

Upper Urinary Tract and Retroperitoneal Hemorrhage

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Common Case Presentation

72-year-old female presents with red colored urine, left side flank pain, and dizziness. She notes the symptoms started yesterday afternoon and her pain has progressed and the urine has become progressively bloodier. She has a 25-pack year smoking history and worked for 30 years as a hair stylist.

I. Receiving the Phone Call and Initial thoughts

A. **Upper tract hematuria and retroperitoneal hemorrhage may result from numerous etiologies including anatomic cause, spontaneous, or as the result of injury or trauma.**
As with hematuria of lower tract origin, the initial questions should center around the nature of hematuria, gross or microscopic, hemodynamic stability of the patient, and the symptomatic nature of the bleeding.

B. **Where is the phone call originating?**

A phone call for an intraoperative consult requires different intervention, limited evaluation, and urgency. An inpatient consult or emergency department consult will need more typical evaluation such as clinical examination, potential imaging, and laboratory review prior to determining necessary intervention.

C. **Is the patient hemodynamically stable? Anemic?**

Hemodynamically unstable patients may require fluid resuscitation and blood transfusion which can be critical in these patients. Retroperitoneal hemorrhage may not have specific clinical signs aside from hemodynamic changes. Unstable patients may require urgent operative intervention and/or blood products and aggressive resuscitation.

D. **Is the patient on anticoagulation or anti-platelet therapy?**

Patients on these medications are more prone to develop spontaneous hemorrhage, especially

when critically ill in ICU setting.

E. Has the patient undergone cross-sectional imaging?

Retroperitoneal hemorrhage is typically diagnosed via cross-sectional imaging (CT or MRI) as symptoms can be non-specific.

F. Has the patient suffered recent trauma or undergone surgical or procedural intervention?

Patients sustaining traumatic injury are usually first evaluated by the trauma service. In non-trauma centers, the evaluation and management follow different protocols than patients with other sources of bleeding. Patients with post-operative or post-procedural, e.g. angiography, bleeding may require urgent surgical or radiologic intervention.

II. Differential Diagnosis

A. Trauma

These patients present following an acute traumatic injury, blunt or penetrating, and have specific signs and symptoms. The onset of this type of hematuria is chronologically related to this traumatic event. Genitourinary trauma is covered in the specific section in this Consults and Emergencies chapter. The comprehensive review is a separate section in the Core Curriculum.

B. Infection

Patients have signs and symptoms of **urinary tract infection** including fever and chills, flank pain, cloudy or malodorous urine, and laboratory values consistent with infection. CBC will show elevated WBC count and urinalysis will be diagnostic of urinary source of infection.

1. Pyelonephritis
2. Fungal infection
3. Tuberculosis
4. Xanthogranulomatous pyelonephritis or abscess

C. Malignancy

As with lower tract bleeding, upper tract urologic malignancies may present with gross hematuria. Often these patients have male sex, with a smoking history, or occupational exposure. Upper tract organs of origins include:

1. **Renal cortical tumors**
2. **Upper tract urothelial tumors**
3. **Adrenal cortical carcinomas**

Each of the malignancies are covered within corresponding sections of the Core Curriculum

D. Renal calculus disease

Patients usually present with specific symptoms of nausea, vomiting, flank pain (in upper tract stones), and fever or chills.

Calculus disease is covered in comprehensive sections of the core curriculum regarding etiology, evaluation, and management.

E. Vascular disease

Numerous **vascular disorders** can impact the upper urinary system. In addition to specific disease processes, i.e. renal artery aneurysm or vascular thrombosis, vascular and renal procedures and surgery can result in upper tract hematuria.

