

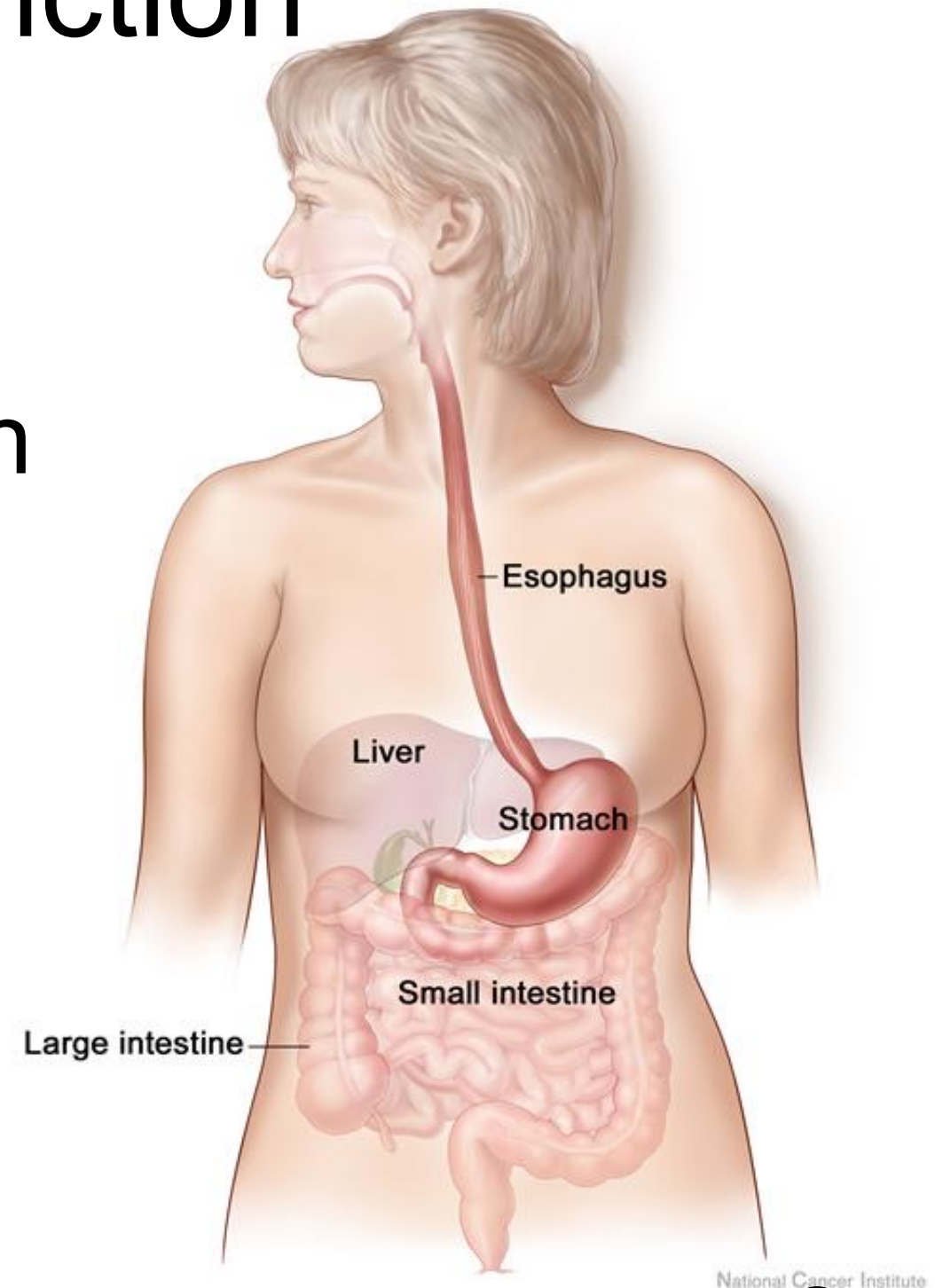
# Tumors of the Esophagus and Gastro-esophageal Junction

# Tumors of the Esophagus and GE Junction

Esophagus – hollow muscular tube which joins throat with stomach

A **Tumor** is an abnormal growth. Tumors can be

- Benign
- Malignant (cancer)



# Benign Tumors of the Esophagus

Benign tumors can increase in size but do not tend to spread to other organs

Benign tumors of the esophagus can cause problems with eating and swallowing, but are not life-threatening

Leiomyomas are examples of benign tumors of the esophagus.

