- Connective Tissue: right-bottom, center.
- Cystic Duct: center.
- L-hook Electrocautery: top.
- Gallbladder: left.

Relative Positions:

- Abdominal Wall is to the right of Gallbladder.
- Liver is to the right of Grasper.
- Gastrointestinal Tract is to the right of Gallbladder.
- Fat is toward the bottom of L-hook Electrocautery.
- Grasper is to the left of L-hook Electrocautery.
- Connective Tissue is to the left of Abdominal Wall.
- Cystic Duct is to the right of Gallbladder.
- L-hook Electrocautery is towards the top of Abdominal Wall.
- Gallbladder is to the left of Liver.

Conversational-1 (10 Qs) (\$0.0017)

Q1: Is the grasper present in the frame?
A1: Yes, the grasper is present.

Q2: Where is the grasper located in the operative view?
A2: The grasper is in the left-upper to center-left portion of the field.

Q3: What is the grasper doing in this image?
A3: The grasper is retracting the liver.

Q4: Is the irrigator present in the frame?
A4: Yes, the irrigator is present.

Q5: What is the irrigator doing in this image?
A5: The irrigator is retracting the liver.

Q6: Is the scissors present in the frame?
A6: Yes, the scissors are present.

Q7: What is the scissors doing in this image?
A7: The scissors are not actively interacting with tissue (idle).

Q8: Where is the gallbladder located in the view?
A8: The gallbladder is located toward the left side of the field.

Q9: Where is the liver located relative to the gallbladder?
A9: The liver is located to the right of the gallbladder.

Q10: Is there active bleeding visible in the field?
A10: No, there is no active bleeding visibly present.

Conversational-2 (10 Qs) (\$0.0020)

Q1: What instruments are visible in this frame?
A1: A grasper, a pair of scissors, and an irrigator are visible.

Q2: What procedural phase is shown in this image?
A2: The case is in the cleaning/coagulation phase.

Q3: Which instruments are actively retracting the liver in this view?
A3: The grasper and the irrigator are both retracting the liver.

Q4: Are the scissors actively cutting or manipulating tissue in this frame?
A4: No. The scissors are present but there is no action showing them cutting or manipulating tissue.

Q5: Is the gallbladder being grasped or manipulated by any instrument here?
A5: No. The visible actions indicate instruments retracting the liver; the gallbladder is present at the left but not being manipulated.

Q6: Where is the cystic duct located relative to the gallbladder and liver?
A6: The cystic duct is centrally located; the gallbladder lies to its left and the liver lies to its right.

Q7: Where are the grasper(s) positioned in the operative field?
A7: The grasper is located toward the left-top and center-left of the field, adjacent to the liver and engaged in retraction.

Q8: Is there visible active bleeding in the operative field?
A8: No active blood or pooling is reported in this view.

Q9: What tissues or structures occupy the lower part of the image?
A9: Fat and portions of the gastrointestinal tract and connective tissue are toward the bottom of the field.

Q10: Are any instruments in direct contact with the cystic duct in this image?
A10: No. The instruments are retracting the liver and are not shown contacting the cystic duct.

Complex Reasoning (2 Qs) (\$0.0023)

Q1: Given that the operative phase is "Cleaning Coagulation" and both the grasper and irrigator are actively retracting the liver, what should the team be trying to accomplish in the next minute and why are those specific instruments positioned as they are?

A1: The immediate goal is to clear and inspect the area of recent coagulation to confirm hemostasis and identify any ongoing bleeding or bile leak before proceeding. The grasper is providing stable elevation of the liver to expose the gallbladder region and the cystic duct region, while the irrigator is being used both to clear blood/clot and to further lift or displace the liver edge for visualization. Together they create a clean working window: the grasper gives consistent retraction and orientation, and the irrigator clears fluid and coagulum so the surgeon can see the surface of the cystic duct and liver bed. This combination allows the operator to determine whether additional point coagulation (with the hook/electrocautery) or mechanical control (clips, sutures, or tissue approximation) is required, and to ensure no obscured bleeder remains before advancing to clipping or division steps.

Q2: What specific signs should the surgeon look for after irrigating and retracting that would indicate the need for additional intervention rather than proceeding, and how do the instruments present affect that assessment?

A2: After irrigation and retraction, the surgeon should look for persistent pulsatile or brisk bleeding (arterial), steady oozing from the liver bed, expanding hematoma, visible bile staining suggesting a leak, or poorly defined anatomy obscured by residual coagulum. The grasper's stable retraction allows inspection of the cystic duct and gallbladder-neck relationships, and the irrigator lets the team remove clot to reveal active bleeding. If brisk bleeding appears, immediate targeted coagulation with the hook electrocautery (currently idle) or placement of clips/sutures is required. If only superficial oozing persists, brief point cautery or application of hemostatic agents and continued suction/irrigation are appropriate. If anatomy remains unclear despite cleaning, further dissection and retraction (not proceeding to clip/divide structures) is indicated.

Concise (\$0.0007)

The grasper and irrigator are actively retracting the liver during cleaning/coagulation. The gallbladder is left-sided with the cystic duct centrally visible. Scissors are present but idle.

Detailed (\$0.0011)

The view is a focused operative field during cleaning/coagulation around the gallbladder and hepatocystic region. The gallbladder lies in the left/central portion of the image with the cystic duct visible just medial/central to it. The liver forms the dominant background structure on the right and centrally.

Two instruments are actively engaged with the liver: a grasper positioned on the left–upper/central–left side is holding and retracting the liver to expose the hepatocystic triangle, and an irrigator is also being used to retract/clear the liver surface at the same time. These actions suggest the team is exposing and cleaning the dissection zone.

A pair of scissors is present in the field but not currently engaged in an active task (idle). An L-hook electrocautery shaft is visible toward the top of the view but is not reported as active in the current moment. Fatty and connective tissues occupy the lower/central areas beneath the working zone, and the abdominal wall and portions of the gastrointestinal tract lie toward the right/lower field. Overall, exposure of the cystic duct/gallbladder region is being maintained with combined retraction and irrigation while other instruments remain available but inactive.

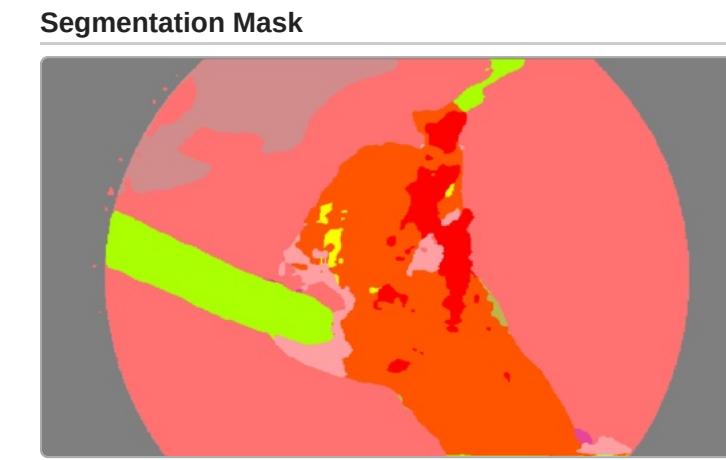
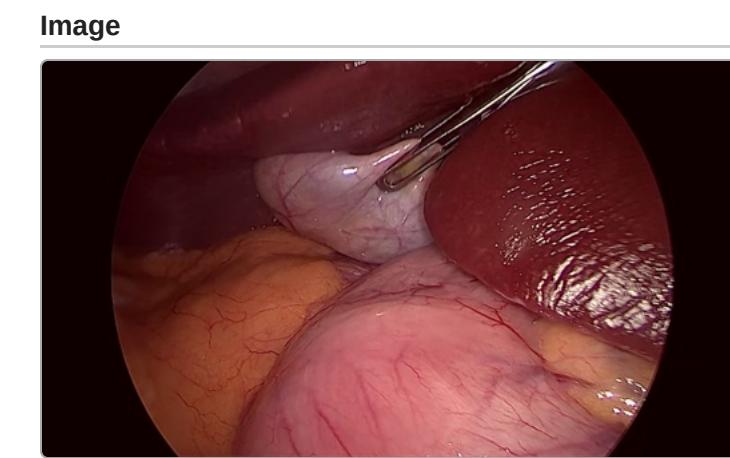


Image	Context (LLM Input)
	<p>Visible instruments: Grasper.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left-top. - Liver: center-left, left-bottom, center, left-top, right. - Gastrointestinal Tract: right-bottom. - Fat: center. - Grasper: left. - Connective Tissue: right-bottom, center-top, center-bottom, center, left-bottom. - Blood: right. - Cystic Duct: center. - L-hook Electrocautery: right-bottom. - Gallbladder: bottom.</p> <p>Relative Positions: - Abdominal Wall is to the left of L-hook Electrocautery. - Liver is towards the top of L-hook Electrocautery. - Gastrointestinal Tract is toward the bottom of Abdominal Wall. - Fat is to the right of Abdominal Wall. - Grasper is to the left of L-hook Electrocautery. - Connective Tissue is toward the bottom of Abdominal Wall. - Blood is to the right of Abdominal Wall. - Cystic Duct is to the left of Gastrointestinal Tract. - L-hook Electrocautery is to the right of Gallbladder. - Gallbladder is toward the bottom of Abdominal Wall.</p>

Conversational-1 (10 Qs) (\$0.0021)	Conversational-2 (7 Qs) (\$0.0024)	Complex Reasoning (2 Qs) (\$0.0021)	Concise (\$0.0006)
<p>Q1: What is the grasper doing in this image? A1: The grasper is retracting the gallbladder.</p> <p>Q2: Where is the grasper located in the operative field? A2: The grasper is on the left side of the view.</p> <p>Q3: Where is the gallbladder located in the frame? A3: The gallbladder is in the lower central portion of the view.</p> <p>Q4: Is the cystic duct visible in this image? A4: Yes. The cystic duct is visible in the central field.</p> <p>Q5: Where is the liver located in this view? A5: The liver occupies the left side and extends toward the central-left area.</p> <p>Q6: Is there visible blood in the operative field? A6: Yes. Blood is visible on the right side of the field.</p> <p>Q7: Where is fatty tissue located in the image? A7: Fatty tissue is present centrally in the operative field.</p> <p>Q8: Where is the connective tissue visible in this frame? A8: Connective tissue is seen mainly in the central to right-lower portions of the view.</p> <p>Q9: Is the L-hook electrocautery visible in this frame? A9: No. The L-hook electrocautery is not visible in this image.</p> <p>Q10: Where is the abdominal wall visible in the operative view? A10: The abdominal wall appears in the upper-left portion of the field.</p>	<p>Q1: Which instruments are visible in this frame? A1: A single laparoscopic grasper is visible; no other instruments are seen.</p> <p>Q2: What procedural phase is depicted in this view? A2: This image corresponds to the Calot triangle dissection phase.</p> <p>Q3: What is the grasper doing and which structure is it manipulating? A3: The grasper is retracting the gallbladder.</p> <p>Q4: Where is the grasper located relative to the gallbladder and the abdominal wall in the image? A4: The grasper is positioned on the left side of the image and lies to the left of the gallbladder, while the abdominal wall is located toward the upper-left.</p> <p>Q5: Is there any electrocautery active or any other tool visible besides the grasper? A5: No electrocautery or other instrument is visibly active in this frame; only the grasper is present and performing retraction.</p> <p>Q6: Which other anatomical structures are visible and where are they located? A6: The liver is visible toward the left/central region, fat is present centrally, connective tissue is seen more toward the center-right, and a small area of blood is visible on the right side of the field.</p> <p>Q7: Is there any bleeding apparent in the operative field? A7: Yes. A localized area of blood is visible on the right side of the image.</p>	<p>Q1: Given that the grasper is actively retracting the gallbladder while the electrocautery hook is present but not currently dissecting, what should the next immediate intraoperative maneuvers be to progress safely through Calot dissection? A1: With the grasper providing traction on the gallbladder (improving exposure) and the hook idle nearby, the immediate steps should be: (1) optimize retraction to create consistent tension that opens the Calot space—usually cephalad and lateral traction on the gallbladder infundibulum; (2) inspect the field for obscuring fat/connective tissue and any oozing blood and clear it (suction or blunt grasping) so anatomy is visible; (3) use the hook electrocautery in short, controlled applications to bluntly and sharply divide superficial connective tissue and fatty adhesions while maintaining the traction vector; (4) skeletonize tissue around the cystic duct and artery until the critical view is obtained (only two structures entering the gallbladder and the lower part of the liver bed cleared). These steps explicitly use the grasper as the traction tool (active) and the hook as the dissecting tool once the field is clear and thermal application will be safe.</p> <p>Q2: Blood is visible in the operative field while the grasper retracts the gallbladder. How does this change your dissection technique and instrument use right now? A2: Visible blood increases the risk of obscured anatomy, so priority shifts to hemorrhage control and visualization before further cutting. Practically: pause active electrocautery use (to avoid creating more thermal injury in a poorly visualized field), apply suction to evacuate blood, use atraumatic grasping or gentle pressure with the grasper to tamponade oozing if the source is accessible, and consider short bipolar/coagulation applications directly on the bleeding point rather than prolonged hook activation across poorly seen tissue. Once hemostasis and a clear field are restored, resume fine dissection with the hook in short bursts while maintaining steady traction with the grasper.</p>	<p>A left-sided grasper retracts the gallbladder downward to expose Calot's triangle. The cystic duct is visible centrally, with the liver positioned adjacent to the left.</p> <p>Detailed (\$0.0007)</p> <p>The view is focused on the lower gallbladder region during Calot triangle dissection. A single grasper enters from the left and is actively retracting the gallbladder inferiorly to expose the cystic region. The cystic duct lies centrally and is being exposed within the dissection field; surrounding connective tissue and central fat are concentrated to the right and center and are being tensioned by the retraction. The liver forms the background and occupies much of the left and posterior field, while a small area of blood is visible on the right. No other instruments are present or actively engaged.</p>



Context (LLM Input)

Visible instruments:
Grasper.

Current phase:
Clipping Cutting

Current action triplets (tool, verb, target):
- (Grasper, Grasp, Gallbladder)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: left-top.
- Liver: top.
- Gastrointestinal Tract: bottom.
- Fat: left.
- Grasper: center-top.
- Gallbladder: left-top, center-top.

Relative Positions:
- Abdominal Wall is towards the top of Gastrointestinal Tract.
- Liver is to the right of Abdominal Wall.
- Gastrointestinal Tract is toward the bottom of Grasper.
- Fat is toward the bottom of Grasper.
- Grasper is to the right of Abdominal Wall.
- Gallbladder is towards the top of Gastrointestinal Tract.

Conversational-1 (10 Qs) (\$0.0017)

- Q1: Is a grasper instrument visible in this image?**
A1: Yes, a grasper is visible.
- Q2: Where is the grasper located in the operative field?**
A2: The grasper is in the upper-central portion of the view.
- Q3: Is the grasper currently grasping tissue?**
A3: Yes, the grasper is grasping tissue.
- Q4: Which structure is the grasper holding?**
A4: The grasper is holding the gallbladder.
- Q5: Is the gallbladder visible in this frame?**
A5: Yes, the gallbladder is visible.
- Q6: Where is the gallbladder located in the frame?**
A6: The gallbladder is in the upper-left to upper-central area.
- Q7: Is the liver visible in this image?**
A7: Yes, the liver is visible.
- Q8: Where is the liver located in the view?**
A8: The liver is in the upper portion of the field, toward the right side.
- Q9: Is fat tissue visible in the operative field?**
A9: Yes, fatty tissue is visible.
- Q10: Where is the gastrointestinal tract located in this image?**
A10: The gastrointestinal tract appears in the lower portion of the view.

Conversational-2 (10 Qs) (\$0.0019)

- Q1: What instrument is visible in this frame?**
A1: I see a single grasper instrument in the operative field.
- Q2: What phase of the cholecystectomy does this image show?**
A2: This view corresponds to the clipping/cutting phase.
- Q3: Which structure is the grasper holding, and where is it located in the frame?**
A3: The grasper is grasping the gallbladder, which lies in the upper central to left-upper portion of the image.
- Q4: Is there any cutting or clipping instrument visible alongside the grasper?**
A4: No — there is no dedicated cutting or clipping instrument visible; only the grasper is present.
- Q5: Where is the liver relative to the grasper and gallbladder?**
A5: The liver occupies the top of the frame and is superior to the grasper and gallbladder.
- Q6: What structures lie inferior to the grasper in this view?**
A6: The gastrointestinal tract and fatty tissue lie inferior to the grasper.
- Q7: Is there noticeable fat in the field, and if so, where is it located?**
A7: Yes. Fat is visible on the left side and is positioned toward the bottom relative to the grasper.
- Q8: How many instruments are actively interacting with tissue in this image?**
A8: One instrument is actively interacting: the grasper is grasping the gallbladder.
- Q9: Where is the abdominal wall positioned relative to the grasper?**
A9: The abdominal wall is located toward the left-top of the image; the grasper sits centrally at the top and is to the right of the abdominal wall.
- Q10: Is there visible blood in this frame?**
A10: No obvious blood is visible in this image.

Complex Reasoning (2 Qs) (\$0.0022)

- Q1: Given that only a grasper is actively holding the gallbladder and the case phase is "Clipping Cutting," what is the most likely immediate step the surgeon will take, and why is the grasper positioned as shown before that step?**
A1: The most likely immediate step is introduction of a clip applier to place clips on the cystic duct and/or cystic artery followed by division. The grasper is actively retracting the gallbladder to expose and tension the structures in Calot's triangle so that the duct and artery (or the two structures that will be clipped) are clearly isolated and presented in a stable, predictable orientation. Proper traction both elevates and lateralizes the gallbladder, opening the angle between the duct/artery and the liver, which reduces the chance of misplacing clips and facilitates perpendicular application of the clip applier. Because no energy tool is active in this frame, the team is likely pausing to maintain optimal exposure while the clipping device is introduced and readied.
- Q2: What specific anatomic and technical safety checks should be confirmed at this stage before placing and cutting clips?**
A2: Before placing clips the surgeon should confirm the critical view of safety: (1) the hepatocystic triangle is cleared of fat and fibrous tissue so that only two tubular structures enter the gallbladder, (2) the lower third of the gallbladder is separated from the liver bed so the cystic duct/artery origins are obvious, and (3) those two structures are definitively identified as cystic duct and artery. Technically, the grasper's traction should present the target structures in a straight, tensioned line to allow perpendicular clip placement. If any uncertainty remains about structure identity, the surgeon should delay clipping and consider additional dissection, intraoperative cholangiography, or consultation rather than blind clipping. Hemostasis should also be assured so bleeding does not obscure landmarks during clipping.

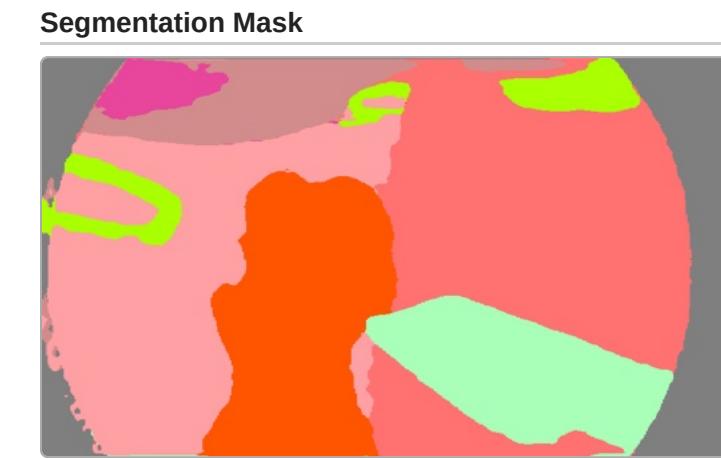
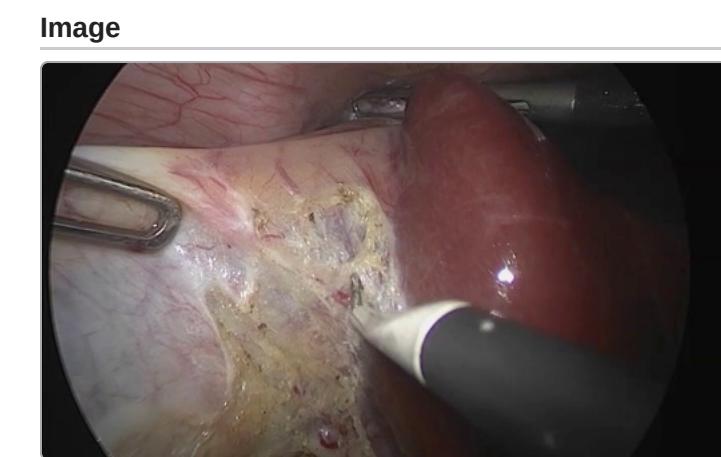
Concise (\$0.0005)

A single grasper actively grasps the gallbladder in the upper central/left field. The gallbladder is positioned near the liver and abdominal wall, with fat and the gastrointestinal tract located inferiorly.

Detailed (\$0.0008)

The view is focused on the upper central field of the abdomen. A single grasper is present at center-top and is actively holding the gallbladder, which lies slightly left-of-center toward the top of the image. The grasper is engaged (not idle), maintaining a firm hold on the gallbladder during the clipping/cutting phase.

The liver forms the superior/background region toward the top/right. The abdominal wall is visible toward the upper-left. Fatty tissue lies to the left and inferior to the grasper, and the gastrointestinal tract occupies the lower portion of the image. No other instruments are visible.



Context (LLM Input)

Visible instruments:
Grasper, Hook.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)
- (Hook, Dissect, Gallbladder)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:
- Abdominal Wall: left-top.
- Liver: right.
- Gastrointestinal Tract: left-top.
- Grasper: top.
- Connective Tissue: left.
- Blood: center-top.
- L-hook Electrocautery: right-bottom, left-bottom.
- Gallbladder: left.

Relative Positions:
- Abdominal Wall is towards the top of L-hook Electrocautery.
- Liver is to the right of Gastrointestinal Tract.
- Gastrointestinal Tract is towards the top of Connective Tissue.
- Grasper is towards the top of L-hook Electrocautery.
- Connective Tissue is toward the bottom of Blood.
- Blood is to the right of Gallbladder.
- L-hook Electrocautery is to the right of Gallbladder.
- Gallbladder is to the left of Liver.

Conversational-1 (10 Qs) (\$0.0023)

Q1: Is the grasper visible in this image?

A1: Yes. The grasper is visible near the top of the field.

Q2: What is the grasper doing to the gallbladder?

A2: The grasper is retracting the gallbladder.

Q3: Is the hook electrocautery visible in this image?

A3: Yes. The hook electrocautery is visible entering from the right side.

Q4: What is the hook doing in this frame?

A4: The hook is dissecting the gallbladder.

Q5: Where is the gallbladder located in the operative view?

A5: The gallbladder is on the left side of the view.

Q6: Where is the liver located in the operative view?

A6: The liver occupies the right side and background of the view.

Q7: Is there blood visible in the field?

A7: Yes, there is blood visible in the upper-central portion of the field.

Q8: Where is the L-hook electrocautery positioned relative to the gallbladder?

A8: The L-hook is positioned to the right of the gallbladder, toward the lower-right area.

Q9: Where is the abdominal wall visible in the image?

A9: The abdominal wall is visible toward the top-left of the view.

Q10: Where is connective tissue located in the frame?

A10: Connective tissue is visible on the left side of the operative field.

Conversational-2 (10 Qs) (\$0.0013)

Q1: Which instruments are visible in this image?

A1: A grasper and an L-hook electrocautery (hook) are visible.

Q2: Which instrument is retracting the gallbladder?

A2: The grasper is retracting the gallbladder.

Q3: Which instrument is performing dissection on the gallbladder?

A3: The L-hook electrocautery is dissecting the gallbladder.

Q4: Where is the gallbladder located relative to the liver in this view?

A4: The gallbladder is to the left of the liver.

Q5: How are the grasper and the hook positioned relative to the gallbladder?

A5: The grasper is positioned above (toward the top of the field) relative to the gallbladder, while the L-hook electrocautery is positioned to the right of the gallbladder.

Q6: Is there visible blood in the operative field, and if so where?

A6: Yes. Blood is visible toward the center-top of the image.

Q7: What non-instrument anatomical structures are visible around the operative site?

A7: The gallbladder is central-left, the liver is on the right, connective tissue is present to the left area, and the abdominal wall is toward the top-left.

Q8: What is the current surgical phase shown in this image?

A8: This image is from the gallbladder dissection phase.

Q9: How are the grasper and L-hook positioned relative to each other in the image?

A9: The grasper is located superiorly (toward the top) relative to the L-hook electrocautery, which sits lower and to the right of the grasper.

Q10: Are both instruments actively interacting with tissue in this frame?

A10: Yes. The grasper is retracting the gallbladder and the L-hook electrocautery is actively dissecting the gallbladder.

Complex Reasoning (2 Qs) (\$0.0025)

Q1: There is focal bleeding visible near the gallbladder-liver interface while the hook is actively dissecting and the grasper is maintaining traction. What should the immediate steps be to control bleeding using only the instruments currently in use, and why?

A1: First, stop further active dissection with the hook to avoid enlarging the defect. Use the grasper (which is actively retracting) to apply gentle compression/tamponade to the bleeding area by bringing the gallbladder or adjacent tissue against the bleeding point—this both reduces blood loss and helps localize the source. While maintaining that traction/compression, reapply the hook for targeted hemostasis using short, intermittent coagulation activations rather than prolonged contact; aim the hook at the bleeding point from the superficial side of the gallbladder wall to coagulate visible vessels while minimizing penetration into the liver parenchyma. Maintain traction to expose the vessel clearly before each brief activation and avoid sweeping or deep bites that could enlarge the defect. These steps use the two present instruments (grasper to compress/visualize and hook to coagulate) and prioritize control of bleeding while limiting additional thermal or mechanical injury.

Q2: During gallbladder dissection with the hook adjacent to the liver, what technical adjustments to the hook dissection reduce the risk of thermal injury to the liver parenchyma?

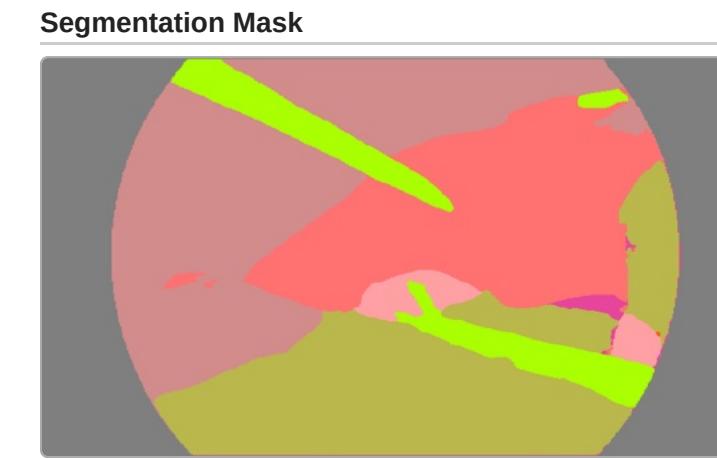
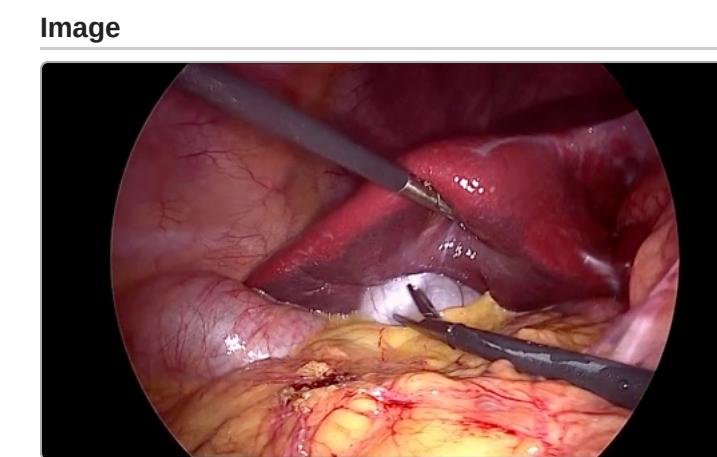
A2: Adjust technique by keeping the plane immediately adjacent to the gallbladder wall—use the hook to take very superficial bites along the gallbladder surface instead of plunging into the liver bed. Use short, intermittent activations at lower power settings and employ lateral sweeping motions to separate adhesions rather than prolonged point contact. Maintain steady, opposing traction with the grasper to tension the tissue so the hook can dissect along a clearer plane; this reduces the need for deep coagulation. Also avoid leaving the energized hook in continuous contact with tissues and withdraw slightly between activations to limit conductive thermal spread into the liver.

Concise (\$0.0006)

A grasper positioned superiorly retracts the gallbladder. A hook electrocautery to the right is actively dissecting the gallbladder near the liver, with some blood and connective tissue visible.

Detailed (\$0.0011)

Close-up laparoscopic view focused on the gallbladder, which lies toward the left/central field with the liver forming the right/background. A grasper is positioned from above and is actively holding and retracting the gallbladder to tension and expose the dissection plane. The hook electrocautery is coming from the lower-right and is actively dissecting the gallbladder attachments; its tip is adjacent to the gallbladder where tissue division is occurring. A small amount of blood is visible in the upper-central/right portion of the field near the dissection site, with connective tissue and fatty/visceral layers immediately beneath that area. The abdominal wall and a portion of the gastrointestinal tract are seen toward the upper-left. The scene shows active tissue manipulation—retraction by the grasper and electrocautery dissection by the hook.



Context (LLM Input)

Visible instruments:
Grasper.

Current phase:
Preparation

Current action triplets (tool, verb, target):
- (Grasper, Grasp, Gallbladder)
- (Grasper, Retract, Liver)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:
- Abdominal Wall: left.
- Liver: right.
- Gastrointestinal Tract: right-bottom.
- Fat: bottom.
- Grasper: right-top, left-top, right-bottom.
- Connective Tissue: right-bottom.
- Gallbladder: right-bottom, center.

Relative Positions:
- Abdominal Wall is to the left of Connective Tissue.
- Liver is to the left of Connective Tissue.
- Gastrointestinal Tract is to the right of Abdominal Wall.
- Fat is toward the bottom of Abdominal Wall.
- Grasper is to the left of Connective Tissue.
- Connective Tissue is to the right of Fat.
- Gallbladder is to the right of Abdominal Wall.

Conversational-1 (10 Qs) (\$0.0016)

- Q1: Is a grasper visible in this frame?**
A1: Yes. A grasper is visible.
- Q2: What structure is the grasper holding?**
A2: The grasper is holding the gallbladder.
- Q3: Which organ is the grasper retracting?**
A3: The grasper is retracting the liver.
- Q4: Where is the gallbladder located in the view?**
A4: The gallbladder is in the central to right-lower area of the frame.
- Q5: Where is the liver located in the view?**
A5: The liver is on the right side of the operative field.
- Q6: Is a hook electrocautery visible in this frame?**
A6: No. A hook electrocautery is not visible.
- Q7: Where is the abdominal wall located in the image?**
A7: The abdominal wall is toward the left side of the view.
- Q8: Is fatty tissue visible in the operative field?**
A8: Yes. Fatty tissue is visible along the lower portion of the field.
- Q9: Where is connective tissue located in the frame?**
A9: Connective tissue is present in the right-lower area.
- Q10: Is the gastrointestinal tract visible in this frame?**
A10: Yes. The gastrointestinal tract is visible toward the right-lower portion.

Conversational-2 (10 Qs) (\$0.0018)

- Q1: What instruments are visible in this image?**
A1: A single laparoscopic grasper is visible.
- Q2: What phase of the operation does this view correspond to?**
A2: This view corresponds to the preparation phase.
- Q3: Which structures is the grasper interacting with in this frame?**
A3: The grasper is grasping the gallbladder and is providing retraction of the liver.
- Q4: Where is the gallbladder located within the frame?**
A4: The gallbladder appears in the central to lower-right portion of the image.
- Q5: Where is the liver relative to the gallbladder in this view?**
A5: The liver occupies the right side of the field and is located adjacent and superior to the gallbladder, which lies more central-inferior on the right.
- Q6: Are any electrocautery instruments visible?**
A6: No electrocautery instruments are visible in this image.
- Q7: Is the gastrointestinal tract visible, and if so where?**
A7: Yes — the gastrointestinal tract is visible toward the right-bottom of the frame.
- Q8: Where is the abdominal wall located in the image?**
A8: The abdominal wall is located on the left side of the image.
- Q9: What tissues occupy the lower part of the field?**
A9: Fatty tissue and connective tissue occupy the inferior portion of the image.
- Q10: How many graspers are present and are any other instruments present?**
A10: There is one grasper present and no other instruments are visible.

Complex Reasoning (2 Qs) (\$0.0021)

- Q1: What is the most likely purpose of the retraction maneuver being performed right now, and how does it set up subsequent dissection steps?**
A1: The instrument in use is actively holding tissue and applying traction. The primary purpose of this maneuver at the preparation phase is to tension and position the gallbladder-liver interface to optimize exposure of the operative field. By retracting the gallbladder (and effectively mobilizing the liver edge), the surgeon opens the operative window where the infundibulum and Calot region will be dissected. This tension creates counter-traction that defines tissue planes and separates fatty/connective tissue, which makes subsequent blunt and energy dissection more controlled and helps the surgeon identify critical structures with less blind cutting. In short, this retraction is a deliberate exposure step to facilitate safe, stepwise dissection rather than an attempt to divide tissue immediately.
- Q2: Given only a single grasper is seen actively providing traction, what specific risks should the surgeon be mindful of while continuing preparation, and why?**
A2: With a single active grasper providing traction, two risks are most relevant. First, excessive or misdirected force can cause tearing of the gallbladder wall or detachment of the cystic plate, leading to bile spillage and obscurement of the field. Second, if traction is transmitted to the liver capsule (either by directly grasping hepatic tissue or by tension at the gallbladder-liver junction), there is danger of capsular tears and bleeding from the liver bed. Both events reduce visibility and complicate dissection. The surgeon should therefore use gentle,atraumatic grasping, ensure the instrument tip is on appropriate gallbladder tissue (not friable fundus or bare liver), and avoid sustained force or extreme torque until additional instruments or exposure maneuvers are in place.

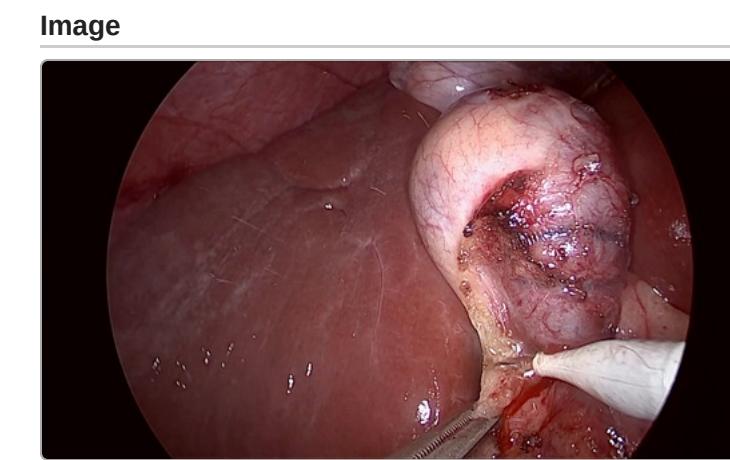
Concise (\$0.0005)

During preparation a single grasper actively holds the gallbladder and retracts the liver to expose the operative field on the right.

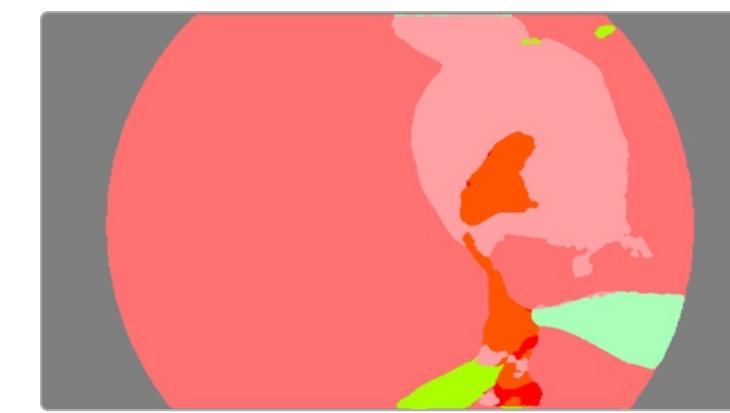
Detailed (\$0.0008)

The view is focused on the right-sided hepatobiliary region with the gallbladder occupying the central-to-right portion of the field. The liver forms the right/background mass, while the abdominal wall lies to the left. Inferiorly there is fatty tissue and portions of the gastrointestinal tract and connective tissue near the lower right.

A single laparoscopic grasper is present and actively engaged: it is holding the gallbladder and providing retraction of the liver to expose the operative field during preparation. The grasper's traction places tension on the gallbladder, helping to open the working window around the gallbladder-liver interface; connective tissue and fat lie below and to the right of this exposure. No other instruments are visible or idle in this frame.



Segmentation Mask



Legend

	Black Background
	Abdominal Wall
	Liver
	Gastrointestinal Tract
	Fat
	Grasper
	Connective Tissue
	Blood
	Cystic Duct
	L-hook Electrocautery
	Gallbladder
	Hepatic Vein
	Liver Ligament

FASL Prediction (Conf: 0.9564)

Context (LLM Input)

Visible instruments:
Hook.

Current phase:
Calot Triangle Dissection

Current action triplets (tool, verb, target):
- (Hook, Dissect, Omentum)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: right-top, center-left, center-right, left-top, left-bottom.
- Liver: left, right, right-bottom, center-bottom.
- Fat: right-bottom.
- Grasper: center-bottom.
- Connective Tissue: right.
- Blood: right-bottom.
- L-hook Electrocautery: right-bottom, center-top.
- Gallbladder: right-top, right-bottom.

Relative Positions:
- Abdominal Wall is to the left of L-hook Electrocautery.
- Liver is to the left of L-hook Electrocautery.
- Fat is toward the bottom of Gallbladder.
- Grasper is to the right of Abdominal Wall.
- Connective Tissue is towards the top of Fat.
- Blood is toward the bottom of Gallbladder.
- L-hook Electrocautery is toward the bottom of Gallbladder.
- Gallbladder is to the right of Abdominal Wall.

Conversational-1 (8 Qs) (\$0.0021)

- Q1: Is the electrocautery hook visible in this frame?**
A1: Yes. The electrocautery hook is visible.
- Q2: How many instruments are visible in the operative field?**
A2: One instrument is visible.
- Q3: Where is the hook positioned in the view?**
A3: The hook is positioned on the right side of the field, toward the lower-right region.
- Q4: Is the hook actively dissecting tissue in this image?**
A4: Yes. The hook is actively dissecting tissue.
- Q5: Which specific tissue is the hook dissecting?**
A5: The hook is dissecting the omentum.
- Q6: Where is the gallbladder located in the frame?**
A6: The gallbladder is on the right side of the operative field.
- Q7: Is there visible bleeding in this image?**
A7: Yes. Blood is visible in the lower-right portion of the field.
- Q8: Is fatty tissue visible in the operative field?**
A8: Yes. Fatty tissue is visible toward the lower-right region.

Conversational-2 (8 Qs) (\$0.0024)

- Q1: Which instrument is visible in this frame and what is it doing?**
A1: Only the hook electrocautery is visible; it is actively dissecting omental/fatty tissue adjacent to the gallbladder.
- Q2: What operative phase is represented in this image?**
A2: This image is during the Calot triangle dissection phase.
- Q3: Is the gallbladder being grasped or retracted by an instrument in this view?**
A3: No. There is no grasper visible in this frame; the gallbladder is not being grasped or retracted here—only the hook is present and dissecting nearby tissue.
- Q4: Where is the gallbladder located relative to the hook electrocautery?**
A4: The gallbladder lies superior to the hook—the hook is positioned below the gallbladder in the operative field.
- Q5: Where is the liver positioned relative to the hook?**
A5: The liver is located to the left of the hook within the surgical field.
- Q6: Is there visible blood or connective/fatty tissue near the dissection site, and where is it located?**
A6: Yes. There is localized blood in the lower/right portion of the field, and fatty/omentum tissue and connective tissue are adjacent to the dissection area on the right side.
- Q7: Where is the abdominal wall located relative to the hook and gallbladder?**
A7: The abdominal wall is located to the left of the hook and therefore to the left of the gallbladder in this view.
- Q8: Is the hook contacting the gallbladder surface or another structure?**
A8: The hook is contacting and dissecting omental/fatty tissue adjacent to the gallbladder rather than directly on the gallbladder wall.

Complex Reasoning (3 Qs) (\$0.0028)

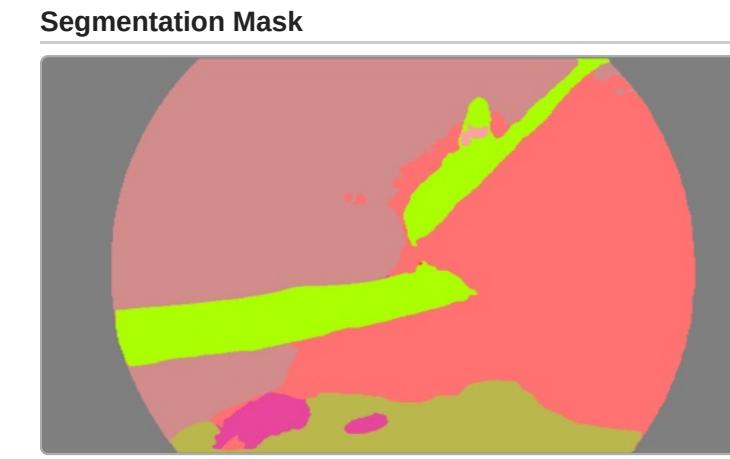
- Q1: What immediate anatomic objective is being pursued by the active electrocautery tip dissecting omental/fatty attachments in this view?**
A1: The hook is actively dividing omental/fatty adhesions adjacent to the gallbladder to clear the operative window and reveal the hepatocystic triangle. By removing this overlying fat/omentum the surgeon aims to expose the plane around the gallbladder neck so that the cystic duct and cystic artery can be identified safely. This step improves visualization of the gallbladder–liver interface and creates the tension-free conditions needed to continue toward obtaining the critical view of safety.
- Q2: Given that only the electrocautery hook is active in the field and there is fresh blood visible inferiorly, how should the surgeon modify their next maneuvers to reduce the risk of misidentification and further complications?**
A2: With blood already present and only the hook actively dissecting, the priority should be to control oozing and restore a clear field before deeper dissection. The surgeon should use short, targeted coagulation bursts with the hook to stop superficial bleeding, avoid prolonged energy activation that could enlarge the injured area, and then reassess tissue planes visually. Proceeding while the field is obscured increases the chance of mistaking structures; therefore advancement should be paused until hemostasis is achieved and anatomy is unambiguous.
- Q3: What specific adjustments to electrocautery technique are advisable in this location to minimize collateral thermal injury to the liver bed and gallbladder wall?**
A3: Because the hook is working very close to the gallbladder–liver interface, the surgeon should use low-to-moderate power settings, apply energy only intermittently for short durations, and ensure the hook tip contacts only the intended tissue. Dissecting with the tip orientated parallel to tissue planes and using sweeping "cutting" motions rather than prolonged fulcrum contact reduces thermal spread. Avoid dragging an activated tip across adhesions that tether to the liver or gallbladder wall. These measures limit lateral thermal injury that could cause liver bleeding or gallbladder perforation.

Concise (\$0.0006)

A hook electrocautery is actively dissecting omental/fatty tissue adjacent to the gallbladder on the right. The gallbladder is visible on the right with the liver located to the left. Small blood and connective tissue are present inferiorly.

Detailed (\$0.0009)

The view is focused on the gallbladder occupying the right side of the field (both upper and lower right portions). The liver forms the background on the left. A single L-hook electrocautery is present from the right/central region and is actively dissecting omental/fatty tissue and associated connective tissue adjacent to the gallbladder, working along its inferior margin. Fatty omentum lies inferior to the gallbladder, with connective tissue layers just above that fat being separated by the hook. A small amount of blood is visible in the lower-right portion of the field beneath the gallbladder. The abdominal wall is seen intermittently around the image periphery. Only the hook is actively engaged in dissection in this frame; no other instruments are present or idle.



FASL Prediction (Conf: 0.9599)

Context (LLM Input)

Visible instruments:
Grasper, SpecimenBag.

Current phase:
Gallbladder Retraction

Current action triplets (tool, verb, target):
- (Grasper, Grasp, Specimen Bag)
- (Grasper, Null Verb, Null Target)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: left.
- Liver: right.
- Gastrointestinal Tract: left-bottom.
- Fat: bottom.
- Grasper: right-top, left-bottom.
- Connective Tissue: center.
- Gallbladder: center-top.

Relative Positions:

- Abdominal Wall is towards the top of Fat.
- Liver is to the right of Gastrointestinal Tract.
- Gastrointestinal Tract is toward the bottom of Abdominal Wall.
- Fat is toward the bottom of Liver.
- Grasper is to the left of Liver.
- Connective Tissue is towards the top of Gastrointestinal Tract.
- Gallbladder is to the right of Abdominal Wall.

Conversational-1 (10 Qs) (\$0.0023)

Q1: Is a specimen bag visible in this image?

A1: Yes. The specimen bag is visible.

Q2: What is the grasper holding in this image?

A2: The grasper is holding the specimen bag.

Q3: Where is the gallbladder located in the view?

A3: The gallbladder is in the center-top of the image.

Q4: Where is the liver located in the view?

A4: The liver is on the right side of the image.

Q5: Where is the abdominal wall located?

A5: The abdominal wall is on the left side, toward the top of the field.

Q6: Is the grasper retracting the gallbladder?

A6: No. The grasper is holding the specimen bag rather than retracting the gallbladder.

Q7: Is fatty tissue visible in the field?

A7: Yes. Fat is visible at the bottom of the field.

Q8: Where is the connective tissue located?

A8: The connective tissue is in the central area of the view.

Q9: Where is the gastrointestinal tract located?

A9: The gastrointestinal tract is in the lower-left portion of the image.

Q10: Is the grasper positioned to the left of the liver?

A10: Yes. The grasper is positioned to the left of the liver.

Conversational-2 (9 Qs) (\$0.0019)

Q1: What instruments are visible in this frame?

A1: A grasper instrument and a specimen retrieval bag are visible.

Q2: How many graspers can be seen and where are they located?

A2: Two grasper regions are visible: one toward the right-top of the image and another toward the left-bottom.

Q3: Which instrument is holding the specimen bag?

A3: A grasper is grasping and holding the specimen bag.

Q4: Where is the gallbladder located in the image?

A4: The gallbladder is located centrally toward the top of the image.

Q5: Is the grasper interacting with the gallbladder in this view?

A5: No. The visible grasper is holding the specimen bag; there is no clear grasper-gallbladder interaction in this frame.

Q6: Where is the liver relative to the visible graspers?

A6: The liver is to the right of the graspers.

Q7: What procedural phase is shown in this image?

A7: This image corresponds to the gallbladder retraction phase.

Q8: What other anatomical structures are visible and where are they located?

A8: The abdominal wall appears toward the top/left, gastrointestinal tract is in the left-bottom, and fatty tissue is toward the bottom of the image; connective tissue is more central.

Q9: Is any electrocautery or hook instrument visible in this frame?

A9: No. There is no hook or electrocautery instrument visible in this frame.

Complex Reasoning (2 Qs) (\$0.0026)

Q1: Given that the retrieval device is being held and traction is directed toward the abdominal wall while the gallbladder is centralized, what is the immediate procedural goal and why is it being performed this way?

A1: The immediate goal is controlled extraction of the gallbladder inside the retrieval device through the abdominal wall. Holding the retrieval device with steady traction aligns the specimen with the port/abdominal wall axis to minimize friction and reduce the chance of tearing the bag or compressing the gallbladder. Performing extraction with the specimen enclosed prevents contamination of the wound with bile or infected contents, preserves the integrity of the specimen for pathology, and reduces the risk of port-site infection. The active instrument here (the grasper) is manipulating the retrieval device; the device itself passively contains the specimen, so the operator must maintain steady, gentle traction and visual confirmation of the bag as it is withdrawn.

Q2: Describe a stepwise technique to withdraw the enclosed specimen safely through the abdominal wall in this situation, including how instrument roles should be managed.

A2: 1) Confirm the specimen is fully enclosed and the bag mouth is secured around the specimen; visually inspect for any tears. 2) Maintain steady traction on the retrieval device with the grasper (active); avoid grasping the gallbladder directly to prevent rupture. 3) Align traction with the port/abdominal wall to reduce lateral forces—use the current instrument trajectory toward the abdominal wall. 4) Withdraw slowly while the assistant stabilizes the external port site as needed; if resistance is felt, stop and reassess rather than applying force. 5) If slight resistance occurs, externally dilate or extend the skin/fascia incision in a controlled manner rather than forcing the bag through. 6) Once the bag is externalized, inspect it before opening; if no leakage, open over a protected field and extract the specimen. Throughout, the grasper is active controlling the bag; any other instruments should be idle or withdrawn to avoid catching or tearing the bag.

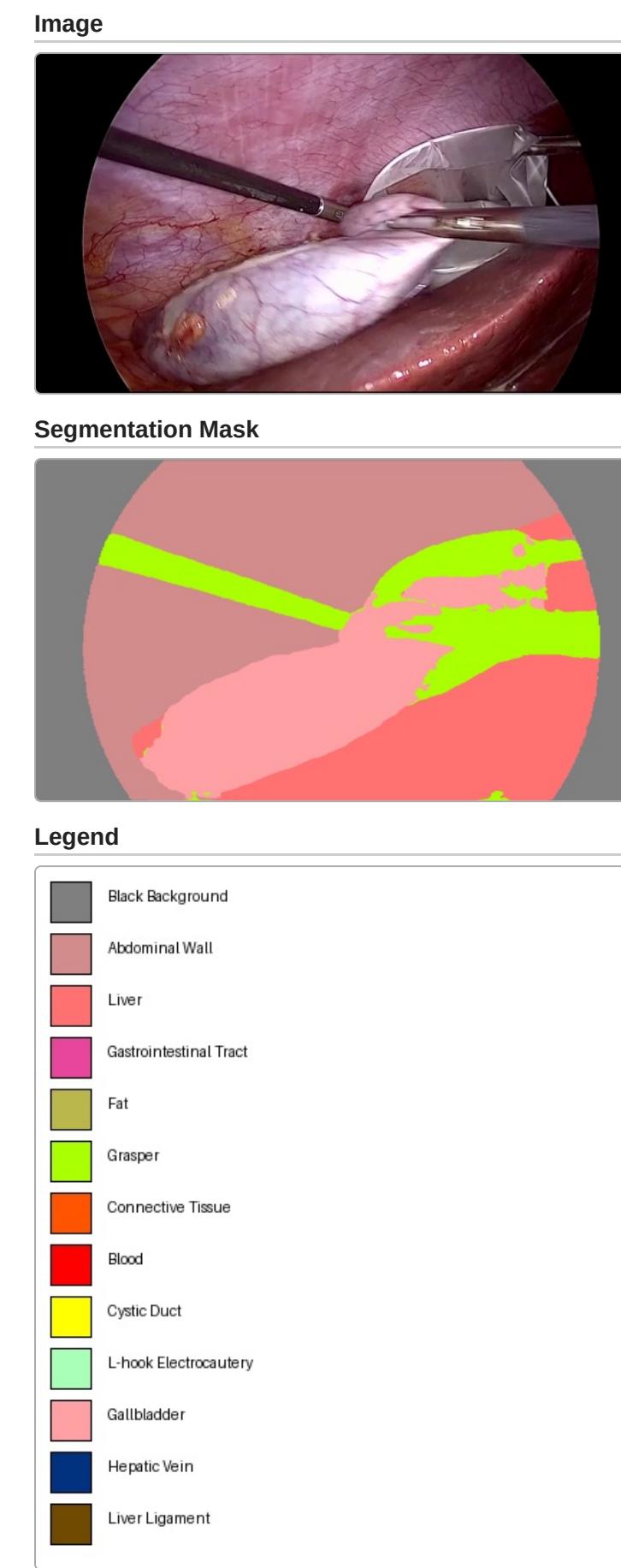
Concise (\$0.0006)

A grasper is actively holding a specimen bag near the gallbladder (visible center-top). The liver lies to the right and the abdominal wall to the left. No other instruments are actively engaged.

Detailed (\$0.0012)

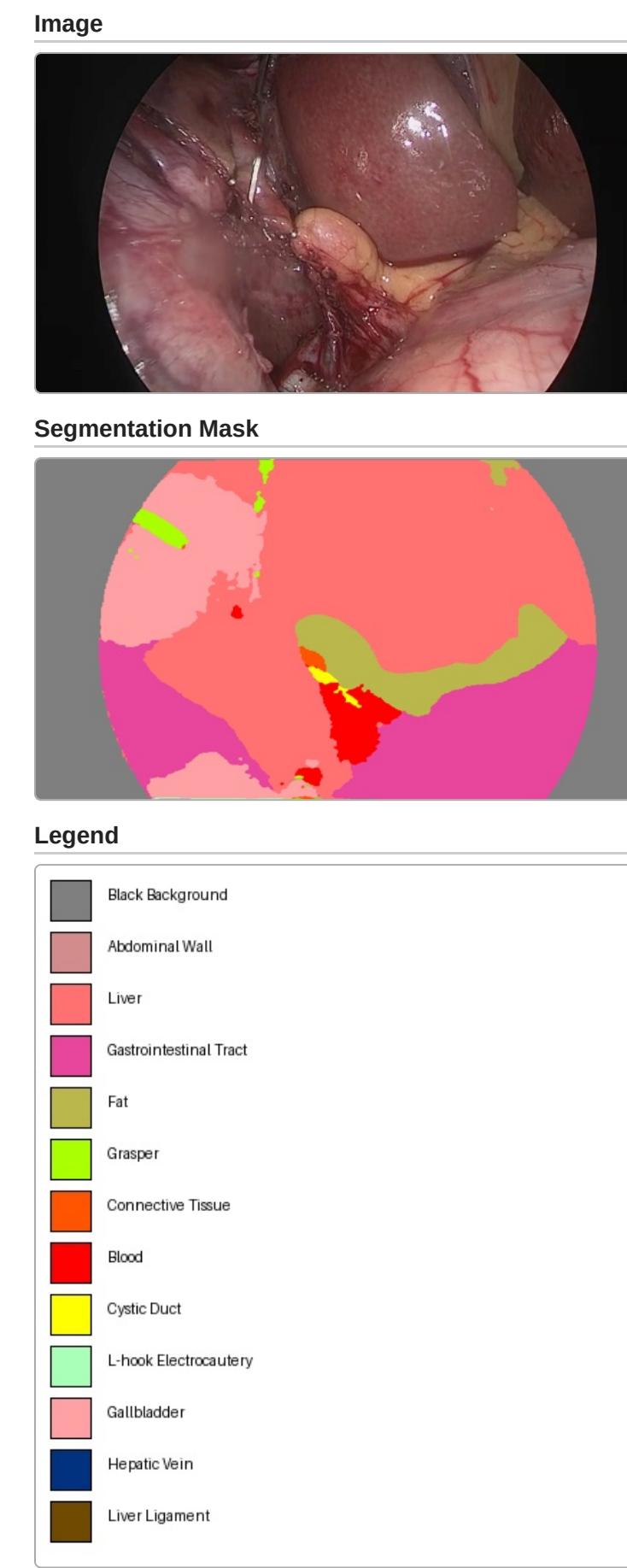
The image shows the operative field focused on the gallbladder, which sits in the center-upper portion of the view. The liver forms the background on the right, while the abdominal wall appears on the left. Fatty tissue and portions of the gastrointestinal tract occupy the lower part of the image, with some connective tissue visible more centrally.

A single grasper is actively engaged: it is holding a specimen retrieval bag in the working area (the grasper is visible both toward the upper-right and lower-left aspects of the frame), securing the bag adjacent to the gallbladder. This instrument is actively manipulating the bag to manage the gallbladder for containment/retraction. No other instruments are present or idle in the scene, and there is no obvious bleeding.