1. Arteriovenous malformations
2. Renal pseudoaneurysm
3. Renal artery aneurysm
4. Renal vein or arterial thrombosis
5. Uretero-arterial (iliac) fistula
6. Loin pain hematuria
7. Nutcracker syndrome
8. Vasculitis

F. Medical Renal Disease

These diseases can either impact the glomerular filtration mechanism (nephropathies) or tubulointerstitial transport and support structures (renal papillary necrosis). Upper tract bleeding from these sources typically produce microscopic or low acuity gross hematuria

G. Obstruction

1. **Ureteropelvic junction obstruction**
2. **Ureteral stricture**

H. Coagulopathy

Often these patients have a history of chronic or acute administration of anticoagulation or antiplatelet drugs.

III. Evaluation

A. Physical Examination

1. **Vital signs:** Due to the potential life threatening nature of a hematuria, physical evaluation should begin with vital signs.
 - a. Tachycardia, hypotension and hypoxia are classic indicators of hypovolemia and are seen with clinically significant bleeding.
 1. Any suggestion of hemodynamic instability (hypotension, tachycardia) should initiate fluid resuscitation and possibly blood transfusion.
 2. An important consideration in the pediatric patient is delayed hypotension only after severe hemorrhage has occurred.
 3. Any indication of infection or sepsis (tachypnea, tachycardia, fever) should initiate resuscitation and administration of intravenous antibiotics

2. General appearance

- a. The patient in acute distress warrants urgent attention. Attention to mental status, pallor and diaphoresis is critical.
- b. Physical examination is focused on the chest abdomen, flank, genitalia, perineum, and extremities.

c. Back

1. Flank bulging with ecchymosis (Grey-Turner's sign) is pathognomonic for retroperitoneal hemorrhage.
2. Evidence of external trauma with obvious rib fractures, particularly ribs 11-12 raise the risk of renal laceration.
3. Some patients may experience lower back tenderness following a ruptured abdominal aortic aneurysm.
4. Presence of recent scars and drainage tubes such as PCN.

d. Abdomen/Pelvis

1. Abdominal distention may be apparent with advanced retroperitoneal bleeding.
2. Retroperitoneal and upper urinary tract bleeding can result in poorly localizing abdominal, flank, or low back pain, and possibly increased abdominal girth in more cephalad hematomas
3. Lower pelvic distention may be seen in the patient with a contained extraperitoneal pelvic hemorrhage.
4. Examination of the pelvis may reveal evidence of pelvic fracture.
5. Suprapubic distention/pain may result from pelvic hematoma, groin ecchymosis usually a late sign

e. Bladder – Hematuria may be noted following placement of a urinary catheter.

f. Extremities

1. Femoral nerve palsy from femoral tunnel compression
2. Weak peripheral pulses from vascular aneurysms or injury after transcutaneous vascular procedures

B. Laboratory Studies

1. CBC

- a. Hemoglobin and Hematocrit values will help direct further monitoring and therapy

2. BUN/Creatinine

- a. Retroperitoneal hemorrhage may produce an obstructive effect on urinary drainage from the kidneys producing an acute kidney injury. Urinary leak resulting in urinoma may similarly cause aberrations in these laboratory parameters

3. Coagulation parameters

- a. INR and PTT should be evaluated and appropriately managed to prevent further bleeding complications as a result of therapy

C. Radiologic Imaging

1. CT Abdomen/Pelvis with Contrast

- a. The mainstay of evaluation in suspected upper urinary tract and retroperitoneal bleeding is contrast enhanced CT scan which allows for an accurate demonstration of the retroperitoneal hematoma as well as localization of the likely etiology.
 1. Zonal anatomy is helpful in the differentiation of the source of retroperitoneal

bleeding. This is most applicable initial management of trauma patients.