# Malignant Tumors of the Esophagus = Cancer

Malignant tumors are also known as cancer

Malignant tumors can increase in size and in some cases can spread to other organs

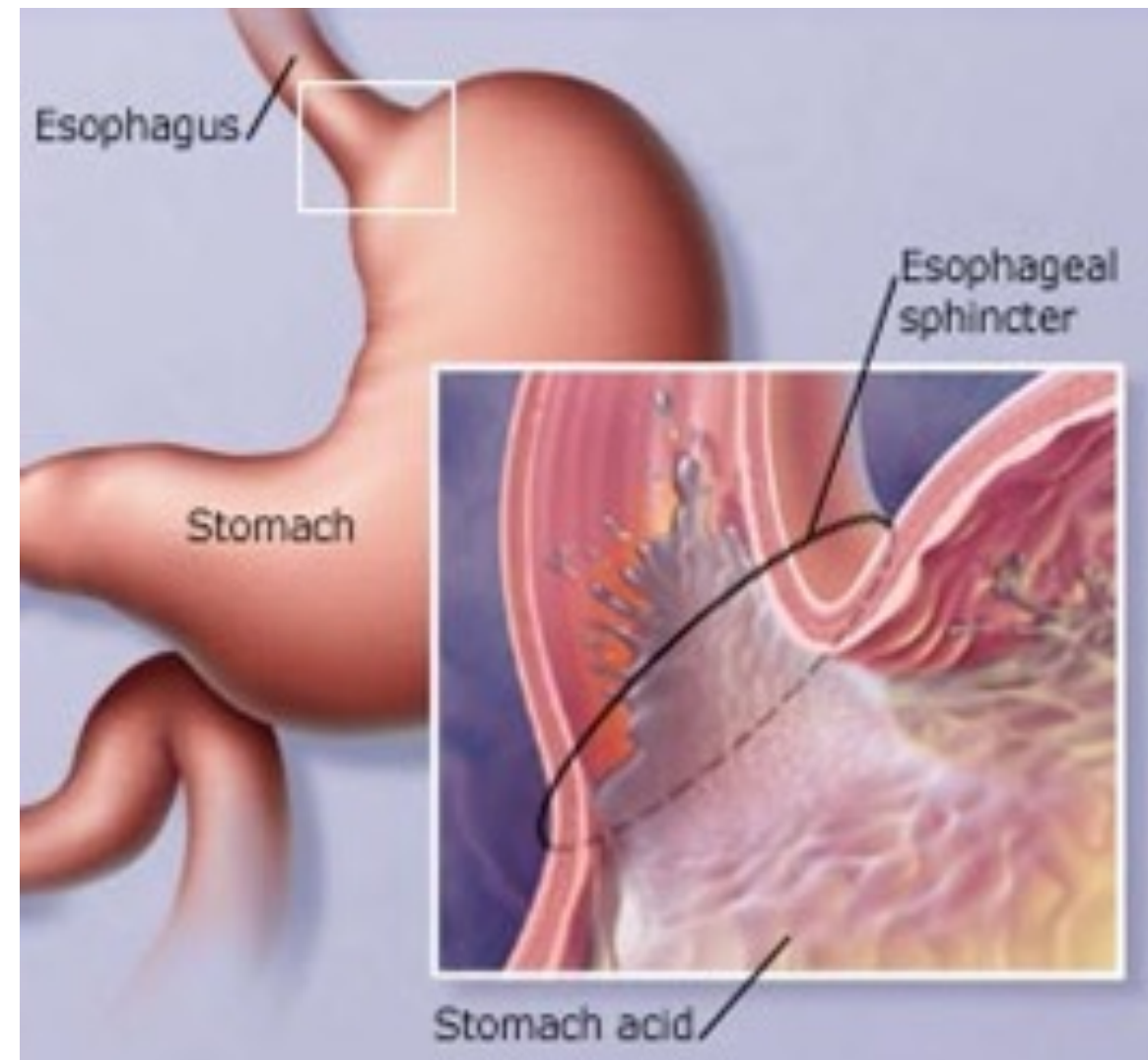
Malignant tumors of the esophagus can cause problems with eating and swallowing, and can be life-threatening

# Types of Esophageal Cancer

- Adenocarcinoma - Generally located at the bottom of the esophagus or at the junction with the stomach. Frequently caused by gastroesophageal reflux
- Squamous Cell Carcinoma - Can occur anywhere along the esophagus

# Gastroesophageal Reflux

- Esophageal sphincter normally prevents stomach acid from reaching distal (lower) esophagus
- Sphincter incompetence leads to reflux
- Esophageal lining (mucosa) is not designed to handle acid