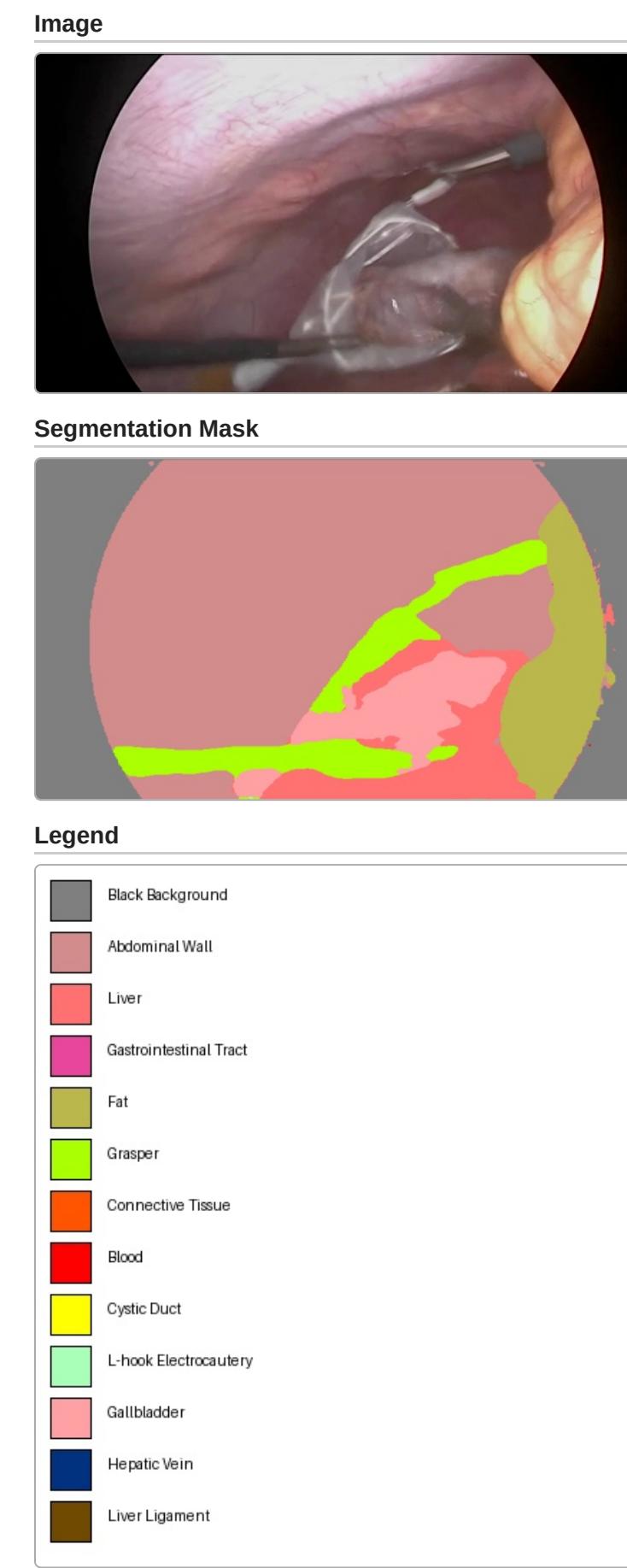


Context (LLM Input)
<p>Visible instruments: Grasper, SpecimenBag.</p> <p>Current phase: Gallbladder Packaging</p> <p>Current action triplets (tool, verb, target): - (Grasper, Grasp, Gallbladder) - (Grasper, Grasp, Specimen Bag)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: top. - Liver: right-bottom. - Grasper: right-top, right-bottom, center-right, center-bottom, center, left-top, left-bottom. - Gallbladder: bottom.</p> <p>Relative Positions: - Abdominal Wall is to the left of Liver. - Liver is to the right of Gallbladder. - Grasper is to the right of Abdominal Wall. - Gallbladder is toward the bottom of Abdominal Wall.</p>

Conversational-1 (8 Qs) (\$0.0024)	Conversational-2 (9 Qs) (\$0.0016)	Complex Reasoning (2 Qs) (\$0.0028)	Concise (\$0.0007)
<p>Q1: Is the specimen bag visible in the operative field? A1: Yes. The specimen bag is visible in the field.</p> <p>Q2: Where is the gallbladder located in the image? A2: The gallbladder is at the bottom of the frame.</p> <p>Q3: Is the grasper grasping the gallbladder? A3: Yes. The grasper is grasping the gallbladder.</p> <p>Q4: Is the grasper grasping the specimen bag? A4: Yes. The grasper is holding the specimen bag.</p> <p>Q5: Where is the grasper located in the frame? A5: The grasper is in the center-right area of the frame.</p> <p>Q6: Where is the liver located in the operative view? A6: The liver is located at the right-bottom of the frame.</p> <p>Q7: Is the abdominal wall visible in this view? A7: Yes. The abdominal wall is visible at the top of the frame.</p> <p>Q8: Is the gallbladder positioned toward the bottom of the abdominal wall? A8: Yes. The gallbladder is toward the bottom of the abdominal wall.</p>	<p>Q1: What instruments are visible in this frame? A1: A single grasper instrument and a specimen retrieval bag are visible.</p> <p>Q2: What phase of the cholecystectomy is being shown? A2: This image is from the gallbladder packaging phase.</p> <p>Q3: What is the grasper holding in this view? A3: The grasper is holding the gallbladder and is also grasping the specimen bag.</p> <p>Q4: Is any electrocautery or hook instrument visible in this frame? A4: No. There is no hook or electrocautery instrument visible.</p> <p>Q5: Where is the gallbladder located within the image? A5: The gallbladder is located toward the bottom of the image, near the lower portion of the abdominal wall.</p> <p>Q6: Where is the liver positioned relative to the gallbladder? A6: The liver is positioned to the right of the gallbladder.</p> <p>Q7: How is the grasper positioned relative to the abdominal wall? A7: The grasper appears to the right of the abdominal wall, occupying the right/central portion of the field near the gallbladder.</p> <p>Q8: Is there visible blood or active bleeding in the field? A8: No active blood or bleeding is visible in this frame.</p> <p>Q9: Is the specimen bag being manipulated in this scene? A9: Yes. The specimen bag is present and is being grasped by the grasper along with the gallbladder.</p>	<p>Q1: Given that the grasper is actively holding both the gallbladder and the specimen bag in this frame, what immediate technique should be used to place the gallbladder into the bag while minimizing the chance of bile or stone spillage? A1: With the grasper holding the gallbladder and engaging the bag, the safest technique is to maintain steady traction on the gallbladder toward the mouth of the open bag while everting or opening the bag around the fundus so the organ can be gently advanced in without squeezing. Keep the axis of pull aligned with the extraction path (upward toward the abdominal wall) so the gallbladder slides into the bag rather than being manipulated sideways against the liver. Avoid compressive force on the gallbladder wall while delivering it into the bag; if the bag has an internal rim or stiffener, use it to create a wide aperture. If any bile or stones are seen or anticipated, position the bag such that any small leak will fall into the bag rather than onto the peritoneum, and once the specimen is contained, close or cinch the bag before beginning extraction. These actions rely on the active retraction provided by the grasper and the bag being held open and oriented away from the liver to prevent contamination and loss of contents.</p> <p>Q2: How does the observed spatial relationship between the gallbladder (inferior) and the liver (to the right) affect the preferred orientation of the specimen bag and the extraction trajectory? A2: Because the gallbladder lies inferior and slightly medial to the liver (with the liver to the right), the bag should be oriented so its mouth faces away from the liver—typically toward the abdominal wall/top—so that the gallbladder is withdrawn along a path that clears the liver. This reduces the chance of the bag or specimen dragging across the liver surface and tearing the gallbladder or snagging liver parenchyma. Aligning the extraction vector cranially (toward the abdominal wall) and keeping the gallbladder tucked within the bag prevents lateral contact with the liver and helps maintain a smooth retrieval through the port.</p>	<p>Detailed (\$0.0007)</p> <p>The view shows the gallbladder low in the field (inferior/central-bottom), with the liver occupying the right and lower background. The abdominal wall/trocar entry is visible toward the top of the image.</p> <p>A single grasper is actively engaged: it is holding the gallbladder and also manipulating a specimen retrieval bag. The grasper is applying traction to the gallbladder while concurrently grasping or opening the specimen bag to enclose the specimen for extraction. The specimen bag lies adjacent to the gallbladder in the lower field as the surgeon packages the organ. No other instruments are present, and there is no obvious bleeding in the scene.</p>

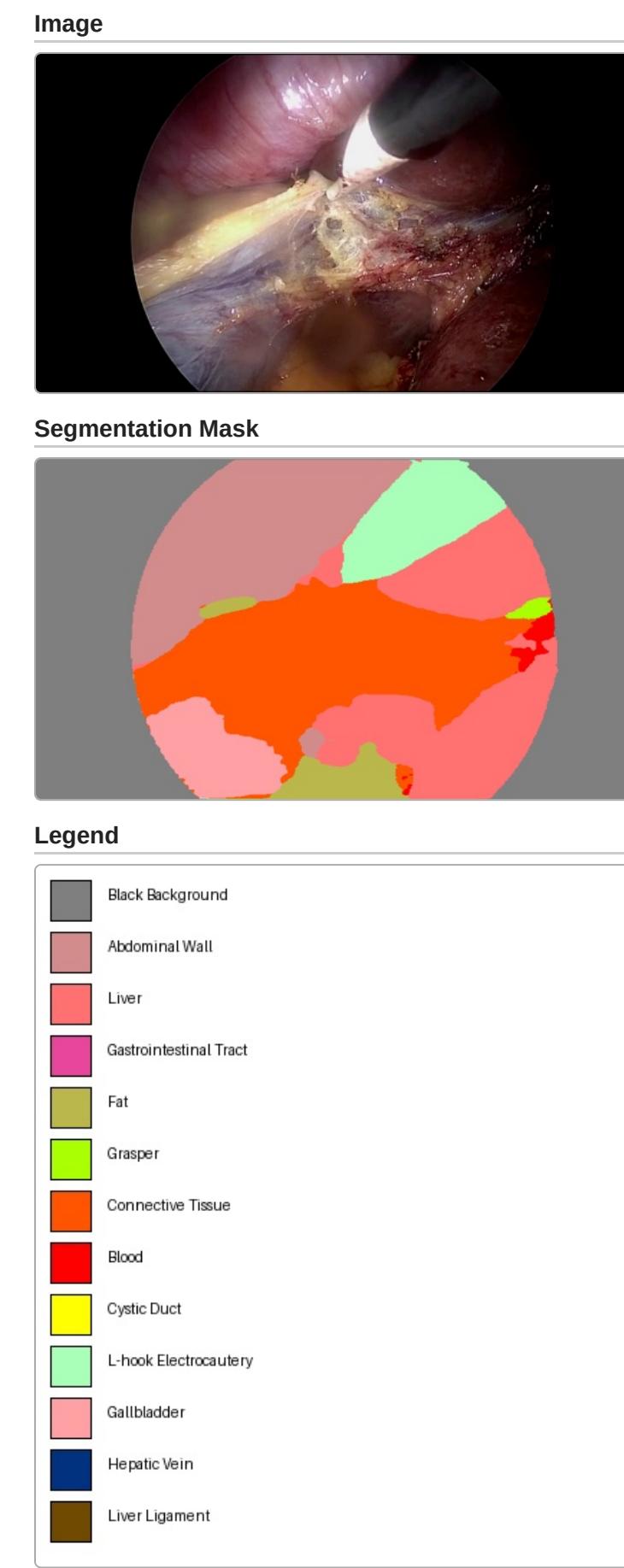


Context (LLM Input)	Conversational-1 (10 Qs) (\$0.0024)	Conversational-2 (10 Qs) (\$0.0022)	Complex Reasoning (2 Qs) (\$0.0028)	Concise (\$0.0007)
<p>Visible instruments: No instruments are visible.</p> <p>Current phase: Clipping Cutting</p> <p>Current action triplets (tool, verb, target): No actions are taking place.</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: top. - Liver: right-top, center-left, center-top, center-bottom, left-top, left-bottom. - Gastrointestinal Tract: bottom. - Fat: right. - Grasper: left-top. - Connective Tissue: center. - Blood: center-bottom. - Cystic Duct: bottom. - L-hook Electrocautery: left-bottom. - Gallbladder: left-top.</p> <p>Relative Positions: - Abdominal Wall is to the right of Gallbladder. - Liver is towards the top of L-hook Electrocautery. - Gastrointestinal Tract is toward the bottom of Grasper. - Fat is to the right of Grasper. - Grasper is towards the top of L-hook Electrocautery. - Connective Tissue is toward the bottom of Grasper. - Blood is toward the bottom of Grasper. - Cystic Duct is toward the bottom of Grasper. - L-hook Electrocautery is to the left of Fat. - Gallbladder is to the left of Fat.</p>	<p>Q1: Where is the gallbladder located in the view? A1: The gallbladder is in the upper-left portion of the frame.</p> <p>Q2: Is the cystic duct visible in this image? A2: Yes. The cystic duct is visible toward the bottom of the field.</p> <p>Q3: Where is the abdominal wall located? A3: The abdominal wall is at the top of the image.</p> <p>Q4: Where is the gastrointestinal tract located? A4: The gastrointestinal tract is at the bottom of the view.</p> <p>Q5: Is fatty tissue visible in the operative field? A5: Yes. Fatty tissue is present on the right side of the field.</p> <p>Q6: Where is connective tissue located in this view? A6: Connective tissue is located in the central part of the image.</p> <p>Q7: Is there blood visible in this frame? A7: Yes. Blood is present in the center-bottom region of the field.</p> <p>Q8: Is the liver visible in this image? A8: Yes. The liver is visible across much of the central and upper areas of the field.</p> <p>Q9: Is a grasper visible in the image? A9: No. No instruments are visible in this frame.</p> <p>Q10: Is an L-hook electrocautery visible in the image? A10: No. No instruments are visible in this frame.</p>	<p>Q1: What surgical phase is shown in this image? A1: The image shows the clipping and cutting phase of the procedure.</p> <p>Q2: Are any instruments visible in this frame? A2: No — there are no instruments visible in this frame.</p> <p>Q3: Which anatomical structures are visible and where are they located in the frame? A3: Visible structures include the gallbladder in the upper-left/central-top region, the liver occupying the right and central portions of the field, the abdominal wall at the top, the gastrointestinal tract along the bottom, fatty tissue on the right, connective tissue in the central region, blood in the central-lower area, and the cystic duct in the lower part of the image.</p> <p>Q4: Is the cystic duct visible relative to the gallbladder, and if so where is it? A4: Yes. The cystic duct appears in the lower portion of the image, inferior (below) the gallbladder.</p> <p>Q5: Is there visible bleeding in the operative field, and where? A5: Yes. There is blood visible in the central to lower-central region of the image.</p> <p>Q6: Are any clips visible on the cystic duct or other structures? A6: No clips are visible in this frame.</p> <p>Q7: How is the gallbladder positioned relative to surrounding soft tissue like fat and the abdominal wall? A7: The gallbladder is in the upper-left region; fatty tissue lies to its right, and the abdominal wall is at the top and positioned to the right of the gallbladder.</p> <p>Q8: Is the liver present in the view, and which side of the image does it occupy? A8: Yes. The liver is visible and primarily occupies the right and central portions of the image.</p> <p>Q9: Is there any active tissue manipulation occurring (grasping, retracting, or dissecting) in this frame? A9: No. There are no active instrument actions visible and no instruments present to perform manipulation.</p> <p>Q10: Is the gallbladder currently being held or retracted by an instrument in this frame? A10: No — the gallbladder is not being grasped or retracted by an instrument in this image.</p>	<p>Q1: Given that the case is at the "Clipping Cutting" stage but no instruments are visible and there is some blood in the field, what should be confirmed visually and procedurally before the surgeon proceeds with transection of the cystic duct? A1: When the team pauses between clipping and cutting, the essential checks are visual and functional. Visually confirm that you have a clear operative field with bleeding controlled and that the anatomy meets the criteria for safe division: only two tubular structures (cystic duct and cystic artery) should be seen entering the gallbladder and the lower gallbladder neck should be mobilized to expose the duct. Procedurally, ensure clips have been placed securely on the intended ends of the cystic duct (and artery as appropriate) and that there is no bile leaking from the duct stump. If the view is obscured by blood or fatty tissue, clear the field by suction and irrigation and obtain hemostasis first; do not transect until these conditions are met. If any uncertainty about anatomy remains, perform further dissection to achieve the critical view of safety or obtain adjunct imaging (e.g., intraoperative cholangiography) rather than proceeding to cut.</p> <p>Q2: How does the presence of blood near the operative site change the immediate technical steps and choice of next maneuvers before cutting the duct? A2: Blood in the field degrades visualization and increases the risk of misidentifying structures. Immediate technical steps should therefore prioritize hemostasis and clearing the view: apply suction and irrigation to remove pooled blood, locally control the bleeding source with targeted coagulation or clips, and gently clear adherent fat or tissue that obscures the ductal anatomy. Only after a bloodless, well-lit field with clearly defined tissue planes should transection be considered. Proceeding to cut while the field remains bloody risks clipping or transecting the wrong structure and increases the chance of postoperative bile leak or hemorrhage.</p>	<p>No instruments are visible. The gallbladder sits in the left-upper field with the cystic duct inferiorly. The liver occupies the central to right field. Connective tissue and a small blood collection are central-inferior. Fat and the gastrointestinal tract lie to the right and bottom. The procedure is in the clipping/cutting phase but no actions are occurring.</p> <p>Detailed (\$0.0009)</p> <p>No instruments are visible in the field and no actions are taking place despite the case being in the clipping/cutting phase. The gallbladder sits toward the upper-left portion of the view with the liver occupying much of the surrounding background. The cystic duct lies in the lower part of the operative field beneath the gallbladder, with surrounding connective tissue centrally. Fatty tissue is present to the right, and portions of the abdominal wall are seen at the top of the image. The gastrointestinal tract is visible in the lower portion. A small amount of blood is pooled in the lower-central area, but there is no active instrument activity or overt bleeding under control in this frame.</p>



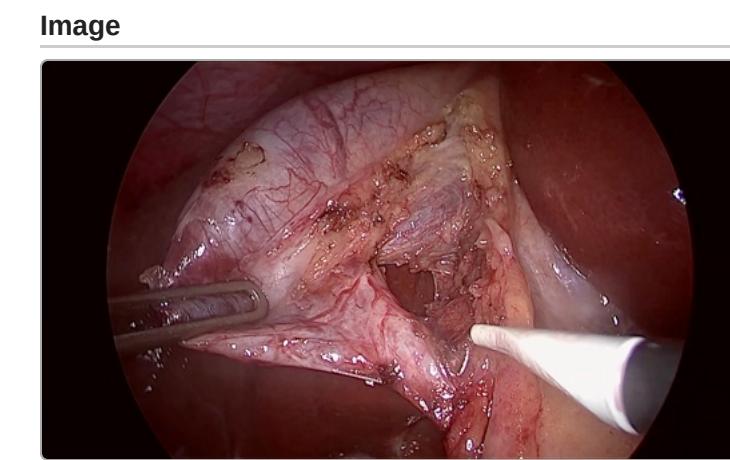
Context (LLM Input)
<p>Visible instruments: Grasper, SpecimenBag.</p> <p>Current phase: Gallbladder Packaging</p> <p>Current action triplets (tool, verb, target): - (Grasper, Grasp, Specimen Bag) - (Grasper, Null Verb, Null Target)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: right-top, right-bottom, center-right, center-bottom, center, left-top, left-bottom. - Liver: right-bottom. - Gastrointestinal Tract: right. - Fat: right. - Grasper: bottom, right-bottom, right, center-bottom. - Blood: right-bottom. - Cystic Duct: left-bottom. - L-hook Electrocautery: center-bottom. - Gallbladder: right-bottom.</p> <p>Relative Positions: - Abdominal Wall is to the left of Blood. - Liver is toward the bottom of Abdominal Wall. - Gastrointestinal Tract is to the right of Abdominal Wall. - Fat is to the right of Abdominal Wall. - Grasper is to the left of Gastrointestinal Tract. - Blood is to the right of Liver. - Cystic Duct is toward the bottom of Abdominal Wall. - L-hook Electrocautery is toward the bottom of Abdominal Wall. - Gallbladder is to the right of Cystic Duct.</p>

Conversational-1 (10 Qs) (\$0.0021)	Conversational-2 (8 Qs) (\$0.0020)	Complex Reasoning (2 Qs) (\$0.0024)	Concise (\$0.0007)
<p>Q1: Is a specimen bag visible in this frame? A1: Yes. A specimen bag is visible in the lower portion of the view.</p> <p>Q2: Is the grasper holding the specimen bag? A2: Yes. The grasper is grasping the specimen bag.</p> <p>Q3: Where is the grasper located in the image? A3: The grasper is in the lower-right region of the operative field.</p> <p>Q4: Where is the gallbladder located in the operative view? A4: The gallbladder is in the lower-right portion of the frame.</p> <p>Q5: How is the cystic duct positioned relative to the gallbladder? A5: The cystic duct is left and slightly inferior to the gallbladder; the gallbladder lies to the right of the cystic duct.</p> <p>Q6: Is there visible blood in the operative field, and if so where? A6: Yes. There is blood visible in the lower-right area.</p> <p>Q7: Where is the liver seen in the image? A7: The liver is visible on the right side, toward the lower-right background.</p> <p>Q8: Is fatty tissue visible in this frame? A8: Yes. Fatty tissue is visible on the right side of the field.</p> <p>Q9: Is the abdominal wall visible in this frame? A9: Yes. The abdominal wall is visible, particularly around the central and right regions.</p> <p>Q10: Is the gastrointestinal tract visible in this frame? A10: Yes. Gastrointestinal tissue is visible on the right side of the image.</p>	<p>Q1: What instruments are visible in this frame? A1: A grasper and a specimen retrieval bag are visible.</p> <p>Q2: What operative phase is occurring in this view? A2: This image is from the gallbladder packaging phase.</p> <p>Q3: Which instrument is holding the specimen bag? A3: The grasper is grasping the specimen bag.</p> <p>Q4: Where is the gallbladder located within the image? A4: The gallbladder is in the lower right portion of the field (right-bottom).</p> <p>Q5: How is the cystic duct positioned relative to the gallbladder? A5: The cystic duct is left and slightly inferior to the gallbladder; the gallbladder lies to the right of the cystic duct.</p> <p>Q6: Is there visible blood in the operative field, and if so where? A6: Yes. Blood is present in the lower right portion of the field, near the gallbladder.</p> <p>Q7: Describe the spatial relationship between the grasper, the specimen bag, and the gallbladder. A7: The grasper is in the lower/right area holding the specimen bag adjacent to the gallbladder, which is also located in the lower right field.</p> <p>Q8: What other major anatomical structures are visible and where are they located? A8: The abdominal wall is seen around the periphery, the liver lies toward the lower part of the field, and portions of the gastrointestinal tract and surrounding fat occupy the right side of the view.</p>	<p>Q1: Given that the grasper is actively manipulating a specimen bag while the gallbladder is being retrieved, what immediate steps should the surgeon take to minimize intra-abdominal contamination and port-site seeding during extraction? A1: The grasper is the active instrument here and is being used to control the bag; the appropriate immediate steps are to ensure the gallbladder (or its contents) is fully enclosed within the bag mouth before any traction is applied, then close or tighten the bag opening around the grasper shaft or bag strings to contain bile/stones. Before withdrawing, suction any visible blood or bile from around the bag to improve visualization and reduce pooled contaminants along the extraction tract. Maintain steady, axial traction to pull the bag through the trocar rather than dragging it across port edges, and if resistance is felt, enlarge the fascial or skin incision rather than force passage, which risks bag rupture and port-site contamination. Throughout, the grasper remains active controlling both bag position and tension while the bag itself is passive containment.</p> <p>Q2: There is some blood visible near the operative field and the cystic duct is anatomically close. What checks or actions should be performed now to reduce postoperative bile leak or bleeding before completing retrieval? A2: With blood present and the cystic duct nearby, the surgeon should actively inspect the cystic duct stump and the liver bed while the grasper holds the specimen bag. Confirm that the cystic duct is securely clipped or ligated and that there is no ongoing bile trickle—if any bile is noted, apply additional clips or suture ligature as needed. For bleeding, identify the source in the liver bed or cystic plate; apply targeted pressure, bipolar coagulation, or hemostatic agents as appropriate until oozing stops. Suction to clear blood and then reinspect is important because persistent oozing can soil the bag during extraction and increase infection risk. Only once hemostasis and a dry field are confirmed should controlled specimen removal proceed.</p>	<p>A grasper holds the specimen bag for gallbladder packaging. The gallbladder is located in the lower-right of the field.</p> <p>Detailed (\$0.0012)</p> <p>The view is focused on the lower right quadrant of the operative field where the gallbladder sits near the lower-central/right area. A grasper is positioned in the lower field and is actively holding/opening a specimen bag adjacent to the gallbladder as part of the packaging step. The cystic duct lies toward the lower-left relative to the gallbladder, and the liver forms the background in the lower portion of the field. Fatty tissue and portions of the gastrointestinal tract are visible to the right, and a small area of blood is present in the lower-right region. The grasper is the only instrument engaged in this moment—it is actively handling the bag to contain the specimen.</p>

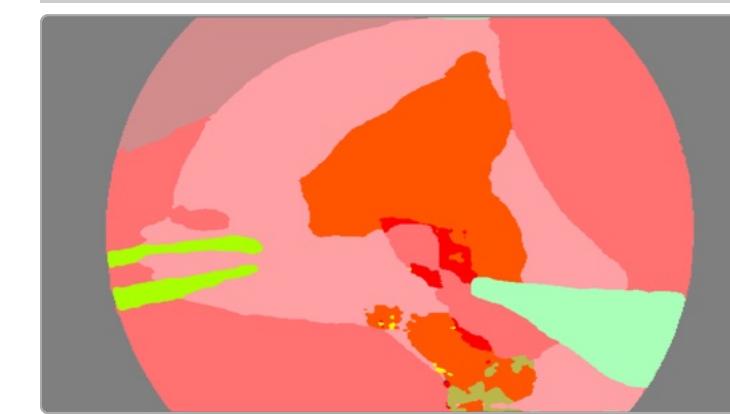


Context (LLM Input)
<p>Visible instruments: Hook.</p> <p>Current phase: Gallbladder Dissection</p> <p>Current action triplets (tool, verb, target): - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions:</p> <ul style="list-style-type: none"> - Abdominal Wall: left-top, left-bottom. - Liver: right. - Gastrointestinal Tract: center-top. - Fat: left-top, center-bottom. - Grasper: center-right, left-bottom. - Connective Tissue: bottom. - Blood: center-right. - L-hook Electrocautery: right-top. - Gallbladder: left-bottom. <p>Relative Positions:</p> <ul style="list-style-type: none"> - Abdominal Wall is to the left of Blood. - Liver is to the right of Gallbladder. - Gastrointestinal Tract is towards the top of Liver. - Fat is toward the bottom of L-hook Electrocautery. - Grasper is to the right of Gallbladder. - Connective Tissue is to the left of Blood. - Blood is to the right of Gallbladder. - L-hook Electrocautery is towards the top of Gallbladder. - Gallbladder is toward the bottom of Abdominal Wall.

Conversational-1 (10 Qs) (\$0.0016)	Conversational-2 (9 Qs) (\$0.0019)	Complex Reasoning (2 Qs) (\$0.0024)	Concise (\$0.0007)
<p>Q1: Is the hook electrocautery visible in this image? A1: Yes. The hook electrocautery is visible.</p> <p>Q2: What is the hook doing in this frame? A2: The hook is dissecting the gallbladder.</p> <p>Q3: Where is the hook located in the operative view? A3: The hook is at the right-top of the frame, above the gallbladder.</p> <p>Q4: Where is the gallbladder located in the image? A4: The gallbladder is in the left-bottom portion of the field.</p> <p>Q5: Is there visible blood in the operative field? A5: Yes. Blood is visible in the center-right area.</p> <p>Q6: Where is the liver located in relation to the frame? A6: The liver is on the right side of the view.</p> <p>Q7: Is a grasper instrument visible in this image? A7: No. A grasper is not visibly present.</p> <p>Q8: Where is the abdominal wall located in the image? A8: The abdominal wall appears on the left side, in both upper and lower portions.</p> <p>Q9: Where is the gastrointestinal tract located in the image? A9: The gastrointestinal tract is in the center-top area of the field.</p> <p>Q10: Where is connective tissue visible in this view? A10: Connective tissue is visible along the bottom of the field.</p>	<p>Q1: What instrument is visible in this frame? A1: Only the L-hook electrocautery (hook) is visible in the image.</p> <p>Q2: What phase of the operation does this image depict? A2: This view corresponds to the gallbladder dissection phase.</p> <p>Q3: What is the hook doing in this frame? A3: The hook electrocautery is actively dissecting the gallbladder.</p> <p>Q4: Where is the gallbladder located within the image? A4: The gallbladder is located in the lower-left (left-bottom) portion of the frame.</p> <p>Q5: Where is the hook positioned relative to the gallbladder? A5: The L-hook is positioned superior and to the right of the gallbladder—approaching from the upper-right aspect of the gallbladder.</p> <p>Q6: Is there any blood visible, and if so, where is it relative to the gallbladder? A6: Yes. Blood is visible in the central-right area of the image, lateral to (to the right of) the gallbladder.</p> <p>Q7: Where is the liver relative to the gallbladder in this view? A7: The liver is located to the right of the gallbladder.</p> <p>Q8: Are any graspers visible or holding the gallbladder in this frame? A8: No. There are no graspers visibly holding or retracting the gallbladder in this frame.</p> <p>Q9: What other tissues or structures are visible near the gallbladder in this image? A9: The gastrointestinal tract appears toward the center-top, fat is present around the lower-central area, and connective tissue is visible toward the bottom of the field, all adjacent to the gallbladder region.</p>	<p>Q1: Given the hook is actively dissecting the gallbladder from the liver bed while a grasper is present but not engaged, what should the immediate technical goal be and how should the instruments be used to achieve it? A1: The immediate goal is a controlled, plane-by-plane separation of the gallbladder from the liver surface while maintaining a clear, tensioned field. The electrocautery hook should be used in short, precise strokes directed superficially along the liver capsule to divide attachments without plunging into the parenchyma. The idle grasper should be actively employed for countertraction — lifting and tensioning the gallbladder away from the liver to expose the dissection plane and allow the hook to work with minimal depth. Using the grasper to create steady, opposing tension reduces the need for deep strokes and helps localize energy application to the intended tissue, improving precision and reducing bleeding risk.</p> <p>Q2: There is visible blood in the operative field adjacent to the dissection. What is the most appropriate immediate management to control bleeding while continuing safe dissection? A2: First clear the field with suction to identify the bleeding source. If the oozing is from small vessels in the liver bed, apply brief, targeted coagulation with the hook using short bursts rather than prolonged application to limit thermal spread. If visibility remains poor or the bleeding is brisk, pause dissection, apply direct pressure with the grasper or a suction tip to tamponade, then achieve hemostasis with bipolar coagulation or topical hemostatic agents if available. Throughout, maintain countertraction so the hook can be precisely aimed; avoid sweeping electrocautery strokes that can enlarge the injury. Reassess once bleeding is controlled before resuming systematic dissection.</p>	<p>An L-hook electrocautery is actively dissecting the gallbladder in the lower-left of the field. The liver is visible to the right, with blood and connective tissue present near the dissection site.</p> <p>Detailed (\$0.0011)</p> <p>The view focuses on the gallbladder located in the lower-left portion of the field. An electrocautery hook is present from the upper-right and is actively dissecting the gallbladder—its tip is directed down toward the gallbladder surface and engaged in tissue division. The liver forms the background on the right side of the image. A small amount of blood/ooze is visible to the right of the gallbladder near the area of dissection. Fatty tissue is seen toward the left top and centrally toward the bottom, with connective tissue occupying the inferior aspect of the field. The abdominal wall is visible along the left edge and the gastrointestinal tract is seen toward the top-center. No other instruments are engaged in this frame; the hook is the active tool performing the dissection.</p>



Segmentation Mask



Legend

Black Background
Abdominal Wall
Liver
Gastrointestinal Tract
Fat
Grasper
Connective Tissue
Blood
Cystic Duct
L-hook Electrocautery
Gallbladder
Hepatic Vein
Liver Ligament

FASL Prediction (Conf: 0.9204)

Context (LLM Input)

Visible instruments:
Grasper, Hook.

Current phase:
Calot Triangle Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)
- (Hook, Dissect, Cystic Duct)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: left-top.
- Liver: right-top, right-bottom, center-left, left-top, left-bottom.
- Fat: center-bottom, right-bottom.
- Grasper: center-left, left-bottom.
- Connective Tissue: right-bottom, center-bottom, top, center.
- Blood: right-bottom.
- Cystic Duct: center-bottom.
- L-hook Electrocautery: right-bottom.
- Gallbladder: right-bottom, center-right, center-bottom, left, left-bottom.
- Hepatic Vein: center-bottom.

Relative Positions:
- Abdominal Wall is to the left of L-hook Electrocautery.
- Liver is to the right of Abdominal Wall.
- Fat is toward the bottom of Gallbladder.
- Grasper is to the left of Blood.
- Connective Tissue is to the right of Grasper.
- Blood is to the left of L-hook Electrocautery.
- Cystic Duct is to the left of L-hook Electrocautery.
- L-hook Electrocautery is to the right of Gallbladder.
- Gallbladder is to the right of Grasper.
- Hepatic Vein is toward the bottom of Gallbladder.

Conversational-1 (10 Qs) (\$0.0026)

- Q1: What is the grasper doing in this image?**
A1: The grasper is retracting the gallbladder.
- Q2: What is the hook doing in this image?**
A2: The hook is dissecting the cystic duct.
- Q3: Where is the cystic duct located in the view?**
A3: The cystic duct is located in the center-bottom of the field.
- Q4: Where is the hook electrocautery tip positioned?**
A4: The hook tip is positioned at the right-bottom of the operative field.
- Q5: Where is the grasper positioned in the view?**
A5: The grasper is positioned at the left-central portion of the field.
- Q6: Is there visible blood in the operative field?**
A6: Yes. Blood is visible at the right-bottom area.
- Q7: Where is the gallbladder located in the image?**
A7: The gallbladder is located centrally in the operative view.
- Q8: Where is the liver located relative to the field?**
A8: The liver occupies the right side and background of the view.
- Q9: Is fatty tissue visible in this frame?**
A9: Yes. Fatty tissue is visible in the lower portion, especially toward the bottom-right.
- Q10: Where is the hepatic vein visible?**
A10: The hepatic vein is visible at the center-bottom of the field.

Conversational-2 (10 Qs) (\$0.0022)

- Q1: What instruments are visible in this frame?**
A1: I can see a grasper and an L-hook electrocautery (hook) in the operative field.
- Q2: Which instrument is retracting the gallbladder and where is that instrument located in the image?**
A2: The grasper is retracting the gallbladder; it is positioned toward the center-left / left-bottom region of the view while holding the gallbladder.
- Q3: Which structure is the hook dissecting and where is that structure located relative to the hook?**
A3: The hook is dissecting the cystic duct. The cystic duct appears at the center-bottom of the field and lies just to the left of the L-hook electrocautery.
- Q4: Describe the left-to-right spatial relationship between the grasper, the gallbladder, and the L-hook in this frame.**
A4: From left to right: the grasper is at center-left engaging the gallbladder, the gallbladder lies to the right of the grasper (center/right), and the L-hook electrocautery is positioned to the right of the gallbladder.
- Q5: Is there any blood visible in the image, and if so where?**
A5: Yes. A region of blood is visible at the right-bottom portion of the field, just left of the L-hook electrocautery.
- Q6: Are connective tissue and fatty tissue visible, and where are they located relative to the gallbladder?**
A6: Yes. Connective tissue and fat are visible primarily in the lower and right portions of the field, adjacent to and inferior to the gallbladder and near the L-hook.
- Q7: Which major organ occupies the right side of the image?**
A7: The liver occupies the right side of the image.
- Q8: Is the hepatic vein visible, and where is it located relative to the gallbladder?**
A8: Yes. The hepatic vein is visible toward the bottom of the gallbladder, located in the center-bottom area of the view.
- Q9: What procedural phase is shown, and which two structures are being directly manipulated in this frame?**
A9: This is the Calot triangle dissection phase. The gallbladder is being retracted by the grasper, and the cystic duct is being dissected with the hook.
- Q10: Are there any additional instruments visible beyond the grasper and the L-hook?**
A10: No. Only the grasper and the L-hook electrocautery are visible in this frame.

Complex Reasoning (2 Qs) (\$0.0024)

- Q1: Given that the gallbladder is under traction by the grasper while a hook is actively dissecting the tubular structure at its infundibulum, what immediate anatomic confirmation should the surgeon obtain before placing any clips or dividing that structure, and what maneuvers in this image support reaching that confirmation?**
A1: The surgeon should confirm that the structure being skeletonized is the cystic duct (and not a common hepatic or common bile duct) by achieving the "critical view of safety": clear the connective tissue in Calot's triangle so that only two structures (cystic duct and cystic artery) enter the gallbladder, and the lower third of the gallbladder is separated from the liver bed. In this scene the grasper is providing cephalolateral traction on the gallbladder, which helps expose the infundibulum and places the duct under tension for safer skeletonization. Continued controlled hook dissection to remove surrounding fat and connective tissue while maintaining that traction will allow visual confirmation of a single tubular structure entering the gallbladder, at which point clipping and division are appropriate. If anatomy remains ambiguous, further dissection or intraoperative cholangiography should be used rather than blind clipping.
- Q2: What specific hazards are introduced by using the monopolar hook near the adjacent venous structure visible in the field, and how should the surgeon modify instrument use to reduce the likelihood of those complications?**
A2: Using monopolar energy near a hepatic venous branch risks thermal spread causing venous wall injury with subsequent bleeding and difficulty achieving hemostasis. It also risks deeper parenchymal injury and potential postoperative bleeding. To reduce these hazards the operator should (1) minimize monopolar activation time and use brief, low-power pulses rather than continuous application, (2) maintain the hook tip directly on the target tissue with clear visualization and avoid sweeping motions toward the vein, (3) favor blunt dissection or cold scissors where the tissue plane is thin over the vein, and (4) if bleeding is anticipated or encountered, switch to bipolar coagulation or apply direct pressure/suction and topical hemostatic agents. These adjustments preserve the exposure provided by the grasper while protecting the adjacent venous structure.

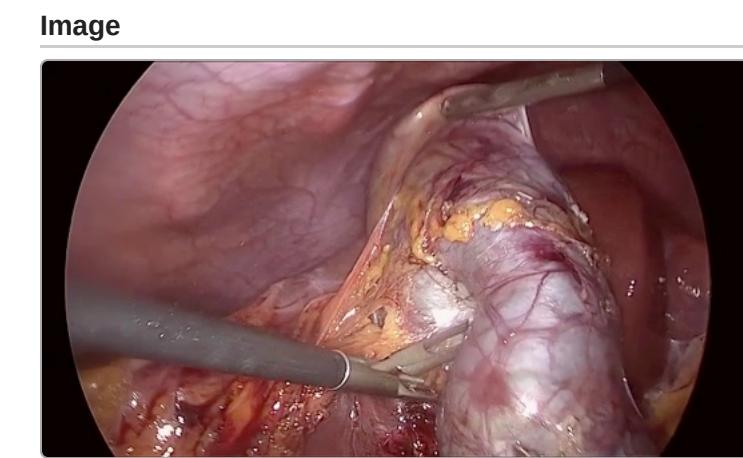
Concise (\$0.0007)

A grasper retracts the gallbladder to expose Calot's triangle. An L-hook electrocautery on the right is actively dissecting the cystic duct, with surrounding liver, connective/fatty tissue and some blood visible.

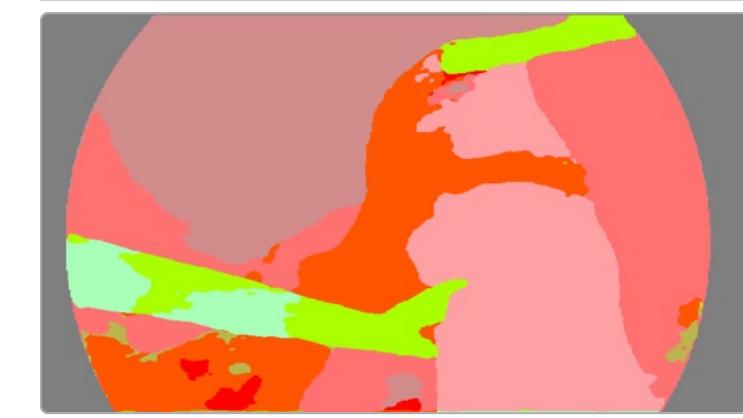
Detailed (\$0.0009)

The image shows a Calot-triangle dissection in progress. The gallbladder occupies the lower-central to right portion of the field, with the liver forming the background on the right. The cystic duct is visualized in the central-lower area beneath the gallbladder, surrounded by fatty and connective tissue. A hepatic vein runs just inferior to the gallbladder.

A grasper is positioned on the left side of the field (slightly toward the center and lower left) and is actively retracting the gallbladder medially/upward to expose the infundibulum and cystic duct. To the right and slightly inferior, an L-hook electrocautery (hook) is inserted and is actively dissecting around the cystic duct, clearing connective tissue attachments in the Calot triangle. There is a small amount of blood visible in the right-lower area near the working line of dissection. Overall, the grasper provides tension and exposure from the left while the hook works from the right to skeletonize the cystic duct.



Segmentation Mask



Legend



FASL Prediction (Conf: 0.9080)

Context (LLM Input)

Visible instruments:
Grasper.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: left-top.
- Liver: right-top, right-bottom, center-left, left-bottom, center-top, center-bottom, center, left, right.
- Gastrointestinal Tract: right-top.
- Fat: bottom.
- Grasper: right-top, right-bottom, center-left, center-right, center-bottom, left-bottom.
- Connective Tissue: right-bottom, center-left, center-right, center-top, center-bottom, center, left-bottom.
- Blood: left-bottom.
- L-hook Electrocautery: left-bottom.
- Gallbladder: right-top, right-bottom.

Relative Positions:
- Abdominal Wall is to the left of Gallbladder.
- Liver is to the right of L-hook Electrocautery.
- Gastrointestinal Tract is to the right of L-hook Electrocautery.
- Fat is toward the bottom of Gastrointestinal Tract.
- Grasper is to the left of Gastrointestinal Tract.
- Connective Tissue is to the left of Gastrointestinal Tract.
- Blood is toward the bottom of Gastrointestinal Tract.
- L-hook Electrocautery is to the left of Gallbladder.
- Gallbladder is to the right of Blood.

Conversational-1 (10 Qs) (\$0.0018)

- Q1: Is a grasper visible in this image?**
A1: Yes. A grasper is visible.
- Q2: Where is the grasper located in the frame?**
A2: The grasper is on the right side of the operative field.
- Q3: What is the grasper doing in this scene?**
A3: The grasper is retracting the gallbladder.
- Q4: Is the gallbladder visible in this image?**
A4: Yes. The gallbladder is visible.
- Q5: Where is the gallbladder located in the view?**
A5: The gallbladder is on the right side of the image, occupying the central-right area.
- Q6: Is there visible blood in the operative field?**
A6: Yes. There is blood visible.
- Q7: Where is the visible blood located?**
A7: The blood is in the lower-left portion of the field.
- Q8: Is an electrocautery hook visible in this image?**
A8: No. An electrocautery hook is not visible.
- Q9: Where is the liver located in the image?**
A9: The liver occupies much of the central and right background of the view.
- Q10: Where is fatty tissue located in the operative field?**
A10: Fatty tissue is located toward the bottom of the image.

Conversational-2 (10 Qs) (\$0.0017)

- Q1: What instrument is visible in this frame?**
A1: A single laparoscopic grasper is visible.
- Q2: How many graspers are present in the image?**
A2: One grasper is present.
- Q3: What surgical phase is shown in this view?**
A3: This view corresponds to the gallbladder dissection phase.
- Q4: What action is the grasper performing on the gallbladder?**
A4: The grasper is retracting the gallbladder.
- Q5: Where is the grasper located relative to the gallbladder within the image?**
A5: The grasper is adjacent to and contacting the gallbladder on the right side of the image, at the upper/right portion of the gallbladder region.
- Q6: Which major organ is visible near the gallbladder, and where is it located relative to the gallbladder?**
A6: The liver is visible and lies to the right of the gallbladder, occupying much of the right side of the field.
- Q7: Is there blood visible in the operative field, and if so, where?**
A7: Yes. Blood is visible in the lower-left portion of the image.
- Q8: What other tissue types are visible around the gallbladder and where are they located?**
A8: Connective tissue is present centrally and inferiorly, and fatty tissue is seen toward the bottom of the field beneath the gallbladder.
- Q9: Is any electrocautery hook or other instrument visible in this frame?**
A9: No. Only the grasper is visible; no electrocautery hook or other instruments are seen.
- Q10: Where is the abdominal wall located in relation to the gallbladder in this image?**
A10: The abdominal wall is to the left and toward the top relative to the gallbladder.

Complex Reasoning (2 Qs) (\$0.0023)

- Q1: Given the grasper is actively retracting the gallbladder while there is fresh blood visible and the electrocautery hook is present but not in use, what should the surgeon do immediately to manage the bleeding and why?**

A1: The immediate priority is to restore a clear operative field and control the bleeding source while preserving the gallbladder wall. Practically, the surgeon should maintain gentle, steady traction with the grasper to optimize exposure, introduce or activate suction to evacuate blood and reveal the bleeding point, and then use the idle hook electrocautery (or a bipolar instrument if available) to coagulate the bleeding vessel once it is identified. This sequence—traction to expose, suction to clear, then targeted energy to hemostasis—minimizes blind application of cautery that could deepen liver injury or perforate the gallbladder. If the bleed appears to originate from diffuse liver bed oozing rather than a single vessel, topical hemostatic agents or low-power, broad surface coagulation can be used rather than prolonged deep passes with the hook to avoid liver parenchymal damage.

- Q2: How should traction with the grasper be adjusted during hepatic bed dissection to reduce the risk of tearing the gallbladder wall?**

A2: Traction should be directional and balanced: the grasper should apply steady, gentle traction that tents the gallbladder away from the liver rather than pulling straight laterally or with jerky movements. Traction from the fundus toward the surgeon (or slightly cephalad depending on port position) exposes the dissection plane and places tension on attachments, allowing small, controlled bites with the hook. Avoid excessive squeezing that thins or crushes the wall, and avoid applying traction perpendicular to the plane of dissection which can predispose to avulsion. If the wall appears thin or ischemic near the liver bed, reduce traction force, take smaller electrocautery strokes, and consider switching to blunt dissection near the vulnerable area to prevent perforation and bile leak.

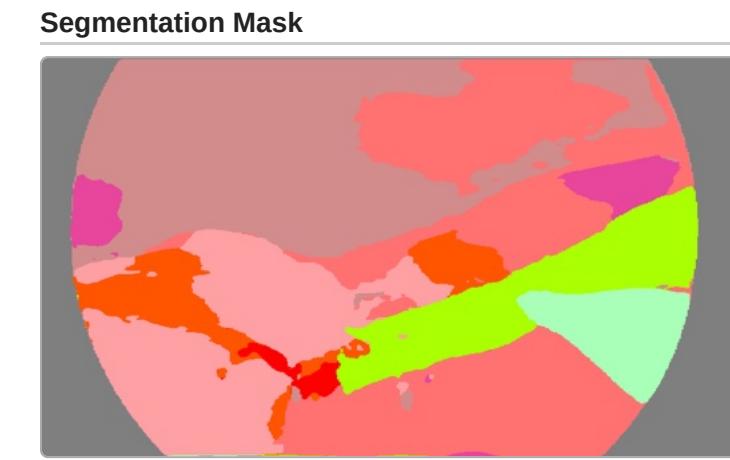
Concise (\$0.0007)

A grasper actively retracts the gallbladder during gallbladder dissection. The gallbladder lies on the right side of the field with the liver nearby to the right and the abdominal wall to the left. Connective tissue and a small amount of blood are visible inferiorly.

Detailed (\$0.0010)

The view is a right-sided operative field focused on the gallbladder, which occupies the right upper/mid portion of the image. The liver forms the dominant background on the right and around the gallbladder. A grasper is the only instrument visible and is actively engaged—it is holding and retracting the gallbladder to provide exposure of the dissection plane.

Surrounding the gallbladder there is connective/fatty tissue inferiorly and centrally that is being tensioned by the retraction, helping to open the dissection plane. The abdominal wall is visible toward the upper-left field. There is a small area of blood in the lower portion of the view. No other instruments are present or actively manipulating tissue in this frame.



FASL Prediction (Conf: 0.8667)

Image

Context (LLM Input)

Visible instruments:
Grasper, Hook.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Liver)
- (Hook, Null Verb, Null Target)

Spatial (extracted from model-generated segmentation mask):
Model-generated segmentation mask confidence is below threshold, so spatial context is not included.

Conversational-1 (7 Qs) (\$0.0020)

- Q1: Is the grasper visible in the frame?**
A1: Yes, the grasper is visible.
- Q2: Is the hook visible in the frame?**
A2: Yes, the hook is visible.
- Q3: What is the grasper doing in this image?**
A3: The grasper is retracting the liver.
- Q4: Is the grasper holding the gallbladder?**
A4: No, the grasper is not holding the gallbladder.
- Q5: Is the hook actively dissecting tissue in this frame?**
A5: No, the hook is not actively dissecting tissue.
- Q6: Is the gallbladder visible in the operative field?**
A6: Yes, the gallbladder is visible.
- Q7: Is the grasper applying traction to tissue?**
A7: Yes, the grasper is applying traction (retracting the liver).

Conversational-2 (8 Qs) (\$0.0016)

- Q1: What instruments are visible in this frame?**
A1: A laparoscopic grasper and a hook-style electrocautery are visible.
- Q2: Which instrument is actively interacting with tissue, and which structure is it retracting?**
A2: The grasper is actively interacting with tissue and is retracting the liver.
- Q3: Is the hook electrocautery actively dissecting in this image?**
A3: No. The hook electrocautery is present but not shown actively dissecting or engaging a target.
- Q4: Is the gallbladder being grasped in this frame?**
A4: No. There is no visual indication of the gallbladder being grasped here; the grasper is engaged with the liver.
- Q5: What operative phase is being shown?**
A5: This view corresponds to the gallbladder dissection phase.
- Q6: How is the grasper positioned relative to the liver?**
A6: The grasper is applied to the liver margin, holding and retracting the liver tissue.
- Q7: Is there any other instrument besides the grasper that is contacting tissue?**
A7: No. Only the grasper is shown contacting and retracting tissue; the hook is present but not contacting tissue.
- Q8: Based on the visible instruments and their activity, what is the primary visible maneuver in this frame?**
A8: The primary visible maneuver is retraction of the liver by the grasper.

Complex Reasoning (2 Qs) (\$0.0024)

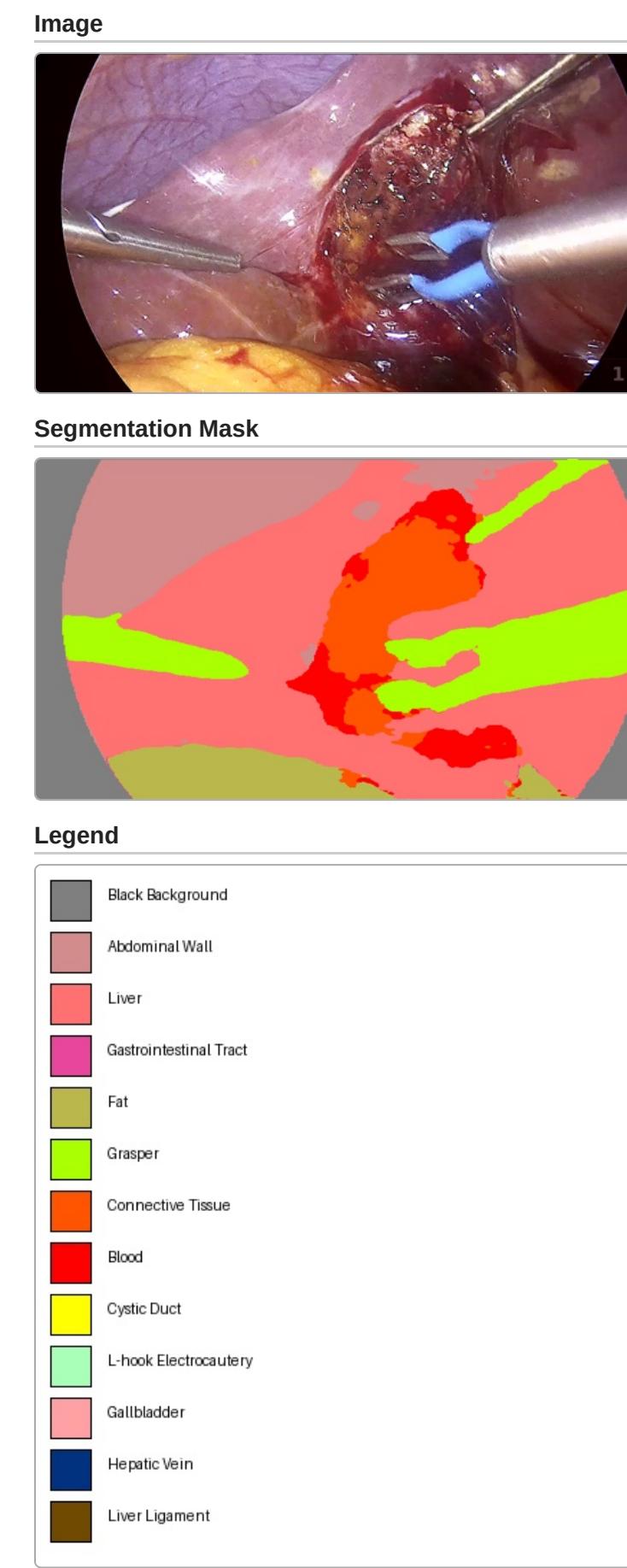
- Q1: Given that the grasper is actively retracting the liver while the hook is present but not being used, what is the likely intent of the surgeon at this moment and how does this maneuver facilitate safer gallbladder dissection?**
A1: The active retraction of the liver is being used to expose the plane between the gallbladder and the liver bed, create countertraction, and tension the tissue so that dissection can proceed in a controlled fashion. By pulling the liver away, the operative field around the gallbladder is widened and the tissue planes are opened, which improves visualization of the gallbladder wall and any attachments. The idle hook indicates a temporary pause—either to reassess the view, let the assistant optimize traction, or to clear the field—so that when electrosurgical dissection resumes it can be performed with precise, targeted movements rather than blind cutting. This combination of controlled retraction (active grasper) and a deliberate, momentary cessation of energy use (idle hook) reduces the risk of inadvertent deep or thermal injury and helps the surgeon maintain the correct dissection plane.
- Q2: What specific iatrogenic injury becomes more likely if the current retraction is too forceful or prolonged, and what immediate intraoperative sign would suggest that this injury has occurred?**
A2: Excessive or prolonged retraction of the liver increases the risk of capsular tear of the hepatic surface leading to oozing or frank bleeding from the liver bed. An immediate intraoperative sign is sudden appearance or increase of blood in the field (fresh red blood), often with weeping from the liver surface rather than a single vessel spouting. You may also see a focal rent in the glistening liver capsule or a hematoma forming under the capsule. Because the grasper is actively holding the liver, releasing or easing that traction often changes the bleeding pattern, which helps distinguish traction-related capsular bleeding from an arterial source.

Concise (\$0.0004)

A grasper retracts the liver to expose the gallbladder during dissection. The hook electrocautery is present but not actively used.

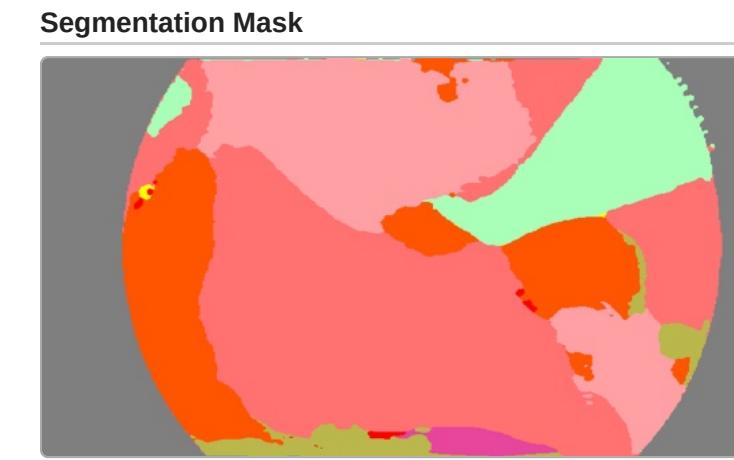
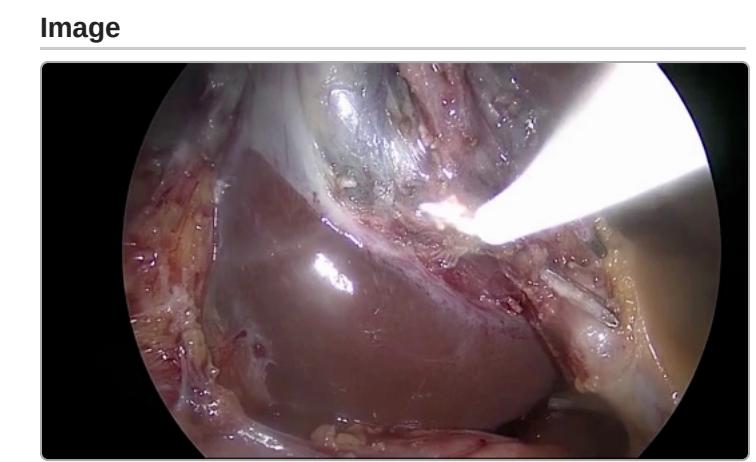
Detailed (\$0.0009)

The view is during gallbladder dissection. The liver and the gallbladder are exposed in the field. A laparoscopic grasper is actively applied to the liver, providing retraction to create exposure of the gallbladder and operative field. A hook (L-hook electrocautery) is also present in the scene but is currently idle—visible in the working area but not actively dissecting at this moment. Active retraction (grasper) versus idle instrument (hook) is the key interaction visible.