- a. Zone 1 (central-medial) retroperitoneal hematoma typically results from injury to great vessels, duodenum, or pancreas
- b. Zone 2 (lateral) retroperitoneal hematoma often associated with renal injury, followed by injury of colon
- c. Zone 3 (pelvic) retroperitoneal hematoma most often associated with pelvic fracture

b. CT Angiogram (CTA)

1. Contrast enhanced CT scan focused on vascular investigation
 1. Vascular injuries are identified with **“blush sign” is indicative of active contrast extravasation and therefore active bleeding.**
2. Bleeding from malignant neovascularity is identified

c. CT Urogram includes delayed phase imaging for more specific evaluation of the urinary tract

IV. Management

A. Initial Management

1. IV access - Initial resuscitation of the patient with diagnosed retroperitoneal bleeding includes establishing large bore peripheral intravenous access.
 - a. Patients may require IV fluid resuscitation, blood transfusion, and potentially antibiotic administration.
2. Patient Disposition
 - a. Depending on the etiology of the retroperitoneal hemorrhage, appropriate consultation should be performed
 - b. Vascular surgery, general surgical, orthopedics, urology all may have a role in the management of upper tract or retroperitoneal bleeding

B. Specific Management

1. Interventional Vascular Radiology

a. Angioembolization

1. Patients with renal arteriovenous malformations or pseudoaneurysm may require super selective angioembolization
2. Blunt renal injury may require therapy if the patient does not respond to expectant management
3. Uretero-arterial fistula from malignant invasion, eroded stent, or prior vascular procedure may require arterial stent placement
4. Advanced renal malignancies may require angioembolization for control of bleeding

b. Urinary Diversion

1. Patients with upper urinary tract bleeding may require urinary diversion with

percutaneous nephrostomy tubes to divert the urinary stream and allow for blood clots to form and stabilize the bleeding

2. Exploratory Laparotomy

- a. In the hemodynamically unstable patient that is unresponsive to resuscitation with fluids and blood products may require surgical exploration.
- b. While the retroperitoneal space is a contained space, the potential volume of this space is large enough for complete exsanguination and therefore the expectation of bleeding tamponade is not advised in the hemodynamically unstable patient unresponsive to initial maneuvers.
- c. **Zonal Anatomic Findings** – Understanding the location of retroperitoneal hematoma plays a significant role in management decisions
 1. Zone 1 (centro-medial) hemorrhage often requires surgical intervention
 2. Zone 2 (lateral) hemorrhage typically do not require urgent intervention in stable patients
 3. Zone 3 (pelvic) hemorrhage may stop after pelvic stabilization and resuscitation. For patients with persistent bleeding and instability, angiography with embolization may be required
- d. **Expanding, pulsatile hematoma** may require expedient control of the renal hilum prior to opening the posterior peritoneum. This can be performed by identifying the **inferior mesenteric vein** and making a vertical incision overlying the peritoneum just anterior to the abdominal aorta proximal to the inferior mesenteric artery and extending proximally towards the ligament of Treitz until the crossing renal vein is encountered at which point it can be secured along with the renal artery using vessel loops.
- e. Full discussion of management of renal and retroperitoneal trauma is covered in the **AUA Urotrauma Guideline (2020)** and the sections of urotrauma of the Core Curriculum.
- f. <https://university.auanet.org/core/trauma/renal-ureter/index.cfm>
- g. <https://www.auanet.org/guidelines/guidelines/urotrauma-guideline>

C. Management of anticoagulation

1. Coagulopathies corrected
2. Anticoagulation therapy reversed

See References 1,2,3,4,5,6

Key Takeaways

1. Upper Urinary Tract and Retroperitoneal Hemorrhage has varied sources and associated diagnosis. A detailed history and physical exam and cross sectional imaging is important to arrive at the correct working diagnosis.
2. Initial management steps include ensuring hemodynamic stability of the patient and if the

patient is hemodynamically unstable, determining whether the patient will require acute radiologic or surgical intervention.

3. Some patients may develop hemorrhage due to chronic medications and consultation with medical services may be required to determine need for these medications and appropriate alternatives to therapy.

Presentations

Upper Urinary Tract and Retroperitoneal Hemorrhage Presentation 1

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