# Gastro-esophageal Reflux

Esophagus lined by squamous (pale) mucosa

Stomach secretes acid to aid digestion

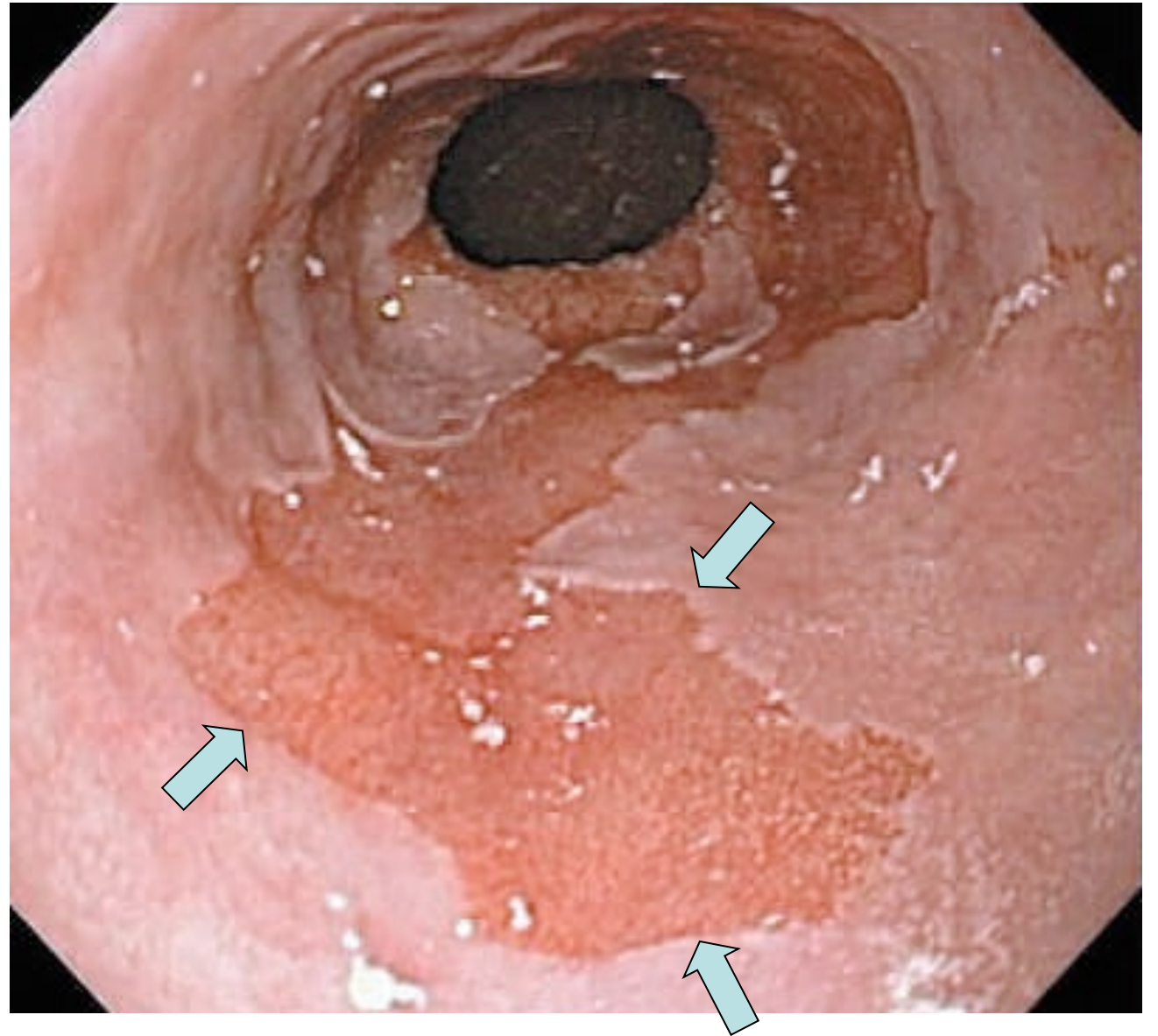
Lower esophageal sphincter prevents acid  
from entering into esophagus (reflux)

Chronic reflux of acid from stomach into  
esophagus irritates and damages  
esophageal mucosa

Esophageal mucosa changes due to acid

# Barrett's Esophagus

Red areas show  
Barrett's changes  
due to acid reflux  
More severe cases  
have larger areas  
of Barrett's  
changes





# Barrett's Esophagus

Acid causes lining of lower esophagus to change to resemble lining of stomach (which is designed to resist acid)

Risk of Barrett's increased by:

- Obesity
- Smoking
- Gastro-esophageal reflux (GERD)