Context (LLM Input)
Visible instruments: Grasper, Bipolar.
Current phase: Cleaning Coagulation
Current action triplets (tool, verb, target): - (Grasper, Retract, Liver) - (Bipolar, Coagulate, Liver)
Spatial (extracted from model-generated segmentation mask): Model-generated segmentation mask confidence is below threshold, so spatial context is not included.

Conversational-1 (10 Qs) (\$0.0017)	Conversational-2 (8 Qs) (\$0.0011)	Complex Reasoning (3 Qs) (\$0.0023)	Concise (\$0.0004)
Q1: Is a grasper visible in the image? A1: Yes, a grasper is visible.	Q1: Which instruments are visible in this frame? A1: A grasper and a bipolar coagulation instrument are visible.	Q1: Given that the grasper is actively retracting the liver while the bipolar instrument is being used to coagulate liver tissue, what is the most likely immediate goal of the surgeon and how do the two instruments work together to achieve it? A1: The immediate goal is focal hemostasis of the exposed liver surface—control of oozing from the hepatic capsule or small parenchymal vessels. The grasper, by retracting the liver, both exposes the bleeding site and provides gentle counter-traction/compression which reduces local blood flow and stabilizes the tissue. The bipolar device is then applied directly to the bleeding point to deliver confined electrical energy between its jaws, denaturing proteins and sealing small vessels. Together this combination—mechanical compression from the grasper plus targeted bipolar coagulation—maximizes the chance of stopping diffuse oozing without excessive thermal spread.	A grasper retracts the liver. A bipolar instrument actively coagulates the liver for cleaning/coagulation.
Q2: Is a bipolar instrument visible in the image? A2: Yes, a bipolar instrument is visible.	Q2: What phase of the operation does this image represent? A2: This image corresponds to the Cleaning Coagulation phase.	Q2: What technique modifications should be used when applying bipolar coagulation on liver parenchyma to minimize collateral tissue injury while achieving effective hemostasis? A2: Use short, controlled activations at the lowest effective power rather than prolonged continuous application; deliver the energy with both jaws of the bipolar firmly enclosing the bleeding tissue to localize current; maintain direct, stable contact (the grasper should steady but not crush the liver excessively); avoid dragging the active tip across tissue while energized; allow brief pauses between activations to let the tissue cool and reassess; irrigate and suction pooled blood to improve visualization and reduce current dispersion. These steps reduce char formation and deep thermal necrosis while improving sealing of small vessels.	Detailed (\$0.0007)
Q3: What is the grasper doing in this frame? A3: The grasper is retracting the liver.	Q3: Which instrument is retracting tissue, and what tissue is it retracting? A3: The grasper is retracting the liver.	Q3: What intraoperative signs should prompt conversion from repeated bipolar attempts to placing a suture or using a mechanical device for hemostasis on the liver? A3: Escalate to mechanical control when bleeding is brisk or pulsatile (suggesting a larger vessel), when bleeding persists despite several careful bipolar applications with proper technique, when coagulation causes char without cessation of bleeding, or when the liver capsule is torn such that bipolar sealing is ineffective. In those situations, direct suturing, application of hemostatic clips, or topical hemostatic agents/matrices (with or without compression) provide more reliable, durable control than continued energy application.	The image shows the liver as the operative target being actively managed. A grasper is holding and retracting the liver to expose the surface and create a stable working field. A bipolar forceps is in contact with the liver parenchyma and is actively delivering coagulation to the tissue, consistent with cleaning/coagulation to control oozing and achieve hemostasis. Both instruments are engaged: the grasper provides traction and exposure, while the bipolar performs the coagulation; no other instruments or structures are described in this view.
Q4: What is the bipolar instrument doing in this frame? A4: The bipolar is coagulating the liver.	Q4: Which instrument is performing coagulation, and on what target? A4: The bipolar instrument is coagulating the liver.		
Q5: Which organ is the grasper contacting? A5: The grasper is contacting the liver.	Q5: Are both instruments interacting with the same organ in this view? A5: Yes. Both the grasper and the bipolar are engaged with the liver.		
Q6: Is the bipolar tip contacting tissue? A6: Yes, the bipolar tip is contacting liver tissue.	Q6: Is any additional instrument visible besides the grasper and bipolar? A6: No. Only the grasper and the bipolar are present in this frame.		
Q7: Is the grasper actively manipulating tissue? A7: Yes, it is actively retracting tissue.	Q7: Is the bipolar actively applied to tissue in this image? A7: Yes. The bipolar is actively coagulating liver tissue in this view.		
Q8: Is the liver visible in the operative field? A8: Yes, the liver is visible.	Q8: What action is the grasper performing while coagulation occurs? A8: The grasper is retracting the liver to expose the area being coagulated.		
Q9: Is the bipolar currently being used for energy application? A9: Yes, it is being used to coagulate tissue.			
Q10: Is the grasper located near the top of the visible field? A10: Yes, the grasper is positioned toward the upper part of the view.			



Context (LLM Input)

Visible instruments:
Hook.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Hook, Dissect, Gallbladder)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: right-bottom.
- Liver: right-top, right-bottom, center-left, center-right, bottom, left-top, left-bottom.
- Gastrointestinal Tract: center-bottom, left-bottom.
- Fat: bottom.
- Grasper: center-top.
- Connective Tissue: right-bottom, center-right, center-top, center-bottom, center, left, left-bottom.
- Blood: bottom.
- Cystic Duct: right-top, left-top.
- L-hook Electrocautery: right-top.
- Gallbladder: top.

Relative Positions:
- Abdominal Wall is to the right of Connective Tissue.
- Liver is to the left of Abdominal Wall.
- Gastrointestinal Tract is toward the bottom of L-hook Electrocautery.
- Fat is to the right of Cystic Duct.
- Grasper is to the left of L-hook Electrocautery.
- Connective Tissue is to the left of L-hook Electrocautery.
- Blood is to the left of Abdominal Wall.
- Cystic Duct is to the left of L-hook Electrocautery.
- L-hook Electrocautery is towards the top of Fat.
- Gallbladder is to the left of Abdominal Wall.

Conversational-1 (10 Qs) (\$0.0020)

- Q1: Is the hook electrocautery visible in this frame?**
A1: Yes. The hook electrocautery is visible entering the field from the right-top.
- Q2: Is the hook dissecting the gallbladder in this image?**
A2: Yes. The hook is actively dissecting the gallbladder.
- Q3: Where is the gallbladder located in the view?**
A3: The gallbladder is located at the top-central portion of the image.
- Q4: Is the cystic duct visible in this frame?**
A4: Yes. The cystic duct is visible near the upper portion of the field adjacent to the gallbladder.
- Q5: Where is the L-hook electrocautery positioned in the operative field?**
A5: The L-hook electrocautery is positioned at the right-top of the operative field.
- Q6: Is there visible blood in the image?**
A6: Yes. Small amounts of blood are visible along the lower portion of the field.
- Q7: Is a grasper present in this frame?**
A7: No. A grasper is not visibly present in this image.
- Q8: Where is the liver located relative to the operative field?**
A8: The liver occupies the upper-right background behind the gallbladder.
- Q9: Is fatty tissue visible in the image?**
A9: Yes. Fatty tissue is visible in the lower portion of the field.
- Q10: Is the hook tip contacting tissue at the gallbladder surface?**
A10: Yes. The hook tip is in contact with tissue on the gallbladder surface.

Conversational-2 (8 Qs) (\$0.0018)

- Q1: Which instrument is visible in this frame and how is it being used?**
A1: A single L-hook electrocautery is visible; it is engaged in dissecting the gallbladder.
- Q2: What operative phase is depicted in this image?**
A2: This image shows the gallbladder dissection phase.
- Q3: Where is the gallbladder located within the field of view?**
A3: The gallbladder is located at the top/central portion of the field, superior to the other abdominal contents visible.
- Q4: How is the L-hook positioned relative to the gallbladder?**
A4: The L-hook is positioned to the right-superior side of the gallbladder and is directed toward its surface as it dissects.
- Q5: Is the liver visible, and if so, where is it relative to the gallbladder?**
A5: Yes. The liver is visible and occupies much of the area to the right and inferior portions of the image relative to the gallbladder.
- Q6: Are other tissue types visible in the lower field, and what are they?**
A6: Yes; connective tissue and fatty tissue are visible in the lower field, and portions of the gastrointestinal tract are present toward the bottom of the view.
- Q7: Is the cystic duct identifiable in this view and where is it relative to the hook?**
A7: A structure consistent with the cystic duct is visible near the upper field and lies slightly to the left of the L-hook in this image.
- Q8: Is there any other instrument present in this frame besides the hook?**
A8: No other instruments are visible in this frame; only the L-hook electrocautery is seen.

Complex Reasoning (2 Qs) (\$0.0033)

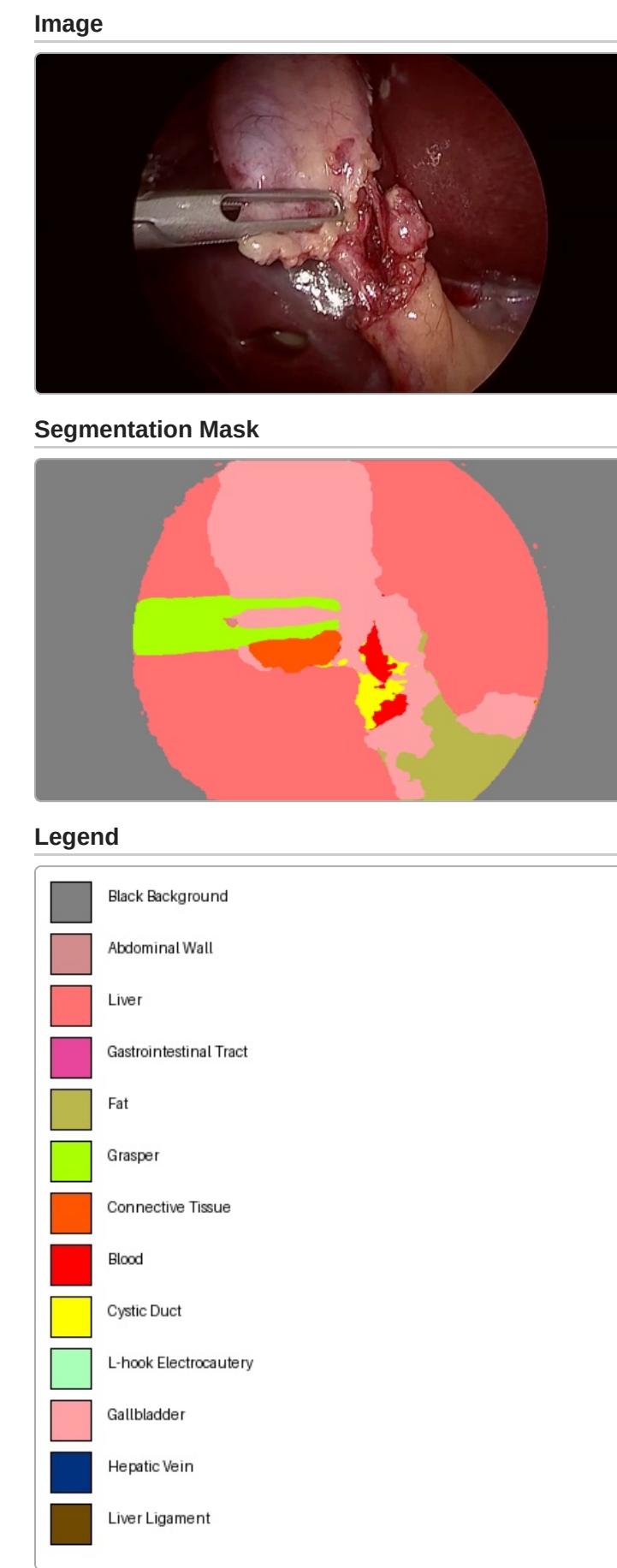
- Q1: Given active monopolar hook dissection of the gallbladder and no other instrument providing countertraction in the field, what immediate technical adjustments should the surgeon make to continue safely while minimizing the risk of thermal injury to nearby biliary structures?**
A1: With only the electrocautery hook engaged in dissection, the surgeon should prioritize controlled, conservative energy use and optimize tissue orientation to avoid deep or lateral thermal spread toward biliary structures. Practical adjustments include: use short, intermittent activations rather than prolonged sweeps; reduce the power setting if possible and favor coag/coaptive pulses for small bleeders instead of continuous cutting; orient the hook so current density is directed into the gallbladder plane and away from suspected ductal tissue (tip-to-tissue contact rather than broad contact); take very small bites of tissue and reassess anatomy frequently between activations. If available, the surgeon should pause dissection whenever tissue planes are unclear and consider introducing atraumatic traction or blunt dissection (rather than further energy) to skeletonize the cystic duct/artery before any clipping or division. These steps limit lateral thermal spread and reduce the chance of inadvertent bile duct injury.
- Q2: How can the operator judge whether the dissection is staying in the correct gallbladder–liver plane to avoid perforation of the gallbladder and subsequent bile spillage while using the hook?**
A2: While dissecting with the hook, the surgeon should look for visual cues of the correct subserosal/liver bed plane: progressive thinning of the connective tissue attachments with an intact serosal surface of the gallbladder, a smooth shiny interface where the gallbladder peels from the liver, and absence of brisk bleeding or sudden cavity exposure that would suggest entry into the gallbladder lumen. Tactile/visual feedback from short, deliberate hook activations helps — if tissue begins to char, pucker, or a yellow-green bile pocket appears, the wall is likely breached. On any sign of thinning or bile leakage, the surgeon should stop energy application, temporarily retract and inspect the area, consider switching to blunt dissection or scissors for finer control, and repair or control the perforation immediately to prevent contamination.

Concise (\$0.0008)

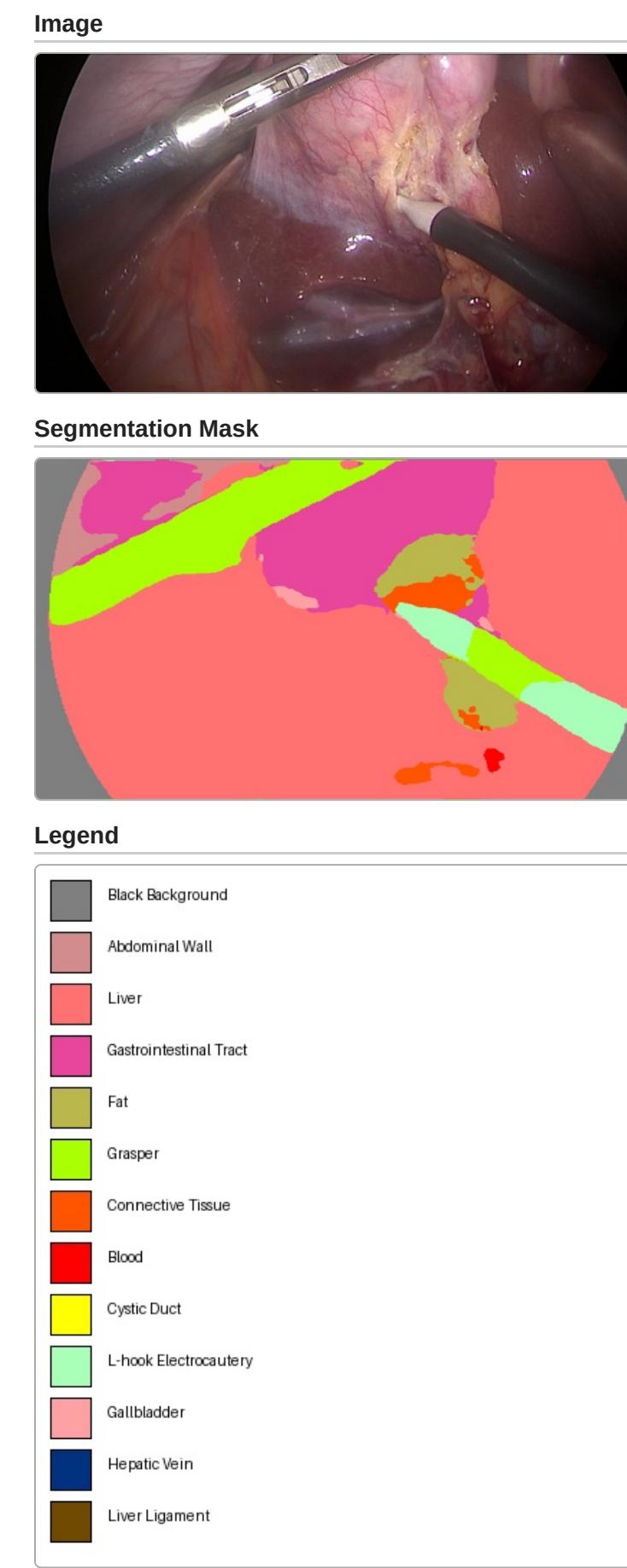
An L-hook electrocautery is actively dissecting the gallbladder. The gallbladder lies at the top of the field with the liver visible to the right. Connective tissue and the cystic duct are present nearby, with a small amount of blood inferiorly.

Detailed (\$0.0010)

The view is focused on the upper gallbladder region with an active electrocautery hook entering from the right–upper quadrant. The hook is being used to dissect the gallbladder wall/attachments (active instrument use). The cystic duct lies nearby, slightly to the left of the hook's working tip, and connective tissue bands surround the dissection plane—these tissues are being separated as the hook dissects. The liver forms the background/left-sided bulk of the field behind the gallbladder. In the lower field there is fatty tissue and portions of the gastrointestinal tract, with a small amount of blood pooling inferiorly. The abdominal wall is visible toward the right-lower edge of the image. No other instruments are present in this frame; the hook is the sole active tool.



Context (LLM Input)	Conversational-1 (10 Qs) (\$0.0019)	Conversational-2 (9 Qs) (\$0.0021)	Complex Reasoning (2 Qs) (\$0.0026)	Concise (\$0.0007)
<p>Visible instruments: Grasper.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: top. - Liver: right-top, right-bottom, center-left, left-bottom, center-right, left-top, right. - Gastrointestinal Tract: right-bottom. - Fat: right-bottom. - Grasper: left. - Connective Tissue: right-bottom, center. - Blood: right-bottom. - Cystic Duct: right-bottom. - L-hook Electrocautery: center-top. - Gallbladder: right-bottom, top, center.</p> <p>Relative Positions: - Abdominal Wall is towards the top of Gastrointestinal Tract. - Liver is to the left of Gastrointestinal Tract. - Gastrointestinal Tract is to the right of Grasper. - Fat is to the right of Grasper. - Grasper is to the left of Blood. - Connective Tissue is to the left of Gastrointestinal Tract. - Blood is towards the top of Fat. - Cystic Duct is to the right of Grasper. - L-hook Electrocautery is towards the top of Liver. - Gallbladder is towards the top of Gastrointestinal Tract.</p>	<p>Q1: Is the grasper visible in this frame? A1: Yes, the grasper is visible on the left side of the field.</p> <p>Q2: What is the grasper doing to the gallbladder? A2: The grasper is retracting the gallbladder.</p> <p>Q3: Where is the grasper located within the view? A3: The grasper is positioned toward the left and upper portion of the image.</p> <p>Q4: Is the gallbladder visible in this image? A4: Yes, the gallbladder is visible in the central to right portion of the view.</p> <p>Q5: Where is the gallbladder located relative to the field? A5: The gallbladder lies centrally, extending toward the right and upper area of the operative field.</p> <p>Q6: Is a hook electrocautery visible in this frame? A6: No, a hook electrocautery is not visible in this frame.</p> <p>Q7: Is blood present in the operative field? A7: Yes, a small amount of blood is visible in the right-bottom region.</p> <p>Q8: Is fatty tissue visible in the view? A8: Yes, fat is visible in the lower-right portion of the field.</p> <p>Q9: Is the cystic duct visible in this image? A9: Yes, the cystic duct is visible toward the right-bottom area of the view.</p> <p>Q10: Where is the liver located in this image? A10: The liver occupies much of the background on the right side of the image.</p>	<p>Q1: Which surgical instruments are visible in this image? A1: A single grasper is visible; no other instruments are seen.</p> <p>Q2: What procedural phase is shown in this view? A2: This is the Calot triangle dissection phase of the cholecystectomy.</p> <p>Q3: What is the grasper doing in this frame? A3: The grasper is retracting the gallbladder.</p> <p>Q4: Where is the grasper located within the operative field? A4: The grasper is positioned on the left side of the image, toward the upper portion of the field.</p> <p>Q5: Where is the gallbladder relative to the grasper and within the image? A5: The gallbladder lies central-to-upper in the field and is immediately adjacent to the grasper — slightly to the right and being pulled superiorly by it.</p> <p>Q6: Where is the cystic duct located relative to the grasper? A6: The cystic duct is located to the right of the grasper, in the lower-right portion of the operative field.</p> <p>Q7: Is there visible blood or fatty tissue near the working area, and where are they located? A7: Yes; fatty tissue and small areas of blood are visible toward the right and lower-right regions adjacent to the operative site.</p> <p>Q8: What major organ is visible and where is it positioned in the image? A8: The liver is visible and occupies the right side of the image.</p> <p>Q9: Is any electrocautery instrument visible or actively engaged in this frame? A9: No electrocautery instrument is visibly present or clearly active in this frame.</p>	<p>Q1: Given the gallbladder is under traction with a grasper and the cystic duct is identifiable nearby, what should be the next focused dissection goal to safely progress toward clipping and division? A1: The immediate goal should be to skeletonize and clearly delineate the cystic duct and cystic artery within Calot's triangle while maintaining effective counter-traction. Practically this means using the grasper to maintain steady lateral/upward traction on the gallbladder to open the plane, then carefully removing the overlying connective tissue and fat with sharp or energy-assisted dissection until the tubular structures are isolated. Only after the duct and artery are circumferentially exposed and their course is unequivocal (achieving the critical view of safety) should clipping and division be attempted. Throughout, energy use should be staged away from the duct so that thermal or mechanical misidentification is avoided.</p> <p>Q2: How does the current direction of traction applied by the grasper influence identification of the cystic structures and the risk of misidentification? A2: The traction vector matters because it creates counter-traction that opens tissue planes. If the grasper retracts the gallbladder outward and cephalad, it tends to pull the gallbladder infundibulum away from the hepatocystic triangle, straightening and exposing the cystic duct/artery. This improves visualization and reduces overlap with the common bile duct. Conversely, incorrect traction (for example, pulling medially or inferiorly) can tent or shorten the cystic duct and distort anatomy, increasing the risk of mistaking common bile duct or aberrant ducts for the cystic duct. Therefore maintaining a consistent, externally-directed traction vector while dissecting is important to minimize misidentification.</p>	<p>Detailed (\$0.0010)</p> <p>This laparoscopic view during Calot triangle dissection shows the gallbladder under active retraction. A single grasper enters from the left side of the field and is holding the gallbladder to provide tension and exposure of the infundibulum/neck region. The liver forms the dominant background on the right, with fatty tissue and portions of the gastrointestinal tract located in the lower-right part of the image. The cystic duct and surrounding connective tissue lie deeper and to the right of the grasper near the gallbladder base. A small amount of blood is visible in the lower-right area. The abdominal wall is seen toward the top of the image. No other instruments are engaged in this frame.</p>

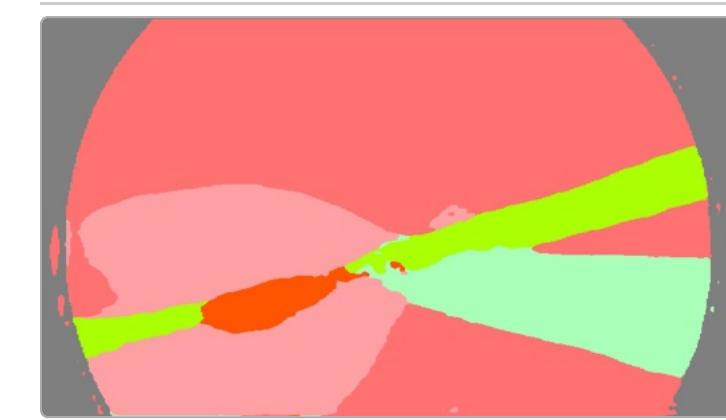


Context (LLM Input)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Grasp, Gallbladder) - (Hook, Null Verb, Null Target)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left-top. - Liver: right-top, center-left, center-right, center-top, bottom, left-top. - Gastrointestinal Tract: top. - Fat: right. - Grasper: left-top. - Connective Tissue: right. - Blood: right-bottom. - L-hook Electrocautery: right-bottom. - Gallbladder: center.</p> <p>Relative Positions: - Abdominal Wall is to the left of Blood. - Liver is to the right of Abdominal Wall. - Gastrointestinal Tract is towards the top of Blood. - Fat is to the right of Abdominal Wall. - Grasper is to the left of Blood. - Connective Tissue is to the right of Abdominal Wall. - Blood is to the right of Gallbladder. - L-hook Electrocautery is to the right of Abdominal Wall. - Gallbladder is to the right of Abdominal Wall.</p>

Conversational-1 (10 Qs) (\$0.0021)	Conversational-2 (8 Qs) (\$0.0019)	Complex Reasoning (2 Qs) (\$0.0027)	Concise (\$0.0005)
<p>Q1: Is the grasper visible in this image? A1: Yes. The grasper is visible at the left-top of the field.</p> <p>Q2: Where is the grasper located in the view? A2: The grasper is positioned in the left-upper portion of the operative field.</p> <p>Q3: What is the grasper holding? A3: The grasper is holding the gallbladder.</p> <p>Q4: Is the hook instrument visible in this frame? A4: Yes. The hook is visible at the right-bottom of the field.</p> <p>Q5: Is the hook actively dissecting tissue in this image? A5: No. The hook appears idle and is not actively dissecting in this frame.</p> <p>Q6: Where is the gallbladder located in the image? A6: The gallbladder is centrally located in the operative view.</p> <p>Q7: Is there visible blood in the operative field? A7: Yes. Blood is visible in the right-lower portion of the view.</p> <p>Q8: Where is the liver located relative to the field? A8: The liver occupies the right and upper portions of the operative field.</p> <p>Q9: Is fatty tissue visible in this image? A9: Yes. Fatty tissue is visible on the right side of the field.</p> <p>Q10: Where is the L-hook electrocautery positioned? A10: The L-hook electrocautery is positioned at the right-bottom of the view.</p>	<p>Q1: What instruments are visible in this frame? A1: A laparoscopic grasper and an L-hook electrocautery (hook) are visible.</p> <p>Q2: What operative phase is shown in this image? A2: This image corresponds to the Calot triangle dissection phase.</p> <p>Q3: What is the grasper doing and where is it located relative to the gallbladder? A3: The grasper is grasping the gallbladder and is positioned in the left-top portion of the field, contacting the gallbladder located centrally.</p> <p>Q4: Is the hook electrocautery actively dissecting tissue in this frame? A4: No. The hook is present but not shown performing an active dissecting action in this frame; it sits to the right-bottom of the field relative to the gallbladder.</p> <p>Q5: Which anatomical structures are clearly visible and where are they located in the image? A5: Visible structures include the gallbladder (central), the liver (predominantly on the right side), abdominal wall (left-top), fatty tissue (toward the right), connective tissue (right), and a region of blood localized at the right-bottom.</p> <p>Q6: Where is the blood pool relative to the gallbladder and the instruments? A6: The blood is located in the right-bottom of the image, lying to the right of the gallbladder and beneath the area where the hook is positioned.</p> <p>Q7: How are the grasper and hook positioned relative to each other across the operative field? A7: They are on opposite sides of the field: the grasper is on the left-top, engaging the gallbladder centrally, while the hook is on the right-bottom, lateral to the gallbladder.</p> <p>Q8: Is the gallbladder being retracted or just held in this view? A8: In this view the gallbladder is being grasped (held) by the grasper; there is no explicit visual indication in this frame of an ongoing retraction maneuver.</p>	<p>Q1: Given that the grasper is actively retracting the gallbladder while the electrocautery hook is present but not in use and there is fresh blood visible adjacent to the working zone, what is the safest immediate sequence of actions to restore a clear operative field and reduce the chance of worsening the bleed? A1: First priority is to clear and control the field before reactivating the hook. The immediate sequence should be: (1) introduce suction (or have the assistant suction) to remove pooled blood and reveal the bleeding source; (2) maintain gentle traction on the gallbladder with the grasper to keep tissue tension and to help tamponade oozing if the traction direction helps; (3) if bleeding persists and the source is visible as a discrete vessel, use targeted bipolar coagulation or apply clips to the vessel rather than indiscriminate monopolar activation of the hook; (4) if the bleeding is diffuse from the liver bed, apply gentle pressure with a dry swab or grasper while using bipolar coagulation or topical hemostatic agents/oxidized cellulose; (5) only after the field is clear and non-target tissue is safely retracted should the hook be reintroduced and activated to continue dissection. This sequence minimizes accidental thermal spread and prevents the hook from obscuring vision by activating in a bloody field.</p> <p>Q2: Why might the surgeon deliberately keep the hook idle while the grasper holds the gallbladder in this stage of Calot triangle dissection, and what does that imply about the next planned steps? A2: Keeping the hook idle while the grasper maintains traction commonly reflects a deliberate pause to reassess anatomy, control bleeding, or optimize exposure before energy use. In this frame it implies the surgeon is prioritizing visualization and tissue tension: the grasper establishes stable retraction of the gallbladder to open the Calot region, while the team either clears blood, adjusts camera view, or prepares a suction or clip instrument. The next planned steps are likely identification of structures within the triangle (clear adipose/connective tissue), selective hemostasis if required, then resuming precise dissection with the hook once planes are clear. This cautious workflow reduces the risk of thermal injury or misidentification of ducts and vessels.</p>	<p>A grasper is actively holding the gallbladder at center. An L-hook electrocautery is positioned to the right-bottom near blood and connective tissue but is not active. The liver is visible to the right.</p> <p>Detailed (\$0.0009)</p> <p>The laparoscopic view is centered on the gallbladder, which sits in the middle of the field with the liver forming the right and background portion of the scene. The abdominal wall is visible toward the upper-left. A grasper is positioned from the left-upper quadrant and is actively holding the gallbladder — stabilizing it and maintaining tension on the gallbladder tissue.</p> <p>On the right-lower side of the image a hook electrocautery shaft is present near a small area of blood; this hook is visible and directed toward the working area but is not actively being used at this moment. Surrounding the gallbladder on the right are connective and fatty tissues, and there is a small amount of blood adjacent to the gallbladder toward the right-lower field. Overall, the grasper is the actively engaged instrument (holding the gallbladder), while the hook is present but currently idle.</p>



Segmentation Mask



Legend



FASL Prediction (Conf: 0.9638)

Context (LLM Input)

Visible instruments:
Grasper, Hook.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Liver)
- (Hook, Dissect, Gallbladder)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:
- Abdominal Wall: left.
- Liver: right-top, right-bottom, center-left, center-right, top, center, left-bottom.
- Gastrointestinal Tract: center-right.
- Grasper: right.
- Connective Tissue: left-bottom.
- L-hook Electrocautery: right-bottom.
- Gallbladder: left-bottom.

Relative Positions:
- Abdominal Wall is to the left of Gastrointestinal Tract.
- Liver is to the right of Abdominal Wall.
- Gastrointestinal Tract is to the right of Liver.
- Grasper is to the right of Abdominal Wall.
- Connective Tissue is to the left of L-hook Electrocautery.
- L-hook Electrocautery is to the right of Abdominal Wall.
- Gallbladder is to the left of L-hook Electrocautery.

Conversational-1 (9 Qs) (\$0.0017)

Q1: Is the grasper visible in this image?
A1: Yes. The grasper is visible.

Q2: Where is the grasper located in the field?
A2: The grasper is on the right side of the operative view.

Q3: What is the grasper doing in this frame?
A3: The grasper is retracting the liver.

Q4: Is the hook electrocautery visible in this image?
A4: Yes. The hook electrocautery is visible.

Q5: Where is the hook electrocautery located in the field?
A5: The hook is positioned at the right-bottom of the view.

Q6: What is the hook doing in this frame?
A6: The hook is dissecting the gallbladder.

Q7: Where is the gallbladder located in the view?
A7: The gallbladder is in the left-bottom region of the field.

Q8: Is the liver visible in this image?
A8: Yes. The liver occupies much of the right side of the view.

Q9: Where is the connective tissue located in the field?
A9: The connective tissue is toward the left-bottom of the view.

Conversational-2 (8 Qs) (\$0.0016)

Q1: Which instruments are visible in this frame and where are they located?
A1: A grasper is visible on the right side of the field, and a hook electrocautery (L-hook) is visible toward the right-bottom of the field.

Q2: What procedural phase is depicted in this image?
A2: The image shows the gallbladder dissection phase.

Q3: Which structure is the grasper interacting with, and how is it positioned relative to that structure?
A3: The grasper is retracting the liver; it is located on the right side where the liver occupies most of the right field.

Q4: What is the hook doing and how is it positioned relative to the gallbladder?
A4: The hook electrocautery is dissecting the gallbladder; the hook is on the right-bottom, to the right of the gallbladder, which lies in the left-bottom region.

Q5: Describe the spatial relationship among the liver, the gallbladder, and the two instruments.
A5: The liver predominates on the right side of the image. The gallbladder is located left-bottom. The grasper is on the right engaging and retracting the liver, while the hook is on the right-bottom approaching and dissecting the gallbladder to its right.

Q6: Are both instruments actively engaging tissue in this frame?
A6: Yes. The grasper is actively retracting the liver, and the hook electrocautery is actively dissecting the gallbladder.

Q7: What other anatomical tissues are visible near the gallbladder in this view?
A7: Connective/fatty tissue appears in the left-bottom area near the gallbladder, and portions of the gastrointestinal tract and abdominal wall are visible more centrally and to the left.

Q8: Where is the gallbladder located within the frame?
A8: The gallbladder is located in the left-bottom portion of the image.

Complex Reasoning (2 Qs) (\$0.0024)

Q1: Given that the grasper is actively retracting the liver while the hook is dissecting the gallbladder off the hepatic bed, what is the immediate technical rationale for this specific combination of maneuvers, and how do they reduce the risk of uncontrolled bleeding?
A1: Retracting the liver with the grasper provides counter-traction that tents the gallbladder away from the hepatic surface and exposes the correct areolar plane between gallbladder and liver. This tension straightens and thins the tissue planes, making small vascular pedicles more visible and easier to isolate. The hook is then used to divide tissue and coagulate vessels in a controlled, stepwise fashion along that exposed plane. Together, steady retraction and targeted electrocautery allow the surgeon to see and address bleeding sources as they appear rather than cutting blindly into the liver parenchyma, which substantially lowers the chance of producing a brisk, uncontrolled hemorrhage.

Q2: What specific instrument maneuvers should be adjusted right now to minimize the chance of perforating the gallbladder wall during continued dissection from the liver bed?
A2: To avoid perforation the surgeon should use shallow, sweeping strokes with the hook that follow the plane of attachment rather than deep, forceful dives toward the gallbladder wall. Maintain firm but gentle counter-traction with the grasper so the wall is tensioned and the dissection plane is accentuated; this reduces need for high energy and deep passes. Angle the hook so its cutting/coagulating surface works along the hepatic surface (away from the gallbladder lumen) and pause to reassess tissue planes where inflammation or fat obscures normal anatomy. If the tissue is particularly friable, convert to more blunt separation with the tip of the hook under low energy rather than continuous cutting to protect the wall.

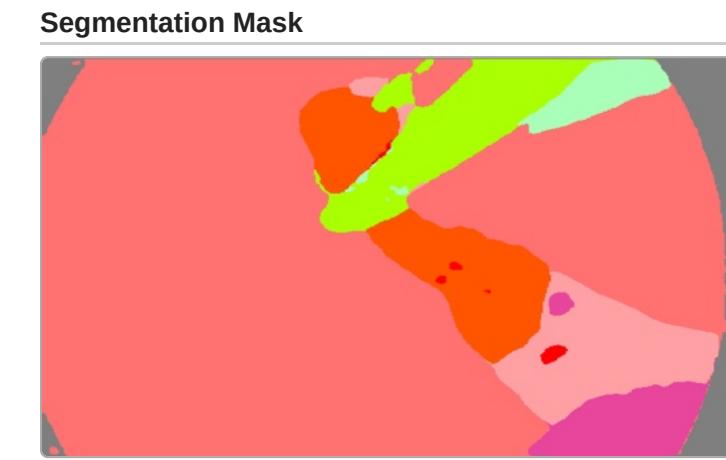
Concise (\$0.0006)

The grasper retracts the liver to expose the gallbladder while the hook electrocautery actively dissects the gallbladder. The gallbladder lies in the left-lower field and both instruments are actively engaged.

Detailed (\$0.0010)

The view is focused on the gallbladder region during active dissection. The liver fills much of the right and posterior field; a grasper is positioned on the right side and is actively holding and retracting the liver to expose the gallbladder and working space. The gallbladder lies toward the lower-left portion of the field, with some connective tissue visible beneath it.

A hook electrocautery (L-hook) approaches from the right-lower quadrant and is actively dissecting the gallbladder off its attachments. The grasper's retraction of the liver creates tension and exposure for the hook to divide tissue along the gallbladder margin. The gastrointestinal structures are visible more centrally to the right but are not being manipulated. No other instruments are engaged in this frame.

**Context (LLM Input)**

Visible instruments:
Grasper, Irrigator.

Current phase:
Cleaning Coagulation

Current action triplets (tool, verb, target):
- (Grasper, Retract, Liver)
- (Irrigator, Aspirate, Fluid)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Liver: right-top, right-bottom, left-top, left, left-bottom.
- Gastrointestinal Tract: right-bottom.
- Fat: center-bottom.
- Grasper: right-top.
- Connective Tissue: right, center-top.
- Blood: right-bottom.
- Cystic Duct: right-bottom.
- L-hook Electrocautery: right-top.
- Gallbladder: right-bottom.

Relative Positions:

- Liver is to the left of Cystic Duct.
- Gastrointestinal Tract is to the right of Liver.
- Fat is to the right of Liver.
- Grasper is towards the top of Gallbladder.
- Connective Tissue is to the left of Gastrointestinal Tract.
- Blood is toward the bottom of L-hook Electrocautery.
- Cystic Duct is to the right of Gallbladder.
- L-hook Electrocautery is to the right of Liver.
- Gallbladder is to the right of Liver.

Conversational-1 (10 Qs) (\$0.0019)**Q1: Is the grasper visible in the operative field?**

A1: Yes. The grasper is visible in the upper-right portion of the view.

Q2: Where is the grasper located relative to the gallbladder?

A2: The grasper is positioned above the gallbladder, toward the top-right of the gallbladder.

Q3: Is the grasper retracting the liver in this frame?

A3: Yes. The grasper is retracting the liver.

Q4: Is the irrigator visible in the image?

A4: Yes. The irrigator is present in the field.

Q5: Is the irrigator actively aspirating fluid in this view?

A5: Yes. The irrigator is aspirating fluid.

Q6: Where is the gallbladder located in the frame?

A6: The gallbladder is located in the lower-right central area of the view.

Q7: Is there visible blood in the operative field?

A7: Yes. Blood is visible in the lower-right portion of the field.

Q8: Where is the liver located in the operative view?

A8: The liver occupies much of the right side of the view and forms the background tissue.

Q9: Where is fatty tissue seen in the image?

A9: Fatty tissue is visible toward the center-bottom of the field.

Q10: Is connective tissue visible near the operative area?

A10: Yes. Connective tissue is visible near the central-top to right areas adjacent to the liver.

Conversational-2 (9 Qs) (\$0.0015)**Q1: What instruments are visible in this frame?**

A1: A laparoscopic grasper and an irrigator are visible.

Q2: What phase of the operation is shown?

A2: This image is during the cleaning/coagulation phase.

Q3: Which instrument is aspirating fluid, and where is that fluid located in the field?

A3: The irrigator is aspirating fluid, which is located in the lower-right portion of the operative field.

Q4: What structure is the grasper retracting in this view?

A4: The grasper is retracting the liver.

Q5: Where is the gallbladder located relative to the liver in this image?

A5: The gallbladder lies to the right of the liver, positioned in the right-lower portion of the field.

Q6: Is there visible blood in the image, and if so where is it?

A6: Yes. Blood is visible in the lower-right part of the image.

Q7: Can you identify the cystic duct and its location relative to the gallbladder?

A7: The cystic duct is visible in the right-lower region and is positioned to the right of the gallbladder.

Q8: How is the grasper positioned relative to the gallbladder?

A8: The grasper is positioned toward the top of the gallbladder, pulling superiorly to provide exposure.

Q9: Are any other instruments besides the grasper and irrigator visible?

A9: No. Only the grasper and the irrigator are present in this frame.

Complex Reasoning (2 Qs) (\$0.0022)**Q1: Given active aspiration of pooled fluid while the liver is being retracted, what is the immediate diagnostic and therapeutic purpose of this maneuver before any further energy application?**

A1: Aiming suction into the pooled fluid while the liver is held under tension serves to restore a clear visual field so the surgeon can localize the bleeding or bile source precisely.

Diagnostic value: removing blood and irrigation fluid permits identification of whether the effluent is arterial spray, venous ooze, or bile from the cystic duct or gallbladder. Therapeutic value: once the source is exposed the surgeon can apply targeted measures (direct pressure/retraction to compress the bleeding point, focal coagulation, clipping, or topical hemostatic agents) rather than blind energy application. In this frame the grasper is actively retracting the liver to open the liver-gallbladder plane and the irrigator is actively aspirating; together they permit accurate localization and safer, focused hemostasis rather than indiscriminate coagulation that could deepen tissue injury.

Q2: How should the team adjust suction/irrigation technique here to avoid creating additional problems (for example displacing clips or worsening bleeding)?

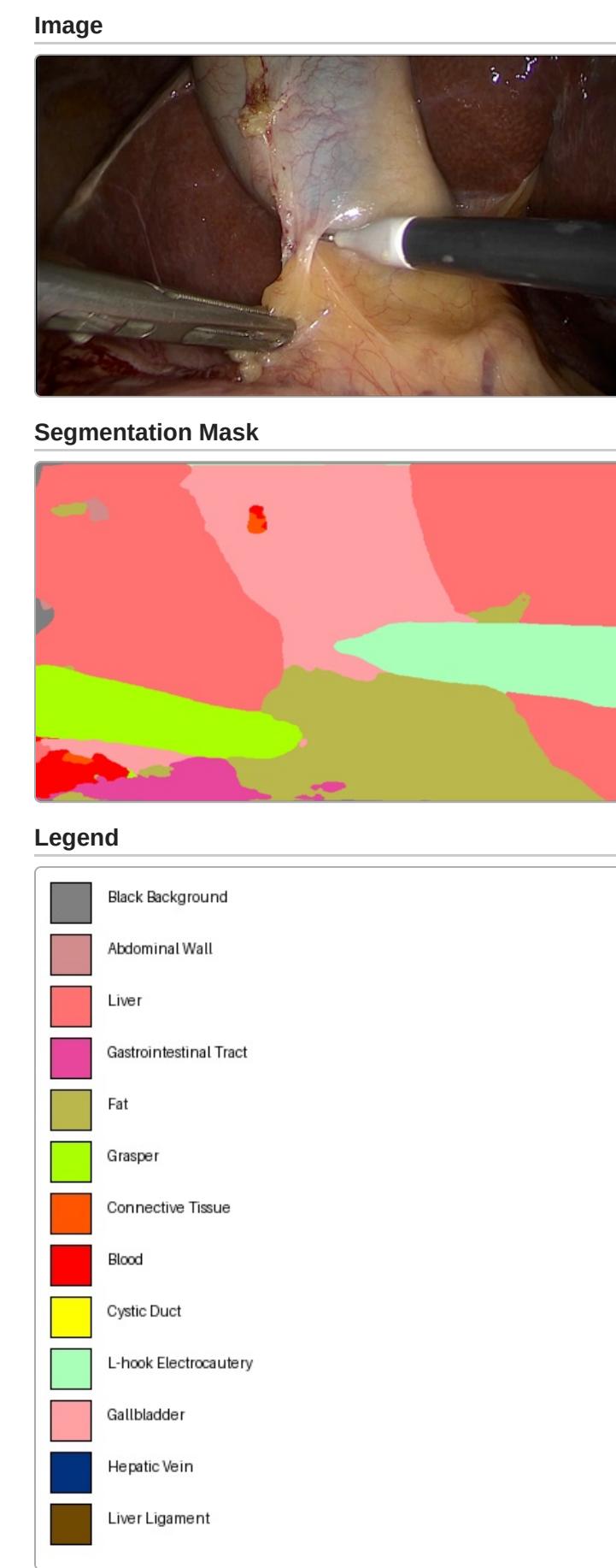
A2: Use short, targeted aspiration pulses and low-volume irrigation rather than continuous high-flow lavage. Position the irrigator tip to clear pooled fluid from the dependent area first, keeping the tip angled away from any partially placed clips or small exposed ducts to avoid dislodgement or suction trauma. Minimize turbulence that can spread blood and obscure landmarks; aspirate after each small bolus of irrigant so blood does not become diffusely suspended. Throughout, maintain the liver retracted with steady traction (active grasper use) so the exposure remains stable during these maneuvers.

Concise (\$0.0007)

A grasper retracts the liver, lifting tissue near the gallbladder. An irrigator is actively aspirating fluid from the operative field; pooled blood is visible inferiorly.

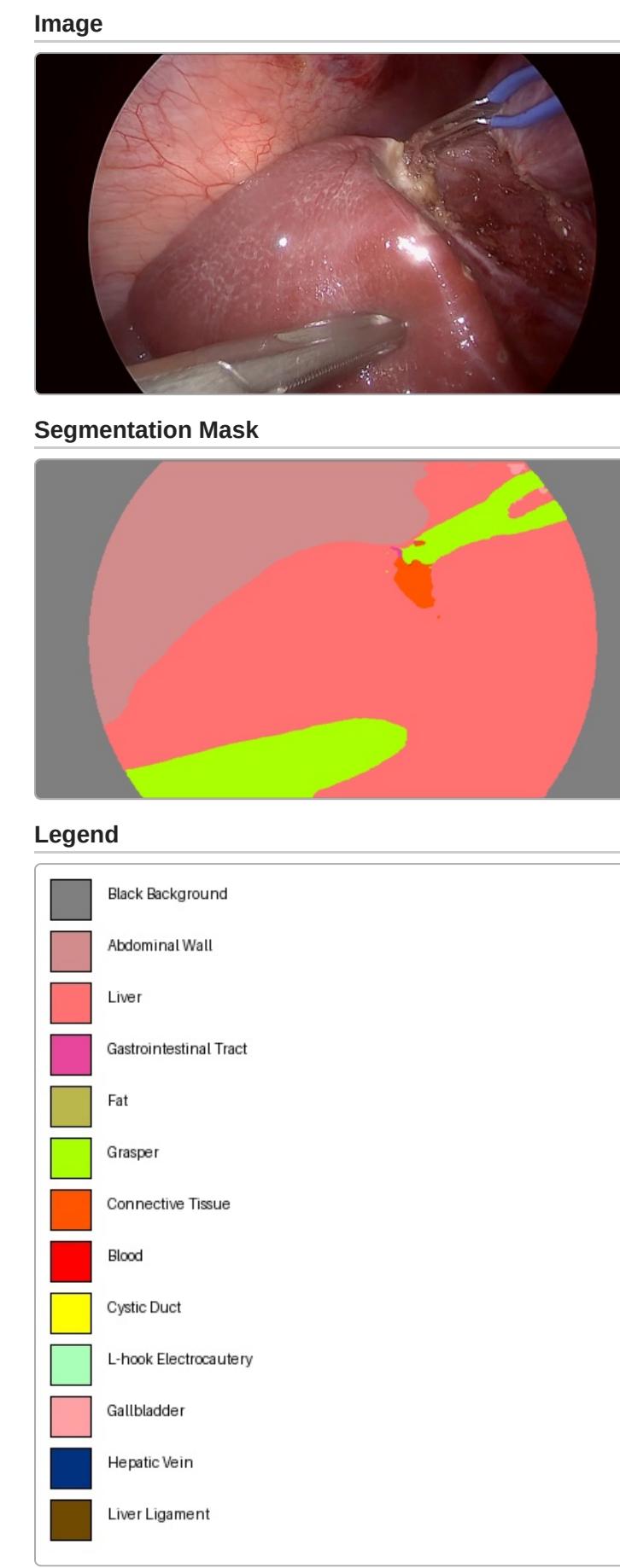
Detailed (\$0.0011)

The view is centered on the hepatobiliary region with the liver forming a large background mass on the left/upper side and the gallbladder lying to its right and slightly lower. A grasper is actively retracting the liver edge upward and laterally to expose the gallbladder and operative field. An irrigator/suction device is active in the lower-right portion of the field, aspirating pooled fluid/blood around the gallbladder and cystic duct region. Fatty tissue occupies the lower-central area and there is connective tissue toward the central-upper field adjacent to the working zone. No other instruments are engaged in this moment.

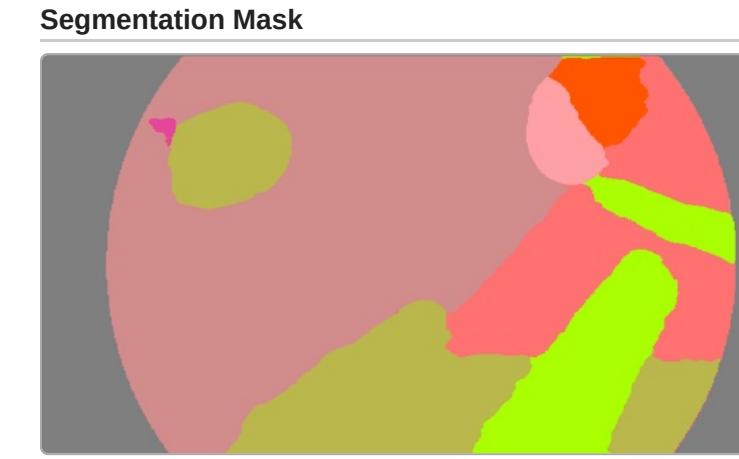


Context (LLM Input)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Omentum) - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left-top. - Liver: right-top, right-bottom, center-right, left, left-bottom. - Gastrointestinal Tract: center-bottom, left-bottom. - Fat: bottom. - Grasper: left-bottom. - Connective Tissue: left. - Blood: left-bottom. - L-hook Electrocautery: right-bottom. - Gallbladder: top.</p> <p>Relative Positions: - Abdominal Wall is to the left of Fat. - Liver is to the right of Blood. - Gastrointestinal Tract is toward the bottom of Gallbladder. - Fat is to the right of Blood. - Grasper is to the left of L-hook Electrocautery. - Connective Tissue is to the left of L-hook Electrocautery. - Blood is to the left of L-hook Electrocautery. - L-hook Electrocautery is to the right of Gallbladder. - Gallbladder is to the right of Blood.</p>

Conversational-1 (10 Qs) (\$0.0017)	Conversational-2 (10 Qs) (\$0.0014)	Complex Reasoning (2 Qs) (\$0.0023)	Concise (\$0.0007)
<p>Q1: Is the gallbladder visible in this image? A1: Yes. The gallbladder is visible in the upper central part of the field.</p> <p>Q2: Where is the grasper located in the view? A2: The grasper is located in the lower-left portion of the operative field.</p> <p>Q3: Is the grasper contacting the omentum? A3: Yes. The grasper is retracting and contacting omental tissue in the lower-left.</p> <p>Q4: What is the hook doing in this frame? A4: The hook is dissecting tissue at the gallbladder.</p> <p>Q5: Where is the hook positioned relative to the gallbladder? A5: The hook is positioned to the right of the gallbladder.</p> <p>Q6: Is there visible blood in the operative field? A6: Yes. A small amount of blood is visible in the lower-left area.</p> <p>Q7: Where is the liver located in the image? A7: The liver occupies the right side of the operative view, forming the background.</p> <p>Q8: Is the abdominal wall visible in this frame? A8: Yes. The abdominal wall is visible at the top-left of the image.</p> <p>Q9: Is fatty tissue visible in the field? A9: Yes. Fatty tissue is present along the lower portion of the view.</p> <p>Q10: Is the gastrointestinal tract visible in this image? A10: Yes. Portions of the gastrointestinal tract are visible in the lower-central to lower-left area.</p>	<p>Q1: What instruments are visible in this frame? A1: I see a grasper and an L-hook electrocautery (hook) in the field.</p> <p>Q2: Which operative phase is depicted in this image? A2: This image is during the Calot triangle dissection phase.</p> <p>Q3: Which instrument is retracting tissue and what tissue is it retracting? A3: The grasper is retracting omental (fatty) tissue.</p> <p>Q4: Which instrument is performing dissection and what is it dissecting? A4: The L-hook electrocautery is dissecting the gallbladder.</p> <p>Q5: Where is the gallbladder located within the frame? A5: The gallbladder is located toward the top (upper central area) of the image.</p> <p>Q6: Where is the grasper positioned relative to the gallbladder? A6: The grasper is positioned inferior and to the left of the gallbladder (left-bottom relative to the gallbladder at the top).</p> <p>Q7: Where is the L-hook electrocautery relative to the gallbladder? A7: The L-hook is to the right of the gallbladder and positioned toward the right-bottom of the frame.</p> <p>Q8: What other anatomical structures are visible and where are they located? A8: The liver is visible primarily on the right side of the image; fatty tissue and gastrointestinal tract structures are toward the bottom; connective tissue is toward the left; and the abdominal wall appears toward the top/left region.</p> <p>Q9: Is any blood visible in the image, and if so where? A9: Yes — blood is visible in the lower portion of the field, concentrated toward the left-bottom area.</p> <p>Q10: How are the grasper and the L-hook positioned relative to each other? A10: The grasper is located to the left of the L-hook; the grasper is left-inferior while the L-hook is right-inferior relative to the central surgical field.</p>	<p>Q1: Given that the grasper is actively retracting omental/fatty tissue while the hook is dissecting the gallbladder, what immediate tissue-plane objective is the surgeon pursuing and why is this coordination important? A1: The immediate objective is to open and define the hepatocystic (Calot) triangle by placing the omentum/fat under tension with the grasper while using the hooked electrocautery to divide adhesions and connective tissue off the gallbladder and liver margin. This traction–countertraction exposes the fascial and adipose planes, allowing the surgeon to skeletonize structures progressively rather than cutting blind. Coordinated use is important because steady retraction separates tissue layers and keeps non-target tissues away from the active energy device, while the hook can precisely dissect along the intended plane; poor coordination would obscure anatomy or allow the hook to contact unintended structures, increasing risk of thermal or mechanical injury.</p> <p>Q2: There is bowel visible beneath the gallbladder; what specific complication is of greatest concern with the current active use of the hooked electrocautery, and what immediate technique adjustments should be made to mitigate that risk? A2: The greatest concern is inadvertent thermal injury to the adjacent bowel from lateral thermal spread or direct contact of the energized hook. To mitigate this risk, the surgeon should (1) maximize separation between the energized tip and the bowel by repositioning the grasper to increase distance and interpose safe tissue if possible; (2) use very short, low-power activations of the hook rather than prolonged coagulation; (3) limit activation to well-visualized target tissue only and avoid cutting when non-target tissue is within the field; and (4) consider switching to blunt dissection or an energy modality with less thermal spread (e.g., bipolar or ultrasonic) if proximity to bowel cannot be reliably maintained.</p>	<p>A grasper at the left-lower field retracts the omentum while the L-hook electrocautery at the right actively dissects the gallbladder (top/central). The liver lies to the right, with connective tissue and some blood inferior-left and gastrointestinal structures/fat beneath the gallbladder.</p> <p>Detailed (\$0.0008)</p> <p>The image is focused on the gallbladder region near the Calot triangle. The gallbladder occupies the upper/central portion of the field. The liver forms the background on the right side. Fatty tissue and portions of the gastrointestinal tract lie in the lower field.</p> <p>A grasper is positioned in the left-lower area and is actively retracting omental/fatty tissue away from the operative field to improve exposure of the gallbladder and Calot triangle. An L-hook electrocautery (hook) is coming in from the right-lower side and is actively dissecting the gallbladder at its margin. Connective tissue lies just left of the hook's position. There is some blood visible in the left-lower region of the view, but no suction instrument is present. Overall, the grasper provides traction (retraction of omentum) while the hook performs electrocautery dissection of the gallbladder.</p>



Context (LLM Input)	Conversational-1 (10 Qs) (\$0.0025)	Conversational-2 (8 Qs) (\$0.0020)	Complex Reasoning (2 Qs) (\$0.0021)	Concise (\$0.0004)
<p>Visible instruments: Grasper, Bipolar.</p> <p>Current phase: Cleaning Coagulation</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Liver) - (Bipolar, Coagulate, Liver)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left. - Liver: right-top. - Gastrointestinal Tract: center-top. - Grasper: right-top, left-bottom, center-top. - Connective Tissue: right-top. - Blood: center-top. - Gallbladder: right-top.</p> <p>Relative Positions: - Abdominal Wall is to the left of Gallbladder. - Liver is toward the bottom of Gallbladder. - Gastrointestinal Tract is to the right of Abdominal Wall. - Grasper is toward the bottom of Gallbladder. - Connective Tissue is to the right of Abdominal Wall. - Blood is to the right of Abdominal Wall. - Gallbladder is to the right of Gastrointestinal Tract.</p>	<p>Q1: Where is the liver located in the operative view? A1: The liver is in the right-upper portion of the field.</p> <p>Q2: What is the grasper doing in this image? A2: The grasper is retracting tissue (retracting the liver).</p> <p>Q3: What is the bipolar doing in this image? A3: The bipolar is performing coagulation on the liver.</p> <p>Q4: Where is the grasper positioned within the frame? A4: The grasper is located toward the upper-central to right-upper area of the view.</p> <p>Q5: Where is the abdominal wall visible? A5: The abdominal wall is visible on the left side of the field.</p> <p>Q6: Is the gallbladder visible in this frame? A6: Yes. The gallbladder is visible at the right-upper area of the view.</p> <p>Q7: Is there visible blood in the operative field? A7: Yes. Blood is present in the central-upper portion of the field.</p> <p>Q8: Where is the gastrointestinal tract located in the image? A8: The gastrointestinal tract is located near the center-top of the view.</p> <p>Q9: Is the grasper positioned toward the bottom of the gallbladder? A9: Yes. The grasper is positioned toward the lower aspect of the gallbladder.</p> <p>Q10: Where is connective tissue observed in the view? A10: Connective tissue is seen in the right-upper portion of the field.</p>	<p>Q1: What instruments are visible in this frame? A1: I see a grasper and a bipolar electrocautery instrument.</p> <p>Q2: Which instrument is contacting the liver and what action is it performing? A2: The bipolar instrument is applied to the liver and is performing coagulation on the liver surface.</p> <p>Q3: What is the grasper doing and where is it located relative to the gallbladder? A3: The grasper is retracting tissue (retracting the liver) and is positioned just inferior to the gallbladder.</p> <p>Q4: Is there any blood visible in the operative field, and if so where? A4: Yes. There is visible blood at the upper center of the image.</p> <p>Q5: Where is the gallbladder located relative to the abdominal wall and the gastrointestinal tract? A5: The gallbladder is on the right side of the field; the abdominal wall lies to the left of the gallbladder, and the gastrointestinal tract is located medial/left of the gallbladder.</p> <p>Q6: How many instruments are actively interacting with tissue, and which tissue are they contacting? A6: Two instruments are interacting with tissue: the grasper is retracting the liver, and the bipolar is coagulating the liver surface.</p> <p>Q7: Which anatomical structures and instruments occupy the right-top area of the image? A7: The right-top region contains the liver, the gallbladder, and the grasper (with adjacent connective tissue in the same area).</p> <p>Q8: What structures lie immediately to the right of the abdominal wall in this view? A8: To the right of the abdominal wall you can see the gastrointestinal tract, connective tissue, and areas of blood.</p>	<p>Q1: Given that the grasper is retracting the liver while the bipolar instrument is actively coagulating and there is visible blood in the field, what is the most likely immediate surgical objective and how do the instruments work together to achieve it? A1: The immediate objective is hemostasis—controlling ongoing bleeding from the liver surface or small vessels in the gallbladder bed. The grasper, held actively, retracts and stabilizes the liver to expose the bleeding point and provide counter-traction so the bipolar tips can be applied precisely. The bipolar device is active and used to coagulate the bleeding tissue, delivering current only between its jaws to denature proteins and seal vessels. Together, retraction improves visualization and exposes the target; bipolar application achieves focal coagulation while minimizing lateral thermal spread, allowing the surgeon to stop the bleed and clear the field before further dissection or closure.</p> <p>Q2: Why is focal bipolar coagulation appropriate for this situation, and what advantages does it offer given the proximity of the gallbladder? A2: Focal bipolar coagulation is appropriate because it confines electrical current between the instrument's tips, enabling targeted coagulation of small bleeding points on the liver surface without wide thermal spread. In this scene the gallbladder is adjacent to the site being treated, so limiting collateral heat reduces the risk of damaging the gallbladder wall or nearby biliary structures. Bipolar also performs well in a bloody field because direct apposition of the jaws on the bleeding tissue allows effective vessel sealing even with some residual blood, whereas less-targeted energy could char or cause deeper injury.</p>	<p>A grasper retracts the liver, exposing the right-sided gallbladder region. A bipolar instrument is actively coagulating the liver for cleaning/coagulation.</p> <p>Detailed (\$0.0009)</p> <p>The view is focused on the right upper quadrant where the liver and gallbladder dominate the field. The gallbladder lies at the right-upper area with the liver immediately adjacent and being held away to improve exposure. A grasper is engaged on the liver, applying retraction—its jaws are positioned near the lower aspect of the gallbladder/liver interface to pull the liver out of the working zone. A bipolar instrument is actively applied to the liver surface for coagulation, contacting the retracted hepatic tissue to achieve hemostasis.</p> <p>Surrounding anatomy is visible: the abdominal wall appears on the left side of the image and portions of the gastrointestinal tract and connective/fatty tissue are seen toward the central/right-upper area. There is some blood on the central upper field being addressed by the bipolar coagulation. Both instruments are actively engaged (grasper retracting the liver, bipolar coagulating); no idle instruments are present.</p>



FASL Prediction (Conf: 0.9689)

Context (LLM Input)

Visible instruments:
Grasper, Irrigator.