# Esophageal Dysplasia

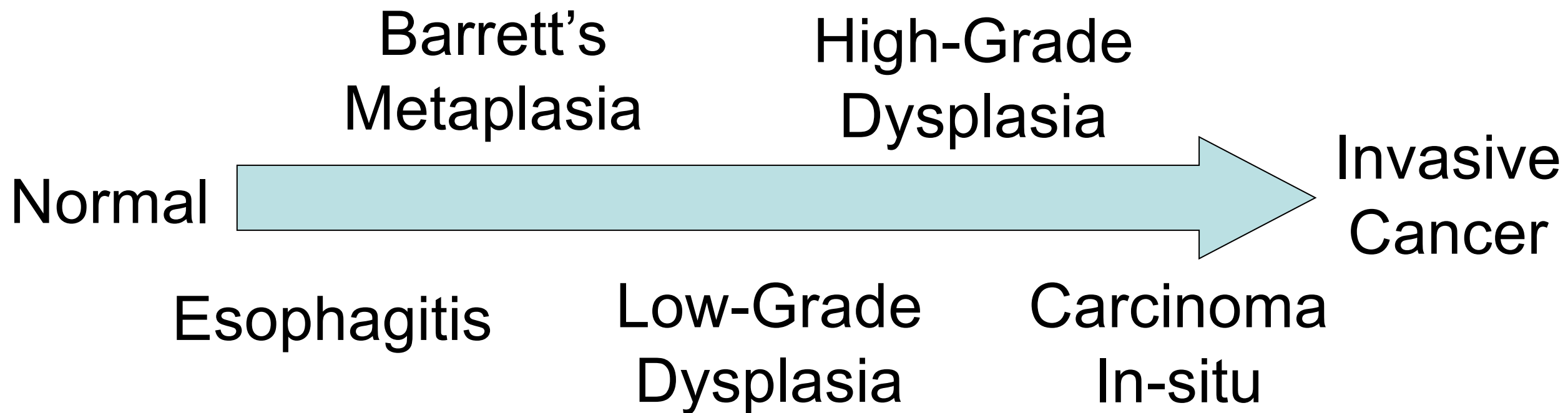
Some patients with Barrett's esophagus can develop dysplasia, which is a pre-cancerous condition.

Barrett's esophagus: Cancer risk 0.5% per year = 1 in 200 develop cancer every year

High-grade dysplasia: Cancer risk 5% per year = 1 in 20 develop cancer every year

# Adenocarcinoma

## Stages of pre-cancerous growth



Dysplasia is a pre-cancerous condition which can lead to cancer

# Cancer Staging

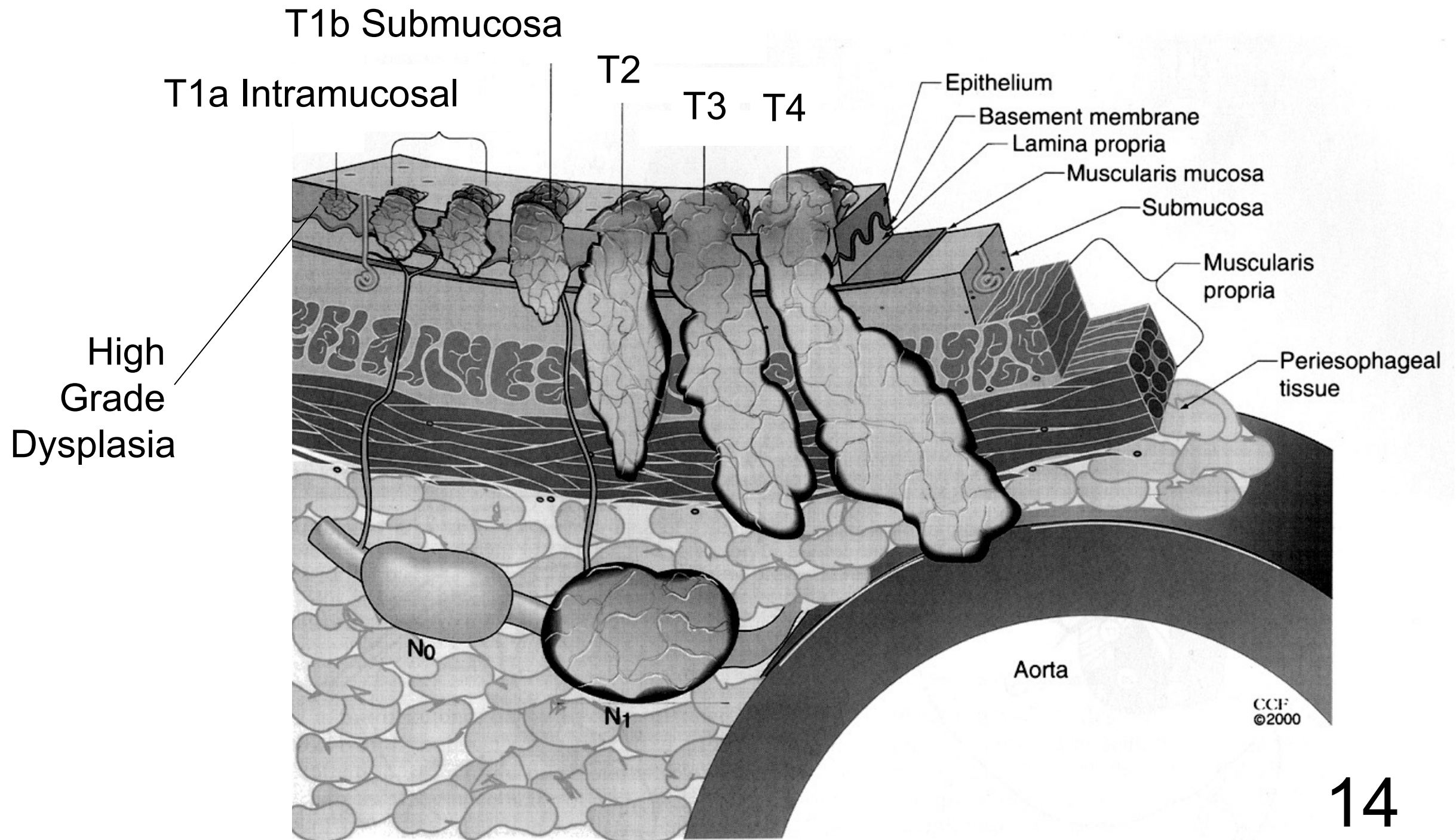
Staging refers to the tests to determine how large a tumor is, whether it has spread to nearby lymph nodes, and whether it has spread to other parts of the body.