Current phase:
Cleaning Coagulation

Current action triplets (tool, verb, target):
- (Grasper, Retract, Liver)
- (Irrigator, Retract, Liver)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: right-top, center-right, right-bottom.
- Liver: right.
- Gastrointestinal Tract: left-top, right-bottom.
- Fat: bottom.
- Grasper: right-bottom.
- Connective Tissue: right-top.
- Gallbladder: right-top.

Relative Positions:

- Abdominal Wall is to the left of Connective Tissue.
- Liver is to the right of Gastrointestinal Tract.
- Gastrointestinal Tract is to the left of Grasper.
- Fat is toward the bottom of Gastrointestinal Tract.
- Grasper is to the right of Abdominal Wall.
- Connective Tissue is towards the top of Grasper.
- Gallbladder is to the right of Abdominal Wall.

Conversational-1 (10 Qs) (\$0.0017)

Q1: Is the grasper visible in this frame?

A1: Yes. The grasper is visible.

Q2: Where is the grasper located in the view?

A2: The grasper is at the right-bottom of the field.

Q3: What is the grasper doing in this image?

A3: The grasper is retracting the liver.

Q4: Is the irrigator visible in this frame?

A4: Yes. The irrigator is present.

Q5: What is the irrigator doing in this image?

A5: The irrigator is retracting the liver.

Q6: Where is the liver located in the operative view?

A6: The liver occupies the right side of the view.

Q7: Where is the gallbladder located in the view?

A7: The gallbladder is at the right-top of the field.

Q8: Is connective tissue visible in this frame?

A8: Yes. Connective tissue appears toward the top-right.

Q9: Is the gastrointestinal tract visible in this frame?

A9: Yes. It is visible toward the left-top and the right-bottom.

Q10: Is fatty tissue visible in this frame?

A10: Yes. Fatty tissue is visible along the bottom of the field.

Conversational-2 (7 Qs) (\$0.0015)

Q1: Which instruments are visible in this frame?

A1: A laparoscopic grasper and an irrigator are visible.

Q2: What phase of the cholecystectomy is shown in this image?

A2: This view corresponds to the Cleaning Coagulation phase.

Q3: Which organ is being retracted, and which instruments are doing the retraction?

A3: The liver is being retracted; both the grasper and the irrigator are engaged in retracting the liver.

Q4: Is the gallbladder being manipulated in this frame?

A4: The gallbladder is visible at the upper-right portion of the field, but it is not the target of manipulation here—the instruments are retracting the liver.

Q5: What other anatomical structures are visible around the operative field?

A5: The abdominal wall is visible on the right (top to bottom), the gastrointestinal tract lies more to the left, fatty tissue is seen inferiorly, and connective tissue is present toward the top-right near the instruments.

Q6: Where is the grasper located relative to the abdominal wall and gastrointestinal tract?

A6: The grasper is positioned to the right of the abdominal wall and to the right of (i.e., lateral to) the gastrointestinal tract, occupying a lower-right location in the image.

Q7: How are the two instruments positioned relative to each other in the operative field?

A7: Both instruments are on the right side near the liver; the grasper occupies a lower-right position, and the irrigator is also on the right, both working together to retract the liver.

Complex Reasoning (2 Qs) (\$0.0025)

Q1: What stepwise instrument actions should the surgeon perform now to reliably identify the precise bleeding source and achieve targeted hemostasis in this field?

A1: First maintain stable exposure with the grasper holding the liver elevated so the bleeding origin remains visible; the irrigator can be used briefly to flush blood away while kept lateral to the active field so it doesn't obscure the point of origin. Next, remove pooled fluid by suction (or by tilting/aspirating with the irrigator) until the field is dry enough to localize the jet or ooze. Once the point is seen, use the grasper for gentle compression against the liver surface or gallbladder bed to temporarily reduce flow and confirm the source. Then apply targeted energy (preferably bipolar for parenchymal oozing) with short, controlled activations directly at the bleeding point while the liver remains retracted. If the bleeding is from a capsular tear in the liver, combine bipolar coagulation with sustained gentle pressure; if it is focal parenchymal bleeding that fails to stop, consider topical hemostatic agent placement or a figure-of-eight suture of the capsule. Throughout, avoid activating energy while irrigant pools the area — clear fluid first — and only resume irrigation after hemostasis is secure to recheck the field.

Q2: Why is it potentially unsafe to activate electrocautery while the irrigator tip or pooled irrigant is in close proximity to the liver surface and grasper?

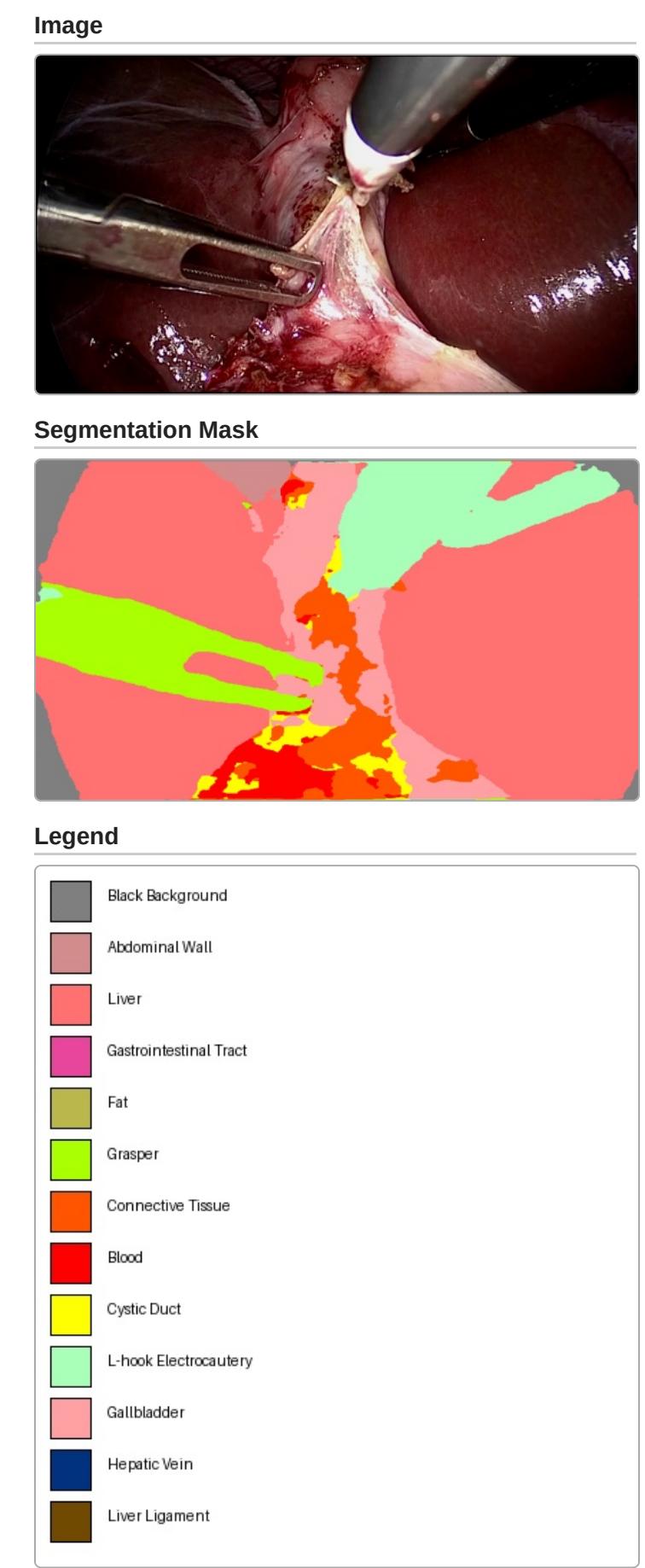
A2: Irrigant pooled around the liver and instruments creates a conductive path that can disperse electrical current, promoting unintended thermal spread and arcing away from the intended target. This increases the risk of deeper thermal injury to adjacent liver parenchyma or serosa, steam formation with tissue disruption, and collateral burns to tissue held by the grasper. Because both the grasper and irrigator are adjacent to the liver, activating monopolar or poorly focused energy without first clearing fluid can produce diffuse heating rather than precise coagulation, compromising hemostasis and potentially causing new injury.

Concise (\$0.0005)

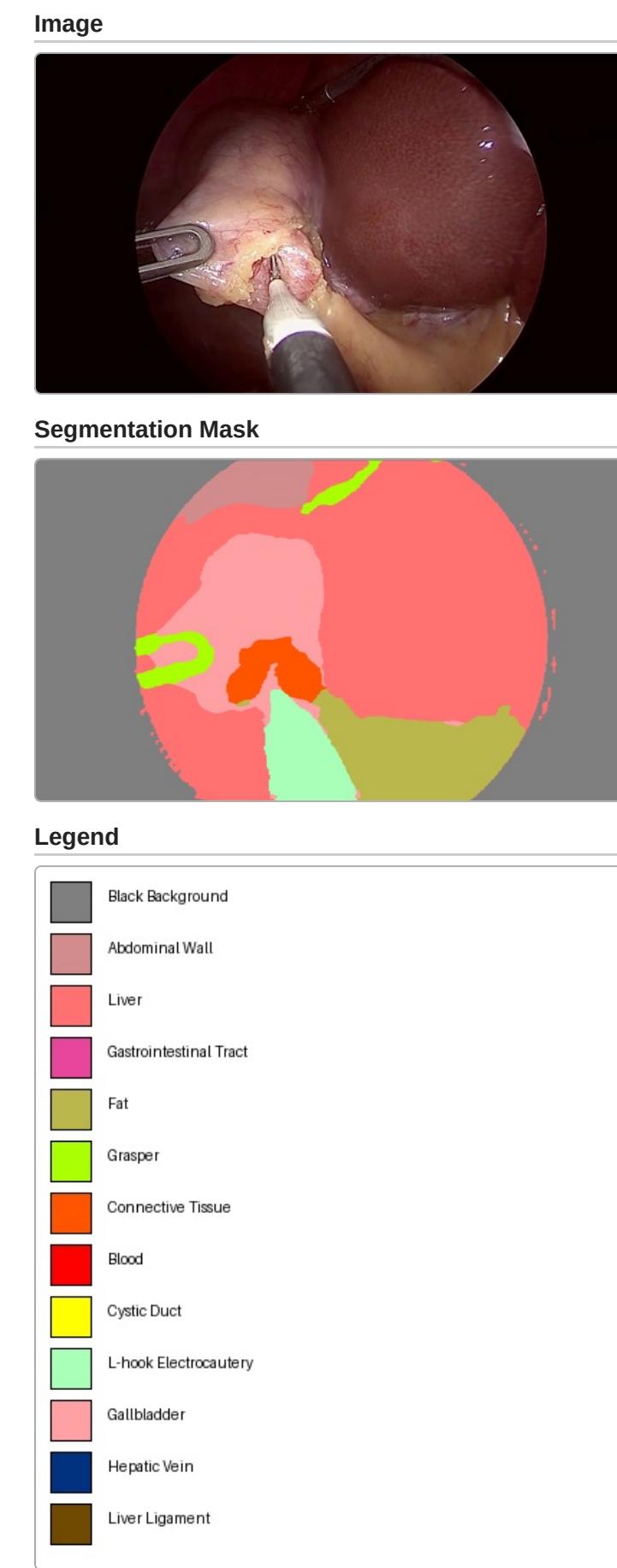
A grasper and an irrigator are both actively retracting the liver during cleaning/coagulation. The gallbladder is visible nearby in the right upper field.

Detailed (\$0.0008)

The view is focused on the right upper quadrant where the liver dominates the right side of the field. A grasper sits in the right-lower portion of the image and is actively retracting the liver to expose the operative area. An irrigator is also present and being used as a retraction tool on the liver, assisting exposure rather than delivering fluid at this moment. The gallbladder lies toward the right-upper area, adjacent to the abdominal wall and some connective tissue that sits near the top of the grasper. Gastrointestinal structures are visible toward the left and lower portions of the frame, with fat occupying the inferior field. Both instruments are actively engaged in retraction to maintain exposure during this cleaning/coagulation phase; no other instruments are visible.

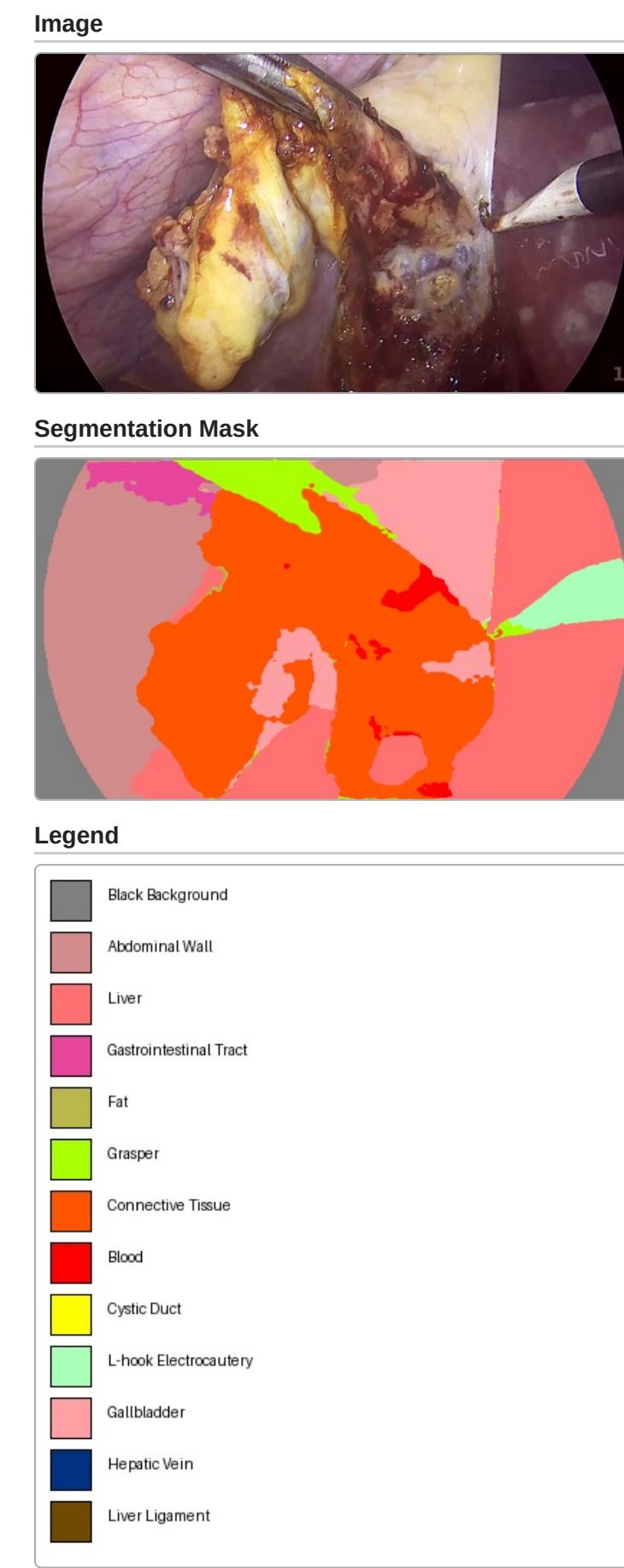


Context (LLM Input)	Conversational-1 (8 Qs) (\$0.0024)	Conversational-2 (9 Qs) (\$0.0015)	Complex Reasoning (2 Qs) (\$0.0027)	Concise (\$0.0004)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder) - (Grasper, Retract, Omentum) - (Hook, Dissect, Omentum)</p> <p>Spatial (extracted from model-generated segmentation mask): Model-generated segmentation mask confidence is below threshold, so spatial context is not included.</p>	<p>Q1: Is the grasper visible in the image? A1: Yes.</p> <p>Q2: Is the hook visible in the image? A2: Yes.</p> <p>Q3: Is the grasper retracting the gallbladder? A3: Yes.</p> <p>Q4: Is the grasper retracting the omentum? A4: Yes.</p> <p>Q5: Is the hook dissecting the omentum? A5: Yes.</p> <p>Q6: Where is the gallbladder located in the frame? A6: Central and toward the upper portion of the view.</p> <p>Q7: Where is the grasper located in the frame? A7: In the upper part of the field, coming from the left side.</p> <p>Q8: Where is the hook positioned relative to the gallbladder? A8: To the right of the gallbladder, oriented toward its margin.</p>	<p>Q1: Which instruments are visible in this frame? A1: A laparoscopic grasper and an L-hook electrocautery (hook) are visible.</p> <p>Q2: What procedural phase is shown in this image? A2: This image shows the Calot triangle dissection phase.</p> <p>Q3: Which tissues is the grasper retracting in this view? A3: The grasper is retracting the gallbladder and an adjacent strip of omental/fatty tissue (omentum).</p> <p>Q4: What is the hook doing and what tissue is it acting on? A4: The hook electrocautery is actively dissecting the omentum (fatty tissue) near the gallbladder.</p> <p>Q5: Are both instruments currently engaged with tissue, and if so how? A5: Yes. The grasper is engaged, holding and retracting the gallbladder and omentum; the hook is engaged, dissecting the omental tissue.</p> <p>Q6: How many distinct targets are being manipulated in this scene, and which instruments handle each? A6: Two distinct targets are being manipulated: the gallbladder (retracted by the grasper) and the omentum (both retracted by the grasper and dissected by the hook).</p> <p>Q7: Is there any other instrument or device visible besides the grasper and the hook? A7: No other instruments or devices are visible in this frame.</p> <p>Q8: Based on instrument roles, what is the functional relationship between the grasper and the hook in this image? A8: The grasper provides retraction and exposure of the gallbladder and omental tissue while the hook performs dissection on the omentum adjacent to the gallbladder.</p> <p>Q9: Is the gallbladder currently being dissected by the hook in this frame? A9: No. The hook is dissecting the omentum; the gallbladder itself is being held and retracted by the grasper.</p>	<p>Q1: How does simultaneous retraction of the gallbladder and adjacent fatty tissue by one instrument while the hook is dissecting those adhesions improve the safety and efficiency of Calot triangle dissection, and what traction vectors are preferred to optimize exposure? A1: Simultaneous retraction of the gallbladder and adjacent omental/fatty tissue places the tissue under tension and clears the working window so the hook can divide adhesions in a controlled fashion. Tension opens natural tissue planes, reduces the need for deep energy application, and helps the surgeon distinguish connective tissue from critical biliary structures. Preferred traction vectors are away from the operative target: gentle cephalad and lateral traction on the gallbladder usually exposes the triangle and pulls the cystic duct/artery away from the liver bed, while retracting the omentum laterally or inferiorly moves non-target tissue out of the path of the hook. These directions create a tenting effect that concentrates dissection forces at the plane of interest and minimizes blind sweeping or tangential traction that could avulse vessels or distort anatomy.</p> <p>Q2: Given that the hook is actively dissecting fatty adhesions, when should the surgeon change from electrocautery dissection to blunt or sharp scissors dissection, and what are the clinical reasons for doing so? A2: The surgeon should convert from hook electrocautery to blunt or cold sharp techniques when tissue planes become poorly defined, when dissection approaches structures that must be preserved (for example when a tubular structure suspected to be the cystic duct or artery appears), or when thermal spread could increase risk to adjacent structures. Clinically, blunt/sharp dissection is indicated if there is dense adhesions that respond poorly to energy, if bleeding obscures the field from small vessel injury, or if precise skeletonization of a duct or artery is required to obtain the critical view of safety. Switching reduces thermal injury risk, improves tactile feedback, and allows more controlled isolation of delicate structures prior to clipping or ligation.</p>	<p>During Calot triangle dissection, a grasper retracts the gallbladder and adjacent omentum. A hook instrument actively dissects the omentum.</p> <p>Detailed (\$0.0008)</p> <p>The view is focused on Calot's triangle dissection. A grasper is actively holding and retracting the gallbladder and adjacent omental/fatty tissue to create tension and expose the operative field. A hook is in active use, dissecting omental/fatty adhesions near the gallbladder to clear the triangle. Both instruments are engaged—the grasper providing traction and exposure, and the hook performing the dissection of omental tissue adjacent to the gallbladder.</p>



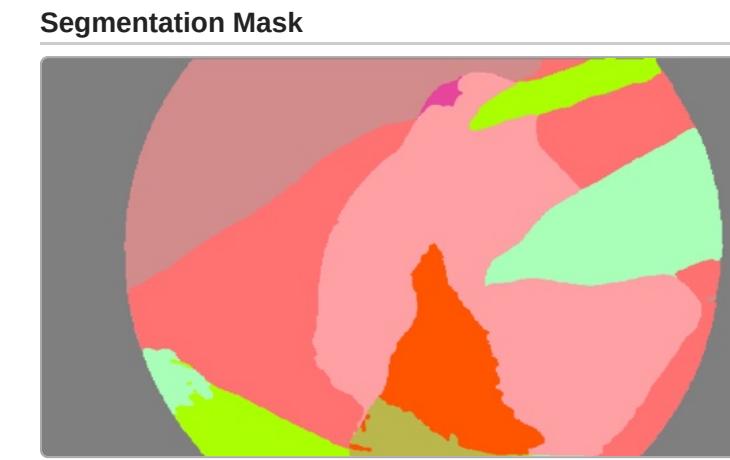
Context (LLM Input)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder) - (Hook, Dissect, Cystic Duct)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left-top. - Liver: right-top, right-bottom, center-left, left-bottom, center-right, center-top, right. - Gastrointestinal Tract: right-bottom. - Fat: right-bottom, left-bottom. - Grasper: left. - Connective Tissue: center. - L-hook Electrocautery: center-bottom. - Gallbladder: left.</p> <p>Relative Positions: - Abdominal Wall is to the left of Gastrointestinal Tract. - Liver is to the left of Gastrointestinal Tract. - Gastrointestinal Tract is to the right of Gallbladder. - Fat is toward the bottom of Abdominal Wall. - Grasper is to the left of Fat. - Connective Tissue is toward the bottom of Abdominal Wall. - L-hook Electrocautery is toward the bottom of Grasper. - Gallbladder is to the left of Fat.</p>

Conversational-1 (12 Qs) (\$0.0020)	Conversational-2 (7 Qs) (\$0.0015)	Complex Reasoning (3 Qs) (\$0.0021)	Concise (\$0.0005)
<p>Q1: Is the grasper visible in the image? A1: Yes. The grasper is visible on the left side of the field.</p> <p>Q2: Where is the grasper located within the view? A2: It is positioned on the left side of the operative field.</p> <p>Q3: What is the grasper doing to the gallbladder? A3: The grasper is retracting the gallbladder.</p> <p>Q4: Is the hook electrocautery visible in the image? A4: Yes. The hook is visible near the center-bottom of the field.</p> <p>Q5: Where is the hook located relative to the gallbladder? A5: The hook is to the right of the gallbladder.</p> <p>Q6: What action is the hook performing in this frame? A6: The hook is dissecting the cystic duct.</p> <p>Q7: Where is the gallbladder located within the image? A7: The gallbladder is on the left side of the view.</p> <p>Q8: Where is the liver located within the view? A8: The liver occupies the right side of the operative field.</p> <p>Q9: Is connective tissue visible in this frame? A9: Yes. Connective tissue is visible centrally in the field.</p> <p>Q10: Is fatty tissue visible in this frame? A10: Yes. Fatty tissue is visible in the lower portion of the field.</p> <p>Q11: Is there visible bleeding in the operative field? A11: No obvious bleeding is visible in this frame.</p> <p>Q12: Is the grasper contacting the gallbladder? A12: Yes. The grasper is in contact with the gallbladder while retracting it.</p>	<p>Q1: Which instruments are visible and where are they located in the frame? A1: A grasper is visible on the left side of the field, and an L-hook electrocautery (hook) is located toward the center-bottom of the field.</p> <p>Q2: What is the grasper doing and which structure is it acting on? A2: The grasper is retracting the gallbladder; it is positioned on the left and pulling the gallbladder to provide exposure.</p> <p>Q3: What tissue is the hook electrocautery interacting with in this view, and where is that tissue relative to the gallbladder? A3: The hook is dissecting the cystic duct, which is located adjacent to the gallbladder and being addressed from the center-bottom/rightward approach relative to the gallbladder.</p> <p>Q4: Which anatomical structures lie to the right of the gallbladder in this image? A4: To the right of the gallbladder are fatty tissue and the gastrointestinal tract; the liver is also positioned toward the right side of the field.</p> <p>Q5: How are the grasper and L-hook positioned relative to each other vertically? A5: The L-hook is positioned below (toward the bottom of the frame) the grasper.</p> <p>Q6: What procedural phase is represented in this image and which instruments are performing the primary actions? A6: This image shows the Calot triangle dissection phase; the grasper is retracting the gallbladder while the L-hook electrocautery is performing dissection of the cystic duct.</p> <p>Q7: Is connective tissue visible, and if so, where is it located relative to the abdominal wall? A7: Yes; connective tissue is visible and is located toward the bottom relative to the abdominal wall.</p>	<p>Q1: Given that the grasper is retracting the gallbladder and the hook is actively dissecting what is labeled as the cystic duct, what is the immediate procedural goal the surgeon is working toward in this frame? A1: The immediate goal is to isolate and skeletonize the cystic duct by clearing connective and fatty tissue around it while maintaining traction on the gallbladder to expose the ductal plane. The active retraction by the grasper provides tension that opens the tissue planes, and the hook is used to divide adhesions and connective tissue surrounding the duct so that the duct's course and margins become clearly visible and ready for safe control (clipping or ligation) in a later step.</p> <p>Q2: What adjustment to traction or instrument positioning would most improve safety of the current dissection? A2: Safer dissection would be achieved by refining the vector of traction so the gallbladder is pulled away from the hepatocystic triangle at an angle that tenses the fibrofatty tissue over the cystic duct without tenting adjacent tissue toward the energy source. Practically, this means repositioning the grasper to provide steady lateral and superior traction (away from the dissection plane) so the hook can work on a clear, perpendicular plane. This improves visualization of the duct boundaries, reduces the need for deep or blind hook passes, and minimizes inadvertent contact of energy with non-target tissue.</p> <p>Q3: What are the main energy-related risks while the hook is dissecting the cystic duct, and how does the scene indicate these risks should be mitigated? A3: The primary energy-related risks are thermal spread to adjacent tissue (including the gallbladder wall and liver bed) and overly deep coagulation causing tissue necrosis or ductal injury. In this frame the hook is close to the cystic duct and liver tissue is nearby; to mitigate risk the surgeon should use short, controlled bursts of low-power coagulation, maintain the hook tip clearly on the intended tissue only, and avoid prolonged application. Concurrently, maintaining clear traction with the grasper so non-target tissue is tensed away from the hook reduces collateral thermal contact.</p>	<p>Detailed (\$0.0011)</p> <p>The gallbladder sits in the left-central field with the liver forming the right-sided/background view. A grasper enters from the left and is actively holding and retracting the gallbladder to expose Calot's triangle. An L-hook electrocautery comes in from a lower-central/right position and is actively dissecting around the cystic duct, working through the central connective tissue plane. Fatty tissue occupies the lower field beneath the gallbladder, and portions of the gastrointestinal tract are visible in the right-lower corner. The abdominal wall is seen toward the upper left. In this frame both instruments are engaged: the grasper provides traction and exposure while the hook performs the dissection of the cystic duct region.</p>



Context (LLM Input)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Gallbladder Packaging</p> <p>Current action triplets (tool, verb, target): - (Grasper, Grasp, Gallbladder) - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Model-generated segmentation mask confidence is below threshold, so spatial context is not included.</p>

Conversational-1 (8 Qs) (\$0.0024)	Conversational-2 (8 Qs) (\$0.0017)	Complex Reasoning (2 Qs) (\$0.0024)	Concise (\$0.0005)
<p>Q1: Is the grasper visible in this image? A1: Yes, a grasper is visible.</p> <p>Q2: Which structure is the grasper holding? A2: The grasper is holding the gallbladder.</p> <p>Q3: Is the hook instrument visible in this view? A3: Yes, the hook electrocautery is visible.</p> <p>Q4: What is the hook doing in this frame? A4: The hook is dissecting the gallbladder.</p> <p>Q5: Is the hook tip contacting the gallbladder? A5: Yes, the hook tip is in contact with the gallbladder.</p> <p>Q6: Where is the gallbladder located within the frame? A6: The gallbladder is positioned centrally in the image.</p> <p>Q7: Is the grasper holding the omentum? A7: No.</p> <p>Q8: Is the grasper actively grasping tissue rather than being idle? A8: Yes, the grasper is actively grasping the gallbladder.</p>	<p>Q1: What instruments are visible in this frame? A1: A grasper and a hook electrocautery (hook) are visible.</p> <p>Q2: What phase of the procedure is shown in this view? A2: This view shows the gallbladder packaging phase.</p> <p>Q3: Which instrument is holding the gallbladder and which is performing dissection? A3: The grasper is holding (grasping/retracting) the gallbladder, and the hook electrocautery is performing dissection on the gallbladder.</p> <p>Q4: Are both instruments in direct contact with the gallbladder in this image? A4: Yes. The grasper is contacting and holding the gallbladder, and the hook is in contact with the gallbladder surface to dissect it.</p> <p>Q5: How many instrument tips are visible and how are they positioned relative to the gallbladder? A5: Two instrument tips are visible: the grasper tip is engaged on the gallbladder to hold it, and the hook tip is adjacent to and contacting the gallbladder where dissection is occurring.</p> <p>Q6: Is a specimen retrieval bag or any additional packaging material visible around the gallbladder? A6: No. There is no retrieval bag or additional packaging material visible around the gallbladder in this frame.</p> <p>Q7: Are any other surgical instruments visible besides the grasper and the hook? A7: No other surgical instruments are visible; only the grasper and the hook electrocautery are present.</p> <p>Q8: Summarize the immediate operative action visible in one sentence. A8: The grasper is holding the gallbladder steady while the hook electrocautery dissects the gallbladder surface as part of the packaging step.</p>	<p>Q1: Given that the grasper is securely holding the gallbladder while the hook is actively dissecting it during the packaging phase, what is the most likely immediate surgical goal and why is this coordinated instrument use important? A1: The immediate goal is to complete separation of the gallbladder from any remaining attachments and to shape or free it so it can be removed from the abdomen without leaving tissue bridges or causing tearing. The grasper provides stable traction and orientation of the specimen, maintaining tension on the gallbladder so tissue planes are exposed and predictable. The hook, used actively, precisely divides residual adhesions or the cystic plate under that tension. This coordination minimizes uncontrolled tearing, reduces the chance of leaving residual tissue, and helps the surgeon control where division occurs so that forces are concentrated at intended cut sites rather than transmitted unpredictably to the cystic pedicle or liver bed.</p> <p>Q2: What immediate verification should be performed before attempting to extract the gallbladder, and how would the instruments in the scene be used to do this? A2: Before extraction, the surgeon should verify complete hemostasis and absence of active bile leak from the gallbladder bed and cystic duct stump. Using the grasper, the surgeon can lift and orient the gallbladder to expose the liver bed; the hook can be used in brief, controlled activation to probe and, if necessary, coagulate small bleeding points. The operating surgeon should also visually inspect for bile staining or pooling; if small leaks are found, suction and targeted coagulation or suture can be applied while maintaining traction to prevent contamination when the specimen is removed.</p>	<p>During gallbladder packaging, a grasper holds the gallbladder while a hook actively dissects tissue of the gallbladder.</p> <p>Detailed (\$0.0006)</p> <p>The image shows the gallbladder being actively handled as part of the packaging step. A grasper firmly holds the gallbladder (active — grasping) to stabilize and control it, while the laparoscopic hook is actively dissecting the gallbladder (active — cutting/separating) to complete mobilization for removal. Only the grasper and hook are present and engaged in these tasks; no other instruments or actions are visible.</p>



FASL Prediction (Conf: 0.9505)

Context (LLM Input)

Visible instruments:
Grasper, Hook.

Current phase:
Calot Triangle Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)
- (Hook, Dissect, Omentum)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: left-top.
- Liver: right-top, left, center-top, right-bottom.
- Gastrointestinal Tract: center-top.
- Fat: center-bottom.
- Grasper: right-top, right-bottom, left-bottom.
- Connective Tissue: center-bottom.
- L-hook Electrocautery: right.
- Gallbladder: right.

Relative Positions:

- Abdominal Wall is to the left of L-hook Electrocautery.
- Liver is to the left of L-hook Electrocautery.
- Gastrointestinal Tract is towards the top of Connective Tissue.
- Fat is toward the bottom of Abdominal Wall.
- Grasper is to the left of L-hook Electrocautery.
- Connective Tissue is toward the bottom of Abdominal Wall.
- L-hook Electrocautery is towards the top of Fat.
- Gallbladder is to the right of Abdominal Wall.

Conversational-1 (10 Qs) (\$0.0017)

Q1: Is the grasper visible in this image?

A1: Yes. The grasper is visible at the right side of the field near the upper area.

Q2: Where is the grasper located in the frame?

A2: The grasper is located toward the right-top of the operative view.

Q3: What is the grasper doing in this scene?

A3: The grasper is retracting tissue, providing traction on the gallbladder.

Q4: Is the hook electrocautery visible?

A4: Yes. The hook electrocautery is visible on the right side of the field.

Q5: What is the hook doing in this image?

A5: The hook is dissecting tissue consistent with omental dissection.

Q6: Where is the gallbladder located in the image?

A6: The gallbladder is on the right side of the operative field, near the center-right.

Q7: Is the liver visible in the operative view?

A7: Yes. The liver is visible in the background of the field, occupying central to upper areas.

Q8: Is fatty tissue visible in this frame?

A8: Yes. Fatty tissue is visible in the lower-central portion of the image.

Q9: Is connective tissue visible in this view?

A9: Yes. Connective tissue is visible toward the lower-central area near the fat.

Q10: Where is the L-hook electrocautery tip positioned relative to the gallbladder?

A10: The L-hook electrocautery tip is positioned to the right of the gallbladder.

Conversational-2 (10 Qs) (\$0.0021)

Q1: Which instruments are visible in this laparoscopic view?

A1: A grasper and an L-hook electrocautery (hook) are visible.

Q2: What procedural phase is shown in this image?

A2: Calot triangle dissection.

Q3: Which instrument is retracting the gallbladder, and where is it located relative to the gallbladder?

A3: The grasper is retracting the gallbladder; it is positioned adjacent to and slightly left of the gallbladder.

Q4: What tissue is the hook electrocautery dissecting, and where is the hook located in the field?

A4: The hook is dissecting omentum (fatty tissue) and is located on the right side of the operative field near the gallbladder.

Q5: Which anatomical structures besides the gallbladder are visible in this image?

A5: The liver, abdominal wall, gastrointestinal tract, fat (omentum), and connective tissue are visible.

Q6: Is there any visible active bleeding in the field?

A6: No active bleeding is visible in this frame.

Q7: How are the grasper and hook positioned relative to each other?

A7: The grasper is positioned to the left of the hook; the hook is on the right side of the field approaching the gallbladder region.

Q8: Which tissues lie inferior (toward the bottom) to the abdominal wall in this view?

A8: Connective tissue and fat lie toward the bottom relative to the abdominal wall.

Q9: How many instruments are currently contacting the gallbladder?

A9: One instrument—the grasper—is contacting and retracting the gallbladder.

Q10: Is the hook closer to the liver or to the gallbladder in this image?

A10: The hook is closer to the gallbladder; the liver is positioned more to the left side of the field.

Complex Reasoning (2 Qs) (\$0.0020)

Q1: Given that the gallbladder is under sustained retraction by the grasper while the hook is dissecting adjacent omental/fatty adhesions, what is the immediate surgical objective and the next two technical actions the surgeon should perform to safely progress toward obtaining the critical view?

A1: The immediate objective is to clear and tension the tissue planes around the infundibulum so the cystic duct and artery can be safely identified (i.e., to progressively expose Calot's triangle). The next two technical actions should be: (1) continue controlled lateral and cephalad traction on the gallbladder with the grasper to open the triangle and maintain constant tension on the dissection plane, and (2) use the hook to carefully divide only the thin omental/fatty attachments in the exposed plane with short, deliberate energy activations or sharp dissection, keeping the hook tip oriented away from deeper structures until the fibrous plane immediately adjacent to the gallbladder is skeletonized. These steps improve visualization and reduce the chance of mistaking other structures for the cystic duct or artery before clipping/dividing.

Q2: What specific risks are increased by using the electrocautery hook to dissect omentum in this view, and how should the team modify technique to mitigate those risks?

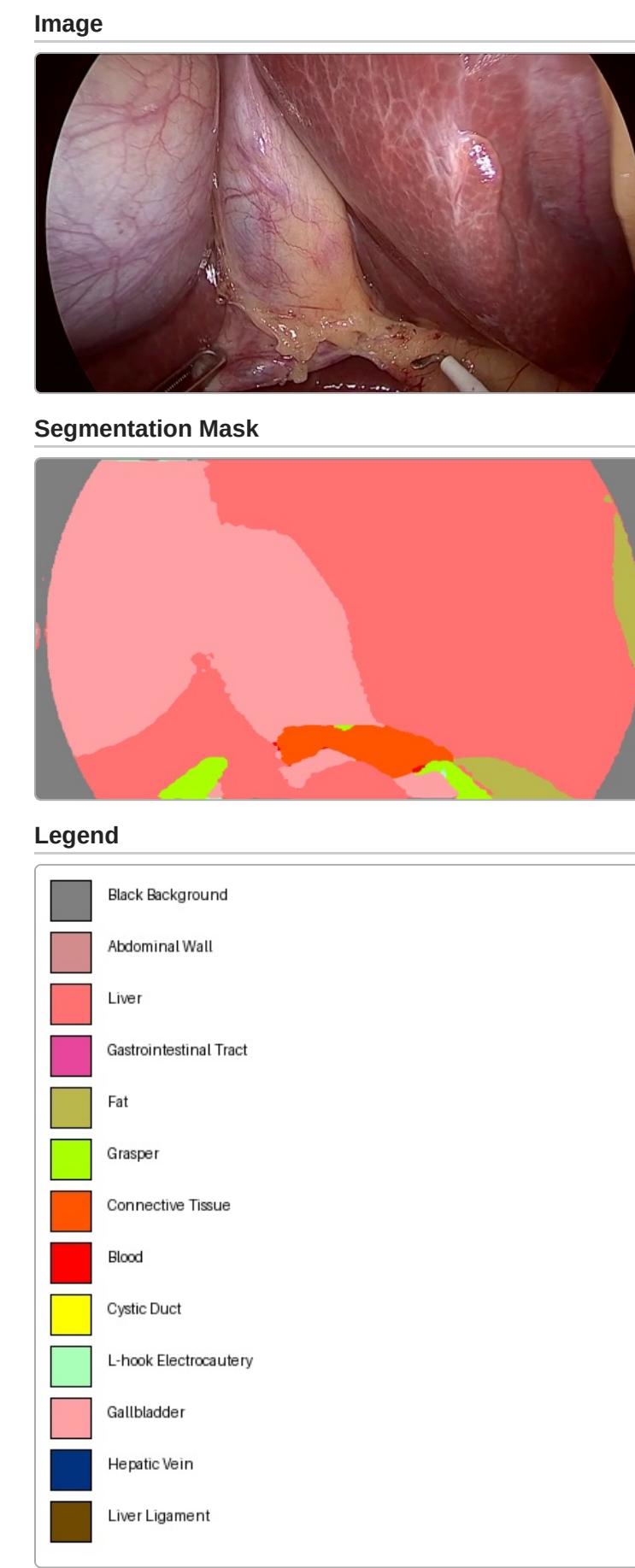
A2: Risks include thermal spread causing collateral injury to the gallbladder wall, liver capsule, or adjacent bowel, and obscured visualization from smoke or bleeding that can lead to misidentification of structures. To mitigate these risks: use short, low-power activations rather than prolonged coagulation, keep the hook tip moving and under direct vision at all times, maintain clear countertraction with the grasper so geometry of the plane is unambiguous, intermittently suction smoke/blood to preserve visibility, and when precise coagulation is needed switch to bipolar or apply clips for a discrete vessel rather than prolonged monopolar activation near critical anatomy.

Concise (\$0.0006)

A grasper retracts the gallbladder to expose Calot's triangle. The L-hook electrocautery (hook) actively dissects omental/fatty tissue adjacent to the gallbladder on the right, near the liver.

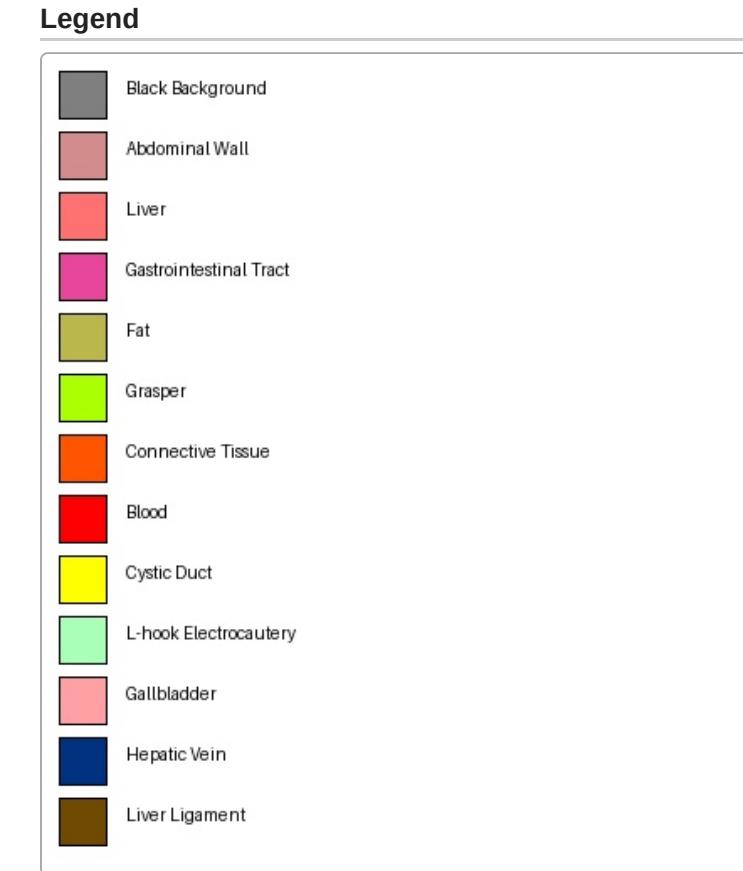
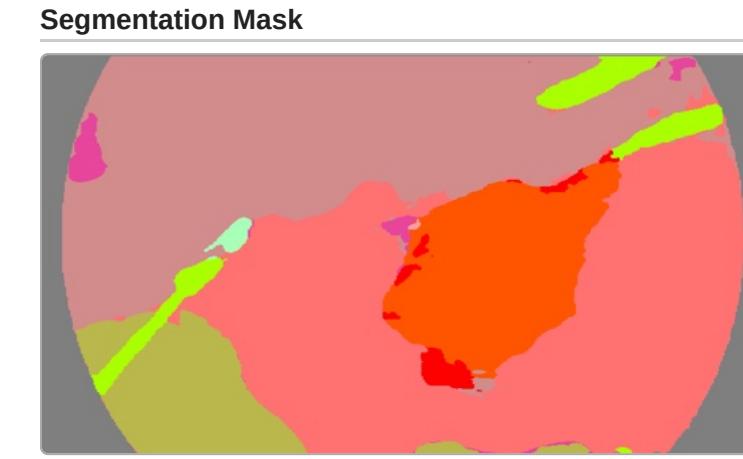
Detailed (\$0.0011)

The view is focused on the right-sided gallbladder and surrounding Calot triangle. The gallbladder sits toward the right side of the field, with the liver occupying much of the left/background region. A grasper is engaged on the gallbladder and is actively providing retraction to expose the dissection plane. From the right, an L-hook electrocautery is actively dissecting omental/fatty tissue and connective adhesions near the gallbladder margin as part of Calot triangle dissection. Fatty omentum and connective tissue lie in the lower field and are the immediate targets of the hook's dissection, while the gastrointestinal tract is visible more centrally-upper in the background and the abdominal wall appears toward the upper-left. Both instruments are in use: the grasper maintains traction on the gallbladder; the hook is performing electrocautery dissection on adjacent omental tissue.



Context (LLM Input)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder) - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left. - Liver: right. - Gastrointestinal Tract: right-top. - Fat: right. - Grasper: bottom. - Connective Tissue: center-bottom, left-bottom. - Blood: center-bottom. - L-hook Electrocautery: left. - Gallbladder: left.</p> <p>Relative Positions: - Abdominal Wall is to the left of Fat. - Liver is to the right of Abdominal Wall. - Gastrointestinal Tract is to the right of Gallbladder. - Fat is to the right of Gallbladder. - Grasper is to the left of Gastrointestinal Tract. - Connective Tissue is to the left of Gastrointestinal Tract. - Blood is to the right of Abdominal Wall. - L-hook Electrocautery is to the left of Gastrointestinal Tract. - Gallbladder is to the left of Liver.</p>

Conversational-1 (12 Qs) (\$0.0029)	Conversational-2 (10 Qs) (\$0.0015)	Complex Reasoning (2 Qs) (\$0.0026)	Concise (\$0.0005)
<p>Q1: Is the gallbladder visible in this image? A1: Yes. The gallbladder is visible on the left side of the field.</p> <p>Q2: Where is the grasper located in the frame? A2: The grasper is positioned at the bottom of the operative field.</p> <p>Q3: What is the grasper doing in this view? A3: The grasper is retracting the gallbladder.</p> <p>Q4: Is the hook instrument contacting tissue? A4: Yes. The hook is in contact with tissue as it dissects.</p> <p>Q5: What is the hook doing in this image? A5: The hook is dissecting the gallbladder.</p> <p>Q6: Is there visible blood in the operative field? A6: Yes. There is blood visible in the lower-central portion of the view.</p> <p>Q7: Where is the liver located in this image? A7: The liver is located on the right side of the view.</p> <p>Q8: Is the abdominal wall visible? A8: Yes. The abdominal wall is visible along the left side of the frame.</p> <p>Q9: Where is connective tissue seen in the field? A9: Connective tissue appears in the lower-central to lower-left portion of the field.</p> <p>Q10: Is fatty tissue visible in this image? A10: Yes. Fatty tissue is visible toward the right side of the view.</p> <p>Q11: Is the grasper contacting the gallbladder? A11: Yes. The grasper is grasping and retracting the gallbladder.</p> <p>Q12: Where is the hook located in the frame? A12: The hook is positioned on the left side of the operative field near the gallbladder.</p>	<p>Q1: Which instruments are visible in this image? A1: A grasper and an L-hook electrocautery (hook) are visible.</p> <p>Q2: What phase of the procedure is shown in this frame? A2: This frame is during Calot triangle dissection.</p> <p>Q3: Which instrument is retracting the gallbladder, and where is it located in the image? A3: The grasper is retracting the gallbladder; it is positioned at the bottom (inferior portion) of the image contacting the gallbladder.</p> <p>Q4: Which instrument is performing dissection, and what is it dissecting? A4: The L-hook electrocautery is performing dissection on the gallbladder.</p> <p>Q5: Where is the gallbladder located relative to the liver and to the hook? A5: The gallbladder is left of the liver and is also left of or adjacent to the L-hook electrocautery, which approaches it from the left side of the field.</p> <p>Q6: Is there any blood visible, and if so where? A6: Yes — blood is visible in the central lower (center-bottom) region of the image.</p> <p>Q7: Where are the liver, gastrointestinal tract, and fat located within the image? A7: The liver is on the right side of the image; the gastrointestinal tract is in the right-top region; fat is located on the right side as well.</p> <p>Q8: Where is connective tissue located relative to the grasper? A8: Connective tissue appears in the lower central and left-lower portions of the field, adjacent to and slightly left of the grasper at the bottom.</p> <p>Q9: Which structures or tissues are being actively manipulated in this frame? A9: The gallbladder is being actively manipulated: the grasper is retracting it and the hook electrocautery is dissecting its tissue.</p> <p>Q10: Are there any other instruments or tools visible besides the grasper and hook? A10: No. Only the grasper and the L-hook electrocautery are visible in this frame.</p>	<p>Q1: Given active retraction of the gallbladder with the grasper and simultaneous dissection with the hook, what is the immediate technical goal the surgeon is accomplishing in the Calot's triangle at this moment and why is the chosen combination of maneuvers appropriate? A1: The immediate goal is to expose and develop a clear dissection plane in the hepatocystic (Calot's) triangle—separating peritoneum, fat and connective tissue from the gallbladder infundibulum so that the cystic duct and artery can be safely identified. The grasper is applying sustained traction on the gallbladder to put these tissues under tension and move them away from the liver and adjacent viscera, which both improves visualization and creates a safer cutting angle. The hook is then used to divide the illuminated, tensioned attachments in short, controlled activations. This combination (traction to tension tissues + hook to dissect) is appropriate because tension defines the correct plane and minimizes blind cutting, while the hook allows precise division of connective tissue when used in short bursts to limit thermal spread.</p> <p>Q2: There is blood visible near the instruments while the hook is dissecting. Based on the instruments and anatomy in view, what is the most likely source of this bleeding and how should it be controlled using only the instruments that are present? A2: With the gallbladder under traction and the hook dissecting at the liver-gallbladder interface, the most likely sources are small oozing vessels in the connective tissue/fat of the hepatocystic triangle or minor bleeding from the liver bed. To control this using the visible instruments: first maintain or adjust traction with the grasper to compress the bleeding site and improve visualization (active instrument use). Then use the hook electrocautery in short, targeted coagulation bursts directly on the bleeding point to achieve hemostasis, minimizing continuous activation to avoid excess thermal spread. If bleeding is reduced by compression, reassess the plane and continue careful dissection; if bleeding persists or is brisk, further exposure and more controlled coagulation of the feeding connective tissue bundles should be performed before proceeding.</p>	<p>A grasper retracts the gallbladder while an L-hook electrocautery actively dissects the gallbladder. The gallbladder is on the left with the liver to the right. Connective tissue and a small area of blood are visible inferiorly/centrally.</p> <p>Detailed (\$0.0010)</p> <p>The view is focused on the Calot triangle region with the gallbladder positioned on the left side of the image and the liver occupying the right/background. A grasper is located in the lower field and is actively holding and retracting the gallbladder to expose the dissection plane. An L-hook electrocautery (hook) is positioned on the left and is actively dissecting the gallbladder tissue using electrocautery energy.</p>



FASL Prediction (Conf: 0.8880)

Context (LLM Input)

Visible instruments:
Bipolar.

Current phase:
Cleaning Coagulation

Current action triplets (tool, verb, target):
- (Bipolar, Null Verb, Null Target)

Spatial (extracted from model-generated segmentation mask):
Model-generated segmentation mask confidence is below threshold, so spatial context is not included.