Staging is important in order to find the right treatment for a particular patient

# Esophageal Cancer Staging

- T** Tumor – How deep has the tumor grown into the wall of the esophagus?
- N** Nodes – Has tumor spread to the lymph nearby nodes?
- M** Metastasis – Has the tumor spread to sites such as the lungs or liver?

# Esophageal Cancer T Stage

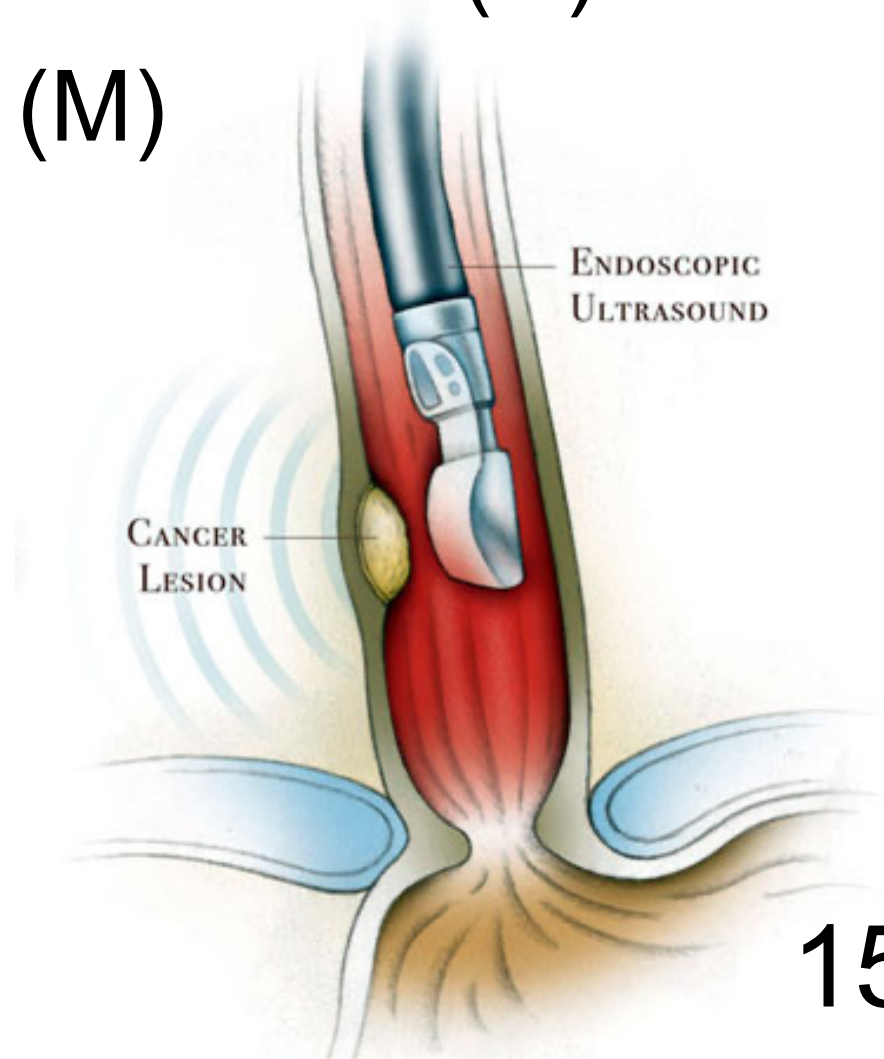


# Esophageal Cancer Staging

## Endoscopic Ultrasound (if needed)

- How deep has cancer grown into the wall? (T)
- Is there involvement of lymph nodes? (N)
- Is there spread to the liver? (M)