Conversational-1 (6 Qs) (\$0.0020)

- Q1: Is the bipolar instrument visible in this image?**
A1: Yes, the bipolar instrument is visible.
- Q2: Where is the bipolar positioned within the operative view?**
A2: The bipolar is located toward the right-central portion of the frame, entering from the right side.
- Q3: Is the bipolar tip contacting tissue in this frame?**
A3: Yes, the bipolar tip is in contact with tissue.
- Q4: Which anatomical structure is immediately adjacent to the bipolar tip?**
A4: The gallbladder is adjacent to the bipolar tip.
- Q5: Is a grasper visible in this image?**
A5: No, a grasper is not visible in this image.
- Q6: Is there visible char or coagulated tissue at the bipolar contact site?**
A6: Yes, there is focal charred/coagulated tissue at the bipolar contact site.

Conversational-2 (6 Qs) (\$0.0017)

- Q1: Which instrument is visible in this frame?**
A1: A bipolar electrosurgical forceps (bipolar) is visible.
- Q2: Are there any other instruments visible in this frame?**
A2: No. The bipolar is the only instrument visible in this image.
- Q3: What phase of the cholecystectomy does this image represent?**
A3: This image corresponds to the cleaning/coagulation phase.
- Q4: Is the bipolar clearly contacting or manipulating a specific tissue in this frame?**
A4: No — the bipolar is present in the field but not clearly engaged with or manipulating a specific tissue target in this frame.
- Q5: Is there visible evidence of active energy delivery (spark, smoke, or tissue charring) around the bipolar?**
A5: No. There is no clear visual sign of active energy delivery around the bipolar in this image.
- Q6: Combining instrument and phase: is the bipolar the only energy device visible during the cleaning/coagulation phase in this view?**
A6: Yes — during the cleaning/coagulation phase shown, the bipolar appears to be the sole energy device visible in the field.

Complex Reasoning (3 Qs) (\$0.0024)

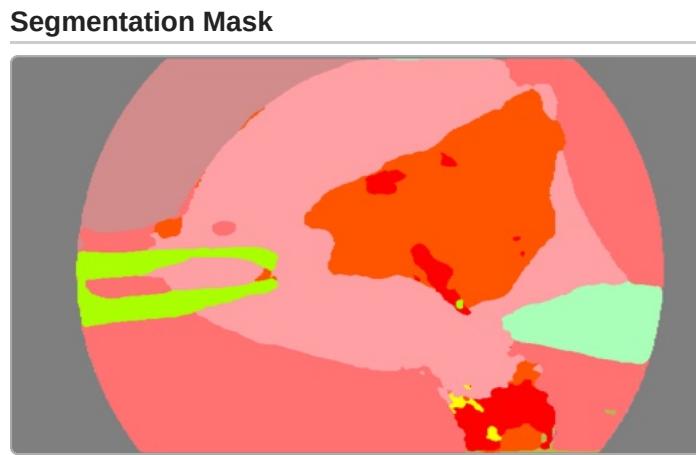
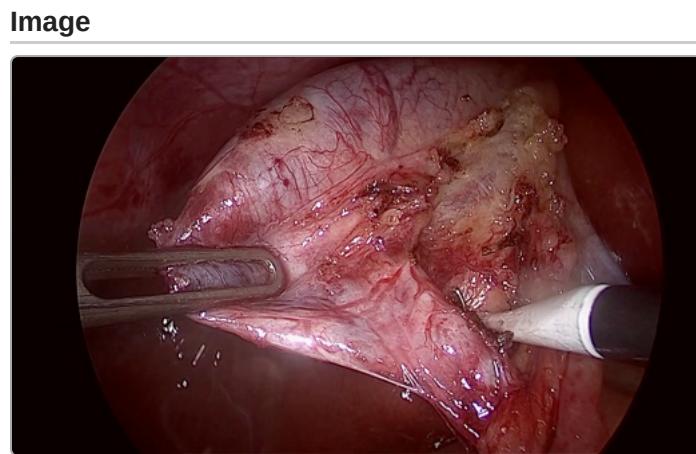
- Q1: Given that only the bipolar instrument is present and the phase is "Cleaning Coagulation," what is the most likely immediate procedural goal at this moment?**
A1: The immediate goal is to achieve targeted hemostasis and to tidy the operative field by coagulating small bleeding points and sealing oozing tissue. During a cleaning/coagulation step the surgeon will typically use the bipolar to apply controlled energy to focal vessels or raw surfaces to stop low-pressure bleeding and to create a dry, stable field before further inspection or the next dissection step. The presence of the bipolar without an active verb suggests the team is poised to perform this focal coagulation once the exact bleeding points are identified and exposure is optimized.
- Q2: What technical advantages does bipolar energy offer for this cleaning/coagulation task compared with monopolar energy, and how do those advantages affect decision-making right now?**
A2: Bipolar energy concentrates current between the two electrode tips so the circuit is confined to the tissue grasped between them, producing more localized heating and less lateral thermal spread. It also does not rely on a patient return pad as monopolar does, reducing whole-body current flow. These properties make bipolar preferable for precise coagulation of small vessels and oozing surfaces when attempting to minimize collateral thermal injury to adjacent tissue. In the current moment, those advantages justify choosing bipolar for focused hemostasis where precision is important and the surgeon wants to avoid broader thermal damage.
- Q3: The bipolar is present but not currently activated. What pre-activation safety and set-up checks should be done before applying coagulation?**
A3: Before activating the bipolar, the operator should: (1) confirm direct, stable contact of the bipolar tips with the targeted tissue to ensure the energy path is localized; (2) visually clear the field so the target is well defined and no non-target tissue lies between the tips; (3) verify device integrity (intact insulation, clean tips) and appropriate instrument orientation; (4) confirm energy settings are appropriate (lowest effective power, coagulation mode); and (5) communicate intent to the team to avoid unintended movement. These checks reduce the risk of arcing, unintended burns, and poor coagulation efficacy.

Concise (\$0.0005)

During Cleaning Coagulation, a bipolar forceps is present in the operative field but is not actively engaged in coagulation or tissue interaction.

Detailed (\$0.0008)

This frame corresponds to the Cleaning Coagulation phase and shows a bipolar instrument (bipolar forceps) in the operative field. The bipolar is present and poised for use but is not currently engaging tissue or applying energy — it appears idle/standby rather than actively coagulating. No other instruments or active tissue interactions are visible in this view.



Context (LLM Input)

Visible instruments:
Grasper, Hook.

Current phase:
Calot Triangle Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)
- (Hook, Dissect, Gallbladder)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: left-top.
- Liver: bottom.
- Gastrointestinal Tract: right-bottom.
- Fat: right-bottom.
- Grasper: center-left, center.
- Connective Tissue: right.
- Blood: right-bottom.
- Cystic Duct: right-bottom.
- L-hook Electrocautery: right-top, right-bottom.
- Gallbladder: right-bottom, center-left, center-bottom.

Relative Positions:

- Abdominal Wall is to the left of Fat.
- Liver is toward the bottom of Abdominal Wall.
- Gastrointestinal Tract is to the right of Abdominal Wall.
- Fat is toward the bottom of Gallbladder.
- Grasper is to the left of L-hook Electrocautery.
- Connective Tissue is to the right of Grasper.
- Blood is to the right of Abdominal Wall.
- Cystic Duct is to the right of Abdominal Wall.
- L-hook Electrocautery is to the right of Abdominal Wall.
- Gallbladder is towards the top of Gastrointestinal Tract.

Conversational-1 (10 Qs) (\$0.0015)

Q1: Is the grasper visible in this frame?

A1: Yes. The grasper is visible in the central-left portion of the view.

Q2: What is the grasper doing to the gallbladder?

A2: The grasper is retracting the gallbladder.

Q3: Is the hook electrocautery visible in this frame?

A3: Yes. The hook is visible on the right side of the view.

Q4: What is the hook currently doing?

A4: The hook is dissecting tissue at the gallbladder.

Q5: Where is the gallbladder located within the operative field?

A5: The gallbladder is located centrally, slightly toward the left and lower center of the view.

Q6: Is the liver visible in this image?

A6: Yes. The liver is visible toward the bottom of the field.

Q7: Is there any blood visible in the operative field?

A7: Yes. There is blood visible in the lower-right portion of the view.

Q8: Is connective tissue visible in this frame?

A8: Yes. Connective tissue is visible on the right side of the field.

Q9: Is fatty tissue visible in this frame?

A9: Yes. Fatty tissue appears toward the lower-right area of the view.

Q10: Is the cystic duct visible in this image?

A10: Yes. The cystic duct is visible toward the right-lower portion of the operative field.

Conversational-2 (9 Qs) (\$0.0015)

Q1: Which instruments are present in this frame and how many of each can you see?

A1: There are two instruments visible: one grasper and one L-hook electrocautery (hook).

Q2: What phase of the operation is shown in this image?

A2: This image shows the Calot triangle dissection phase.

Q3: Which instrument is retracting the gallbladder and where is it located in the field?

A3: The grasper is retracting the gallbladder and is positioned toward the center-left of the image.

Q4: Which instrument is performing dissection on the gallbladder and where is it relative to the grasper?

A4: The L-hook electrocautery is dissecting the gallbladder and is located to the right of the grasper.

Q5: Is the cystic duct visible in this view, and if so, where is it located?

A5: Yes — the cystic duct is visible in the right-lower portion of the field.

Q6: Where are the liver and abdominal wall located in the image?

A6: The liver appears toward the bottom of the image, while the abdominal wall is toward the left-top.

Q7: Are there any signs of blood or connective tissue and where are they located relative to the instruments?

A7: Yes. Blood is present in the right-bottom area, and connective tissue is located to the right of the grasper (near the hook).

Q8: How is the gallbladder positioned relative to the gastrointestinal tract and fat in the image?

A8: The gallbladder is situated above (toward the top of) the gastrointestinal tract and above adjacent fatty tissue, occupying a central to right-lower region of the field.

Q9: Are there any other instruments visible besides the grasper and the hook?

A9: No. Only the grasper and the L-hook electrocautery are visible in this frame.

Complex Reasoning (1 Qs) (\$0.0026)

Q1: Given that the grasper is actively retracting the gallbladder while the hook is dissecting at the infundibular region and there is some blood in the field, what immediate steps should be taken to both control the bleeding and maintain a safe dissection plane so the risk of bile duct injury is minimized?

A1: First, prioritize a clear view: use suction/irrigation to remove blood and pooled fluid so tissue planes and the hook tip remain visible. The retracting grasper should maintain steady traction on the gallbladder to tension the infundibulum while another instrument (suction) clears the field; avoid flipping or losing that traction because it exposes and stabilizes the target plane. If bleeding is from small oozing vessels in the connective tissue or liver edge, apply brief, low-power coagulation with the hook only when the bleeding point and adjacent bile duct region are clearly seen, or use atrumatic pressure with the grasper/sponge for tamponade until suction clears enough to identify the source. Avoid prolonged or high-power energy activations near the infundibulum/cystic duct to reduce thermal spread. Concurrently, proceed with meticulous sharp/blunt dissection to skeletonize the presumed cystic structures: clear fatty/connective tissue progressively under direct vision so that only two structures enter the gallbladder before any clipping or division. These steps—clear the field, maintain traction, control focal bleeding with minimal energy, and continue careful dissection—reduce both obscured anatomy and thermal/mechanical injury risk.

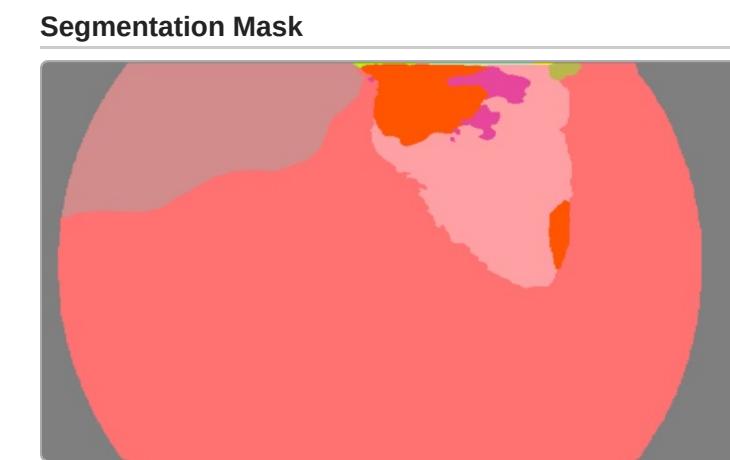
Concise (\$0.0005)

A grasper retracts the gallbladder from the center-left while an L-hook electrocautery on the right actively dissects the gallbladder. The liver lies inferiorly.

Detailed (\$0.0009)

The view centers on the gallbladder being retracted by a grasper that enters from the left/central field. The grasper is actively holding and applying traction to the gallbladder, lifting it toward the left-central portion of the image to expose the dissection plane. An L-hook electrocautery approaches from the right and is actively dissecting along the gallbladder margin — the hook lies to the right of the grasper and is engaged at the working edge of the gallbladder.

The liver occupies the lower/background portion of the field. Fatty tissue and portions of the gastrointestinal tract are present in the right-lower area beneath the gallbladder, and connective tissue lies immediately to the right of the grasper and near the hook's working zone. There is some blood visible in the right-lower field adjacent to the dissection area, and the cystic duct region is also located toward the right-lower quadrant, near where the hook is dissecting.



Context (LLM Input)

Visible instruments:
No instruments are visible.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
No actions are taking place.

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: left-top.
- Liver: center-top.
- Gastrointestinal Tract: center-top.
- Fat: right-top.
- Grasper: center-top.
- Connective Tissue: center-right, center-top.
- Cystic Duct: right-top.
- L-hook Electrocautery: center-top.
- Gallbladder: right-top, center-top.

Relative Positions:

- Abdominal Wall is to the left of Gallbladder.
- Liver is toward the bottom of Fat.
- Gastrointestinal Tract is to the right of Abdominal Wall.
- Fat is to the right of Grasper.
- Grasper is towards the top of Liver.
- Connective Tissue is to the right of Abdominal Wall.
- Cystic Duct is towards the top of Liver.
- L-hook Electrocautery is to the right of Abdominal Wall.
- Gallbladder is towards the top of Liver.

Conversational-1 (8 Qs) (\$0.0020)

Q1: Is the gallbladder visible in this frame?

A1: Yes. The gallbladder is visible in the upper-central to upper-right portion of the image.

Q2: Where is the cystic duct located in the operative view?

A2: The cystic duct is visible in the upper-right region of the field.

Q3: Is the liver visible in this frame?

A3: Yes. The liver occupies the central upper portion of the image.

Q4: Are any surgical instruments visible in this frame?

A4: No. There are no instruments visible in this image.

Q5: Is fatty tissue visible in the field?

A5: Yes. Fatty tissue is visible toward the right-upper area of the view.

Q6: Where is the abdominal wall located in this image?

A6: The abdominal wall is seen in the upper-left portion of the field.

Q7: Is connective tissue visible in the operative view?

A7: Yes. Connective tissue is present in the central to right-central upper area.

Q8: Where is the gallbladder relative to the liver?

A8: The gallbladder lies at the top of the liver, in the upper-central/right area of the view.

Conversational-2 (9 Qs) (\$0.0019)

Q1: What surgical phase is shown in this image?

A1: This image shows the gallbladder dissection phase.

Q2: Are any instruments visible in the field right now?

A2: No. There are no instruments visible in this frame.

Q3: Which organ occupies the upper right/central top portion of the image?

A3: The gallbladder is located in the upper right to central top portion of the image.

Q4: Is the cystic duct visible, and where is it located relative to the liver?

A4: Yes. The cystic duct is visible toward the top-right area and lies adjacent to the superior aspect of the liver.

Q5: Where is the abdominal wall positioned relative to the gallbladder?

A5: The abdominal wall is to the left of the gallbladder (situated more toward the left-top of the image).

Q6: Is there any active instrument manipulation (grasping or electrocautery) occurring in this frame?

A6: No active manipulation is visible; no grasping or electrocautery action is occurring in this moment.

Q7: Are fatty tissues present in the field, and where are they located relative to the gallbladder?

A7: Yes. Fatty tissue is visible in the right-top region of the image, adjacent to the area containing the gallbladder.

Q8: Which structures occupy the upper central portion of the image?

A8: The liver and portions of the gastrointestinal tract occupy the upper central area of the image.

Q9: Is there any visible blood or active bleeding in the operative field?

A9: No. There is no visible blood or active bleeding in this frame.

Complex Reasoning (2 Qs) (\$0.0025)

Q1: Is it safe to proceed to clipping and division of the cystic duct at this moment?

A1: No — proceeding to clip and divide the duct now would be premature. The image shows the gallbladder in relation to the liver and a tubular structure in the triangle area, but no instruments are engaged and tissue planes and surrounding connective/fatty tissue are not clearly cleared. Before any clipping, the surgeon must obtain the critical view of safety: fully mobilize the lower part of the gallbladder off the liver bed as needed, clear fat and connective tissue so only two structures (cystic duct and artery) enter the gallbladder, and positively identify the cystic artery. If ambiguity remains, further dissection or adjuncts (e.g., intraoperative cholangiography) should be used. Clipping in an inadequately exposed field risks misidentification and major bile duct injury.

Q2: What immediate intraoperative maneuvers should the team perform to optimize visualization and allow safe continuation of gallbladder dissection?

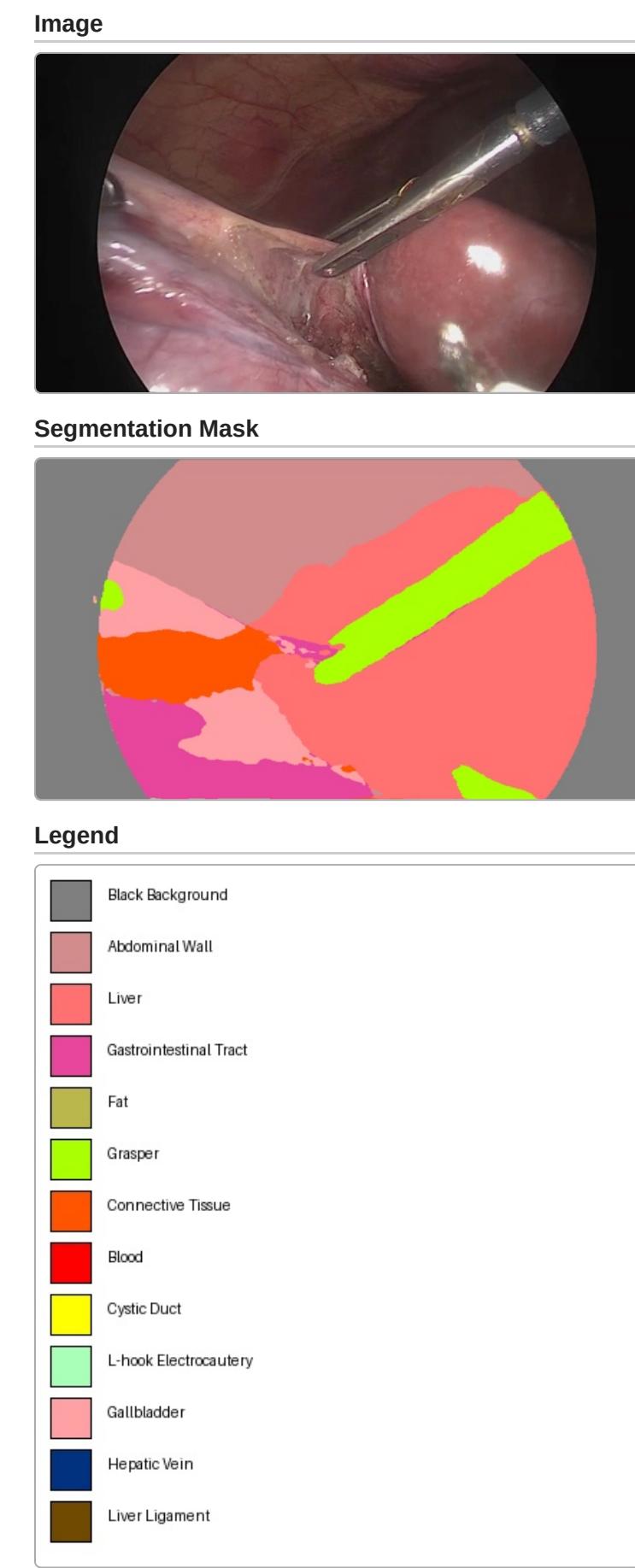
A2: First, introduceatraumatic retraction of the gallbladder to apply controlled tension (usually cephalad and lateral on the infundibulum) to open the triangle. Simultaneously use a dissecting instrument (hook or blunt dissector) to sweep away connective tissue and fat from the triangle while keeping traction. Use suction/irrigation to clear any fluid or small blood that obscures the view and to remove smoke when energy is used. Progressive, layered dissection with small bites and frequent reassessment of anatomy should continue until the cystic duct and artery are clearly delineated and the critical view is achieved. Note that in the current frame there are no active instruments — these introductions must be deliberate and coordinated.

Concise (\$0.0006)

No instruments are visible and there are no active maneuvers. In the gallbladder dissection phase, the gallbladder sits right/center-top adjacent to the liver and cystic duct. Connective tissue and fat are present to the right/center, with the abdominal wall to the left-top and the gastrointestinal tract near the center-top.

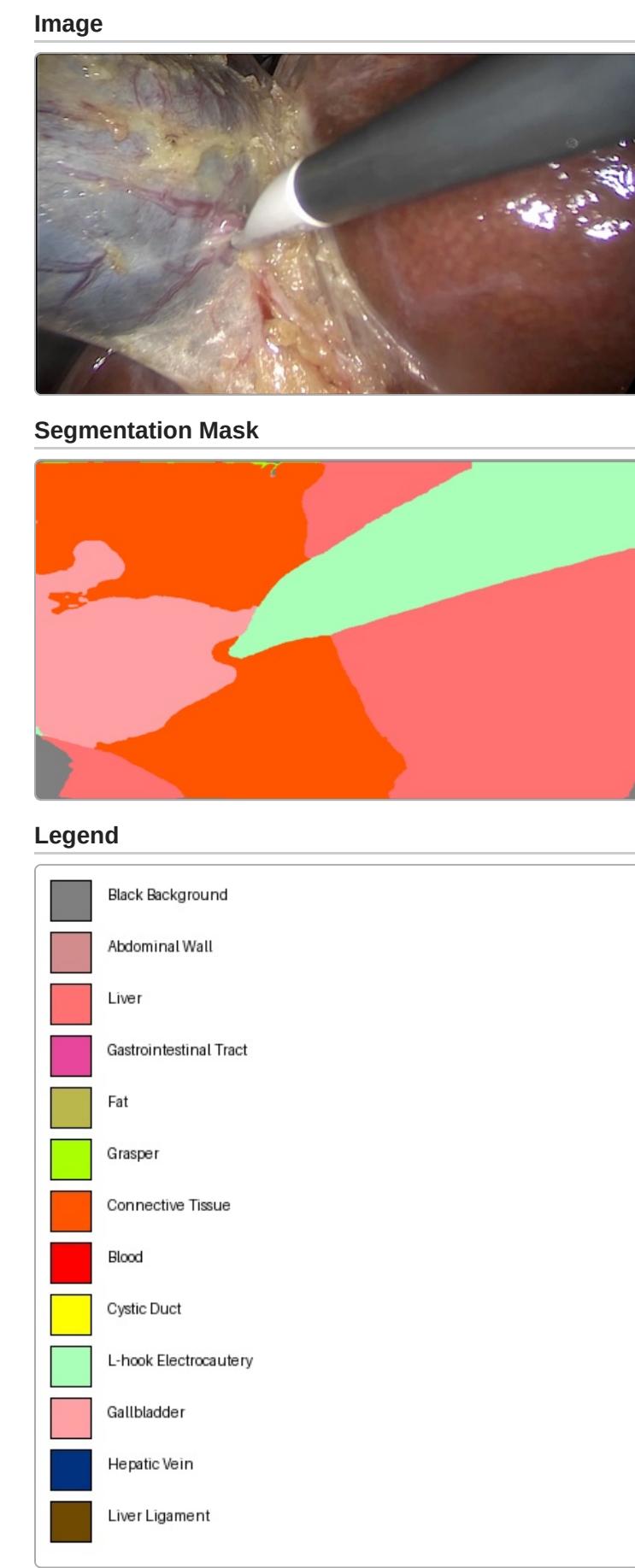
Detailed (\$0.0008)

The view is a static operative field focused on the gallbladder region during gallbladder dissection. The gallbladder sits at the upper-central to right portion of the image, lying directly over and slightly above the liver which occupies the central background. The cystic duct is visible near the superior aspect of the liver, adjacent to the gallbladder on the right-upper side. Connective tissue is concentrated to the center-right and upper center, and fatty tissue is present toward the right-upper quadrant of the field. The abdominal wall appears along the left-upper margin; portions of the gastrointestinal tract are seen near the central top. No instruments are visible in the frame and no active instrument actions are occurring at this moment.



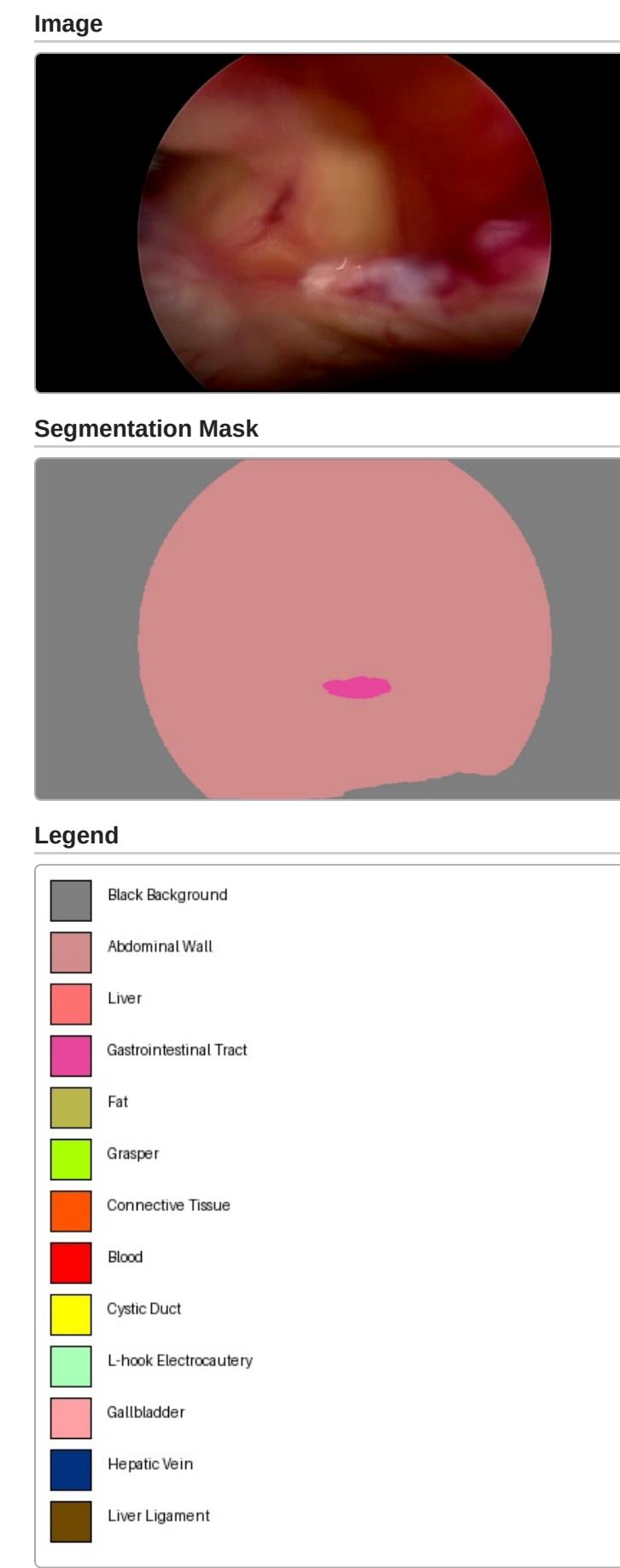
Context (LLM Input)
<p>Visible instruments: Grasper.</p> <p>Current phase: Gallbladder Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder) - (Grasper, Retract, Liver)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: top. - Liver: right. - Gastrointestinal Tract: left-bottom. - Grasper: right. - Connective Tissue: left-bottom. - L-hook Electrocautery: left-bottom. - Gallbladder: left.</p> <p>Relative Positions: - Abdominal Wall is towards the top of L-hook Electrocautery. - Liver is to the right of L-hook Electrocautery. - Gastrointestinal Tract is to the left of Grasper. - Grasper is to the right of Connective Tissue. - Connective Tissue is to the left of Liver. - L-hook Electrocautery is toward the bottom of Connective Tissue. - Gallbladder is to the left of Grasper.</p>

Conversational-1 (10 Qs) (\$0.0018)	Conversational-2 (7 Qs) (\$0.0020)	Complex Reasoning (2 Qs) (\$0.0027)	Concise (\$0.0006)
<p>Q1: What instrument is visible in this frame? A1: A grasper is visible.</p> <p>Q2: Where is the grasper located in the view? A2: The grasper is on the right side of the image.</p> <p>Q3: What is the grasper doing to the gallbladder? A3: The grasper is retracting the gallbladder.</p> <p>Q4: What is the grasper doing to the liver? A4: The grasper is retracting the liver.</p> <p>Q5: Where is the gallbladder located in the operative field? A5: The gallbladder is in the left-central portion of the view.</p> <p>Q6: Where is the liver located in the image? A6: The liver is on the right side of the field.</p> <p>Q7: Where is the abdominal wall visible? A7: The abdominal wall is visible at the top of the image.</p> <p>Q8: Where is the connective tissue located? A8: Connective tissue is toward the lower-left portion of the view.</p> <p>Q9: Where is the gastrointestinal tract located? A9: The gastrointestinal tract appears at the lower-left of the image.</p> <p>Q10: Is a hook electrocautery visible in this frame? A10: No. The hook electrocautery is not visible.</p>	<p>Q1: What instrument is visible in this frame? A1: A single grasper is visible.</p> <p>Q2: What phase of the operation is depicted in this image? A2: This image shows the gallbladder dissection phase.</p> <p>Q3: Which structures is the grasper actively retracting in this view? A3: The grasper is retracting the gallbladder and also providing retraction of the liver.</p> <p>Q4: Where is the gallbladder located relative to the grasper and the liver in the field of view? A4: The gallbladder lies to the left of the grasper and occupies the left/central portion of the field, while the liver is on the right side of the field.</p> <p>Q5: Is any electrocautery hook visible in the frame? A5: No — there is no electrocautery hook visible; only the grasper is seen.</p> <p>Q6: What tissues are visible in the lower-left region of the image? A6: The lower-left region contains connective tissue and portions of the gastrointestinal tract.</p> <p>Q7: Is the grasper positioned closer to the liver or to the gastrointestinal tract? A7: The grasper is positioned closer to the liver on the right side of the field; the gastrointestinal tract lies to the left and inferior relative to the grasper.</p>	<p>Q1: Given that the grasper is actively retracting both the gallbladder and adjacent liver while an electrocautery device is present but not being used, what is the most appropriate immediate next-step strategy to safely continue detaching the gallbladder from the liver bed? A1: The grasper is providing traction to expose the gallbladder-liver interface; with the cautery device available but idle, the safest next step is to proceed with controlled, incremental dissection along the gallbladder liver bed using short, low-power applications of electrocautery only to focal bleeding points or tissue attachments while maintaining gentle countertraction. Practically this means: maintain steady retraction to tension the plane, activate the electrocautery in brief bursts to divide adhesions or coagulate small vessels, and advance the dissection with alternating traction and division rather than blunt, forceful pulls. This approach minimizes tearing of the hepatic capsule and limits thermal spread into the liver parenchyma because energy applications are targeted and intermittent while the grasper keeps tissue oriented for safe visualization.</p> <p>Q2: What specific complications are most likely if the surgeon continues to apply strong upward traction on the gallbladder during detachment from the liver bed without using the energy instrument to control small bleeders? A2: Sustained strong traction without controlled division/coagulation increases the risk of two key problems: (1) mechanical avulsion of liver capsule or small bridging vessels leading to brisk or diffuse bleeding from the liver bed, and (2) tearing of the gallbladder wall causing bile spillage. Both worsen visualization and make precise dissection more difficult. Because no energy is being applied to seal vessels, bleeding may be harder to control laparoscopically and could necessitate prolonged attempts at hemostasis or conversion to alternative measures. The grasper's role as the only active tool means traction must be modulated to avoid these mechanical injuries until the electrocautery is used judiciously.</p>	<p>Phase: Gallbladder dissection. A single grasper on the right is actively retracting the gallbladder (located to the left) and retracting the liver to facilitate the dissection.</p> <p>Detailed (\$0.0010)</p> <p>Laparoscopic view focused on the gallbladder bed during gallbladder dissection. The gallbladder lies toward the left side of the field and is being actively held and retracted by a grasper positioned to the right of the organ. The grasper applies upward/anteriorlateral traction on the gallbladder and also provides retraction of adjacent liver tissue to improve exposure of the dissection plane. The liver occupies the right side/background of the image. The abdominal wall is seen superiorly. Lower and left portions of the frame contain connective/visceral tissue consistent with the gastrointestinal tract and surrounding fat. No other instruments are visible; the grasper is the only instrument actively manipulating tissue in this view.</p>



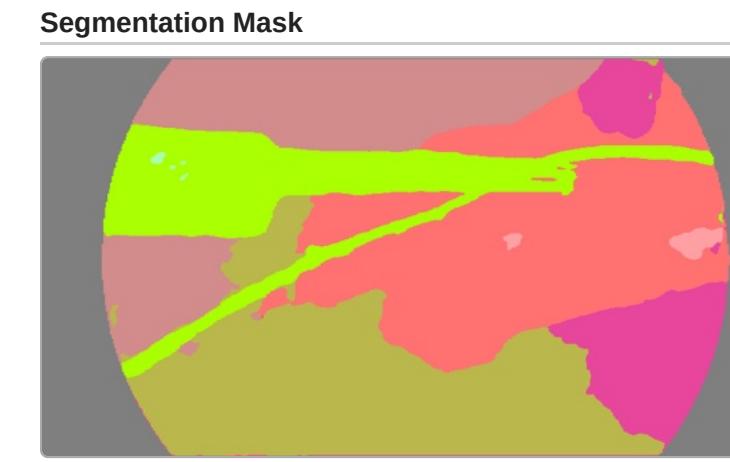
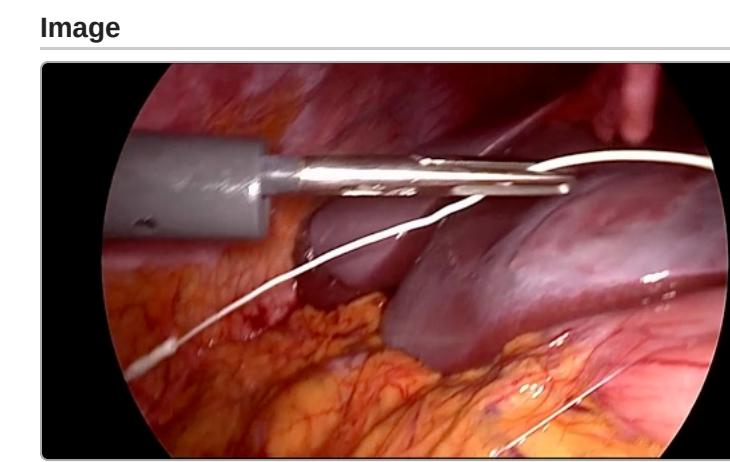
Context (LLM Input)
<p>Visible instruments: Hook.</p> <p>Current phase: Gallbladder Dissection</p> <p>Current action triplets (tool, verb, target): - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: center-top. - Liver: right. - Grasper: left-top. - Connective Tissue: left. - L-hook Electrocautery: right-top, left-bottom. - Gallbladder: left.</p> <p>Relative Positions: - Abdominal Wall is to the left of Liver. - Liver is to the right of Gallbladder. - Grasper is to the left of Liver. - Connective Tissue is to the left of Liver. - L-hook Electrocautery is to the right of Gallbladder. - Gallbladder is toward the bottom of Grasper.</p>

Conversational-1 (9 Qs) (\$0.0019)	Conversational-2 (7 Qs) (\$0.0015)	Complex Reasoning (2 Qs) (\$0.0025)	Concise (\$0.0006)
<p>Q1: Is a hook electrocautery instrument visible in this frame? A1: Yes. A hook electrocautery is visible.</p> <p>Q2: Is a grasper visible in this frame? A2: No. A grasper is not visible.</p> <p>Q3: What is the hook doing in this view? A3: The hook is dissecting the gallbladder.</p> <p>Q4: Is the hook positioned to the right of the gallbladder? A4: Yes. The hook is to the right of the gallbladder.</p> <p>Q5: Where is the gallbladder located in the operative view? A5: The gallbladder is on the left side of the field.</p> <p>Q6: Where is the liver located in the operative view? A6: The liver is on the right side of the field.</p> <p>Q7: Where is the abdominal wall visible in this image? A7: The abdominal wall appears at the center-top of the view.</p> <p>Q8: Where is connective tissue visible in the frame? A8: Connective tissue is visible on the left side of the view.</p> <p>Q9: Is the tip of the hook contacting the gallbladder surface? A9: Yes. The hook tip is contacting and dissecting along the gallbladder surface.</p>	<p>Q1: Which instrument is visible and actively dissecting tissue in this frame, and what is its target? A1: I see a hook electrocautery instrument that is actively dissecting the gallbladder.</p> <p>Q2: Is any grasper visible holding or retracting the gallbladder in this image? A2: No — only the hook is visible; there is no grasper present in this frame to hold or retract the gallbladder.</p> <p>Q3: Where is the hook located relative to the gallbladder and the liver in the operative field? A3: The hook is positioned to the right of the gallbladder and lies to the left of the liver from this viewpoint.</p> <p>Q4: What surgical phase is shown, and which structure is being dissected during this phase? A4: This view is during the gallbladder dissection phase, and the gallbladder itself is being dissected.</p> <p>Q5: Where is the abdominal wall visible in relation to the operative field? A5: The abdominal wall is visible toward the top-central portion of the image.</p> <p>Q6: Is there any obvious bleeding or hematoma visible in this frame? A6: No obvious blood or active bleeding is visible in this image.</p> <p>Q7: Describe the overall spatial relationship among the gallbladder, hook, and liver as seen here. A7: The gallbladder sits centrally-left in the field, the hook is immediately to its right and engaging it, and the liver is located to the right of both the gallbladder and the hook.</p>	<p>Q1: Given the hook is actively dissecting the gallbladder while a grasper is present but not actively manipulating tissue, what is the immediate surgical goal at this point in gallbladder dissection and how should the team orient their next maneuvers to achieve it safely? A1: The immediate goal is to complete safe separation of the gallbladder from the liver bed along the correct tissue plane while maintaining a clear operative field and avoiding injury to the liver capsule or gallbladder wall. To achieve this safely, the surgeon should: continue controlled, short bursts of the electrocautery hook directed along the plane between gallbladder and liver; maintain steady countertraction with the grasper (reposition it if necessary to provide optimal cephalad or lateral tension on the gallbladder); keep the hook tip oriented parallel to the liver surface to avoid plunging into the hepatic parenchyma; and proceed in small incremental sweeps from fundus toward infundibulum (or vice versa depending on exposure) so that tissue is divided under tension and the plane is visualized at all times. The grasper should be actively used for countertraction rather than remaining idle to expose tissue planes and reduce the risk of inadvertent deep thermal injury.</p> <p>Q2: What are the most likely bleeding sources during this stage and what stepwise management should be anticipated if minor oozing is encountered? A2: At this stage, minor bleeding typically arises from small vessels in the liver bed or from tiny branches adherent to the gallbladder serosa after electrocautery division. Stepwise management: first, clear the field with suction and irrigation to identify the bleeding point; apply gentle pressure with the grasper or a swab to tamponade oozing; use brief, targeted coagulation with the hook (short activations, low power) directed onto the bleeding point while avoiding prolonged contact to reduce thermal spread; if bleeding persists, switch to bipolar coagulation or apply a topical hemostatic agent (gelatin, thrombin-based products) to the area; for more significant persistent bleeding, consider direct suturing or clips to the vessel and convert exposure by retraction or additional ports if needed. Throughout, maintain clear visualization—failing to control oozing promptly will obscure anatomy and increase the risk of deeper injury.</p>	<p>A hook electrocautery is actively dissecting the gallbladder. The gallbladder lies left of the field with the liver to the right and connective tissue adjacent. The abdominal wall is visible superiorly.</p> <p>Detailed (\$0.0011)</p> <p>The image is a laparoscopic close-up of the gallbladder region during gallbladder dissection. The gallbladder occupies the left/central portion of the field, with the liver forming the right/background side. The L-hook electrocautery is positioned to the right of the gallbladder and is actively dissecting the gallbladder (working on the gallbladder wall/attachment to create a dissection plane). The abdominal wall/peritoneal surface is visible at the center-top of the image. Connective tissue is present adjacent to the liver on the left side of the liver. No other instruments are engaged in this view; the hook is the sole active instrument.</p>



Context (LLM Input)
<p>Visible instruments: No instruments are visible.</p> <p>Current phase: Cleaning Coagulation</p> <p>Current action triplets (tool, verb, target): No actions are taking place.</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: [x_min: 16, y_min: 0, x_max: 85, y_max: 99] - Gastrointestinal Tract: right-bottom.</p> <p>Relative Positions: - Abdominal Wall is towards the top of Gastrointestinal Tract.</p>

Conversational-1 (6 Qs) (\$0.0016)	Conversational-2 (9 Qs) (\$0.0013)	Complex Reasoning (2 Qs) (\$0.0025)	Concise (\$0.0006)
<p>Q1: Are any surgical instruments visible in this image? A1: No. There are no surgical instruments visible in the frame.</p> <p>Q2: Where is the abdominal wall located in this view? A2: The abdominal wall is visible across the upper portion of the image.</p> <p>Q3: Is the gastrointestinal tract visible in this image? A3: Yes. The gastrointestinal tract is visible.</p> <p>Q4: Where is the gastrointestinal tract located in the frame? A4: The gastrointestinal tract is located in the lower-right portion of the view.</p> <p>Q5: What is the spatial relationship between the abdominal wall and the gastrointestinal tract? A5: The abdominal wall lies above the gastrointestinal tract.</p> <p>Q6: Is there any visible blood in the operative field? A6: No obvious blood is visible in the field.</p>	<p>Q1: Are any surgical instruments visible in this frame? A1: No — there are no instruments visible in this frame.</p> <p>Q2: What operative phase is depicted in this image? A2: This image corresponds to the cleaning coagulation phase.</p> <p>Q3: Which anatomical structures can be clearly seen? A3: The abdominal wall is visible toward the top of the image, and a portion of the gastrointestinal tract is visible in the right-lower region.</p> <p>Q4: Where is the abdominal wall located within the frame? A4: The abdominal wall occupies the upper portion of the frame, spanning across the top area.</p> <p>Q5: Where is the gastrointestinal tract located relative to the abdominal wall? A5: The gastrointestinal tract is inferior and to the right of the abdominal wall (right-bottom of the image).</p> <p>Q6: Are any surgical actions taking place in this frame? A6: No — there are no actions occurring; no tools are engaging tissue in this view.</p> <p>Q7: Is the gallbladder visible in this image? A7: No — the gallbladder is not visible in this frame.</p> <p>Q8: Is any electrocautery device or active cautery visible? A8: No electrocautery device or visible active cautery is present in this frame.</p> <p>Q9: Is there evidence of bleeding or blood collection visible here? A9: No visible blood or bleeding is apparent in this image.</p>	<p>Q1: With no instruments visible while the case is labeled "Cleaning Coagulation," what does this pause most likely represent and what immediate checks should the team perform before reintroducing instruments or resuming dissection? A1: A visible absence of instruments during a "Cleaning Coagulation" moment most commonly reflects a brief pause to assess the field after applying energy — the surgeon is checking that hemostasis is adequate and the view is clear. Immediate checks should include: confirm there is no ongoing active bleeding (look for pulsatile or expanding hematoma), visually inspect the exposed tissues for signs of thermal injury or serosal compromise, clear blood and debris so anatomy is visible, and ensure pneumoperitoneum and camera optics are stable. Because no instrument is currently active, reintroduction of instruments should be delayed until the field is clean and any oozing is controlled to avoid obscured visualization and inadvertent instrument contact with obscured tissue.</p> <p>Q2: Given that the gastrointestinal tract is adjacent in the lower/right portion of the field, what specific hazard does coagulation pose here and what intraoperative behaviors minimize that hazard? A2: When bowel lies close to the coagulation zone, the principal hazard is unintended thermal injury to the bowel serosa or wall from direct contact or heat spread. To minimize this risk the team should limit energy application time and intensity, direct energy away from the bowel, avoid sweeping or broad coagulation strokes that include the bowel surface, and wait to reassess the area after brief bursts rather than prolonged activation. Maintaining a clear field so distance between the energized area and the bowel is visible is essential; if uncertainty remains, irrigate and inspect the bowel surface for blanching, bubbling, or perforation before continuing.</p>	<p>No instruments are visible. The field is occupied mainly by the abdominal wall with the gastrointestinal tract appearing in the lower-right. No surgical actions are taking place.</p> <p>Detailed (\$0.0006)</p> <p>The laparoscopic view shows no instruments in the field and no active tissue manipulation. The abdominal wall occupies the upper portion of the image, while gastrointestinal structures (bowel) lie in the lower-right quadrant. There is no visible bleeding or device interaction; the scene appears static with no current coagulation or instrument activity.</p>



Context (LLM Input)

Visible instruments:
Grasper.

Current phase:
Gallbladder Retraction

Current action triplets (tool, verb, target):
- (Grasper, Grasp, Specimen Bag)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: top.
- Liver: right.
- Gastrointestinal Tract: right-bottom.
- Fat: bottom.
- Grasper: top.
- Blood: center-left.
- L-hook Electrocautery: left-top.
- Gallbladder: right-top, center-right.

Relative Positions:
- Abdominal Wall is to the left of Gallbladder.
- Liver is to the right of Blood.
- Gastrointestinal Tract is to the right of Blood.
- Fat is to the left of Gallbladder.
- Grasper is to the left of Gallbladder.
- Blood is toward the bottom of Abdominal Wall.
- L-hook Electrocautery is towards the top of Fat.
- Gallbladder is to the right of Liver.

Conversational-1 (10 Qs) (\$0.0017)

- Q1: Is a grasper visible in this frame?**
A1: Yes. A grasper is visible.
- Q2: Where is the grasper located in the view?**
A2: The grasper is located at the top of the operative field.
- Q3: What is the grasper holding?**
A3: The grasper is holding a specimen bag.
- Q4: Is the gallbladder visible in this image?**
A4: Yes. The gallbladder is visible.
- Q5: Where is the gallbladder located in the view?**
A5: The gallbladder is in the right-upper central area of the field.
- Q6: Is there blood visible in this frame?**
A6: Yes. There is blood visible.
- Q7: Where is the blood located in the view?**
A7: The blood is located toward the center-left of the field.
- Q8: Is the liver visible in this image?**
A8: Yes. The liver is visible.
- Q9: Where is the liver located in the view?**
A9: The liver is on the right side of the operative field.
- Q10: Is an L-hook electrocautery visible in this frame?**
A10: No. An L-hook electrocautery is not visible.

Conversational-2 (9 Qs) (\$0.0020)

- Q1: Which instrument is visible in this frame?**
A1: A single grasper is visible.
- Q2: What procedural phase is shown in this image?**
A2: This image shows the gallbladder retraction phase.
- Q3: What is the grasper holding?**
A3: The grasper is holding a specimen bag.
- Q4: Where is the grasper located relative to the gallbladder in the operative field?**
A4: The grasper is positioned toward the top of the frame and to the left of the gallbladder.
- Q5: Where is the gallbladder located within the image?**
A5: The gallbladder appears in the upper right/center-right portion of the field.
- Q6: Is any electrocautery (hook) visible in this frame?**
A6: No. Only the grasper is visible; no hook electrocautery is seen.
- Q7: Is blood visible in the operative field, and if so where?**
A7: Yes. A region of blood is visible in the central-left portion of the image.
- Q8: Which anatomical structure is closest to the specimen bag being grasped?**
A8: The specimen bag is adjacent to the gallbladder in the upper right region of the field.
- Q9: Are there other noticeable tissues adjacent to the gallbladder in this view?**
A9: Yes. Fatty tissue is visible beneath the gallbladder, and the liver is seen on the right side of the field.

Complex Reasoning (2 Qs) (\$0.0021)

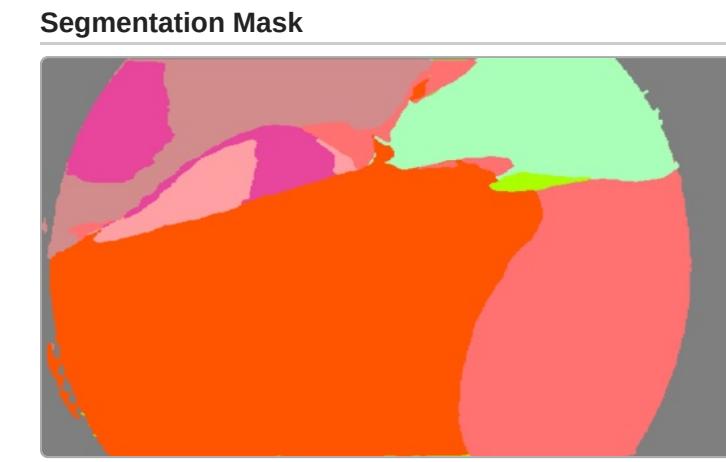
- Q1: Given that the grasper is actively holding a specimen retrieval bag around the gallbladder while the energy hook is present but not cutting, what is the likely immediate operative goal and why is use of a retrieval bag important now?**
A1: The immediate goal is extraction of the gallbladder from the abdominal cavity while containing its contents. The grasper's engagement with the specimen bag indicates the gallbladder has been placed in the bag and is being retracted toward a port for removal. Using a retrieval bag at this stage prevents bile, infected material, or spilled stones from contaminating the peritoneal cavity or the port site if the gallbladder wall is thin or perforated. It also facilitates controlled traction along the axis of the port during withdrawal so that the specimen is removed intact and minimizes the risk of port-site seeding or wound infection.
- Q2: There is a small area of blood visible away from the gallbladder while the bag is being held for extraction. Before withdrawing the bag and specimen, what steps should be taken and how do the instrument positions influence those steps?**
A2: Before extraction, any active bleeding or oozing should be controlled to maintain a clear field and reduce risk of postoperative hematoma or obscured bleeding. With the grasper occupied holding the bag, the surgeon should: (1) ensure the electrocautery hook is inactive and withdrawn or safely parked to avoid inadvertent thermal injury during manipulation; (2) use suction to clear the visible blood and inspect the liver bed and surrounding tissues for the bleeding source; (3) apply targeted hemostasis (bipolar coagulation or additional clips/energy) if a bleeding point is identified; and (4) irrigate and re-suction to confirm a dry field. The grasper's continued traction on the bag should be coordinated so it does not obscure the bleeding site while hemostasis is achieved.

Concise (\$0.0006)

A single grasper is active, firmly holding a specimen bag. The gallbladder lies in the right-upper central field near the liver. The abdominal wall is superior, fat tissue inferior, and blood is present center-left.

Detailed (\$0.0012)

The view is focused on the right-upper abdominal quadrant where the gallbladder lies toward the right and upper center of the image. A single laparoscopic grasper is visible entering from the upper field on the left side of the gallbladder; it is actively holding a specimen retrieval bag that contains the gallbladder and is providing upward/central retraction to tension the specimen. The liver occupies the right background, with fatty tissue and portions of the gastrointestinal tract seen in the lower field. A small amount of blood is present toward the center-left of the view. No other instruments are actively engaged in this frame.



Context (LLM Input)

Visible instruments:
Grasper, Hook.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Cystic Plate)
- (Grasper, Retract, Gallbladder)
- (Hook, Dissect, Gallbladder)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:
- Abdominal Wall: left-top.
- Liver: right.
- Gastrointestinal Tract: left-top.
- Fat: center-top.
- Grasper: right-top.
- Connective Tissue: left.
- L-hook Electrocautery: right-top, center-top.
- Gallbladder: left-top.

Relative Positions:

- Abdominal Wall is to the left of Liver.
- Liver is to the right of Gastrointestinal Tract.
- Gastrointestinal Tract is to the left of L-hook Electrocautery.
- Fat is towards the top of Connective Tissue.
- Grasper is to the right of Abdominal Wall.
- Connective Tissue is to the left of L-hook Electrocautery.
- L-hook Electrocautery is to the right of Gallbladder.
- Gallbladder is to the left of Liver.

Conversational-1 (10 Qs) (\$0.0020)

Q1: Is the grasper visible in this frame?
A1: Yes. The grasper is visible.

Q2: Where is the grasper located in the view?
A2: The grasper is at the right-upper portion of the field.

Q3: What is the grasper doing in this image?
A3: The grasper is retracting tissue (gallbladder and cystic plate).

Q4: Is the hook electrocautery visible in this frame?
A4: Yes. The hook electrocautery is visible.

Q5: Where is the hook electrocautery located?
A5: The hook is positioned to the right of center and toward the top of the view.

Q6: What is the hook doing in this image?
A6: The hook is dissecting the gallbladder.

Q7: Where is the gallbladder located in the operative view?
A7: The gallbladder is in the upper-left portion of the field.

Q8: Where is the liver located in this view?
A8: The liver is on the right side of the operative field.

Q9: Where is connective tissue seen in the image?
A9: Connective tissue is visible on the left side of the field.

Q10: Where is fatty tissue located in the view?
A10: Fatty tissue is toward the center-top of the image.

Conversational-2 (9 Qs) (\$0.0019)

Q1: What instruments are visible in this image and where are they located within the field?
A1: A single grasper and an L-hook electrocautery are visible. Both instruments are located on the right/top portion of the field relative to the image, while the gallbladder sits toward the left/top.

Q2: What procedural phase is depicted in this frame?
A2: This frame is during the gallbladder dissection phase.

Q3: Which structure(s) is the grasper holding or retracting?
A3: The grasper is retracting the gallbladder and also providing traction on the cystic plate.

Q4: What target is the hook electrocautery working on in this view?
A4: The hook electrocautery is dissecting the gallbladder; it is positioned to the right of the gallbladder and engaged with its tissue.

Q5: How is the liver positioned relative to the gallbladder in the image?
A5: The liver is to the right of the gallbladder and occupies the right side of the operative field.

Q6: Are both instruments approaching the gallbladder from the same side?
A6: Yes. Both the grasper and the hook are positioned on the right side of the image and are directed toward the gallbladder on the left/top.

Q7: Where is fatty tissue located relative to the gallbladder and instruments?
A7: Fatty tissue appears in the central/top region of the field, near the gallbladder and between the instruments and some surrounding connective tissue.

Q8: Is connective tissue visible near the dissection area, and if so, where?
A8: Yes. Connective tissue is visible toward the left side of the field, adjacent to the gallbladder and near the area being retracted and dissected.

Q9: Is the grasper positioned more superior or inferior compared with the gallbladder in the frame?
A9: The grasper is positioned slightly more to the right/top of the field, effectively superior relative to the gallbladder, which is left/top but slightly inferior to the grasper's tip.

Complex Reasoning (3 Qs) (\$0.0022)

Q1: Given the instruments and their current actions, what is the immediate technical goal of the surgeon in this moment of gallbladder dissection?
A1: The grasper is providing sustained traction on the cystic plate and the gallbladder while the electrocautery hook is actively dissecting the gallbladder. Together this indicates the immediate goal is controlled separation of the gallbladder from the liver bed by maintaining countertraction and progressively dividing attachments. Retraction tensions the tissue to define the dissection plane, and the hook is used to sweep along that plane to free the gallbladder without tearing the wall or plunging into liver parenchyma.

Q2: How should the hook be used here to reduce the risk of thermal or parenchymal injury, given its position relative to the gallbladder?
A2: Because the hook is working on the side of the gallbladder opposite the retractor, it should be used with short, low-energy bursts and shallow sweeping motions parallel to the gallbladder surface rather than long, deep strokes. The surgeon should keep the hook tip moving along the plane between gallbladder and liver, avoid prolonged activation in one spot, and orient the hook so energy is delivered to the connective/fibrofatty attachments rather than driven into the liver parenchyma. Continuous gentle countertraction from the grasper helps expose the correct plane and minimizes the need for forceful or deep coagulation.

Q3: What immediate intraoperative sign visible in this configuration would most strongly suggest that the gallbladder wall is at risk of perforation, and what should be done first if that sign appears?
A3: A sign would be sudden thinning or "popping" of the gallbladder wall under tension — for example, the wall ballooning or a visible defect where tissue tents and the hook approaches the mucosa. If this is seen, the first action is to stop energy activation, relieve traction slightly with the grasper to reduce tension, and apply gentle compression over the area to limit spillage. Then control any bile leakage with suction (or sponge) and consider converting to blunt dissection or repairing the defect rather than continuing sharp electrocautery through the weakened wall.

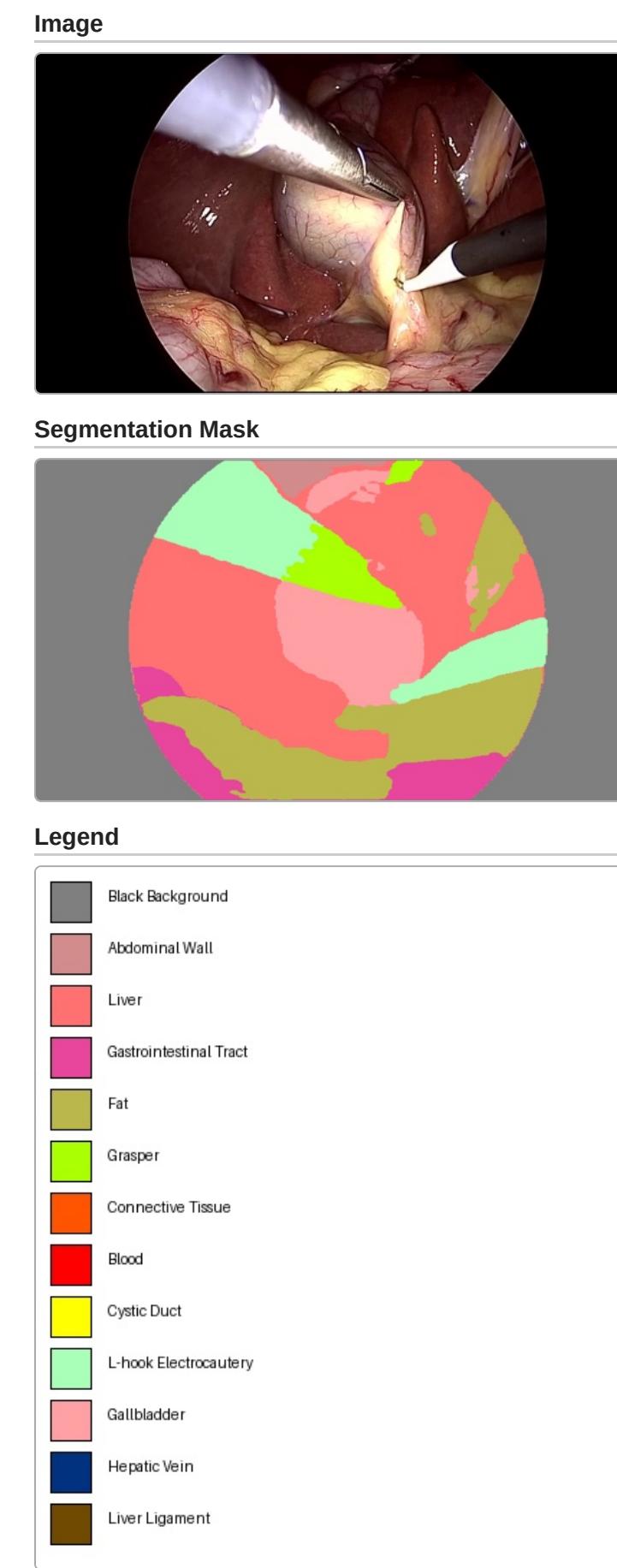
Concise (\$0.0007)

A grasper (right-top) actively retracts the gallbladder and cystic plate.
An L-hook electrocautery (center/right-top) is actively dissecting the gallbladder near its interface with the liver on the right.
Surrounding connective tissue and fat are visible.

Detailed (\$0.0010)

This laparoscopic view is focused on the gallbladder and its bed during gallbladder dissection. The gallbladder sits in the upper-left part of the field with the liver forming the background on the right. Fatty tissue lies toward the central-top, and connective tissue is present left of the working instruments. The abdominal wall and portions of the gastrointestinal tract are visible toward the upper-left perimeter.

A grasper is positioned in the upper-right region and is actively engaging the gallbladder and the adjacent cystic plate—applying sustained retraction to expose the dissection plane. An L-hook electrocautery is located to the right/center-top of the gallbladder and is actively dissecting the gallbladder from its hepatic bed. The grasper's retraction creates tension while the hook performs controlled dissection along the gallbladder margin to separate it from surrounding connective tissue.

**Context (LLM Input)**

Visible instruments:
Grasper, Hook.

Current phase:
Calot Triangle Dissection

Current action triplets (tool, verb, target):
- (Grasper, Grasp, Gallbladder)
- (Grasper, Retract, Gallbladder)
- (Hook, Null Verb, Null Target)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: center-top.
- Liver: right-top, right-bottom, center-left, center-right, center-top, left-top, left, left-bottom.
- Gastrointestinal Tract: bottom.
- Fat: bottom.
- Grasper: top.
- L-hook Electrocautery: left-top, center-right, center.
- Gallbladder: center.

Relative Positions:

- Abdominal Wall is towards the top of Gastrointestinal Tract.
- Liver is towards the top of Gastrointestinal Tract.
- Gastrointestinal Tract is toward the bottom of Grasper.
- Fat is toward the bottom of Abdominal Wall.
- Grasper is towards the top of Fat.
- L-hook Electrocautery is towards the top of Gastrointestinal Tract.
- Gallbladder is toward the bottom of Abdominal Wall.

Conversational-1 (10 Qs) (\$0.0020)

Q1: Is the grasper visible in this frame?

A1: Yes. The grasper is visible at the top of the image.

Q2: Is the hook visible in this frame?

A2: Yes. The hook is present near the center-right of the field.

Q3: Is the grasper contacting the gallbladder?

A3: Yes. The grasper is grasping the gallbladder.

Q4: Is the grasper retracting the gallbladder?

A4: Yes. The grasper is applying retraction to the gallbladder.

Q5: Where is the gallbladder located in the operative view?

A5: The gallbladder is centered in the frame.

Q6: Where is the liver located relative to the view?

A6: The liver occupies the right side and background of the view.

Q7: Where is fatty tissue visible in the image?

A7: Fatty tissue is visible in the lower portion of the field.

Q8: Is the hook actively dissecting tissue in this frame?

A8: No. The hook is present but not shown actively dissecting.

Q9: How many surgical instruments are visible?

A9: Two instruments are visible: a grasper and a hook.

Q10: Is the grasper positioned above the fatty tissue?

A10: Yes. The grasper is located toward the top of the fatty tissue.

Conversational-2 (8 Qs) (\$0.0018)

Q1: Which instruments are visible in this image and where are they located within the frame?

A1: I see a single grasper positioned toward the top of the frame and an L-hook electrocautery located slightly to the right-center of the image.

Q2: What is the grasper holding and in which direction is it retracting that structure?

A2: The grasper is grasping the gallbladder, retracting it upward/toward the top of the frame to provide exposure.

Q3: Is the hook electrocautery actively dissecting tissue in this view, and how can you tell?

A3: No. The hook is present near the operative field but is not currently engaged in a dissection action in this frame.

Q4: What major anatomical structures surround the gallbladder in this view, and where are they located relative to it?

A4: The liver lies to the right of the gallbladder, the abdominal wall is superior (top) to it, and gastrointestinal/fatty tissue are located inferiorly (toward the bottom) of the gallbladder.

Q5: During this phase (Calot triangle dissection), which instrument is providing exposure of the triangle and how?

A5: The grasper is providing exposure by retracting the gallbladder superiorly, which helps open the Calot triangle.

Q6: Are there any other instruments visible besides the grasper and the hook?

A6: No. Only the grasper and the L-hook electrocautery are visible in this image.

Q7: How are the grasper and hook positioned relative to each other around the gallbladder?

A7: The grasper is superior and centrally attached to the gallbladder, while the hook is positioned to the right-center of the gallbladder, adjacent but not actively contacting it.

Q8: Is there visible fatty tissue or bowel in the lower part of the image, and if so where?

A8: Yes. Fatty tissue and gastrointestinal structures are visible in the lower portion of the image, below the gallbladder.

Complex Reasoning (2 Qs) (\$0.0022)

Q1: Given that the grasper is actively retracting the gallbladder while the hook is present but not currently dissecting, what immediate check should the surgeon perform before re-engaging the hook to continue Calot triangle dissection?

A1: The surgeon should confirm that the retraction direction and tension are optimizing exposure of the infundibulum and Calot triangle and that no non-target tissue (fat or omentum) or liver surface lies in the intended diathermy path. Practically, this means momentarily adjusting traction to place the gallbladder under steady, clear tension (usually lateral and slightly cephalad), visually verifying that the hook's tip will contact only the intended adhesion or connective tissue, and ensuring the hook is electrically isolated from any metal or moist tissue that could transmit energy. Because the hook is idle in this frame, the surgeon has a window to reposition the grasper if needed so that intermittent short activations of the hook will divide only targeted attachments and avoid thermal spread to the adjacent liver bed or surrounding fat.

Q2: Based on the instruments' positions and the current phase, how close does the field appear to be to obtaining the critical view of safety, and what specific dissection steps remain to achieve it?

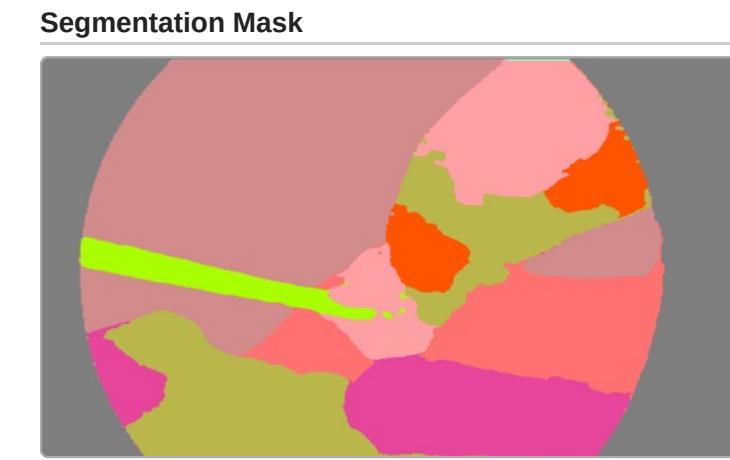
A2: The scene shows active traction of the gallbladder with the hook nearby but not dissecting, which is an appropriate stage for working toward the critical view. However, the critical view is not yet achieved: the surgeon still needs to clear the hepatocystic triangle of fat and connective tissue, free the lower part of the gallbladder from the liver bed so only two structures enter the gallbladder, and clearly identify the cystic duct and artery. Concretely, remaining steps are (1) use the hook (under controlled activation) to dissect and remove residual fat/adhesions around the infundibulum, (2) continue lateral/cephalad traction to tension the triangle, and (3) skeletonize the structures so two tubular structures are seen entering the gallbladder before any clipping or division.

Concise (\$0.0005)

A grasper at the top of the field is actively grasping and retracting the gallbladder in the central view. An L-hook electrocautery is present nearby but currently idle. The liver lies to the right, the abdominal wall is superior, and the gastrointestinal tract and surrounding fat are inferior.

Detailed (\$0.0010)

Central in the view is the gallbladder being firmly held and retracted by a grasper that enters from the upper part of the image — the grasper is actively grasping and pulling the gallbladder to expose the Calot triangle. The hook (L-hook electrocautery) is also visible, positioned near the gallbladder in the upper/central area but is not actively engaged at this moment. The liver forms much of the background surrounding the working area, while fatty tissue and portions of the gastrointestinal tract lie toward the lower field and the abdominal wall is seen superiorly. Overall, the grasper is providing traction and exposure (active), and the hook is present and poised but idle.



Context (LLM Input)

Visible instruments:
Grasper.

Current phase:
Preparation

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: left.
- Liver: right-bottom.
- Gastrointestinal Tract: bottom.
- Fat: right-top, center-left, center-top, center-bottom, left-bottom.
- Grasper: left-bottom.
- Connective Tissue: right-top.
- L-hook Electrocautery: right-top.
- Gallbladder: right.

Relative Positions:
- Abdominal Wall is to the left of L-hook Electrocautery.
- Liver is to the right of Grasper.
- Gastrointestinal Tract is toward the bottom of L-hook Electrocautery.
- Fat is toward the bottom of L-hook Electrocautery.
- Grasper is to the left of Connective Tissue.
- Connective Tissue is to the right of Abdominal Wall.
- L-hook Electrocautery is towards the top of Liver.
- Gallbladder is to the right of Grasper.

Conversational-1 (10 Qs) (\$0.0013)

- Q1: Is a grasper visible in this image?**
A1: Yes, a grasper is visible in the left-lower portion of the view.
- Q2: What structure is the grasper holding?**
A2: The grasper is holding the gallbladder.
- Q3: What is the grasper doing to the gallbladder?**
A3: The grasper is retracting the gallbladder.
- Q4: Where is the gallbladder located in the frame?**
A4: The gallbladder is on the right side of the view, toward the central-right area.
- Q5: Is an L-hook electrocautery visible in this image?**
A5: No, an L-hook electrocautery is not visibly present.
- Q6: Where is the liver located relative to the grasper?**
A6: The liver lies to the right and somewhat lower than the grasper.
- Q7: Is fatty tissue visible in the operative field?**
A7: Yes, fatty tissue is visible, mainly toward the right and lower areas.
- Q8: Where is the abdominal wall located in the image?**
A8: The abdominal wall is seen on the left side of the view.
- Q9: Are any other instruments besides the grasper visible?**
A9: No, no other instruments are visible in this frame.
- Q10: Where is connective tissue located relative to the grasper?**
A10: The connective tissue is to the right and toward the upper area relative to the grasper.

Conversational-2 (8 Qs) (\$0.0023)

- Q1: What instruments are visible in this frame?**
A1: A single grasper is visible in the operative field.
- Q2: What phase of the cholecystectomy is shown in this image?**
A2: This image corresponds to the Preparation phase.
- Q3: What action is the grasper performing right now?**
A3: The grasper is retracting the gallbladder.
- Q4: Where is the grasper located relative to the gallbladder in the image?**
A4: The grasper is in the lower-left portion of the view, and the gallbladder is on the right side; therefore the grasper is positioned to the left of the gallbladder.
- Q5: Which anatomical structures and tissues are visible and where are they located spatially?**
A5: The abdominal wall appears on the left side of the field; the liver is visible on the right and lower portion; the gastrointestinal tract is at the bottom; fatty tissue is present in multiple areas (including right-top and central regions); connective tissue is toward the right-top area; and the gallbladder is on the right.
- Q6: Is there any electrocautery or other instrument tip visible besides the grasper?**
A6: No. No electrocautery or other instrument tip is visible in this frame—only the grasper is seen.
- Q7: Is there visible active dissection by a second tool in this image?**
A7: No. Only retraction by the grasper is visible; no other tool is actively dissecting in this frame.
- Q8: Is there blood present in the operative field in this image?**
A8: No blood is visible in the operative field in this image.

Complex Reasoning (2 Qs) (\$0.0022)

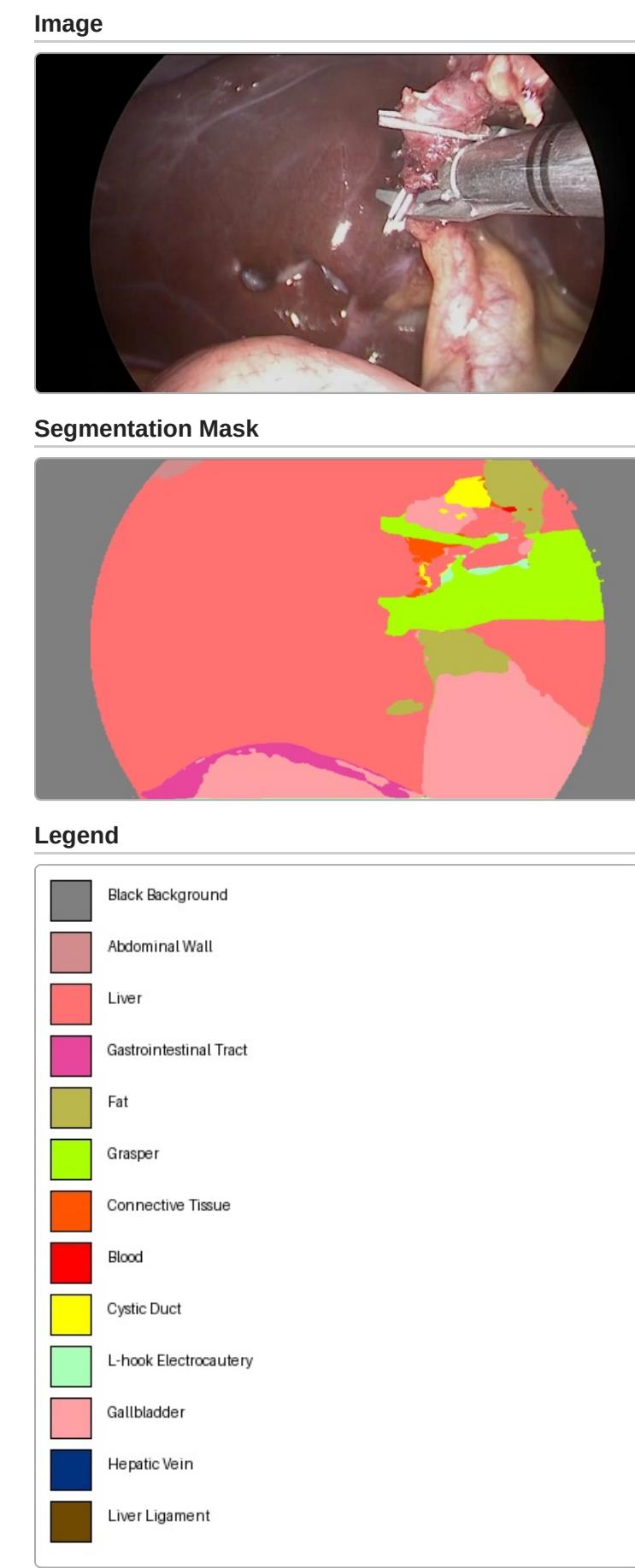
- Q1: Given the current preparation-phase posture with the gallbladder under grasper traction, what is the immediate surgical objective the team is accomplishing and why is this important for subsequent Calot triangle dissection?**
A1: The immediate objective is to create sustained, stable exposure of the gallbladder infundibulum and hepatocystic triangle by applying targeted traction. The grasper is actively retracting the gallbladder to tension the tissues and move adipose/connective layers away from the intended dissection plane. This exposure is important because it stretches and separates tissue planes, reduces overlap of fatty tissue with critical structures, and provides a consistent working angle for any subsequent dissecting instrument, all of which are necessary to safely identify anatomy during the Calot triangle dissection that follows.
- Q2: How should the traction vector be adjusted now to optimize visualization of the cystic duct-cystic artery region for safe dissection and clipping later?**
A2: Traction should be directed to produce lateral and slight inferolateral (or lateral-caudal) pull on the gallbladder infundibulum while maintaining the fundus or body countertraction as needed. This opens the hepatocystic triangle by separating the gallbladder from the liver edge and flattens the infundibulum away from the liver, exposing the plane where the cystic duct and artery run. Small incremental adjustments—rather than forceful pulls—help define the plane without tearing the gallbladder wall. Because the grasper is the only active instrument visible, coordinating its orientation (rotate or translate tip) to lift and rotate the infundibulum will best expose the target structures for safe clipping.

Concise (\$0.0006)

A laparoscopic grasper at the left-bottom actively retracts the gallbladder located to the right. Surrounding liver, fatty and connective tissue, and the abdominal wall are visible as the field is prepared.

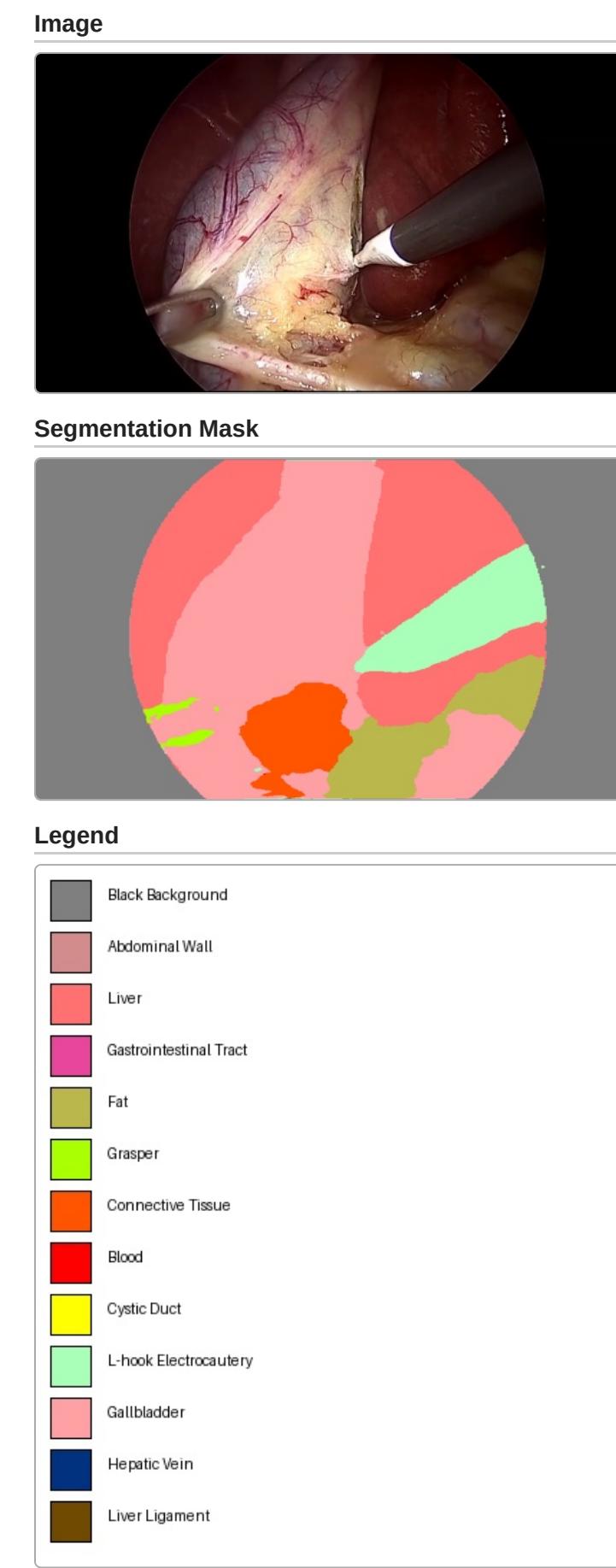
Detailed (\$0.0010)

During the preparation phase, the gallbladder sits on the right side of the field with the liver forming the deeper/right-background and gastrointestinal structures occupying the lower field. A single grasper enters from the lower-left and is actively holding and retracting the gallbladder toward the right to create tension and improve exposure. Surrounding fat is visible throughout the lower and central areas, and connective tissue lies toward the upper-right. The abdominal wall is visible on the left. No other instruments are present or engaged, and there is no obvious bleeding in this view.

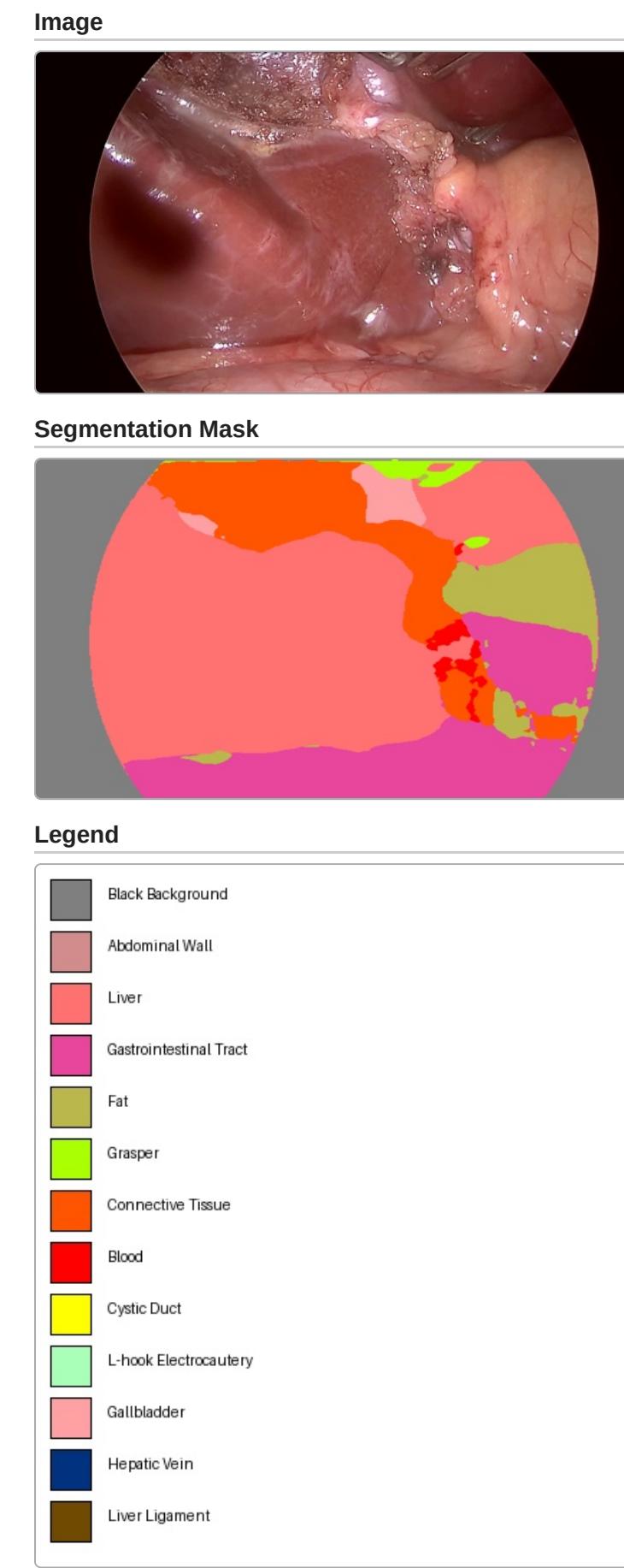


Context (LLM Input)
<p>Visible instruments: Clipper.</p> <p>Current phase: Clipping Cutting</p> <p>Current action triplets (tool, verb, target): - (Clipper, Clip, Cystic Duct)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left-top. - Liver: right-top, right-bottom, center-right, center-bottom, left-bottom. - Gastrointestinal Tract: left-bottom. - Fat: right. - Grasper: right-top. - Connective Tissue: right-top. - Blood: right-top. - Cystic Duct: right-top. - L-hook Electrocautery: right. - Gallbladder: right.</p> <p>Relative Positions: - Abdominal Wall is to the left of Gallbladder. - Liver is to the left of Blood. - Gastrointestinal Tract is toward the bottom of Blood. - Fat is to the right of Abdominal Wall. - Grasper is to the right of Abdominal Wall. - Connective Tissue is towards the top of Gastrointestinal Tract. - Blood is towards the top of Gallbladder. - Cystic Duct is towards the top of Gastrointestinal Tract. - L-hook Electrocautery is to the right of Abdominal Wall. - Gallbladder is toward the bottom of Cystic Duct.</p>

Conversational-1 (9 Qs) (\$0.0019)	Conversational-2 (9 Qs) (\$0.0014)	Complex Reasoning (2 Qs) (\$0.0033)	Concise (\$0.0005)
<p>Q1: Is the clipper visible in this frame? A1: Yes. The clipper is visible in the operative field at the right-top area.</p> <p>Q2: What is the clipper doing in this image? A2: The clipper is applying a clip to the cystic duct.</p> <p>Q3: Where is the cystic duct located in the view? A3: The cystic duct is located in the right-top portion of the field.</p> <p>Q4: Is the gallbladder visible in this frame? A4: Yes. The gallbladder is visible on the right side of the view.</p> <p>Q5: Where is the liver located in the image? A5: The liver occupies much of the right and lower portions of the background.</p> <p>Q6: Is there visible blood in the operative field? A6: Yes. Small amounts of blood are visible in the right-top region.</p> <p>Q7: Is a grasper visible in this frame? A7: No. Only the clipper is visible in this frame.</p> <p>Q8: Where is the abdominal wall located in the view? A8: The abdominal wall is visible toward the left-top of the image.</p> <p>Q9: Is fatty tissue visible in this frame? A9: Yes. Fatty tissue is present on the right side of the field.</p>	<p>Q1: Which instrument is visible in this frame? A1: A clipper is the only instrument visible.</p> <p>Q2: What operative phase is depicted in this image? A2: This image shows the clipping and cutting phase.</p> <p>Q3: Which structure is the clipper engaging in this view? A3: The clipper is applied to the cystic duct.</p> <p>Q4: Where is the cystic duct located relative to the gallbladder in the image? A4: The cystic duct is superior (toward the top/right) relative to the gallbladder, which lies below it.</p> <p>Q5: Is a grasper visible in the operative field? A5: No. Only the clipper is visible in this frame; a grasper is not seen.</p> <p>Q6: Is there any blood visible in the surgical field, and if so, where? A6: Yes. Blood is visible in the right-upper area adjacent to the gallbladder and cystic duct.</p> <p>Q7: Which major organ lies adjacent to the clipping site? A7: The liver is adjacent to the clipping site, occupying the right/central operative field near the cystic duct and gallbladder.</p> <p>Q8: How is the clipper positioned relative to the abdominal wall? A8: The clipper is positioned to the right of the abdominal wall, in the right-upper quadrant of the field where the cystic duct is located.</p> <p>Q9: Is gastrointestinal tract tissue visible in this frame? A9: No clear gastrointestinal tract structures are visible in the immediate clipping area; the visible anatomy centers on the liver, gallbladder, cystic duct, and adjacent fat/blood.</p>	<p>Q1: What immediate checks should the surgeon perform right after the device fires on the tubular structure to ensure it is safe to proceed to transection? A1: Right after the clipper has been actively applied to the tubular structure, the surgeon should visually and tactically confirm several things before cutting. First, verify that the clips are fully seated on soft tissue only and lie flush across the lumen (not skewed or partially off the structure). Second, ensure the clip placement pattern provides a secure seal: typically securing the hepatic-side stump with appropriate proximal clips and leaving a short stump on the gallbladder side; confirm no clip overlaps or includes adjacent tissue that could distort anatomy. Third, inspect the immediate field for any bleeding or bile emerging from the clamped stump—any persistent leak means the seal is incomplete and additional clips are needed. Finally, confirm the clipped structure is the intended conduit by its course toward the gallbladder and liver (i.e., that proximal anatomy consistent with the upstream bile conduit has been preserved). These checks are triggered by the fact that the clipper is the active tool in the image and any error at this step directly determines whether transection is safe.</p> <p>Q2: If the clip is placed too close to the junction with the hepatic biliary conduit, what patient-level complications are most likely to result and why? A2: Placing a clip too close to the junction with the biliary conduit leading to the liver risks partial or complete obstruction of that main conduit or inadvertent inclusion of that conduit within the clip. Clinically this can cause postoperative biliary obstruction with jaundice, cholestasis, retained stones, or bile stasis-related infection. Mechanistically, a misapplied clip narrows or occludes the lumen of the larger duct or damages its wall; additionally, a clip across the wrong structure can cause bile leak if the intended ductal continuity is disrupted. Because the clipper in the image is being used at the critical biliary junction, precise distance from the liver-side conduit must be respected to avoid these outcomes.</p>	<p>A clipper is actively applying a clip to the cystic duct. The gallbladder lies adjacent on the right with liver and surrounding connective/fatty tissue nearby. A small amount of blood is visible.</p> <p>Detailed (\$0.0011)</p> <p>This is a close-up laparoscopic view of the hepatocystic region during clipping and cutting. The gallbladder occupies the right-sided field with its cystic duct extending superiorly from the gallbladder; the clipper is introduced from the right and its jaws are engaged on the cystic duct, actively applying a surgical clip. The liver forms the background on the right, while the abdominal wall is visible toward the left/top of the image. Adjacent fat and connective tissue frame the operative window, and a small amount of blood is present near the working area. No other instruments are present or actively engaged in this frame.</p>



Context (LLM Input)	Conversational-1 (10 Qs) (\$0.0025)	Conversational-2 (10 Qs) (\$0.0015)	Complex Reasoning (2 Qs) (\$0.0024)	Concise (\$0.0007)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Grasp, Gallbladder) - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left. - Liver: right-top, left-top, right-bottom, left-bottom. - Gastrointestinal Tract: right-bottom. - Fat: right-bottom. - Grasper: left-bottom. - Connective Tissue: center-bottom. - Blood: center-bottom. - L-hook Electrocautery: right. - Gallbladder: right-bottom, left, center, center-bottom.</p> <p>Relative Positions: - Abdominal Wall is to the left of Gastrointestinal Tract. - Liver is to the left of Gastrointestinal Tract. - Gastrointestinal Tract is to the right of Gallbladder. - Fat is to the right of Abdominal Wall. - Grasper is to the left of L-hook Electrocautery. - Connective Tissue is to the left of L-hook Electrocautery. - Blood is to the left of L-hook Electrocautery. - L-hook Electrocautery is to the right of Abdominal Wall. - Gallbladder is to the left of L-hook Electrocautery.</p>	<p>Q1: Is the grasper visible in this image? A1: Yes. The grasper is visible at the left-bottom portion of the view.</p> <p>Q2: What is the grasper doing? A2: The grasper is grasping the gallbladder (providing retraction).</p> <p>Q3: Where is the hook electrocautery located? A3: The hook electrocautery is on the right side of the operative field.</p> <p>Q4: What is the hook doing? A4: The hook is dissecting the gallbladder.</p> <p>Q5: Where is the gallbladder located in the view? A5: The gallbladder occupies the central area of the field, slightly left of the right-side hook.</p> <p>Q6: Is there visible blood in the image? A6: Yes. A small amount of blood is visible in the center-bottom of the field.</p> <p>Q7: Is the gastrointestinal tract visible? A7: Yes. The gastrointestinal tract is visible at the right-bottom of the view.</p> <p>Q8: Where is the connective tissue located? A8: The connective tissue is located in the center-bottom region of the field.</p> <p>Q9: Where is the abdominal wall located? A9: The abdominal wall is visible on the left side of the view.</p> <p>Q10: Is the liver visible in this frame? A10: Yes. The liver appears as background tissue on the right side of the operative view.</p>	<p>Q1: Which instruments are visible in this frame and how many of each? A1: There is one grasper and one hook electrocautery visible.</p> <p>Q2: What phase of the cholecystectomy is shown in this image? A2: This image shows the Calot triangle dissection phase.</p> <p>Q3: Which tool is holding the gallbladder and what is it doing with it? A3: The grasper is holding the gallbladder and retracting it to provide exposure.</p> <p>Q4: Which tool is dissecting tissue and what is its target? A4: The hook electrocautery is dissecting the gallbladder (tissue adjacent to the gallbladder).</p> <p>Q5: Where is the grasper located relative to the hook electrocautery in the operative field? A5: The grasper is to the left of the hook electrocautery.</p> <p>Q6: Where is the gallbladder located relative to the hook electrocautery and the gastrointestinal tract? A6: The gallbladder is left of the hook electrocautery and left of the gastrointestinal tract, situated toward the center of the field.</p> <p>Q7: Is there any blood visible in the view, and if so where is it located relative to the hook? A7: Yes, blood is visible in the lower central portion of the field and is to the left of the hook electrocautery.</p> <p>Q8: Is connective tissue present near the operative site, and where is it located? A8: Yes. Connective tissue appears in the central lower area, adjacent to the gallbladder and lying left of the hook.</p> <p>Q9: Where is the abdominal wall visible in this image? A9: The abdominal wall is visible toward the left side of the image.</p> <p>Q10: Are any other instruments besides the grasper and hook present in the frame? A10: No other instruments are visible in this frame.</p>	<p>Q1: Given that one instrument is maintaining traction on the gallbladder while the other is actively dividing tissue, what precise tissue plane is the surgeon most likely attempting to develop now, and why is developing that plane crucial before any clipping or division? A1: With the grasper holding the gallbladder under tension and the electrocautery hook currently dissecting, the surgeon is most likely developing the plane between the gallbladder infundibulum/cystic structures and the surrounding connective/fatty tissue of Calot's triangle (i.e., clearing adhesions and peritoneal covering to expose the cystic duct and artery). Clearing this plane is crucial because it separates obscuring tissue so that the relevant tubular structures can be identified visually and mobilized. Only after that safe dissection and clear identification of the two structures entering the gallbladder (the critical view of safety) should definitive clipping and division be performed to avoid misidentifying and injuring the common bile duct or aberrant vessels.</p> <p>Q2: There is small bleeding/ooze visible near the dissection. If the surgeon continues electrocautery dissection without first addressing this, what complication is more likely and what immediate steps should be taken to mitigate it? A2: Continuing electrocautery while oozing is present increases the likelihood of obscured visualization, leading to inadvertent thermal or mechanical injury to non-target structures and propagation of bleeding. Immediate mitigation should include controlled suctioning to clear blood, gentle pressure or a bipolar/low-power coagulation to control the source of bleeding, and reassessment of the field. Only when hemostasis and a clear view are restored should fine dissection resume. This preserves the ability to identify critical anatomy and reduces the chance of escalating injury.</p>	<p>During Calot triangle dissection, a grasper on the left is firmly holding the gallbladder. A hook electrocautery to the right is actively dissecting the gallbladder toward the liver. Connective tissue and a small amount of blood are visible centrally/inferiorly.</p> <p>Detailed (\$0.0009)</p> <p>This is a Calot triangle dissection view focused on the gallbladder and surrounding tissues. The gallbladder occupies the central to lower portion of the field, extending slightly toward the left, with the liver forming the background. A grasper is positioned in the left-lower quadrant of the image and is actively holding and retracting the gallbladder to provide tension and exposure. From the right side, an L-hook electrocautery enters the field and is actively dissecting the gallbladder margin; the hook lies to the right of the gallbladder and to the right of the grasper.</p> <p>Central-lower tissue planes show connective tissue and a small amount of blood adjacent to the working area, consistent with ongoing dissection. Fatty tissue and portions of the gastrointestinal tract lie more toward the right-lower region, while the abdominal wall appears toward the left. Overall, the scene shows coordinated retraction by the grasper and active electrocautery dissection by the hook to expose the Calot triangle.</p>

**Context (LLM Input)**

Visible instruments:
No instruments are visible.

Current phase:
Cleaning Coagulation

Current action triplets (tool, verb, target):
No actions are taking place.

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:

- Abdominal Wall: left-bottom.
- Liver: right-top, left-top, left.
- Gastrointestinal Tract: bottom.
- Fat: right-top.
- Grasper: right-top.
- Connective Tissue: top.
- Blood: right-bottom.
- Gallbladder: left-top, center-top.

Relative Positions:

- Abdominal Wall is to the left of Fat.
- Liver is to the left of Fat.
- Gastrointestinal Tract is toward the bottom of Grasper.
- Fat is to the right of Gallbladder.
- Grasper is to the right of Abdominal Wall.
- Connective Tissue is towards the top of Gastrointestinal Tract.
- Blood is toward the bottom of Gallbladder.
- Gallbladder is towards the top of Gastrointestinal Tract.

Conversational-1 (8 Qs) (\$0.0015)

Q1: Is any surgical instrument visible in this image?

A1: No. No surgical instruments are visible in the frame.

Q2: Where is the gallbladder located in the view?

A2: The gallbladder is in the upper-central to upper-left portion of the image.

Q3: Where is the liver located in the view?

A3: The liver occupies the upper part of the field, primarily toward the left side.

Q4: Where is the abdominal wall visible?

A4: The abdominal wall is visible in the lower-left portion of the frame.

Q5: Where is fatty tissue located in the image?

A5: Fatty tissue is present in the upper-right area of the view.

Q6: Where is connective tissue seen?

A6: Connective tissue is along the upper-most portion of the image.

Q7: Where is the gastrointestinal tract located?

A7: The gastrointestinal tract appears in the lower portion of the field.

Q8: Is there visible blood in this frame?

A8: Yes. Blood is visible in the lower-right portion of the image.

Conversational-2 (7 Qs) (\$0.0018)

Q1: Are any instruments visible in this frame?

A1: No instruments are visible in this frame; there are no graspers or electrocautery hooks apparent.

Q2: What procedural phase is shown, and are any actions currently being performed?

A2: This view corresponds to the cleaning/coagulation phase, and no surgical actions or instrument manipulations are occurring in the image.

Q3: Which anatomical structures can be seen and where are they located in the frame?

A3: The gallbladder is visible in the upper central/left portion of the image; the liver occupies the upper field (left and right top); fat is located on the right-top; the abdominal wall appears toward the left-bottom; the gastrointestinal tract is at the bottom; connective tissue is in the upper region; and a collection of blood is visible at the right-bottom.

Q4: Is there visible blood, and how is it positioned relative to the gallbladder?

A4: Yes. A blood collection is visible at the right-bottom of the image, positioned below and to the right of the gallbladder.

Q5: Where is the fat relative to the gallbladder and the abdominal wall?

A5: The fat is to the right of the gallbladder and lies to the right of the abdominal wall.

Q6: Is any instrument grasping or retracting the gallbladder in this view?

A6: No. There is no instrument visible grasping or retracting the gallbladder in this image.

Q7: Where is connective tissue located relative to the gastrointestinal tract?

A7: The connective tissue is situated toward the top of the gastrointestinal tract.

Complex Reasoning (2 Qs) (\$0.0023)

Q1: Given that the case is in the Cleaning Coagulation phase but no instrument is currently visible in the field, what immediate steps should the surgeon and team perform before resuming dissection to minimize risk?

A1: When coagulation/cleaning has been performed but no instrument is visible, the team should first confirm hemostasis and a clear operative view before any further cutting or traction. Practically this means: (1) irrigate and suction the area to remove pooled blood and visualize the gallbladder bed and surrounding tissue; (2) inspect the entire visible field for any active oozing or a discrete bleeding point and achieve definitive control (additional coagulation, topical hemostat, pressure, or suture) if present; (3) ensure pneumoperitoneum and camera view are optimized so anatomy is not obscured by smoke or fluid; and (4) verbally confirm with the scrub nurse that the needed instruments and energy settings are ready prior to reintroducing active dissection. These steps reduce the chance of resuming dissection with impaired visibility or untreated bleeding that could lead to misidentification of structures or conversion to open surgery.

Q2: What are the most likely sources of the small amount of blood seen near the gallbladder, and how should management differ depending on the source?

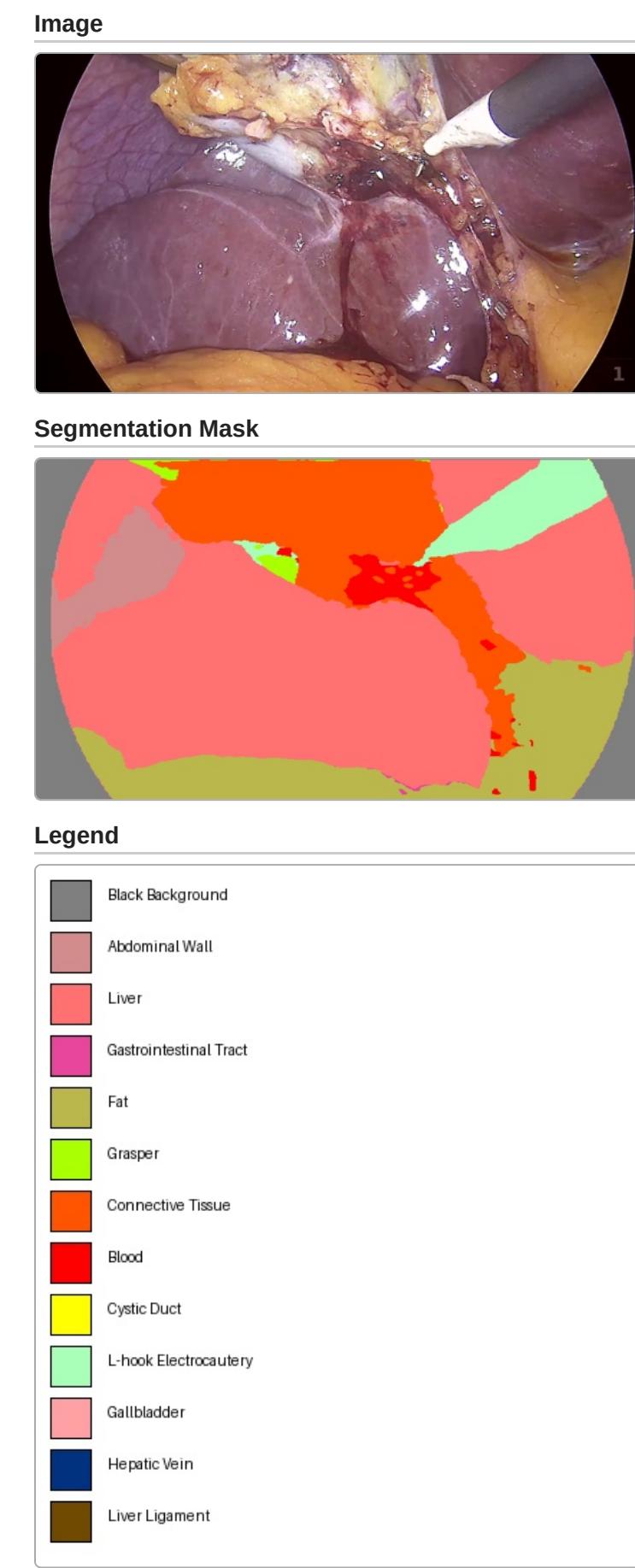
A2: Small bleeding in this region most commonly arises from three sources: (1) oozing from the liver bed (capsular or parenchymal sinusoids) after traction or blunt dissection; (2) a small arterial branch in the Calot's triangle or cystic plate; or (3) a superficial tear of the gallbladder wall. Management differs: diffuse oozing from the liver bed is usually controlled with gentle pressure, bipolar or monopolar coagulation, or topical hemostatic agents; a focal arterial bleeder warrants direct pinpoint coagulation or placement of a clip/suture if accessible; a gallbladder wall perforation should prompt suctioning of bile/blood, inspection for contamination, and either primary repair or controlled drainage depending on size. The immediate priority is to clear the field to identify the bleeding pattern and then choose the targeted control method.

Concise (\$0.0006)

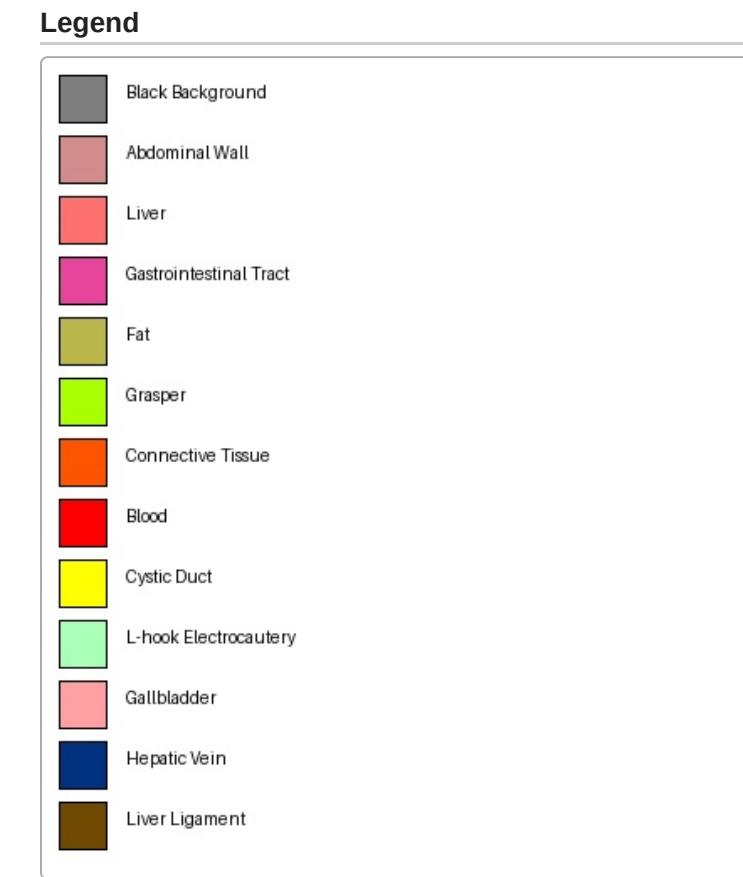
No instruments are visible and no active actions are occurring. The gallbladder lies in the upper central-left field adjacent to the liver, surrounded by fat and connective tissue. Small blood is visible inferior to the gallbladder; the gastrointestinal tract and abdominal wall are seen more inferiorly.

Detailed (\$0.0012)

Laparoscopic view during the cleaning/coagulation stage with no instruments visible or actively engaged in the field. The gallbladder is positioned in the upper-central portion of the image, sitting above the gastrointestinal tract. The liver forms the left-sided background adjacent to the gallbladder. Fatty tissue and omental fat predominate on the right side of the field, lying lateral to the gallbladder. Connective tissue/adhesions are concentrated toward the upper portion of the image, above the bowel. A small collection of blood is visible in the lower-right/lower region beneath the gallbladder. The abdominal wall is seen toward the lower-left. No active device contact or manipulation is occurring in this frame.



Context (LLM Input)	Conversational-1 (10 Qs) (\$0.0020)	Conversational-2 (10 Qs) (\$0.0021)	Complex Reasoning (3 Qs) (\$0.0023)	Concise (\$0.0006)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Gallbladder Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Grasp, Gallbladder) - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left-top. - Liver: right-top, center-left, center-right, center-top, bottom, left-top, left-bottom. - Gastrointestinal Tract: right-bottom. - Fat: bottom. - Grasper: left-top. - Connective Tissue: top. - Blood: right-top. - Cystic Duct: right-top. - L-hook Electrocautery: right-top, left-top.</p> <p>Relative Positions: - Abdominal Wall is to the left of L-hook Electrocautery. - Liver is to the left of Cystic Duct. - Gastrointestinal Tract is to the right of Abdominal Wall. - Fat is to the right of Abdominal Wall. - Grasper is to the left of L-hook Electrocautery. - Connective Tissue is to the right of Abdominal Wall. - Blood is to the right of Abdominal Wall. - Cystic Duct is to the right of L-hook Electrocautery. - L-hook Electrocautery is towards the top of Gastrointestinal Tract.</p>	<p>Q1: Is the grasper visible in this image? A1: Yes.</p> <p>Q2: Where is the grasper located in the view? A2: Left-top of the field.</p> <p>Q3: What is the grasper doing to the gallbladder? A3: Grasping the gallbladder.</p> <p>Q4: Is the hook electrocautery visible in this image? A4: Yes.</p> <p>Q5: Where is the hook electrocautery positioned? A5: Right-top of the view near the operative area.</p> <p>Q6: What is the hook doing in this frame? A6: Dissecting the gallbladder.</p> <p>Q7: Is the cystic duct visible in the image? A7: Yes.</p> <p>Q8: Where is the cystic duct located? A8: Right-top region of the field.</p> <p>Q9: Is there any visible blood in the operative field? A9: Yes.</p> <p>Q10: Where is the gallbladder located in the image? A10: Central and toward the top of the field where the instruments are contacting it.</p>	<p>Q1: What instruments are visible in this frame and where are they located? A1: A grasper is visible toward the top-left of the field, and an L-hook electrocautery is visible toward the top-right.</p> <p>Q2: What operative phase is shown in this image? A2: This image is from the gallbladder dissection phase.</p> <p>Q3: Which instrument is grasping the gallbladder and which is performing dissection? A3: The grasper is grasping the gallbladder, and the L-hook electrocautery is dissecting the gallbladder.</p> <p>Q4: How is the grasper positioned relative to the L-hook electrocautery? A4: The grasper is positioned to the left (and toward the top) of the L-hook electrocautery.</p> <p>Q5: Where is the cystic duct located and how does it relate spatially to the liver? A5: The cystic duct appears at the top-right of the field, and the liver is located to the left of the cystic duct.</p> <p>Q6: Is there visible blood in the scene, and if so, where? A6: Yes. A blood area is visible at the top-right region of the image.</p> <p>Q7: Is the gastrointestinal tract visible in this frame, and where is it found? A7: Yes. The gastrointestinal tract is visible in the bottom-right of the image.</p> <p>Q8: What other tissues or structures are visible around the gallbladder? A8: Visible adjacent tissues include liver (occupying left and central parts of the field), connective tissue toward the top, and fat toward the bottom; the abdominal wall is present toward the left-top.</p> <p>Q9: Describe the spatial relationship among the grasper, gallbladder, and L-hook during this dissection. A9: The grasper is superior-left and is retracting the gallbladder, while the L-hook approaches from the right-top to dissect the gallbladder margin; the gallbladder lies between and slightly beneath those instruments in the upper field.</p> <p>Q10: Are any other instruments present in the image besides the grasper and the L-hook? A10: No. Only the grasper and the L-hook electrocautery are visible.</p>	<p>Q1: Given that the grasper is actively retracting the gallbladder while the hook is dissecting the gallbladder wall, what is the immediate technical objective of the surgeon in this moment of gallbladder dissection? A1: The immediate technical objective is to develop and maintain a clear dissection plane between the gallbladder serosa and the liver bed so the gallbladder can be progressively separated from the hepatic surface. Active traction with the grasper provides countertraction to tension the tissues and expose the avascular plane, while the hook is being used to divide connective tissues and peel the gallbladder off the liver. Achieving steady, controlled progress along the gallbladder surface (rather than taking deep bites) preserves the gallbladder wall integrity until it is fully mobilized for removal.</p> <p>Q2: What specific hazards are introduced by using an electrocautery hook in close proximity to both visible blood and a tubular ductal structure? A2: Using an electrocautery hook near bleeding and a nearby duct increases two main hazards. First, thermal spread or inadvertent deep cautery into the liver bed can worsen bleeding by coagulating tissue unevenly or can create deeper hepatic injury; existing blood can obscure the field and make precise application of energy more difficult. Second, if a biliary ductal structure is nearby and not clearly isolated, heat or traction may damage the duct leading to a partial or full-thickness bile duct injury. Thus, there is an elevated risk of both hemorrhage from the liver bed and bile duct injury unless visualization is optimized and energy application is tightly controlled.</p> <p>Q3: How should the assistant adjust instrument positioning to improve safety and visualization for continued dissection? A3: The assistant should optimize traction–countertraction: reposition the grasper to exert firm, consistent lateral and slightly cephalad traction on the gallbladder (ideally on the infundibulum or body) to tension the plane between gallbladder and liver. This pulls connective tissue taut and exposes the dissection plane for precise hook work. If fatty/connective tissue obscures the plane, the assistant can retract it away from the working zone. The grasper should not squeeze the gallbladder excessively (risking perforation) and should be ready to provide blunt exposure or tamponade if minor bleeding occurs.</p>	<p>Concise (\$0.0006)</p> <p>A grasper (left/top) firmly holds the gallbladder while an L-hook electrocautery (right/top) actively dissects the gallbladder near the cystic duct and liver. Both instruments are in active use.</p> <p>Detailed (\$0.0011)</p> <p>Central view of the gallbladder with the liver forming much of the background. A grasper enters from the upper-left and is firmly holding the gallbladder, providing traction to expose the dissection plane. An L-hook electrocautery approaches from the upper-right and is actively dissecting the gallbladder from its attachments, working toward the right-superior area where the cystic duct is visualized. There is localized blood near the right-upper dissection site. Connective tissue lies toward the top of the field and fatty tissue occupies the lower portion; portions of the gastrointestinal tract are seen tucked in the lower-right. Both instruments are engaged in the procedure: the grasper for retraction/holding and the hook for active dissection.</p>



FASL Prediction (Conf: 0.9575)

Context (LLM Input)

Visible instruments:
Grasper.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:
- Abdominal Wall: left-top.
- Liver: right-top, right-bottom, center-right, center-top, center-bottom, left, right.
- Grasper: bottom.
- Connective Tissue: right-bottom, center.
- Blood: right-bottom.
- Cystic Duct: right-bottom.
- L-hook Electrocautery: right.
- Gallbladder: right-top, right-bottom, top, center.

Relative Positions:
- Abdominal Wall is to the left of Cystic Duct.
- Liver is to the left of Cystic Duct.
- Grasper is toward the bottom of Abdominal Wall.
- Connective Tissue is to the right of Abdominal Wall.
- Blood is to the right of Abdominal Wall.
- Cystic Duct is to the right of Connective Tissue.
- L-hook Electrocautery is to the right of Abdominal Wall.
- Gallbladder is to the right of Abdominal Wall.