## Outpatient procedure



# Esophageal Cancer Staging

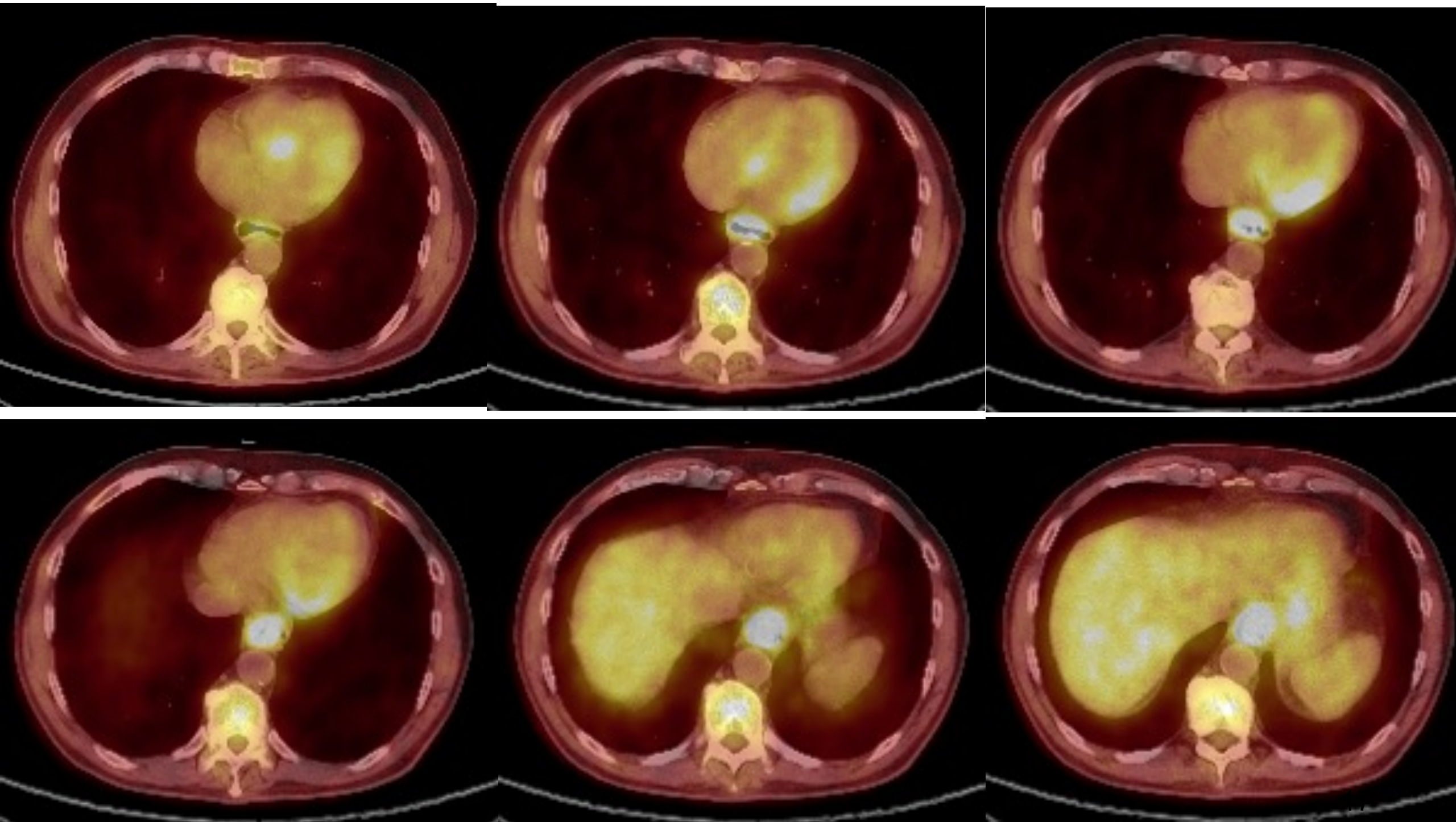
## PET Scan

- Is there evidence of distant spread?
- Is there spread to the liver?
- Is there spread to the lungs?

PET scan helps to determine the M stage  
Similar to CT scan (scanner more open than  
MRI scanners)



# PET/CT



# Laparoscopy for Staging

## Diagnostic Laparoscopy

- Is there spread to the liver?
- Is there spread within the abdominal cavity?

Requires general anesthesia in OR

Can be done as an outpatient

Can be performed at the beginning of an operation to remove the tumor or as a separate procedure

# Esophageal Cancer Stage

**T\_\_** Tumor – How deep has the tumor grown into the wall of the esophagus?

**N\_\_** Nodes – Has tumor spread to the lymph nearby nodes?

**M\_\_** Metastasis – Has the tumor spread to sites such as the lungs or liver?

# Esophageal Cancer Treatment

Treatment is based upon stage and the ability of a patient to undergo treatment

In some cases, treatment decisions are straightforward, while in others, decision-making is more complex

Complex cases often require consultation with other specialists

# Esophageal Cancer Treatments

Superficial

Endoscopic Therapy

Localized

Esophagectomy

Locally Advanced

Chemotherapy

± Radiation



Surgery

Neoadjuvant  
Therapy

Metastatic

Chemotherapy ± RT

# Esophageal Cancer Treatments

Superficial

T1a = Stage I

Endoscopic Therapy

Localized

T1b

T2 = Stage II

Esophagectomy

Locally Advanced

T3 = Stage III

Chemotherapy  
± Radiation



Surgery

Neoadjuvant  
Therapy

Metastatic

M1 = Stage IV

Chemotherapy ± RT

# Esophageal Cancer Treatment

## Dysplasia (pre-cancer)

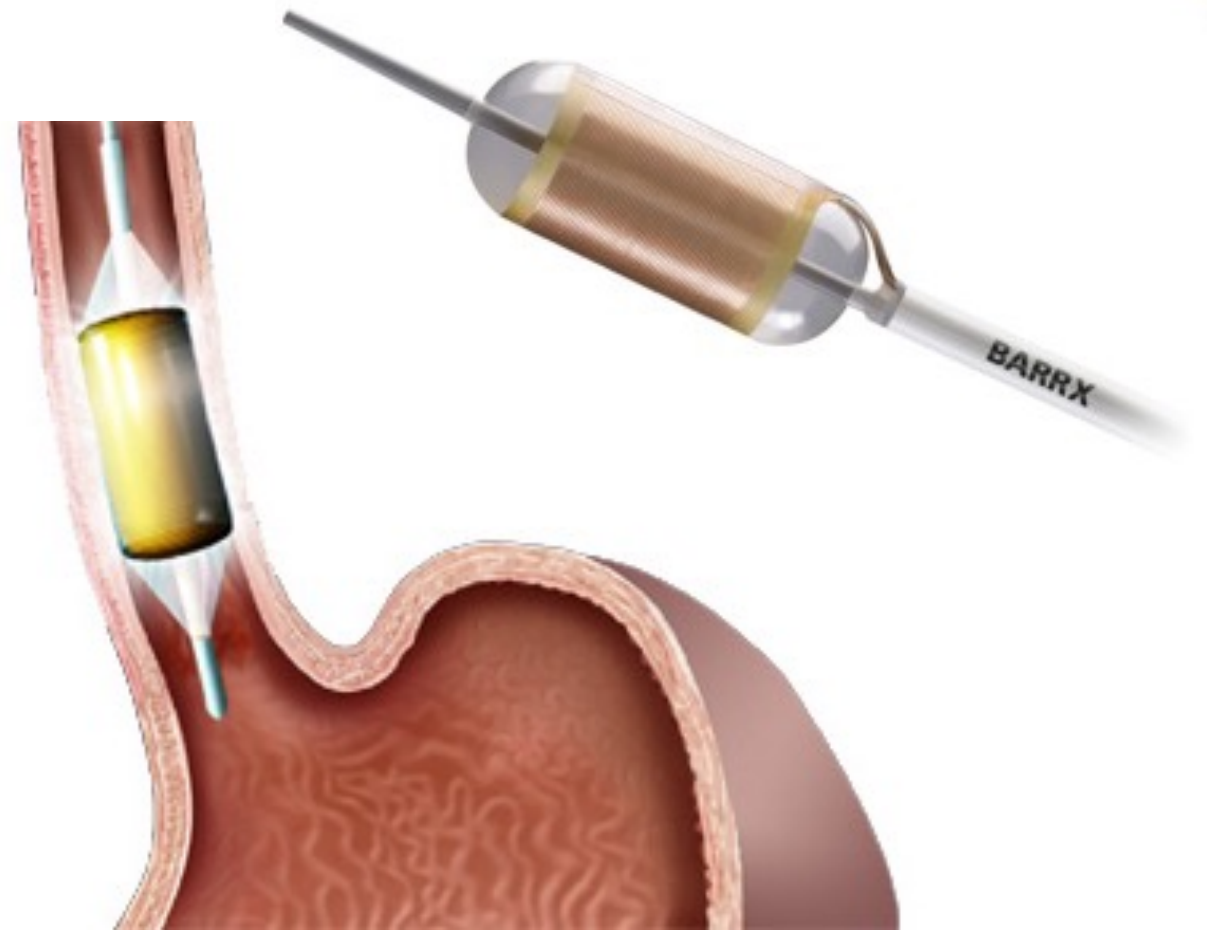
High-grade dysplasia can be caused by Barrett's esophagus and can lead to the development of esophageal cancer if left untreated