Conversational-1 (10 Qs) (\$0.0019)

- Q1: Is a grasper instrument visible in this image?**
A1: Yes. A grasper is visible.
- Q2: Where is the grasper located within the frame?**
A2: The grasper is located toward the bottom of the view.
- Q3: What is the grasper doing in this image?**
A3: The grasper is retracting the gallbladder.
- Q4: Is the gallbladder visible in this image?**
A4: Yes. The gallbladder is visible.
- Q5: Where is the gallbladder located in the operative field?**
A5: The gallbladder occupies the right and upper-central portion of the frame.
- Q6: Is there visible blood in the image?**
A6: Yes. Blood is visible in the right-bottom area.
- Q7: Is the liver visible in this image?**
A7: Yes. The liver is visible.
- Q8: Where is the liver located in the frame?**
A8: The liver is primarily in the background on the right side of the view.
- Q9: Is connective tissue visible in the image?**
A9: Yes. Connective tissue is visible toward the center and lower-right region.
- Q10: Is the cystic duct visible in this image?**
A10: Yes. The cystic duct is visible in the right-bottom portion of the field.

Conversational-2 (8 Qs) (\$0.0023)

- Q1: Which instruments are visible in this frame?**
A1: Only a single grasper is visible in this frame.
- Q2: What phase of the procedure is shown in this image?**
A2: This image is during the gallbladder dissection phase.
- Q3: What is the grasper doing in this view?**
A3: The grasper is retracting the gallbladder.
- Q4: Where is the gallbladder located within the operative field in this frame?**
A4: The gallbladder occupies the right and upper-central region of the field.
- Q5: Where is the grasper positioned relative to the gallbladder?**
A5: The grasper is located inferiorly (toward the bottom of the frame) relative to the gallbladder and is engaging its lower aspect to provide retraction.
- Q6: Which other anatomical structures are visible around the operative site?**
A6: The abdominal wall and the liver are visible, along with connective (fatty) tissue and a cystic-duct region toward the right-lower area; a small area of blood is present in the lower right portion of the field.
- Q7: Is a hook electrocautery instrument visible or active in this frame?**
A7: No. A hook electrocautery is not visible or active in this frame—only the grasper is seen.
- Q8: Is the grasper holding any tissue besides the gallbladder?**
A8: No—on this image the grasper is shown retracting the gallbladder and is not seen holding other distinct tissues.

Complex Reasoning (2 Qs) (\$0.0021)

- Q1: Given that only the grasper is actively retracting the gallbladder while there is visible blood near the operative field, what is the most likely immediate source of bleeding and why?**

A1: With the gallbladder under traction and the blood localized adjacent to the gallbladder and connective tissue, the most likely sources are oozing from the liver bed where the gallbladder is being separated or a small vessel (such as a branch of the cystic artery) in the infundibular region. The grasper is providing traction but no energy instrument is currently active, so any bleeding seen at this stage typically reflects surface oozing from raw liver parenchyma or from small tributaries in the connective tissue around the cystic duct/infundibulum rather than a large arterial hemorrhage.

- Q2: Should the surgeon continue mechanical dissection now or first control the bleeding? Explain the rationale and immediate steps.**

A2: The surgeon should first control the bleeding before proceeding with further dissection. Even minor bleeding can rapidly obscure anatomy in the gallbladder–cystic duct region and increases the risk of misidentifying ducts or vessels. Immediate steps include temporarily maintaining traction with the grasper to expose the source, introducing suction to clear the field, applying gentle pressure or a damp sponge if available, and using targeted hemostasis (bipolar or the available hook electrocautery) once visualization is restored. If the bleeding appears to originate from a discrete vessel, precise energy application or clip ligation should be used; diffuse liver-bed oozing may be managed with topical hemostatic agents or low-power coagulation. These actions protect the critical view and reduce the chance of inadvertent injury.

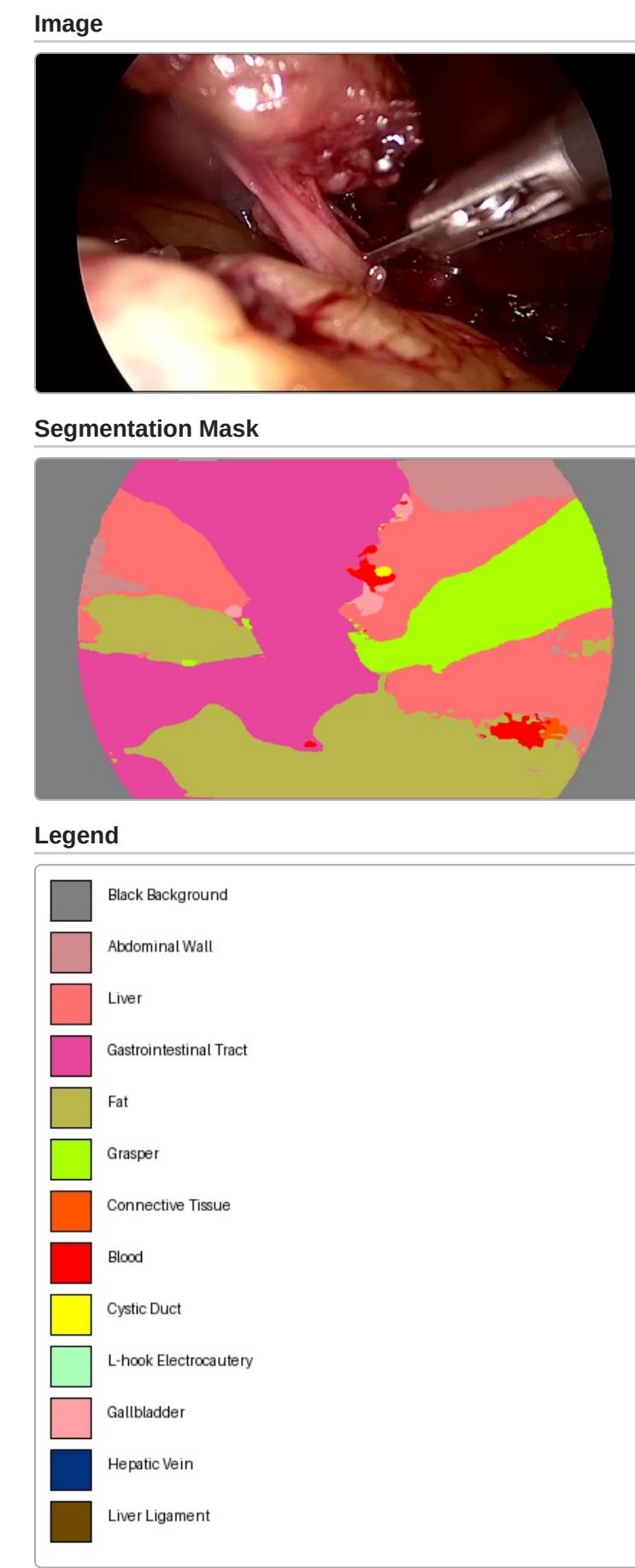
Concise (\$0.0008)

A grasper actively retracts the gallbladder during gallbladder dissection. The gallbladder is positioned to the right and superior, adjacent to the liver. Connective tissue and the cystic duct are visible in the lower-right area with some localized blood.

Detailed (\$0.0013)

Laparoscopic view during gallbladder dissection: the gallbladder occupies the right/central portion of the field with the liver forming the background on the right. The only instrument visible is a grasper in the lower part of the image; it is actively holding and retracting the gallbladder to provide tension and exposure of the dissection plane.

Adjacent tissue in the lower-central to right-bottom area consists of connective/fatty tissue and a small amount of blood. The cystic duct is visible toward the right-bottom, lying next to the connective tissue and the area of limited bleeding. The abdominal wall is seen toward the upper left. No other instruments are engaged in this frame.



Context (LLM Input)
Visible instruments: No instruments are visible.
Current phase: Clipping Cutting
Current action triplets (tool, verb, target): No actions are taking place.
Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: right-top. - Liver: right-top, right-bottom, center-left, center-top, center, left-top. - Gastrointestinal Tract: left. - Fat: bottom. - Grasper: right. - Connective Tissue: right-top, right-bottom. - Blood: right. - Cystic Duct: right-top. - L-hook Electrocautery: left-top. - Gallbladder: right-top.
Relative Positions: - Abdominal Wall is towards the top of Connective Tissue. - Liver is to the right of L-hook Electrocautery. - Gastrointestinal Tract is to the left of Connective Tissue. - Fat is toward the bottom of Abdominal Wall. - Grasper is to the right of Gastrointestinal Tract. - Connective Tissue is to the right of Gallbladder. - Blood is to the right of Gastrointestinal Tract. - Cystic Duct is to the left of Connective Tissue. - L-hook Electrocautery is towards the top of Gastrointestinal Tract. - Gallbladder is towards the top of Fat.

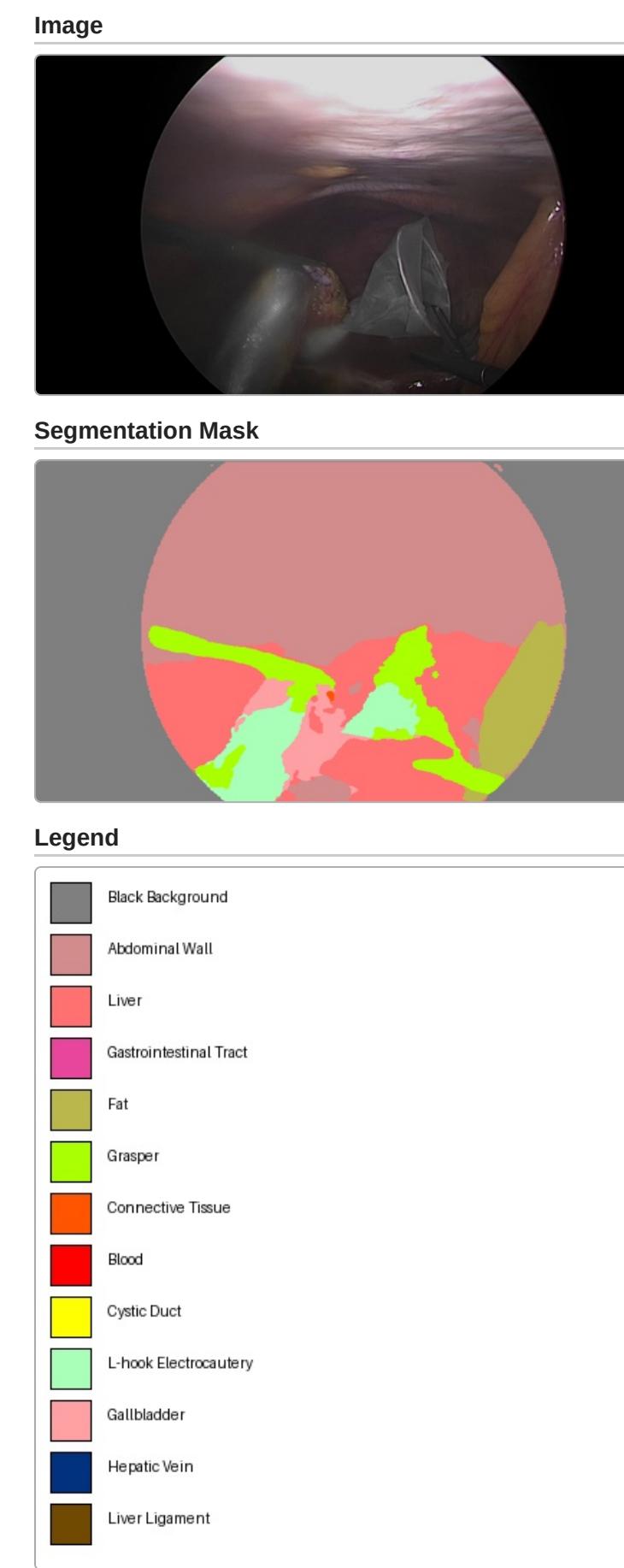
Conversational-1 (10 Qs) (\$0.0016)
Q1: Is any instrument visible in this frame? A1: No instruments are visible in this frame.
Q2: Where is the gallbladder located in the image? A2: The gallbladder is at the right-top portion of the view.
Q3: Is the cystic duct visible in this view? A3: Yes. The cystic duct is visible at the right-top region.
Q4: Where is the liver located in the operative field? A4: The liver occupies much of the central and right portions of the field, including the top and center.
Q5: Is there visible blood in the operative field? A5: Yes. Blood is visible on the right side of the field.
Q6: Where is the abdominal wall seen in this image? A6: The abdominal wall is visible at the right-top of the view.
Q7: Is connective tissue visible in the frame? A7: Yes. Connective tissue is present on the right side, seen in both upper and lower areas.
Q8: Where is the gastrointestinal tract located in the image? A8: The gastrointestinal tract is on the left side of the view.
Q9: Where is fatty tissue located in the operative field? A9: Fatty tissue is located toward the bottom of the frame.
Q10: Is the L-hook electrocautery visible in this frame? A10: No. The L-hook electrocautery is not visibly present in the frame.

Conversational-2 (10 Qs) (\$0.0018)
Q1: Are any surgical instruments visible in this image? A1: No instruments are visible in this image.
Q2: What phase of the procedure is shown in this frame? A2: The image corresponds to the clipping and cutting phase.
Q3: Are any actions currently taking place in the field? A3: No active instrument actions are occurring in this frame.
Q4: Which major anatomical structures are visible and where are they located in the image? A4: The liver occupies much of the right and central field. The gallbladder is visible in the right-top central area, positioned toward the top of the surrounding fat. The gastrointestinal tract lies on the left side. Connective tissue appears on the right (top and bottom), with fat toward the bottom. The abdominal wall is toward the right-top.
Q5: Is the cystic duct visible, and if so where is it relative to the gallbladder and connective tissue? A5: Yes — the cystic duct is visible in the right-top region. It is adjacent to the gallbladder area and lies to the left of a band of connective tissue.
Q6: Is there any blood visible in the operative field, and where is it located? A6: Yes. A region of blood is present on the right side of the image.
Q7: Where is the abdominal wall located relative to the connective tissue? A7: The abdominal wall is toward the top relative to the connective tissue and is located in the right-top portion of the image.
Q8: Is there visible fatty tissue, and how is the gallbladder positioned relative to that fat? A8: Yes. Fatty tissue is present predominantly toward the bottom of the image, and the gallbladder is positioned toward the top of that fat layer.
Q9: Are any clips or clip applicators visible on the cystic duct or in the field? A9: No clips or clip applicators are visible in this image.
Q10: Does the image show an intact operative field without active instrument engagement, and how would you describe the scene? A10: Yes. The field shows anatomical structures (liver, gallbladder, cystic duct, connective tissue, fat) with no instruments or active manipulation visible; it appears prepared for or between clipping/cutting steps.

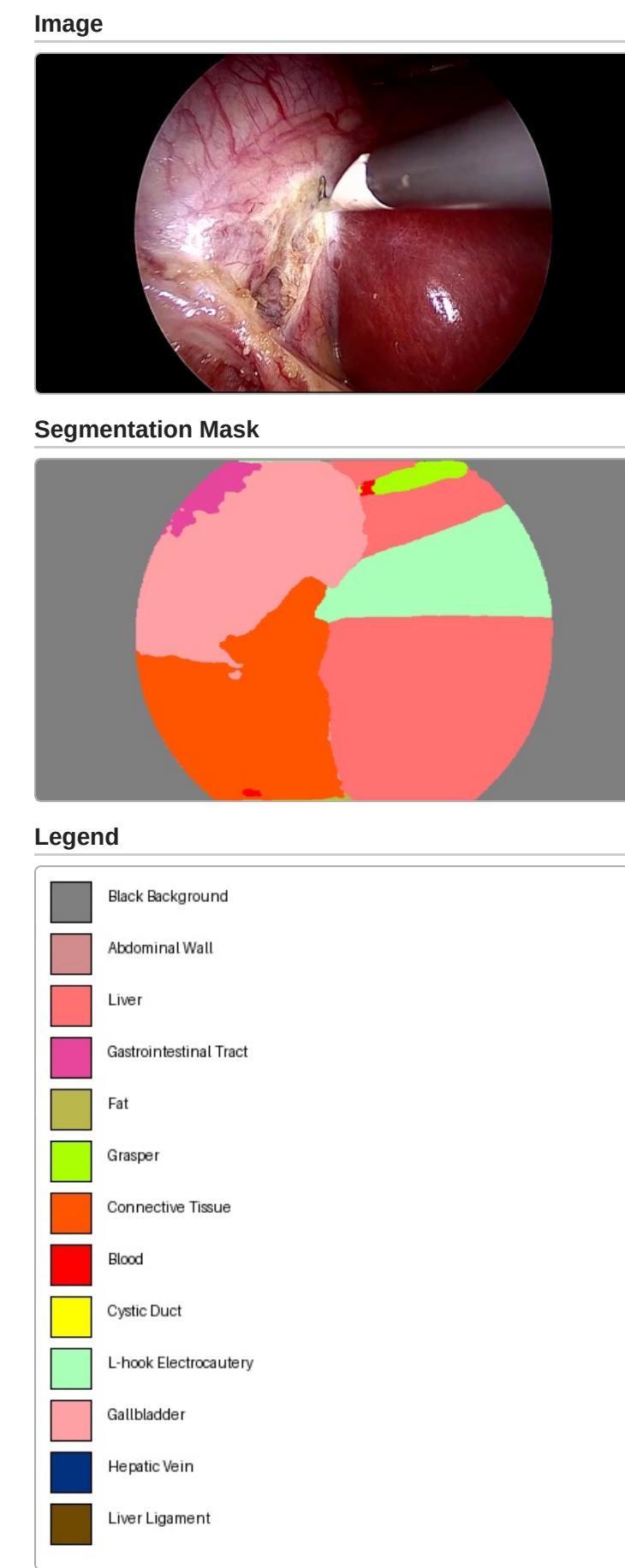
Complex Reasoning (1 Qs) (\$0.0029)
Q1: The operative phase is clipping/cutting but no instruments are visible in the field. What are the most likely clinical interpretations of this moment, and what immediate steps should the team take before any clip application? A1: When clipping/cutting is declared but no instruments are in view, the most likely interpretations are: the surgeon has temporarily removed instruments to reassess anatomy, is adjusting external port positions, or is preparing/sterilizing a clip applier off-camera. It may also indicate a brief pause to clear blood or irrigate before definitive division. Immediate steps should therefore include: - Re-establish a clear, blood-free view (suction/irrigation) because there is evidence of blood adjacent to the operative site; visualization is essential prior to clipping. - Confirm anatomy: ensure the tubular structure intended for division is the cystic duct by clearing surrounding connective/fatty tissue and demonstrating its relation to the gallbladder and common bile duct. - Ask for the clip applier and grasper to be returned into view with appropriate traction applied so the duct is tensioned and aligned for perpendicular clip placement. - Communicate clearly with the scrub team to have clips sized and loaded, and confirm that electrocautery is not inadvertently active while the clip applier is introduced. These steps reduce the chance of clipping the wrong structure or performing a blind division in a contaminated field.
Concise (\$0.0006)
No instruments are visible in the field. The gallbladder lies in the upper right region with the cystic duct and surrounding connective tissue immediately adjacent to its right; the liver occupies much of the right and central view. Small amounts of blood and fat are present inferiorly, and there is no active instrument use.

Detailed (\$0.0008)

The laparoscopic view is focused on the right-sided gallbladder region. The gallbladder occupies the upper-right portion of the field with the liver forming much of the central and right background. The cystic duct is visible adjacent to the gallbladder toward the right-upper area, with surrounding connective tissue to its right. Fatty tissue lies more inferiorly beneath the gallbladder. The gastrointestinal tract appears on the left side of the image. A small amount of blood is present on the right. The abdominal wall can be seen at the superior aspect. No instruments are visible in the field and there are no active actions (no clipping or cutting) occurring in this frame.

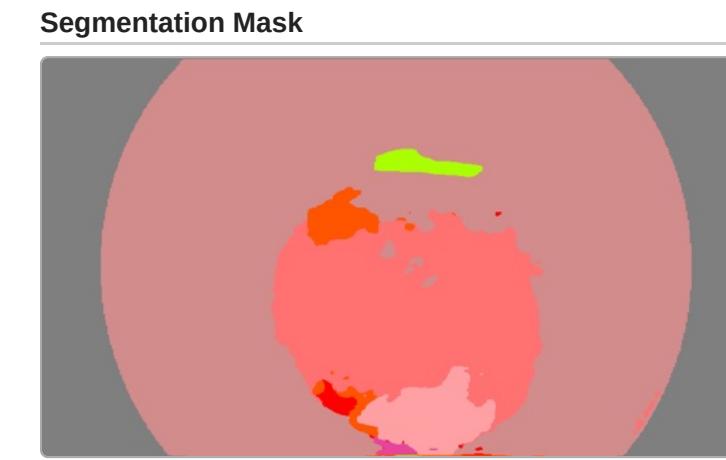


Context (LLM Input)	Conversational-1 (10 Qs) (\$0.0020)	Conversational-2 (8 Qs) (\$0.0017)	Complex Reasoning (3 Qs) (\$0.0026)	Concise (\$0.0008)
<p>Visible instruments: Grasper.</p> <p>Current phase: Cleaning Coagulation</p> <p>Current action triplets (tool, verb, target): - (Grasper, Grasp, Specimen Bag) - (Grasper, Pack, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: top. - Liver: bottom. - Gastrointestinal Tract: right-bottom. - Fat: right-bottom. - Grasper: bottom. - Connective Tissue: center-bottom. - L-hook Electrocautery: center-bottom. - Gallbladder: center-bottom.</p> <p>Relative Positions: - Abdominal Wall is to the left of Gastrointestinal Tract. - Liver is to the left of Gastrointestinal Tract. - Gastrointestinal Tract is to the right of Gallbladder. - Fat is to the right of L-hook Electrocautery. - Grasper is to the left of Gastrointestinal Tract. - Connective Tissue is toward the bottom of Abdominal Wall. - L-hook Electrocautery is toward the bottom of Abdominal Wall. - Gallbladder is to the left of Fat.</p>	<p>Q1: Is a hook electrocautery visible in this frame? A1: No. Only a grasper is visible.</p> <p>Q2: What is the grasper holding? A2: The grasper is holding a specimen retrieval bag.</p> <p>Q3: Where is the grasper located in the operative view? A3: The grasper is positioned at the bottom of the frame.</p> <p>Q4: Where is the gallbladder located in the view? A4: The gallbladder is located in the center-bottom of the field.</p> <p>Q5: Is the grasper retracting the gallbladder? A5: No. The grasper is packing/holding the specimen bag with the gallbladder rather than retracting it.</p> <p>Q6: Is the gallbladder being packed into a bag in this image? A6: Yes. The gallbladder is being packed into a specimen bag.</p> <p>Q7: Is the liver visible in this frame? A7: Yes. The liver is visible in the lower portion of the view.</p> <p>Q8: How many instruments are visible? A8: One instrument is visible: the grasper.</p> <p>Q9: Where is the gastrointestinal tract relative to the grasper? A9: The gastrointestinal tract is to the right of the grasper.</p> <p>Q10: Is there fatty tissue visible in the field? A10: Yes. Fatty tissue is visible toward the lower-right portion of the field.</p>	<p>Q1: What instruments are visible in this frame? A1: Only a grasper is visible in the operative field.</p> <p>Q2: What is the grasper holding or manipulating in this image? A2: The grasper is holding a specimen bag and is packing or containing the gallbladder within it.</p> <p>Q3: What phase of the procedure does this image represent? A3: This view corresponds to the Cleaning Coagulation phase.</p> <p>Q4: Where is the gallbladder located relative to the gastrointestinal tract and nearby fat? A4: The gallbladder is left of the gastrointestinal tract and left of the fatty tissue; it appears in the central-lower portion of the field.</p>	<p>Q1: What is the primary clinical purpose of the current cleaning/coagulation maneuver while the specimen is being packed for removal? A1: The immediate purpose is to prepare the operative field for safe extraction by controlling any residual oozing, removing blood or bile that would obscure inspection, and securing the specimen within a retrieval device to prevent contamination. In this frame the grasping instrument is actively holding and packing the specimen into the bag while energy is not being applied, which allows the surgeon to inspect the fossa and surrounding tissue for small bleeding points and bile leakage; any such points can then be coagulated in a controlled fashion before the specimen is withdrawn.</p> <p>Q2: Before extracting the bagged specimen through the abdominal wall, what specific checks and actions should be performed to minimize the risk of contamination and retained stones? A2: First, confirm the specimen is completely enclosed in the retrieval bag and that the bag's integrity appears intact while the grasper holds it. Suction and irrigate the area to clear pooled bile or blood and visually inspect the gallbladder fossa for residual stones or debris. Verify the cystic duct stump and any vascular clips are secure; if there is any doubt about clips, address that before extraction. If stones are suspected within the bag, ensure the bag mouth is closed and extract through an appropriately sized port or slightly enlarge the fascial opening rather than forcing the bag, to avoid tearing. Finally, after removal, re-inspect and irrigate the cavity if there was any spillage and aspirate thoroughly.</p> <p>Q3: What complications can arise if the retrieval bag ruptures during extraction, and what intraoperative steps reduce the clinical impact? A3: Rupture can lead to intraperitoneal contamination with bile and spilled gallstones, which increases the risk of postoperative abscess, inflammatory adhesions, and port-site implantation of infected material. To reduce impact: immediately suction and irrigate the area thoroughly, retrieve any visible spilled stones with graspers, consider placement of a drain if contamination is substantial, and document/communicate the spillage for postoperative monitoring. Preventive measures include ensuring complete enclosure of the specimen, using a robust bag, and not forcing extraction through a too-small incision.</p>	<p>A single grasper at the lower center of the field actively grasps the specimen bag and packs the gallbladder. The gallbladder and surrounding connective tissue are centered low in the view, with the liver inferiorly and the gastrointestinal tract to the right-bottom.</p> <p>Detailed (\$0.0010)</p> <p>The view is focused on the lower central abdomen where the excised gallbladder sits. A single grasper occupies the lower part of the field and is actively engaged: it is holding a specimen retrieval bag and packing the gallbladder into that bag. The surrounding operative field shows connective tissue immediately adjacent to the gallbladder, with the liver lying deeper/behind in the lower background. To the right of the gallbladder are portions of bowel and fatty tissue. The abdominal wall is visible toward the top of the image. No other instruments are present or actively engaged in this frame—the grasper is the only instrument manipulating tissue and the specimen.</p>



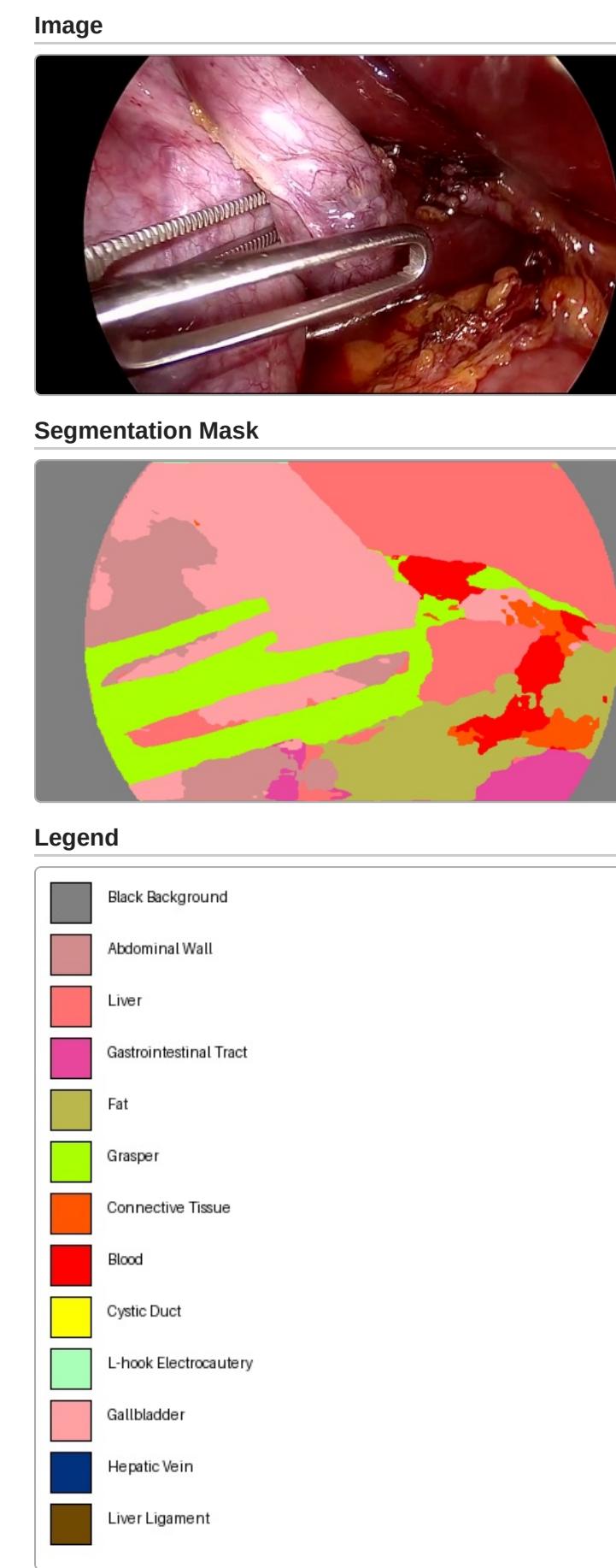
Context (LLM Input)
<p>Visible instruments: Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Hook, Dissect, Cystic Plate)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left-top. - Liver: right. - Gastrointestinal Tract: left-top. - Fat: center-bottom. - Grasper: right-top. - Connective Tissue: left-bottom. - Blood: center-bottom, center-top. - L-hook Electrocautery: right-top. - Gallbladder: left-top.</p> <p>Relative Positions: - Abdominal Wall is to the left of Liver. - Liver is to the right of Gastrointestinal Tract. - Gastrointestinal Tract is to the left of L-hook Electrocautery. - Fat is toward the bottom of Grasper. - Grasper is towards the top of Connective Tissue. - Connective Tissue is to the left of L-hook Electrocautery. - Blood is towards the top of Fat. - L-hook Electrocautery is towards the top of Fat. - Gallbladder is towards the top of Fat.</p>

Conversational-1 (10 Qs) (\$0.0016)	Conversational-2 (8 Qs) (\$0.0015)	Complex Reasoning (3 Qs) (\$0.0028)	Concise (\$0.0008)
<p>Q1: Is a grasper visible in this frame? A1: No. The grasper is not visible.</p> <p>Q2: What is the hook doing in this frame? A2: The hook is dissecting the cystic plate.</p> <p>Q3: Where is the hook located in the operative view? A3: The hook is at the right-top region of the view.</p> <p>Q4: Where is the gallbladder located in the image? A4: The gallbladder is at the left-top of the view.</p> <p>Q5: Is there blood visible in the field? A5: Yes. Blood is visible centrally in the field.</p> <p>Q6: Where is the liver located in the view? A6: The liver is on the right side of the view.</p> <p>Q7: Where is the abdominal wall located in the image? A7: The abdominal wall is toward the left-top area.</p> <p>Q8: Where is fatty tissue located in the operative field? A8: Fatty tissue is in the center-bottom portion of the field.</p> <p>Q9: Where is connective tissue visible in the image? A9: Connective tissue is toward the left-bottom area.</p> <p>Q10: Is the gastrointestinal tract visible in this frame? A10: Yes. The gastrointestinal tract is visible at the left-top.</p>	<p>Q1: Which instruments are visible in this image and how many are there? A1: A single instrument is visible: the L-hook electrocautery (hook).</p> <p>Q2: What procedural phase is shown in this view? A2: This image depicts the Calot triangle dissection phase.</p> <p>Q3: What specific tissue is the hook interacting with, and where is that tissue located relative to the gallbladder? A3: The hook is dissecting the cystic plate, which is adjacent to the gallbladder bed; the gallbladder is located in the upper-left portion of the field while the hook is to its right.</p> <p>Q4: Where is the gallbladder located in the frame, and which major organ lies to its right? A4: The gallbladder is in the upper-left (left-top) region of the image, and the liver is located to the right of the gallbladder.</p> <p>Q5: Is there any blood visible in the operative field, and if so, where? A5: Yes. Blood is visible centrally, present near both the center-top and center-bottom regions of the field.</p> <p>Q6: Are there any graspers or other instruments visible assisting tissue manipulation? A6: No. Only the hook electrocautery is visible; no grasper or other instruments are seen in this frame.</p> <p>Q7: What non-organ tissues are visible and where are they located (e.g., fat, connective tissue, abdominal wall)? A7: The abdominal wall is visible toward the left-top, fat is located centrally toward the bottom, and connective tissue is present toward the left-bottom of the image.</p> <p>Q8: How is the hook positioned relative to the fat and connective tissue in the operative field? A8: The L-hook electrocautery is positioned toward the top of the field and lies to the right of the connective tissue; fat is more central-bottom relative to the hook.</p>	<p>Q1: What is the immediate surgical objective of the current maneuver? A1: The active instrument is engaged in dissecting the cystic plate while the field shows the gallbladder/liver interface being exposed. The immediate objective is to free the gallbladder from its liver bed attachments and to open the correct tissue plane so the cystic plate can be separated safely. This step improves exposure of the proximal cystic structures and creates the necessary tension and space to identify and skeletonize the cystic duct and artery in subsequent steps.</p> <p>Q2: Given that only the energy hook is actively dissecting in this frame, what specific hazards are increased and why? A2: Working with the hook as the sole active instrument increases the risk of two principal hazards: thermal injury and inadvertent deep parenchymal damage. The hook delivers monopolar energy concentrated at its tip, so without effective countertraction or blunt retraction beside it, there is less control over the depth and direction of energy application. That can cause unintended thermal spread into the liver parenchyma or adjacent connective tissue, producing bleeding from small intrahepatic vessels or a gallbladder wall perforation with bile leakage. The presence of blood in the field further suggests that even low-grade oozing can rapidly obscure landmarks, increasing the chance of a misdirected application of energy.</p> <p>Q3: If brisk oozing from the liver surface is encountered during this cystic plate dissection, what immediate steps should be taken to control it while preserving anatomy for further dissection? A3: First, halt active cutting and apply a controlled, atraumatic response to re-establish visualization and hemostasis. Use the hook to briefly coagulate the bleeding focus with short, low-power applications rather than prolonged continuous activation, minimizing collateral thermal spread. Apply gentle tamponade with a laparoscopic instrument or sponge to identify the exact bleeding point, then reapply targeted coagulation. If bleeding persists or obscures anatomy, clear the field of blood to reassess the tissue planes before resuming dissection; continuing blind dissection risks greater injury. Throughout, proceed incrementally—control bleeding, confirm the plane, and then continue skeletonizing structures only once the field is clear.</p>	<p>Detailed (\$0.0013)</p> <p>This is a close-up view of the gallbladder region during Calot triangle dissection. The gallbladder sits in the upper-left portion of the field with the liver occupying the right side/background. A single electrocautery hook (L-hook) is entering from the right-upper quadrant and is actively dissecting the cystic plate along the gallbladder bed, separating gallbladder tissue from its attachments. Connective tissue is concentrated in the lower-left area and fatty tissue lies in the central lower field. Small amounts of blood are visible centrally (both upper and lower central zones), consistent with the ongoing dissection. The abdominal wall and portions of the gastrointestinal tract appear toward the upper left, but no grasper or other instrument is present—only the hook is actively engaged in tissue dissection.</p>

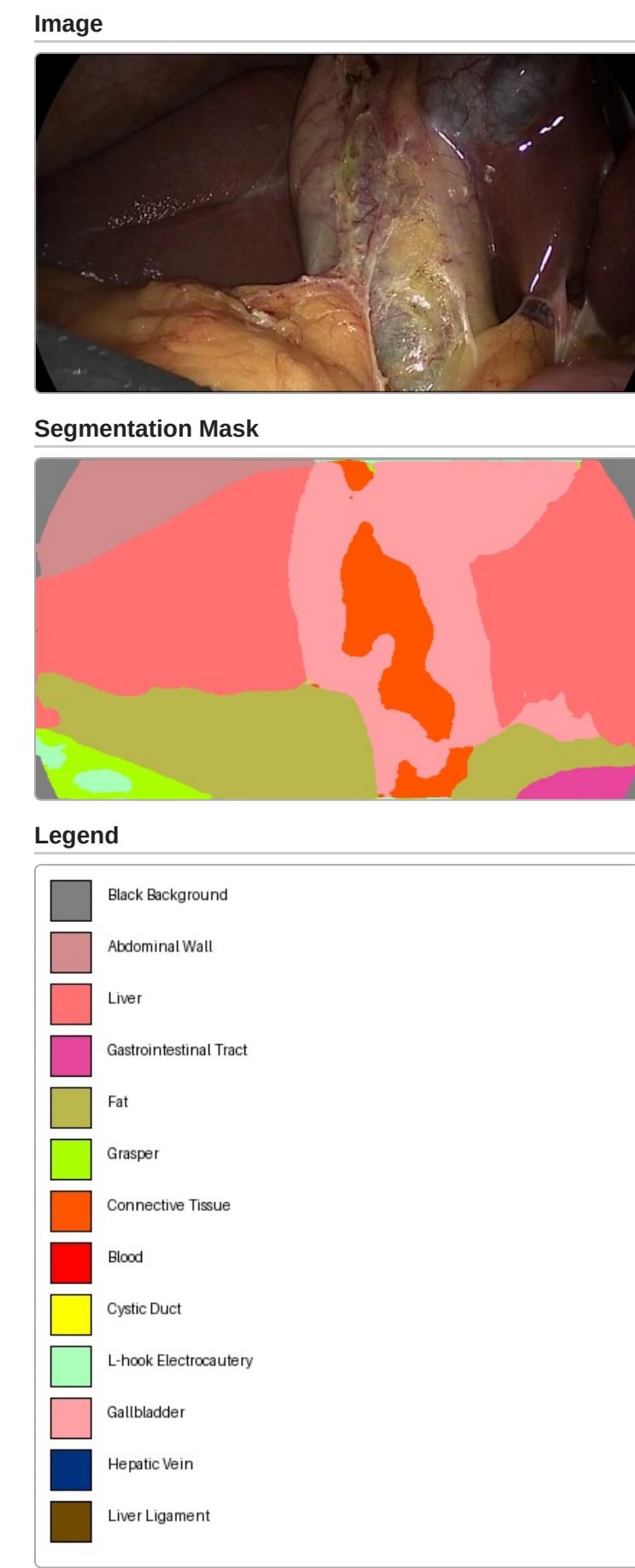


Context (LLM Input)
<p>Visible instruments: No instruments are visible.</p> <p>Current phase: Preparation</p> <p>Current action triplets (tool, verb, target): No actions are taking place.</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: <ul style="list-style-type: none"> - Abdominal Wall: center. - Liver: bottom. - Gastrointestinal Tract: center-bottom. - Grasper: center-bottom, center-top. - Connective Tissue: left. - Blood: center-bottom. - Gallbladder: center-bottom. Relative Positions: <ul style="list-style-type: none"> - Abdominal Wall is towards the top of Gastrointestinal Tract. - Liver is toward the bottom of Grasper. - Gastrointestinal Tract is toward the bottom of Grasper. - Grasper is towards the top of Gallbladder. - Connective Tissue is towards the top of Gastrointestinal Tract. - Blood is toward the bottom of Grasper. - Gallbladder is toward the bottom of Abdominal Wall. </p>

Conversational-1 (9 Qs) (\$0.0018)	Conversational-2 (10 Qs) (\$0.0015)	Complex Reasoning (2 Qs) (\$0.0025)	Concise (\$0.0005)
<p>Q1: Is a grasper visible in this frame? A1: No.</p> <p>Q2: Is a hook visible in this frame? A2: No.</p> <p>Q3: Is the gallbladder visible? A3: Yes.</p> <p>Q4: Where is the gallbladder located? A4: Center-bottom of the view.</p> <p>Q5: Where is the liver located? A5: Bottom of the view.</p> <p>Q6: Is there visible blood in the operative field? A6: Yes.</p> <p>Q7: Where is the abdominal wall located? A7: Central area of the view.</p> <p>Q8: Where is the connective tissue located? A8: On the left side of the view.</p> <p>Q9: Where is the gastrointestinal tract located? A9: Center-bottom of the view.</p>	<p>Q1: Which surgical instruments are visible in this frame? A1: I do not see any surgical instruments in the field; the view contains only native tissues.</p> <p>Q2: What operative phase does this image represent? A2: This view corresponds to the preparation phase of the procedure.</p> <p>Q3: Which anatomical structures are visible in the lower half of the image? A3: In the lower half I can see the liver, gastrointestinal tract, blood in the field, and the gallbladder.</p> <p>Q4: Where is the abdominal wall located relative to the gallbladder in this image? A4: The abdominal wall is positioned above the gallbladder (toward the top of the image), while the gallbladder is lower in the field.</p> <p>Q5: Is there any active surgical action taking place in this frame? A5: No active surgical actions are occurring; no tools are engaging tissue at this moment.</p> <p>Q6: Is there any evidence of bleeding visible in the image, and if so, where? A6: Yes. There is blood visible toward the center-bottom portion of the image.</p> <p>Q7: Where is connective tissue seen in relation to the gastrointestinal tract? A7: The connective tissue is located above (toward the top of) the gastrointestinal tract and toward the left side of the image.</p> <p>Q8: Which structure appears centrally near the top of the view? A8: The abdominal wall appears centrally toward the top of the view.</p> <p>Q9: Is the gallbladder visible, and if so, where is it located? A9: Yes. The gallbladder is visible and sits centrally toward the lower portion of the image (center-bottom).</p> <p>Q10: Are any instruments entering the field that might soon be used, such as graspers or hooks? A10: No instruments are currently entering the field; there are no visible graspers, hooks, or other devices in this frame.</p>	<p>Q1: Given that no instruments are currently in the field and the operative view shows the gallbladder adjacent to the liver and gastrointestinal tract with some blood present, what should be the immediate priorities before introducing instruments to begin dissection? A1: Immediate priorities are to establish a clear, safe working environment and a planned strategy for exposure. Practically this means: (1) evacuate any blood or pooled fluid with suction and irrigate to restore full visualization so tissue planes can be reliably identified; (2) confirm adequate pneumoperitoneum and scope focus/lighting to avoid misidentification; (3) inspect the gallbladder–liver interface and adjacent bowel to identify adhesions or unexpected anatomy that would affect port choice and retraction direction; and (4) decide and communicate who will handle suction, graspers, and energy so instruments can be introduced in a controlled sequence. Because no instruments are active, these preparatory steps reduce the risk of starting blind dissection and minimize the chance of thermal or mechanical injury once instruments are introduced.</p> <p>Q2: How should port placement and retraction strategy be planned now to optimize exposure of the Calot triangle while minimizing risk to the adjacent bowel seen in the field? A2: Port placement and retraction should be designed to provide upward and lateral traction on the gallbladder fundus and infundibulum to expose the Calot triangle away from the bowel. Practically, that means positioning a grasper port that allows the assistant to retract the gallbladder cephalad and laterally toward the right shoulder, and a working port for the primary surgeon that permits an energy device to approach from an angle that opens the plane between gallbladder and liver. An additional port or angled suction port should be available to keep the bowel out of the field and to clear fluid. The plan should avoid trajectories that bring energized instruments directly toward the gastrointestinal tract; if adhesions tether bowel near the gallbladder, those should be lysed under direct vision with blunt dissection or careful bipolar/monopolar control while suction and retraction maintain separation.</p>	<p>No instruments are visible and no actions are occurring. The gallbladder and gastrointestinal tract occupy the central lower field with blood present there. The liver is located at the bottom, the abdominal wall is central-superior, and connective tissue lies to the left.</p> <p>Detailed (\$0.0007)</p> <p>The image shows a preparatory laparoscopic view with no instruments present or engaged. The abdominal wall occupies the central/upper portion of the field, and the gallbladder lies in the central-lower area beneath it. The liver is seen more inferiorly in the background, with portions of the gastrointestinal tract also occupying the lower central region. Connective tissue is visible toward the left side of the view. A small area of blood is present in the lower central field. No active manipulation, dissection, or retraction is occurring at this time.</p>

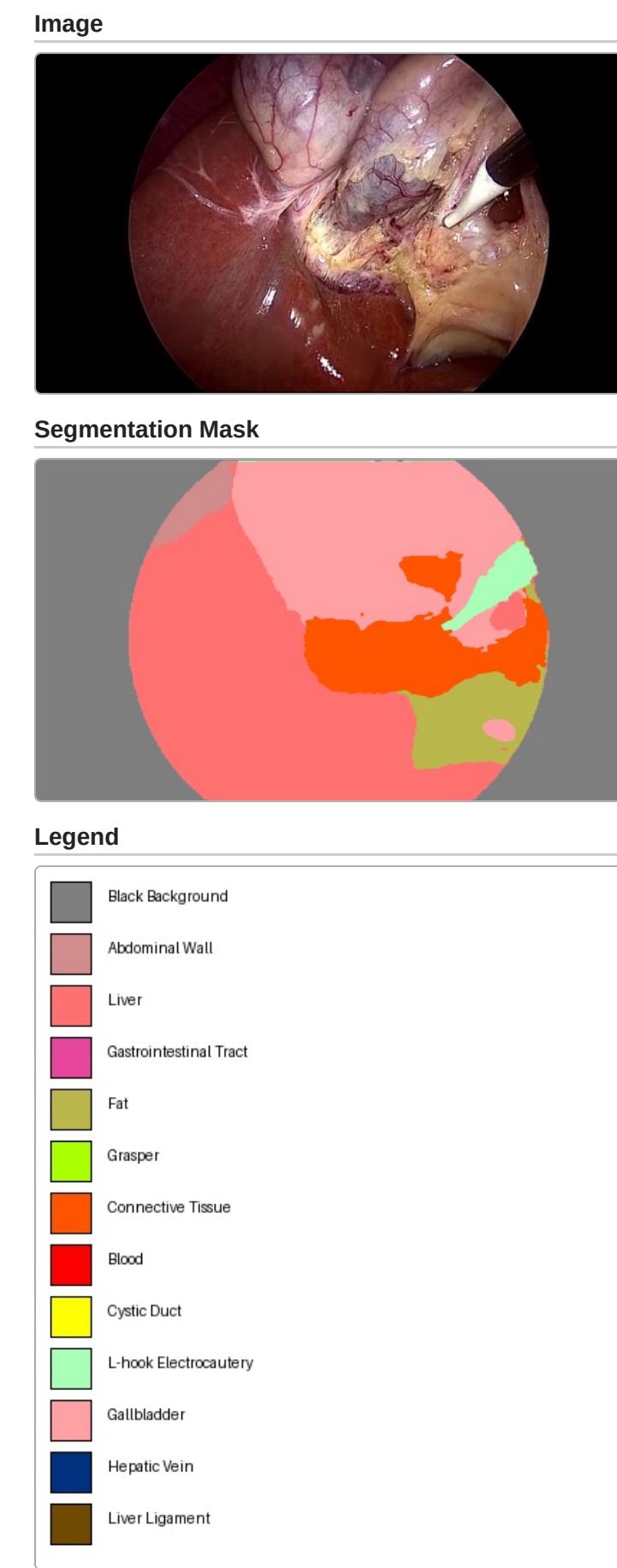


Context (LLM Input)	Conversational-1 (7 Qs) (\$0.0023)	Conversational-2 (7 Qs) (\$0.0015)	Complex Reasoning (3 Qs) (\$0.0020)	Concise (\$0.0005)
<p>Visible instruments: Grasper.</p> <p>Current phase: Gallbladder Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Model-generated segmentation mask confidence is below threshold, so spatial context is not included.</p>	<p>Q1: How many instruments are visible in this frame? A1: One instrument is visible: a grasper.</p> <p>Q2: Is a hook electrocautery visible in this frame? A2: No, a hook electrocautery is not visible.</p> <p>Q3: Is the grasper grasping the gallbladder? A3: Yes, the grasper is holding the gallbladder.</p> <p>Q4: What is the grasper doing to the gallbladder? A4: The grasper is retracting the gallbladder.</p> <p>Q5: Is the gallbladder present in the operative view? A5: Yes, the gallbladder is visible in the field.</p> <p>Q6: Are the grasper's jaws closed on tissue? A6: Yes, the grasper's jaws are closed on the gallbladder.</p> <p>Q7: Is the grasper the only instrument present in the operative field? A7: Yes, the grasper is the only instrument present.</p>	<p>Q1: What instruments are visible in this frame? A1: A single grasper is visible.</p> <p>Q2: What phase of the cholecystectomy is being performed in this image? A2: This image shows the gallbladder dissection phase.</p> <p>Q3: Which instrument is actively interacting with tissue and what is it doing? A3: The grasper is actively retracting the gallbladder.</p> <p>Q4: Is any electrocautery or other energy device visible in this view? A4: No. There is no electrocautery or other energy device visible—only the grasper.</p> <p>Q5: Is the grasper holding the gallbladder to provide exposure for dissection? A5: Yes. The grasper is holding and retracting the gallbladder to provide exposure for dissection.</p> <p>Q6: Are there any other instruments present in the surgical field besides the grasper? A6: No other instruments are present in the visible field.</p> <p>Q7: Is the operative field focused on the gallbladder-liver interface consistent with dissection from the liver bed? A7: Yes. The view centers on the gallbladder and its interface with surrounding tissue, consistent with dissection from the liver bed.</p>	<p>Q1: What specific mechanical effect is the current retraction likely producing to facilitate safe progression of gallbladder dissection? A1: The active grasper is applying controlled traction to tension the gallbladder wall and its attachments. This tension separates tissue layers, opening a visible dissection plane and stabilizing the gallbladder so the surgeon can perform precise blunt or cutting maneuvers. By providing countertraction, the grasper both exposes avascular planes and keeps mobile tissue away from the working edge, reducing the need for sweeping motions that could tear tissue or obscure the field.</p> <p>Q2: Which intraoperative complication is most directly increased by overly aggressive retraction here, and what immediate signs would indicate it has occurred? A2: Excessive traction most directly increases the risk of gallbladder wall tearing with bile leakage (perforation). Immediate signs would be sudden loss of tension and collapse of the gallbladder contour, visible bile or clear fluid in the field, and a rapid change in tissue appearance at the traction point (fayed or lacerated edges). There may also be a sudden shift in the position of the gallbladder if the grasp slips through a torn wall.</p> <p>Q3: If visualization becomes compromised during this phase while only a grasper is present, what stepwise adjustments should be made before resuming dissection? A3: First, reduce traction slightly to relieve tension that may be kinking or obscuring anatomy. Then suction or irrigate the field if fluid or blood is present to restore a clear view. Reposition the grasper to obtain more uniform, broad-based traction (e.g., seize a firmer portion of the wall rather than a thin edge). Reassess the exposed plane and only resume dissection once the anatomy is visible and tissue tension is optimal; if clarity cannot be restored, request an adjunct instrument (suction or a dissecting tool) rather than proceeding blind.</p>	<p>A grasper retracts the gallbladder during gallbladder dissection. No other instruments are active.</p> <p>Detailed (\$0.0010)</p> <p>The view is focused on the gallbladder, which is being actively retracted by a single grasper. The grasper is firmly holding the gallbladder to provide traction and exposure of the dissection plane during the Gallbladder Dissection phase. No other instruments are visible or idle in the field. The traction from the grasper is maintaining tension on the gallbladder to facilitate ongoing dissection.</p>

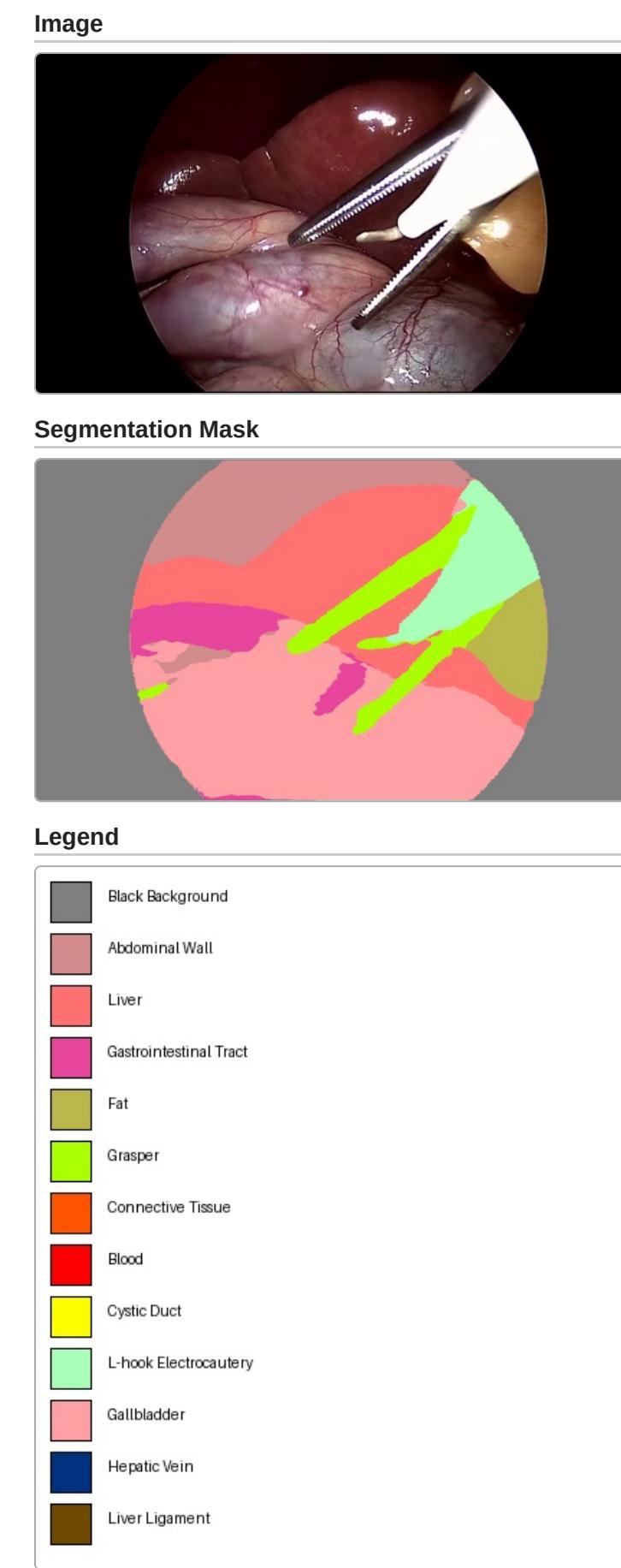


Context (LLM Input)
<p>Visible instruments: Grasper.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Omentum)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left-top. - Liver: left-bottom, left, right, right-bottom. - Gastrointestinal Tract: right-bottom. - Fat: bottom. - Grasper: left-bottom. - Connective Tissue: right. - L-hook Electrocautery: left-bottom. - Gallbladder: right.</p> <p>Relative Positions: - Abdominal Wall is to the left of Gallbladder. - Liver is to the left of Gastrointestinal Tract. - Gastrointestinal Tract is to the right of Grasper. - Fat is to the left of Gastrointestinal Tract. - Grasper is to the left of Gallbladder. - Connective Tissue is to the right of Grasper. - L-hook Electrocautery is to the left of Gastrointestinal Tract. - Gallbladder is to the right of L-hook Electrocautery.</p>

Conversational-1 (11 Qs) (\$0.0019)	Conversational-2 (7 Qs) (\$0.0019)	Complex Reasoning (2 Qs) (\$0.0023)	Concise (\$0.0006)
<p>Q1: Is the grasper visible in the operative field? A1: Yes. The grasper is visible.</p> <p>Q2: Where is the grasper located in the view? A2: The grasper is in the lower-left (left-bottom) portion of the view.</p> <p>Q3: What is the grasper doing in this frame? A3: The grasper is retracting tissue (retracting the omentum).</p> <p>Q4: Is the hook electrocautery visible in the frame? A4: No. The hook electrocautery is not visible.</p> <p>Q5: Is the gallbladder visible in the image? A5: Yes. The gallbladder is visible.</p> <p>Q6: Where is the gallbladder located in the view? A6: The gallbladder is on the right side of the field.</p> <p>Q7: Where is the abdominal wall seen in the image? A7: The abdominal wall is at the upper-left (left-top) portion of the view.</p> <p>Q8: Where is the liver located in this view? A8: The liver occupies the left side, toward the lower portion of the view.</p> <p>Q9: Is there any visible bleeding in the field? A9: No obvious blood is visible in this frame.</p> <p>Q10: Where is fatty tissue located in the image? A10: Fatty tissue is present along the lower portion of the field.</p> <p>Q11: Where is the connective tissue located relative to the view? A11: Connective tissue is located on the right side of the operative field.</p>	<p>Q1: Which instrument is visible in this frame and where is it located? A1: A single grasper is visible, positioned toward the left-bottom region of the operative field.</p> <p>Q2: What is the grasper doing in this image? A2: The grasper is retracting omental/fatty tissue (omentum) away from the operative area.</p> <p>Q3: Where is the gallbladder located relative to the grasper and within the frame? A3: The gallbladder lies to the right of the grasper and is situated on the right side of the image.</p> <p>Q4: What anatomical surfaces or tissues are visible and where are they roughly located? A4: The abdominal wall is visible toward the left-top, fat/omentum is concentrated at the bottom, and the gallbladder is on the right side of the field.</p> <p>Q5: Is any electrocautery or other instrument visible besides the grasper? A5: No. Only the grasper is visible in this frame; no other instruments are seen.</p> <p>Q6: What tissue is immediately to the right of the grasper? A6: Connective tissue is immediately to the right of the grasper.</p> <p>Q7: Where is the gastrointestinal tract located relative to the grasper? A7: The gastrointestinal tract is located toward the right-bottom of the frame and lies to the right of the grasper.</p>	<p>Q1: Given that only a grasper is actively retracting omental tissue while an electrocautery hook is present but not being used, what is the immediate operative goal the surgeon should be achieving in this moment of Calot triangle dissection? A1: The immediate goal is to create and maintain optimal exposure of the Calot region by using the grasper to pull the omentum and surrounding fat away from the gallbladder so that peritoneal and connective tissue planes can be identified safely. With the grasper applying sustained traction, the surgeon should be looking to tension the tissues so the peritoneal reflections and any fatty adhesions become taut and easier to inspect. The electrocautery hook, though visible, should remain idle until the planes are clearly visualized; once the anatomy is exposed and traction is appropriate, the hook can be activated in a controlled fashion to incise the peritoneum and divide small adhesions. This staged approach — controlled traction first, then targeted energy use — minimizes the chance of inadvertent tissue injury while progressing the dissection toward clear identification of the structures within the triangle.</p> <p>Q2: What technical adjustments to retraction and instrument use would most effectively improve visualization here, and why are those adjustments important before energizing the hook? A2: To improve visualization, the surgeon should adjust the grasper to provide more superior and lateral traction on the omentum and gallbladder so the tissue plane is flattened and the operative field opened. Slight rotation of the grasped tissue to present the peritoneal fold directly into view will help identify the natural dissection plane. These adjustments are important because they convert a loose, mobile tissue envelope into a tense, well-defined plane where small vessels and connective tissue are easier to see and divide deliberately. Only after this improved exposure should the electrocautery hook be activated, and then with short, precise coagulation/cut bursts aimed at discrete adhesions — reducing thermal spread to adjacent liver or biliary tissue and lowering the risk of unintended injury.</p>	<p>During Calot triangle dissection, a grasper (left-inferior) actively retracts omentum/fat. The gallbladder lies to the right of the instrument while the liver occupies the left/lower field.</p> <p>Detailed (\$0.0011)</p> <p>This is a Calot triangle dissection view. The gallbladder is positioned on the right side of the field with the liver occupying the left/background region. A single grasper is visible in the left-lower quadrant of the image and is actively retracting omental/fatty tissue away from the operative window to expose the triangle. The retraction places the grasper to the left of the gallbladder, creating tension and clearing fat in the lower field. Connective tissue lies just to the right of the grasper, bordering the working area between the grasper and the gallbladder. The abdominal wall is visible toward the upper-left, and portions of the gastrointestinal tract/floor are seen in the lower-right, deeper to the gallbladder. No other instruments are actively engaged in this frame.</p>

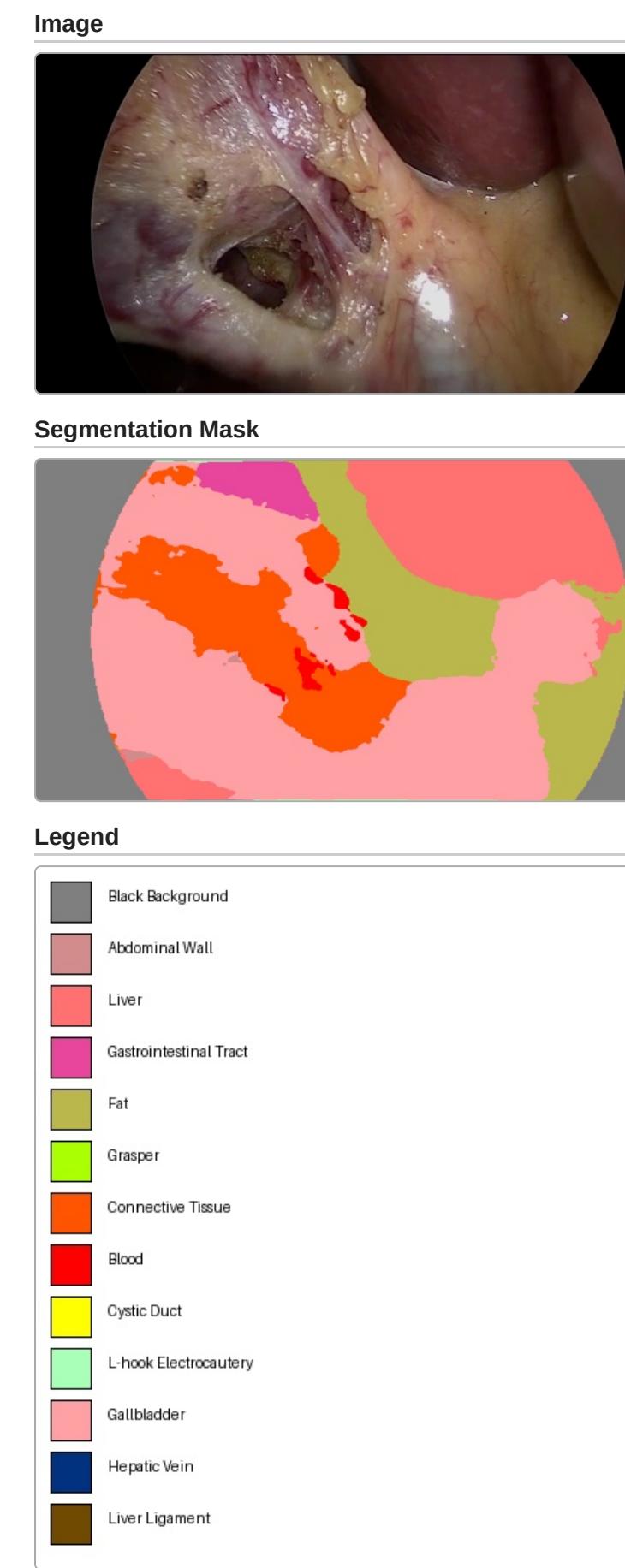


Context (LLM Input)	Conversational-1 (9 Qs) (\$0.0016)	Conversational-2 (10 Qs) (\$0.0023)	Complex Reasoning (2 Qs) (\$0.0024)	Concise (\$0.0006)
<p>Visible instruments: Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Hook, Dissect, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left-top. - Liver: left. - Gastrointestinal Tract: right. - Fat: center-right, right-bottom. - Grasper: right-top. - Connective Tissue: right. - Cystic Duct: right-top. - L-hook Electrocautery: right-top. - Gallbladder: top.</p> <p>Relative Positions: - Abdominal Wall is to the left of Gastrointestinal Tract. - Liver is to the left of Cystic Duct. - Gastrointestinal Tract is to the right of Liver. - Fat is to the right of Abdominal Wall. - Grasper is to the right of Abdominal Wall. - Connective Tissue is to the right of Abdominal Wall. - Cystic Duct is to the right of Abdominal Wall. - L-hook Electrocautery is to the right of Abdominal Wall. - Gallbladder is towards the top of Fat.</p>	<p>Q1: Is the hook visible in this frame? A1: Yes. The hook is visible at the right-upper portion of the field.</p> <p>Q2: What is the hook doing in this image? A2: The hook is dissecting tissue of the gallbladder.</p> <p>Q3: Where is the gallbladder located in the view? A3: The gallbladder is located toward the top of the image.</p> <p>Q4: Where is the liver located relative to the field? A4: The liver is on the left side of the operative view.</p> <p>Q5: Is the cystic duct visible in this frame? A5: Yes. The cystic duct is visible at the right-upper region.</p> <p>Q6: Where is the abdominal wall seen in the image? A6: The abdominal wall is visible at the left-upper part of the field.</p> <p>Q7: Is the gastrointestinal tract visible in the image? A7: Yes. The gastrointestinal tract is visible on the right side of the view.</p> <p>Q8: Is fat visible in the operative field? A8: Yes. Fat is visible in the center-right and right-lower portions.</p> <p>Q9: Is a grasper visible in this frame? A9: No. Only the hook instrument is visible.</p>	<p>Q1: What instrument is visible in this frame? A1: A single L-hook electrocautery (hook) is visible.</p> <p>Q2: What phase of the operation does this image show? A2: This view is during Calot triangle dissection.</p> <p>Q3: What is the hook doing in this image? A3: The hook is dissecting the gallbladder, positioned at the gallbladder margin.</p> <p>Q4: Where is the gallbladder located within the image? A4: The gallbladder occupies the upper/central portion of the view (top of the image).</p> <p>Q5: Where is the liver located relative to the gallbladder in the frame? A5: The liver is on the left side of the field, left of the gallbladder.</p> <p>Q6: Is there a grasper visible in this frame? A6: No—only the hook electrocautery is visible; no grasper is seen.</p> <p>Q7: Is the cystic duct visible, and if so, where is it located? A7: Yes. The cystic duct appears in the right-upper portion of the view (right-top), lateral to the gallbladder.</p> <p>Q8: What other tissues are immediately adjacent to the dissection area? A8: Adjacent to the gallbladder and dissection site are fatty tissue and connective tissue toward the right and inferior portions of the field, with gastrointestinal structures also appearing on the right.</p> <p>Q9: Is there visible bleeding at the dissection site in this image? A9: No active blood or obvious bleeding is visible in the image.</p> <p>Q10: How is the hook positioned relative to the gallbladder when performing the dissection? A10: The hook is located at the right-superior margin of the gallbladder, approaching the gallbladder laterally from the right to perform dissection.</p>	<p>Q1: Given the active electrocautery hook dissecting the gallbladder in this view, what is the most immediate anatomical target the surgeon is trying to expose, and why is that exposure necessary before any clipping or dividing? A1: The surgeon is working to delineate and skeletonize the structures entering the gallbladder at the hepatocystic triangle so that the cystic duct and cystic artery can be unequivocally identified. Active hook dissection is being used to remove fat and connective tissue around the gallbladder margin and create a clear plane; this exposure is necessary to avoid mistaking other biliary or vascular structures (which lie deeper and more medially) for the cystic duct. Only after those two structures are clearly separated from surrounding tissue and from the liver bed should clipping and division be attempted to minimize the risk of bile duct or vascular injury.</p> <p>Q2: What specific visual or tactile milestones should the surgeon achieve in this scene to confirm a safe plane for proceeding to clip the duct and artery? A2: The surgeon should obtain the “critical view of safety,” which requires three milestones visible/achievable during continued dissection with the hook: (1) clearance of fat and fibrous tissue so only two tubular structures remain entering the gallbladder, (2) those two structures are confirmed to be cystic duct and artery by their anatomy and course (they enter the gallbladder laterally and do not run medially toward the common bile duct), and (3) the lower one-third of the gallbladder is separated from the liver bed so the infundibulum is mobilized. In practical terms here, that means continued controlled hook dissection to remove overlying connective tissue until a tubular-looking duct and a smaller arterial structure can be followed clearly before any clipping.</p>	<p>Concise (\$0.0006)</p> <p>A hook electrocautery is actively dissecting the gallbladder in the upper field. The liver lies to the left, while the cystic duct, connective tissue, and gastrointestinal tract are located to the right.</p> <p>Detailed (\$0.0009)</p> <p>The view is focused on the superior aspect of the gallbladder during Calot triangle dissection. The gallbladder occupies the upper central field; the liver forms the left background and the gastrointestinal tract lies to the right. Fatty tissue and connective tissue are concentrated on the right and lower-right portions of the image, with the abdominal wall visible in the left-upper region.</p> <p>A single L-hook electrocautery is entering from the right-upper quadrant and its tip is actively dissecting the gallbladder—working at the gallbladder margin near the cystic duct region, which is also located toward the right-upper area. The hook is the only active instrument in this frame; no grasper is present to provide retraction. No significant bleeding is apparent.</p>



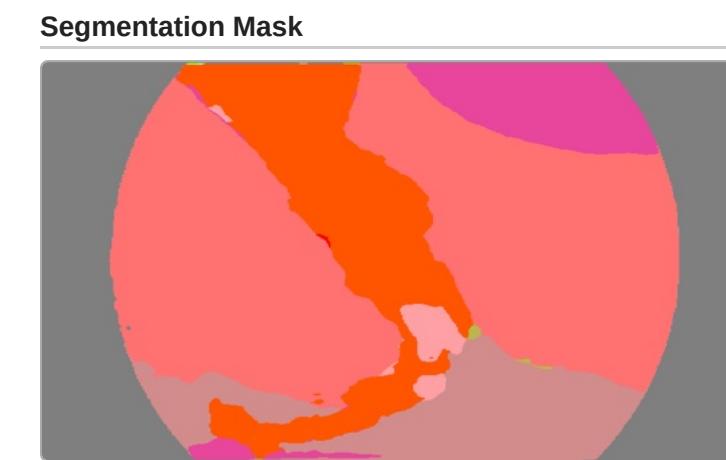
Context (LLM Input)
<p>Visible instruments: Grasper, Hook.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Grasp, Gallbladder) - (Hook, Null Verb, Null Target)</p> <p>Spatial (extracted from model-generated segmentation mask):</p> <p>Absolute Positions: - Abdominal Wall: left. - Liver: top. - Gastrointestinal Tract: left. - Fat: center-right. - Grasper: right. - L-hook Electrocautery: right-top. - Gallbladder: bottom.</p> <p>Relative Positions: - Abdominal Wall is to the left of Fat. - Liver is to the left of Fat. - Gastrointestinal Tract is to the left of Fat. - Fat is to the right of Gallbladder. - Grasper is to the right of Gastrointestinal Tract. - L-hook Electrocautery is to the right of Gastrointestinal Tract. - Gallbladder is to the left of L-hook Electrocautery.</p>

Conversational-1 (9 Qs) (\$0.0016)	Conversational-2 (8 Qs) (\$0.0016)	Complex Reasoning (2 Qs) (\$0.0020)	Concise (\$0.0008)
<p>Q1: Is the grasper holding the gallbladder? A1: Yes. The grasper is grasping the gallbladder.</p> <p>Q2: Where is the grasper located in the view? A2: The grasper is on the right side of the operative field.</p> <p>Q3: Is the hook visible in this image? A3: Yes. The hook is visible at the right-top of the view.</p> <p>Q4: Where is the gallbladder located in the operative field? A4: The gallbladder is at the bottom of the frame.</p> <p>Q5: Where is the liver located in the frame? A5: The liver is toward the top of the view.</p> <p>Q6: Is fatty tissue visible in this scene? A6: Yes. Fat is visible in the center-right portion of the field.</p> <p>Q7: Where is the abdominal wall located? A7: The abdominal wall is on the left side of the image.</p> <p>Q8: Is the hook positioned to the right of the gallbladder? A8: Yes. The hook is positioned to the right of the gallbladder.</p> <p>Q9: Is the grasper to the right of the gastrointestinal tract? A9: Yes. The grasper is located to the right of the gastrointestinal tract.</p>	<p>Q1: Which instruments are visible in this frame, and which one is actively grasping tissue? A1: A laparoscopic grasper and an L-hook electrocautery (hook) are visible. The grasper is actively grasping the gallbladder.</p> <p>Q2: Where is the gallbladder located within the image, and what is immediately to its right? A2: The gallbladder is in the lower part of the field (bottom). Immediately to its right is fatty tissue, and the L-hook electrocautery is positioned to the right-top relative to the gallbladder.</p> <p>Q3: What larger organs or structures can be seen and where are they positioned relative to the operative field? A3: The liver is visible toward the top of the field, the gastrointestinal tract is on the left side, and the abdominal wall appears on the left. Fatty tissue is present center-right.</p> <p>Q4: Is the hook electrocautery actively dissecting tissue in this frame? A4: No. The hook electrocautery is present on the right-top but is not shown actively dissecting a specific target in this frame.</p> <p>Q5: How are the grasper and hook positioned relative to each other and to the gallbladder? A5: Both instruments are on the right side of the field. The grasper is positioned to grasp and retract the lower gallbladder, while the L-hook is slightly superior and to the right of the gallbladder.</p> <p>Q6: What phase of the cholecystectomy does this image represent? A6: This image corresponds to the Calot triangle dissection phase.</p> <p>Q7: Is there visible fatty tissue near the area being manipulated, and if so, where is it relative to the gallbladder? A7: Yes. Fatty tissue is visible center-right and lies to the right of the gallbladder.</p> <p>Q8: Are any other instruments or foreign objects visible in the frame besides the grasper and the L-hook? A8: No. Only the grasper and the L-hook electrocautery are visible in this frame.</p>	<p>Q1: Given that the grasper is actively holding and retracting the gallbladder while the electrocautery hook is present but not in use, what is the most appropriate immediate next technical step to progress safe dissection of the Calot triangle? A1: With traction established on the gallbladder, the priority is to optimize exposure before energizing the hook. The immediate step is to use traction to create tension on the hepatocystic triangle (pull the infundibulum laterally and slightly caudally) and then gently sweep or tent away fat and connective tissue with the blunt or atraumatic edge of the hook or with the grasper to identify tissue planes. Do not activate electrocautery until the peritoneal layer and fat overlying the triangle are clearly separated and the desired plane is visible. This minimizes blind thermal application and reduces risk of inadvertent injury. If small bleeding or oozing is encountered, control it with short, controlled coagulation bursts or pressure with the grasper before resuming dissection so visibility is maintained for accurate identification of structures.</p> <p>Q2: How does the current balance between active retraction and an idle electrocautery tip affect the risk of ductal or vascular injury, and what maneuver reduces that risk? A2: Active retraction elevates and tensions tissues, which is necessary to delineate anatomy, but an idle electrocautery tip nearby represents a latent thermal hazard if activated without clear visualization. The combination can increase risk if traction distorts anatomy (for example, tenting or pulling the common bile duct into the field) or if the hook is applied too deeply. To reduce risk, the surgeon should adjust traction to align with the anatomical plane (lateral/caudal traction on the gallbladder fundus/infundibulum), clear fat/connective tissue to reveal only the structures entering the gallbladder, and then use the hook in short, superficial strokes directed along the avascular plane. Confirming the critical view of safety before any clipping or division is the definitive maneuver to minimize ductal or vascular injury.</p>	<p>Calot triangle dissection: a grasper on the right is actively grasping the gallbladder in the lower field. A hook electrocautery is positioned at the right-upper field near the liver and surrounding fat but is currently inactive.</p> <p>Detailed (\$0.0007)</p> <p>The view centers on the lower portion of the operative field where the gallbladder sits near the bottom of the image. A grasper approaches from the right and is actively holding the gallbladder, providing traction to expose the Calot region. The liver forms the upper/background portion of the scene, while the abdominal wall and portions of the gastrointestinal tract lie toward the left. Fatty tissue occupies the center-right area adjacent to the gallbladder. A hook electrocautery shaft is present in the right-upper quadrant of the field but is not currently engaged in dissection or cutting. No active electrosurgical action or bleeding is visible in this moment.</p>



Context (LLM Input)
<p>Visible instruments: No instruments are visible.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): No actions are taking place.</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: <ul style="list-style-type: none"> - Abdominal Wall: left-bottom. - Liver: right-top. - Gastrointestinal Tract: left-top. - Fat: right. - Grasper: center. - Connective Tissue: left. - Blood: center. - Cystic Duct: center. - L-hook Electrocautery: left-top, center-bottom. - Gallbladder: center-left, center-right, center-top, bottom, center, left-top. </p> <p>Relative Positions: <ul style="list-style-type: none"> - Abdominal Wall is to the left of Liver. - Liver is to the right of Connective Tissue. - Gastrointestinal Tract is towards the top of Abdominal Wall. - Fat is to the right of Abdominal Wall. - Grasper is to the left of Liver. - Connective Tissue is to the left of Fat. - Blood is to the left of Liver. - Cystic Duct is to the left of Fat. - L-hook Electrocautery is to the left of Liver. - Gallbladder is toward the bottom of Gastrointestinal Tract. </p>

Conversational-1 (10 Qs) (\$0.0018)	Conversational-2 (8 Qs) (\$0.0019)	Complex Reasoning (2 Qs) (\$0.0024)	Concise (\$0.0007)
<p>Q1: Is the gallbladder visible in this image? A1: Yes. The gallbladder is visible in the central area, slightly toward the left.</p> <p>Q2: Where is the cystic duct located in the operative field? A2: The cystic duct is visible in the central region of the image.</p> <p>Q3: Is there visible blood in the field? A3: Yes. A small amount of blood is present centrally.</p> <p>Q4: Is the liver visible in this view? A4: Yes. The liver appears in the upper-right/background portion of the field.</p> <p>Q5: Where is the abdominal wall located in this frame? A5: The abdominal wall is at the lower-left portion of the image.</p> <p>Q6: Where is fatty tissue located in the image? A6: Fatty tissue is present on the right side of the operative field.</p> <p>Q7: Is a grasper visible in this frame? A7: No. A grasper is not visible in this image.</p> <p>Q8: Is an L-hook electrocautery visible in this frame? A8: No. An L-hook electrocautery is not visible in this image.</p> <p>Q9: Is connective tissue visible in the field? A9: Yes. Connective tissue is visible on the left side of the view.</p> <p>Q10: Is the gastrointestinal tract visible in this image? A10: Yes. The gastrointestinal tract is visible toward the upper-left portion of the field.</p>	<p>Q1: Are any instruments visible in this frame? A1: No instruments are visible in this frame.</p> <p>Q2: What surgical phase is shown in this image? A2: This image corresponds to the Calot triangle dissection phase.</p> <p>Q3: Which anatomical structures are visible in the central operative field? A3: The gallbladder and the cystic duct are visible centrally, and there is blood present in the central field as well.</p> <p>Q4: Where is the liver located relative to the gallbladder in this view? A4: The liver is positioned to the right and slightly superior of the gallbladder.</p> <p>Q5: Is there blood in the operative field, and where is it located? A5: Yes. Blood is present centrally in the field.</p> <p>Q6: Is the L-hook electrocautery or any other instrument contacting tissue here? A6: No. No electrocautery or other instruments are visible or contacting tissue in this frame.</p> <p>Q7: What tissues are immediately adjacent to the cystic duct in this image? A7: Fat lies to the right of the cystic duct, connective tissue is nearby on the left side, and the gallbladder is adjacent centrally.</p> <p>Q8: Are any instrument-tissue interactions occurring at this moment? A8: No—there are no instrument-tissue interactions visible and no actions are taking place.</p>	<p>Q1: Given that the operation is in Calot triangle dissection but no instruments are currently visible and there is fresh blood in the field, what should the team anticipate as the immediate next maneuver and why? A1: The immediate priority is to regain a clear, dry visual field before any further dissection or definitive steps. Practically this means reintroducing suction to evacuate blood and irrigate as needed, then bringing a retraction instrument back into the view to re-establish consistent traction on the gallbladder (usually fundal/cephalad traction plus lateral retraction of the infundibulum). Clearing the field will allow identification of the cystic duct and surrounding connective/fatty tissue in the Calot triangle; without that, further energy use or blind clipping risks bile duct or vascular injury. The team should also be prepared to control the bleeding source (pressure with a grasper or local application of bipolar/clip) if suction reveals ongoing oozing or a discrete arterial source.</p> <p>Q2: Is it appropriate to proceed with clipping and dividing the cystic duct in this frame? Explain the reasoning. A2: No, it is not appropriate yet. Clipping and dividing the cystic duct should only occur once anatomy is clearly defined and the critical view of safety is obtained. In this scene the field is contaminated by blood and there are no instruments actively retracting or dissecting to expose and isolate structures. Proceeding would risk misidentification of structures (e.g., mistaking a low common bile duct or aberrant duct for the cystic duct) and potential bile duct injury. The correct sequence is to clear blood, restore retraction, remove residual fat/connective tissue around the infundibulum, confirm only two structures enter the gallbladder, then apply clips.</p>	<p>No instruments are visible and no active manipulation is occurring. The Calot triangle is exposed: the gallbladder lies centrally and inferiorly, with the cystic duct nearby centrally. The liver occupies the right–upper area. Connective tissue lies to the left and fat to the right. A small amount of blood is present.</p> <p>Detailed (\$0.0010)</p> <p>This laparoscopic field shows the gallbladder occupying the central portion of the view and extending upward and slightly leftward. The cystic duct is visible in the central area beneath the gallbladder. The liver forms the background on the right and superior aspect of the image, while omental/fatty tissue lies on the right side of the field. Connective tissue is concentrated along the left side, with the gastrointestinal tract visible toward the upper-left. A small amount of blood is present centrally. The abdominal wall is seen toward the lower-left. No instruments are visible in the frame and no instrument actions are taking place at this moment.</p>



FASL Prediction (Conf: 0.9491)

Context (LLM Input)

Visible instruments:
No instruments are visible.

Current phase:
Calot Triangle Dissection

Current action triplets (tool, verb, target):
No actions are taking place.

Spatial (extracted from model-generated segmentation mask):
Absolute Positions:

- Abdominal Wall: bottom.
- Liver: right-top, left-bottom, left-top, left, right.
- Gastrointestinal Tract: right-top.
- Fat: right-bottom.
- Grasper: left-top.
- Connective Tissue: left.
- Blood: center.
- L-hook Electrocautery: left-top, center-top.
- Gallbladder: right-bottom.

 Relative Positions:

- Abdominal Wall is toward the bottom of L-hook Electrocautery.
- Liver is toward the bottom of L-hook Electrocautery.
- Gastrointestinal Tract is towards the top of Abdominal Wall.
- Fat is to the right of Grasper.
- Grasper is towards the top of Abdominal Wall.
- Connective Tissue is towards the top of Abdominal Wall.
- Blood is to the left of Fat.
- L-hook Electrocautery is towards the top of Gallbladder.
- Gallbladder is toward the bottom of Grasper.

Conversational-1 (9 Qs) (\$0.0018)

- Q1: Is the gallbladder visible in the image?**
A1: Yes. The gallbladder is visible in the lower-right portion of the frame.
- Q2: Where is the abdominal wall located in the view?**
A2: The abdominal wall is located along the bottom of the image.
- Q3: Where is the liver located in the operative field?**
A3: The liver occupies much of the left side and extends into the upper portions of the field.
- Q4: Where is the fat tissue located?**
A4: Fatty tissue is visible in the lower-right region of the view.
- Q5: Is there blood visible in this frame?**
A5: Yes. Blood is visible in the central area of the operative field.
- Q6: Is a grasper instrument visible?**
A6: No. No grasper is visible in this image.
- Q7: Is the L-hook electrocautery visible?**
A7: No. The L-hook is not visible in this frame.
- Q8: Where is connective tissue located in the image?**
A8: Connective tissue is visible on the left side of the operative field.
- Q9: Where is the gastrointestinal tract located?**
A9: The gastrointestinal tract is visible in the upper-right portion of the image.

Conversational-2 (9 Qs) (\$0.0026)

- Q1: What operative phase is depicted in this image?**
A1: I observe the Calot triangle dissection phase of the laparoscopic cholecystectomy.
- Q2: Which anatomical structures are visible in this frame?**
A2: I see the gallbladder (lower-right), portions of the liver (central to right), abdominal wall along the bottom, fatty tissue on the right-bottom, connective tissue on the left, a segment of gastrointestinal tract in the upper-right, and a central area of blood.
- Q3: Are any surgical instruments visible or contacting tissue in this view?**
A3: No instruments are visible in this frame, and none appear to be contacting tissue.
- Q4: Where is the gallbladder located within the image?**
A4: The gallbladder is located in the lower-right portion of the image, adjacent to areas of fatty tissue.
- Q5: Where is the blood located relative to the fatty tissue?**
A5: The blood collection is centrally located and lies to the left of the fatty tissue.
- Q6: Where is the gastrointestinal tract relative to the abdominal wall?**
A6: The gastrointestinal tract appears above (superior to) the abdominal wall and is situated in the upper-right area of the image.
- Q7: Where is the connective tissue located relative to the abdominal wall?**
A7: The connective tissue is positioned toward the top of the abdominal wall on the left side of the field.
- Q8: Is the liver visible, and if so, which part of the image does it occupy?**
A8: Yes. The liver occupies much of the central to right portions of the image, appearing across both upper and mid regions on the right.
- Q9: Is there any visible instrument-shaped object in the upper field despite no instruments being reported?**
A9: I do not see any instrument-shaped objects in the upper field; the view shows anatomical structures only.

Complex Reasoning (2 Qs) (\$0.0026)

- Q1: With a small pool of blood obscuring the operative field during Calot triangle dissection and no instruments currently in view, what is the immediate priority and why?**
A1: The immediate priority is to re-establish a clear field before any further dissection. Blood in the center of view should be evacuated with suction/irrigation so the source can be identified; proceeding while visualization is poor greatly increases the risk of misidentifying structures. Once suction clears blood, the surgeon can determine whether the bleeding arises from a small arterial branch in the hepatocystic triangle, oozing from the liver bed, or a gallbladder wall defect, and then choose an appropriate hemostatic maneuver (pressure/packing, targeted electrocautery or clipping, topical agents). Maintaining visualization also preserves the ability to obtain the critical view of safety and prevents inadvertent injury to the bile duct or major vessels. Because no instruments are present in the field now, the team should promptly introduce a suction device (and a retractor/grasper if needed) rather than continuing blind dissection.
- Q2: What are the most likely sources of the observed bleeding in this stage of dissection, and how would the management differ for each source?**
A2: At the Calot dissection stage the common sources are: - A small branch of the cystic artery or accessory arterial twig in the cystohepatic triangle: this typically bleeds in a focused manner. Management is focal—suction to visualize, then control with bipolar coagulation, targeted monopolar cautery, or placement of clips on the bleeding vessel. - Oozing from the liver parenchyma of the liver bed: this is usually diffuse low-pressure bleeding. Management prioritizes pressure with a swab or atraumatic grasper, topical hemostatic agents (e.g., oxidized cellulose), and gentle electrocautery as needed. Excessive fulguration should be avoided to prevent liver injury. - Gallbladder wall perforation with bile/blood leak: management requires controlling the leak (suction, local cauterization or suturing of the defect if accessible) and minimizing contamination; this may also prompt more careful evacuation of bile and irrigation. Differentiating the source after clearing the blood is essential because the choice between clipping a discrete vessel versus packing/topical measures for parenchymal ooze is different and affects subsequent dissection strategy.

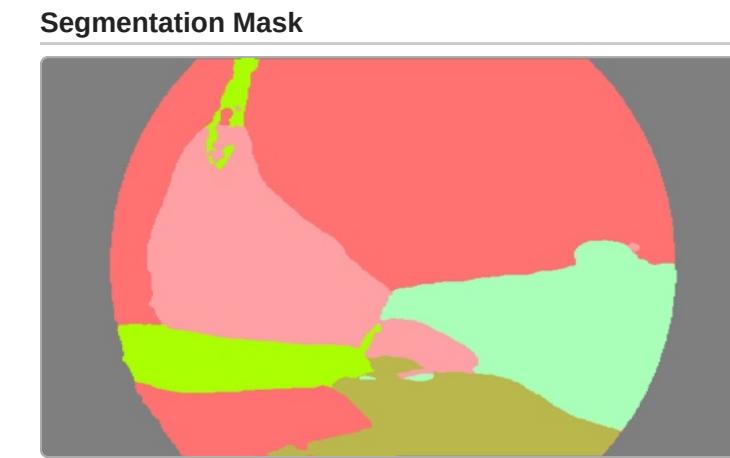
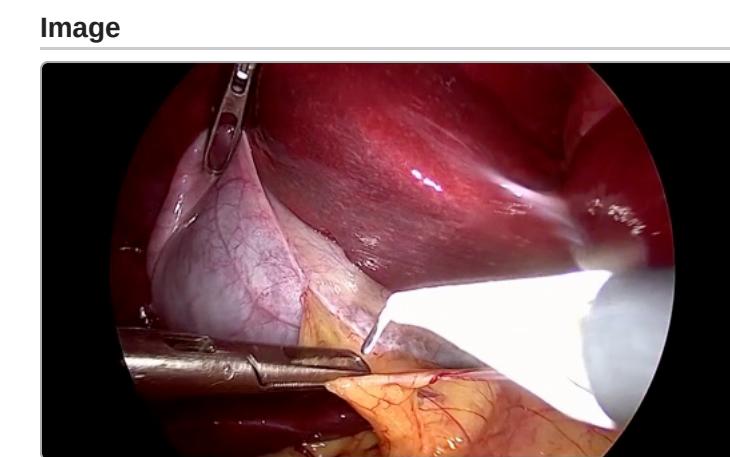
Concise (\$0.0006)

Calot triangle dissection is underway but no instruments are visible and no actions are occurring. The gallbladder lies in the lower-right portion of the field. The liver occupies much of the right/upper and left regions. A central area of blood is present. Fatty tissue is at the right-bottom, connective tissue toward the left, and the abdominal wall forms the lower boundary.

Detailed (\$0.0011)

The view is focused on the Calot triangle region with the gallbladder positioned in the lower-right portion of the field. The liver forms a large background mass extending across much of the image, bordering the gallbladder. Fatty tissue lies toward the lower-right area adjacent to the gallbladder, while a band of connective tissue is visible more toward the left side of the operative field. The abdominal wall appears along the bottom edge of the image and portions of the gastrointestinal tract are seen in the upper-right quadrant.

There is a small area of blood centrally located in the field, consistent with minor oozing or a recent focal bleed near the dissection plane. No surgical instruments are visible in the image and no instrument actions are occurring at this moment; the operative field is clear of graspers or electrocautery devices in view.



Context (LLM Input)

Visible instruments:
Grasper, Hook.

Current phase:
Calot Triangle Dissection

Current action triplets (tool, verb, target):
- (Grasper, Retract, Gallbladder)
- (Grasper, Retract, Omentum)
- (Hook, Dissect, Omentum)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:
- Abdominal Wall: top.
- Liver: top.
- Gastrointestinal Tract: right-bottom.
- Fat: bottom.
- Grasper: left-top, left-bottom.
- L-hook Electrocautery: right-bottom, center-bottom.
- Gallbladder: left.

Relative Positions:
- Abdominal Wall is to the right of Grasper.
- Liver is towards the top of Gastrointestinal Tract.
- Gastrointestinal Tract is to the right of Fat.
- Fat is to the right of Grasper.
- Grasper is to the left of L-hook Electrocautery.
- L-hook Electrocautery is to the right of Gallbladder.
- Gallbladder is to the left of Abdominal Wall.

Conversational-1 (12 Qs) (\$0.0020)

- Q1: Is the grasper visible in this image?**
A1: Yes, the grasper is visible.
- Q2: Where is the grasper located in the operative view?**
A2: The grasper is on the left side of the field, toward the upper quadrant.
- Q3: What is the grasper doing to the gallbladder in this frame?**
A3: The grasper is retracting the gallbladder.
- Q4: Is the hook electrocautery visible in this image?**
A4: Yes, the hook electrocautery is visible.
- Q5: What is the hook doing in this frame?**
A5: The hook is dissecting omental tissue.
- Q6: Where is the hook positioned relative to the gallbladder?**
A6: The hook is to the right of the gallbladder.
- Q7: Is the gallbladder present in the view?**
A7: Yes, the gallbladder is present.
- Q8: Where is the gallbladder located in the frame?**
A8: The gallbladder is located on the left side of the image, toward the upper-central area.
- Q9: Is omental tissue being retracted in this image?**
A9: Yes, omental tissue is being retracted.
- Q10: Is the liver visible in this view?**
A10: Yes, the liver is visible at the top of the field.
- Q11: Is fatty tissue visible in the image?**
A11: Yes, fatty tissue is visible in the lower portion of the field.
- Q12: Is any portion of the gastrointestinal tract visible?**
A12: Yes, it is visible in the lower-right area of the image.

Conversational-2 (8 Qs) (\$0.0021)

- Q1: Which instruments are visible in this frame?**
A1: A single grasper and a hook electrocautery are visible.
- Q2: Where is the grasper located in the field and which tissues is it retracting?**
A2: The grasper is on the left side of the field (visible toward both top and lower left) and is retracting the gallbladder and adjacent omental (fatty) tissue.
- Q3: Where is the hook electrocautery positioned and what is it doing?**
A3: The hook electrocautery is on the center-right to right-bottom of the field and is dissecting omental tissue.
- Q4: Is the hook located to the right or left of the gallbladder?**
A4: The hook electrocautery is to the right of the gallbladder.
- Q5: What anatomical structures occupy the upper part of the image?**
A5: The abdominal wall and the liver are located toward the top of the image.
- Q6: Where is fatty tissue relative to the grasper?**
A6: Fatty tissue is located to the right and toward the bottom relative to the grasper.
- Q7: How are the grasper, gallbladder, and hook positioned relative to each other?**
A7: The grasper is on the left engaging and retracting the gallbladder; the gallbladder lies left-central, and the hook is positioned to the right (center-bottom) dissecting omental tissue lateral to the gallbladder.
- Q8: Is the gastrointestinal tract visible, and if so where is it located?**
A8: Yes — the gastrointestinal tract appears in the right-bottom portion of the field.

Complex Reasoning (2 Qs) (\$0.0024)

- Q1: With the grasper applying bidirectional traction on the gallbladder and omentum while the electrocautery hook is dissecting the omental attachments, what immediate adjustments to electrosurgical technique and instrument handling reduce the risk of collateral thermal injury to adjacent bowel and liver?**
A1: Because the grasper is actively retracting both the gallbladder and omentum, the hook is being used in close proximity to two different tissue types and nearby viscera. To minimize collateral thermal injury you should: use short, intermittent activation pulses rather than prolonged continuous coagulation; reduce the energy/power setting appropriate for fine dissection of fatty tissue; keep the hook tip constantly in view and directed toward the intended target (the omental attachments) so stray current is minimized; maintain traction to create a clear tensioned plane so the hook contacts only the tissue to be divided; avoid sweeping or broad movements that can transfer heat to adjacent serosa; and, if the bowel or liver edge is close, change to blunt dissection or reposition the grasper to move non-target tissue further away before reactivating energy. These steps explicitly use the active roles of the grasper (to tension and distance non-target tissue) and the hook (to apply controlled energy) to improve safety.
- Q2: How does simultaneous retraction of the gallbladder and omentum facilitate safe progress through the Calot triangle dissection, and what anatomical landmarks become easier to expose as a result?**
A2: Applying traction on both the gallbladder and adjacent omentum tensions and separates tissue layers, which opens the plane of dissection and displaces fatty tissue laterally. This clarifies the region of the cystic pedicle and helps reveal the cystic duct and cystic artery by removing overlying omentum and fat. With this exposure the inferior margin of the liver and the lateral border of the gallbladder become more distinct, making it easier to identify the triangle bounded by the cystic duct inferiorly, the common hepatic duct medially, and the liver superiorly. The active grasper creates sustained retraction while the hook performs incremental division of the omental attachments, together enabling safer delineation of these landmarks before any clipping or division.

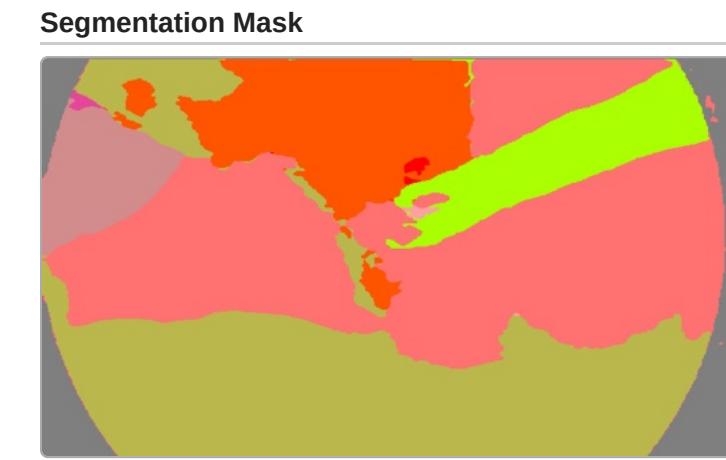
Concise (\$0.0006)

A grasper on the left retracts the gallbladder and adjacent omentum/fat. A hook electrocautery on the right is actively dissecting omental/fatty tissue within the Calot triangle.

Detailed (\$0.0009)

The view is focused on the gallbladder region with the liver and abdominal wall occupying the upper field. The gallbladder lies on the left side of the image. A grasper is positioned on the left, engaging the gallbladder and adjacent omental/fatty tissue — it is actively retracting both the gallbladder and the omentum to expose the Calot's triangle.

From the right-lower/central-lower side, an L-hook electrocautery approaches the working area and is actively dissecting the omentum (fatty attachments) near the gallbladder. The hook sits to the right of the gallbladder while the grasper remains to its left, creating opposing tension for precise dissection. Lower portions of the field contain fatty tissue/omentum and the gastrointestinal tract is visible toward the right-lower quadrant. The instruments are actively cooperating: the grasper provides traction and exposure, and the hook performs electrocautery dissection of the omental attachments.



Context (LLM Input)

Visible instruments:
Grasper, Bipolar.

Current phase:
Gallbladder Dissection

Current action triplets (tool, verb, target):
- (Grasper, Grasp, Gallbladder)
- (Bipolar, Coagulate, Blood Vessel)

Spatial (extracted from model-generated segmentation mask):

Absolute Positions:

- Abdominal Wall: left-top.
- Liver: right-top, right-bottom, center, left-top, left-bottom.
- Gastrointestinal Tract: left.
- Fat: bottom.
- Grasper: right-top.
- Connective Tissue: top.
- Blood: center-top.
- Cystic Duct: left-top.
- Gallbladder: center-right, center.

Relative Positions:

- Abdominal Wall is to the left of Liver.
- Liver is to the right of Gastrointestinal Tract.
- Gastrointestinal Tract is to the left of Grasper.
- Fat is toward the bottom of Cystic Duct.
- Grasper is to the right of Fat.
- Connective Tissue is to the right of Abdominal Wall.
- Blood is to the right of Abdominal Wall.
- Cystic Duct is to the left of Liver.
- Gallbladder is towards the top of Fat.

Conversational-1 (10 Qs) (\$0.0022)

Q1: Is the bipolar instrument visible in this image?

A1: Yes. The bipolar instrument is visible near the central-top of the field adjacent to a small vessel.

Q2: What structure is the grasper holding?

A2: The grasper is holding the gallbladder.

Q3: Where is the gallbladder located in the view?

A3: The gallbladder is in the center-right of the frame.

Q4: Is there visible blood in the operative field?

A4: Yes. A small area of blood is visible in the central-top region.

Q5: What is the bipolar instrument coagulating?

A5: The bipolar is coagulating a blood vessel in the central-top area.

Q6: Where is the cystic duct located in this view?

A6: The cystic duct is located toward the left-top of the image.

Q7: What is the grasper doing in this scene?

A7: The grasper is grasping and retracting the gallbladder.

Q8: Where is the liver located in the image?

A8: The liver occupies the right side of the view and forms the posterior background.

Q9: Is fatty tissue visible in the field?

A9: Yes. Fatty tissue is visible along the lower portion of the field.

Q10: Where is the visible blood relative to the gallbladder?

A10: The blood is located above and slightly central to the gallbladder in the upper-central area.

Conversational-2 (10 Qs) (\$0.0017)

Q1: What instruments are visible in this frame and how many are there?

A1: Two instruments are visible: a grasper and a bipolar electrosurgical instrument (bipolar).

Q2: Which structure is the grasper holding and where is it located in the image?

A2: The grasper is holding the gallbladder, which is located centrally and slightly to the right of center in the field.

Q3: Which instrument is actively coagulating a blood vessel and where is that blood visualized?

A3: The bipolar instrument is coagulating a blood vessel. Areas of blood are visible in the central-superior part of the image (center-top).

Q4: Where is the cystic duct relative to the gallbladder and to surrounding fat?

A4: The cystic duct appears toward the left-superior portion of the image, to the left of the gallbladder; fatty tissue lies inferiorly relative to the cystic duct.

Q5: What phase of the cholecystectomy is shown in this view?

A5: This view corresponds to the gallbladder dissection phase.

Q6: Is the liver visible, and if so on which side of the image does it predominantly appear?

A6: Yes. The liver is visible and predominantly occupies the right side of the image.

Q7: What tissue lies inferior to the gallbladder in this image?

A7: Fatty tissue is located inferior to the gallbladder.

Q8: How is the blood positioned relative to the abdominal wall?

A8: The blood is positioned to the right of the abdominal wall.

Q9: Are both instruments positioned in the upper half of the image, and if not, which is located superiorly?

A9: The grasper is positioned superiorly (upper/right area). The bipolar is engaged centrally near the area of blood at the top center; both are in the upper half of the field.

Q10: Which instrument is interacting with the gallbladder and what is it doing?

A10: The grasper is interacting with the gallbladder by grasping and retracting it.

Complex Reasoning (2 Qs) (\$0.0024)

Q1: Given active coagulation of a vessel while the gallbladder is being retracted, what is the most appropriate immediate sequence of actions to control the bleeding and safely continue dissection?

A1: First, maintain the current retraction with the grasper to keep the bleeding point exposed and provide gentle counter-tension—this both improves visualization and can give temporary tamponade. With the bipolar actively coagulating, confirm the bleeding source is a discrete vessel (likely a small branch from the gallbladder bed or cystic vascular pedicle) and target that vessel directly between the bipolar jaws. Use short, controlled coagulation bursts at low-to-moderate power and verify that the hemorrhage has stopped after each application. If oozing persists despite focused coagulation, continue brief pressure with the grasper to tamponade while repeating targeted coagulation until reliable hemostasis is obtained. Only once the field is dry and anatomy is clearly visible should the surgeon resume progressive dissection of the gallbladder from the liver bed.

Q2: Why is bipolar electrocautery an appropriate choice for controlling this type of bleeding in the current anatomical context?

A2: Bipolar energy confines the current flow between the instrument jaws, providing focused coagulation of a small vessel with less lateral thermal spread compared with monopolar hook cautery. In this frame the gallbladder and cystic structures lie nearby, so minimizing collateral thermal injury is important. The bipolar jaws allow the surgeon to grasp or encompass the bleeding vessel and coagulate it directly, giving predictable hemostasis in a wet field and reducing the chance of damaging adjacent ductal or hepatic tissue while maintaining the retraction provided by the grasper.

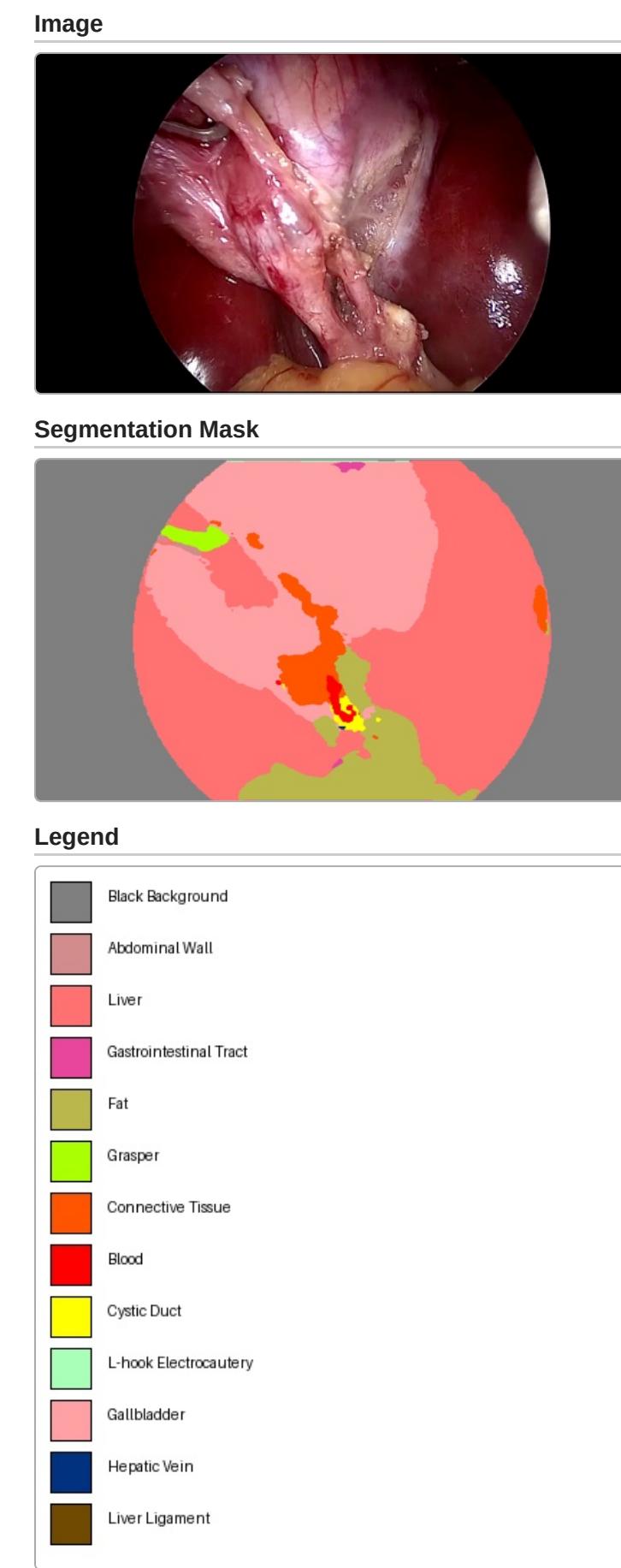
Concise (\$0.0005)

A grasper holds the gallbladder centrally/right while bipolar forceps actively coagulate a nearby blood vessel. The liver is positioned to the right and the cystic duct is visible toward the left-top.

Detailed (\$0.0009)

The view is focused on the gallbladder during dissection. The gallbladder sits in the central to right portion of the field and is being firmly held by a grasper coming in from the right-upper area to provide traction and exposure. The liver forms the dominant background around the operative site. The cystic duct can be seen toward the upper-left region of the image, with connective tissue near the upper field and fatty tissue occupying the lower portion.

A bipolar instrument is actively coagulating a bleeding vessel in the upper-central area of the field—there is visible blood at the center-top where coagulation is being applied. Both instruments are actively engaged: the grasper is retracting and stabilizing the gallbladder while the bipolar is performing targeted hemostasis on the vessel adjacent to the dissection plane.



Context (LLM Input)	Conversational-1 (9 Qs) (\$0.0018)	Conversational-2 (10 Qs) (\$0.0022)	Complex Reasoning (2 Qs) (\$0.0028)	Concise (\$0.0008)
<p>Visible instruments: Grasper.</p> <p>Current phase: Calot Triangle Dissection</p> <p>Current action triplets (tool, verb, target): - (Grasper, Retract, Gallbladder)</p> <p>Spatial (extracted from model-generated segmentation mask): Absolute Positions: - Abdominal Wall: left-top. - Liver: right-bottom, center-left, right, center, left-top, left-bottom. - Gastrointestinal Tract: center-top. - Fat: center-bottom. - Grasper: left-top. - Connective Tissue: left. - Blood: bottom. - Cystic Duct: center-bottom. - L-hook Electrocautery: center-top. - Gallbladder: top. - Hepatic Vein: center-bottom.</p> <p>Relative Positions: - Abdominal Wall is towards the top of Fat. - Liver is to the right of Grasper. - Gastrointestinal Tract is towards the top of Fat. - Fat is toward the bottom of Gallbladder. - Grasper is to the left of Connective Tissue. - Connective Tissue is toward the bottom of L-hook Electrocautery. - Blood is toward the bottom of Gastrointestinal Tract. - Cystic Duct is toward the bottom of Gastrointestinal Tract. - L-hook Electrocautery is towards the top of Liver. - Gallbladder is towards the top of Hepatic Vein. - Hepatic Vein is toward the bottom of Gastrointestinal Tract.</p>	<p>Q1: Is the grasper visible in this image? A1: Yes, the grasper is visible.</p> <p>Q2: What is the grasper doing in this view? A2: The grasper is retracting the gallbladder.</p> <p>Q3: What structure is the grasper holding? A3: The grasper is holding the gallbladder.</p> <p>Q4: Where is the grasper located in the frame? A4: The grasper is positioned at the left-top of the view.</p> <p>Q5: Where is the gallbladder located in the frame? A5: The gallbladder is at the top central portion of the field.</p> <p>Q6: Where is the liver located relative to the grasper? A6: The liver lies to the right of the grasper.</p> <p>Q7: Is there any visible blood in the operative field? A7: Yes, there is blood visible in the lower portion of the field.</p> <p>Q8: Where is fatty tissue located in this image? A8: Fatty tissue is present toward the center-bottom of the view.</p> <p>Q9: Where is the abdominal wall visible in the image? A9: The abdominal wall is visible at the left-top region of the frame.</p>	<p>Q1: What instrument(s) do you see in this frame? A1: I see a single grasper instrument in the field.</p> <p>Q2: What operative phase is depicted in this image? A2: This view corresponds to the Calot triangle dissection phase of a laparoscopic cholecystectomy.</p> <p>Q3: What is the grasper doing to the gallbladder right now? A3: The grasper is retracting the gallbladder to provide exposure of the dissection area.</p> <p>Q4: Where is the grasper located relative to the gallbladder within the image? A4: The grasper is in the upper-left region of the image, positioned adjacent to the superior-left aspect of the gallbladder.</p> <p>Q5: Which other anatomical structures are visible in the frame and where are they located? A5: Visible structures include the abdominal wall (toward the top), the liver (predominantly to the right), gastrointestinal tract (central-top), fat/connective tissue (central-bottom), the cystic duct (center-bottom), and the hepatic vein area (center-bottom).</p> <p>Q6: Is an electrocautery hook present and active in this view? A6: No. I do not see an electrocautery hook present or active in this frame; only the grasper is visible.</p> <p>Q7: Is any blood visible in the image, and if so where? A7: Yes. Blood is visible toward the bottom of the image.</p> <p>Q8: Where is the cystic duct located relative to the gallbladder and the grasper? A8: The cystic duct is located in the center-bottom of the frame, inferior to the gallbladder and below the area being retracted by the grasper.</p> <p>Q9: How is the liver positioned relative to the grasper and gallbladder? A9: The liver is on the right side of the image, lateral to the grasper and lateral to the gallbladder.</p> <p>Q10: Are there any retracting or grasping actions on tissues other than the gallbladder visible here? A10: No. The visible action is the grasper retracting the gallbladder; no other tissue-specific grasping is evident in this frame.</p>	<p>Q1: Given that the grasper is actively retracting the gallbladder while the hook is present but not currently cutting, what specific next maneuvers would optimize exposure and minimize the risk of misidentifying biliary structures as you progress the Calot triangle dissection? A1: Keep the gallbladder under steady cephalad (and slightly lateral) traction with the grasper to tension the infundibulum and open the Calot triangle. Use the hook only intermittently for short, controlled sharp/blunt dissection strokes to divide superficial connective tissue while the grasper maintains tension; avoid prolonged coagulation cycles. Progress in small steps: bluntly sweep loose fat and areolar tissue away from the expected path of the cystic duct and artery, then perform fine hook dissection to skeletonize those tubular structures. Before any clipping or division, confirm the critical view of safety by clearing the lower third of the gallbladder off the liver bed and ensuring only two tubular structures enter the gallbladder. Throughout, keep the hook idle and withdrawn from the field when not actively dissecting to prevent inadvertent activation on non-target tissue.</p> <p>Q2: How does the current direction of gallbladder traction influence both exposure and the types of injuries that are most likely if dissection is continued without adjustment? A2: Cephalad (upward) traction on the gallbladder opens the Calot triangle and separates the cystic structures from the surrounding tissues, improving visualization. If traction is maintained appropriately, it reduces the chance of misidentifying the common bile duct as the cystic duct. However, excessive lateral or ventral traction can tent or distort biliary anatomy, increasing the risk of clipping or cutting the wrong structure. Also, if traction pulls the gallbladder away from the liver bed unevenly, the surgeon may dissect too deep into the liver parenchyma or near hepatic veins—raising the risk of venous bleeding—or inadvertently perforate the gallbladder wall, causing bile spillage.</p>	<p>Concise (\$0.0008)</p> <p>A single grasper actively retracts the gallbladder upward/left to expose the Calot triangle. The gallbladder sits at the top/center with the cystic duct visible inferiorly amid surrounding fat and connective tissue. The liver lies to the right, with minor blood noted in the lower field.</p> <p>Detailed (\$0.0010)</p> <p>The view is focused on the gallbladder in the upper central field. A single grasper enters from the left-superior aspect and is actively holding and retracting the gallbladder, creating tension to expose the Calot region. The liver occupies much of the right and deeper background, while fatty tissue lies in the lower central field beneath the gallbladder. The cystic duct and hepatic vein structures are visible toward the lower central/basal area, with some connective tissue along the left side. A small amount of blood is present in the inferior field. No cutting or electrocautery instrument is engaged in this frame.</p>