Radio-frequency ablation is an endoscopic therapy which can destroy the abnormal dysplasia and allow regrowth of normal esophageal lining (and prevent cancer)

# Esophageal Dysplasia

## Endoscopic RF Ablation

Ablation destroys abnormal mucosa and allows overgrowth of normal squamous mucosa





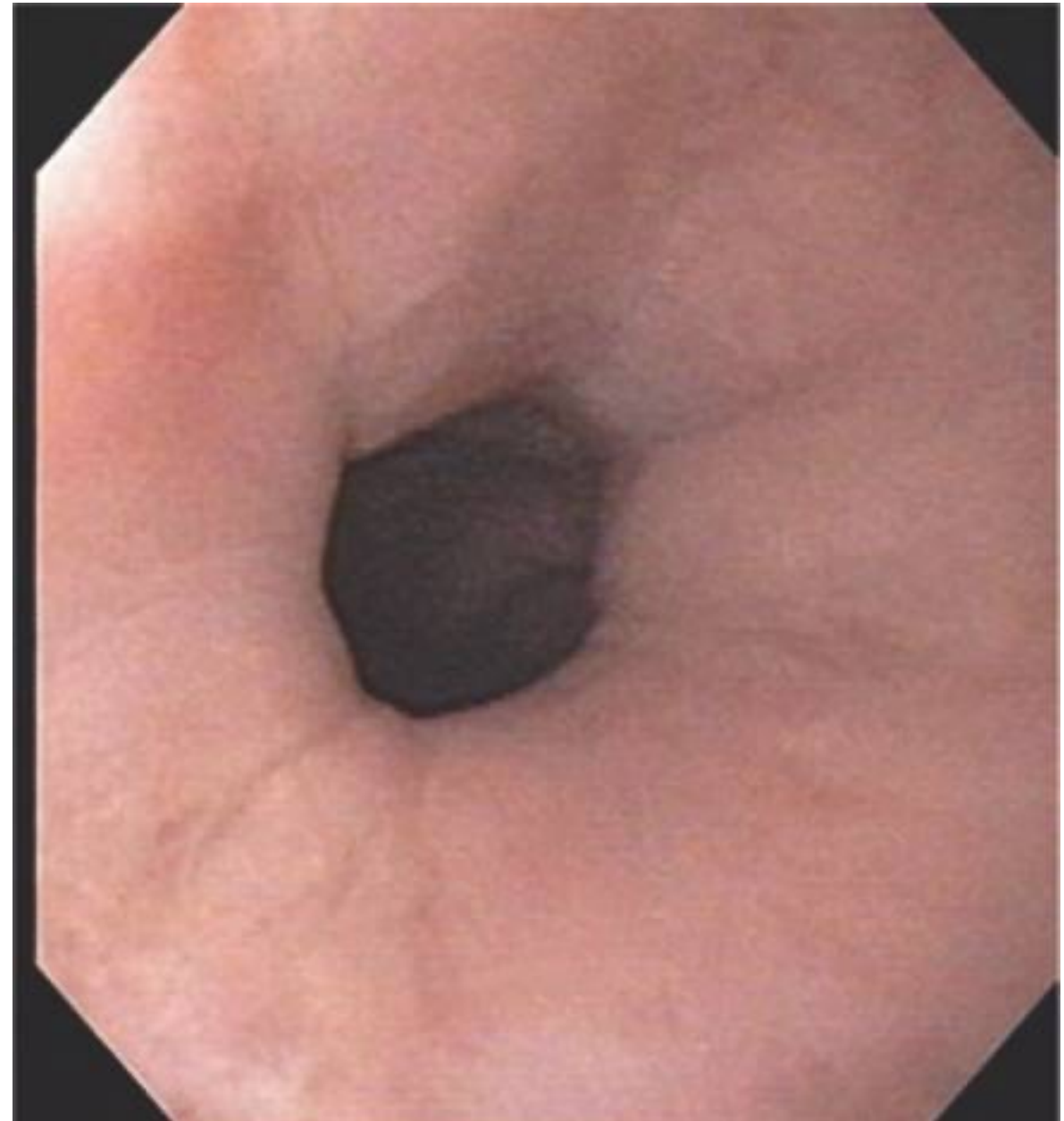
# Esophageal Dysplasia

## Endoscopic Radiofrequency Ablation

Before



After

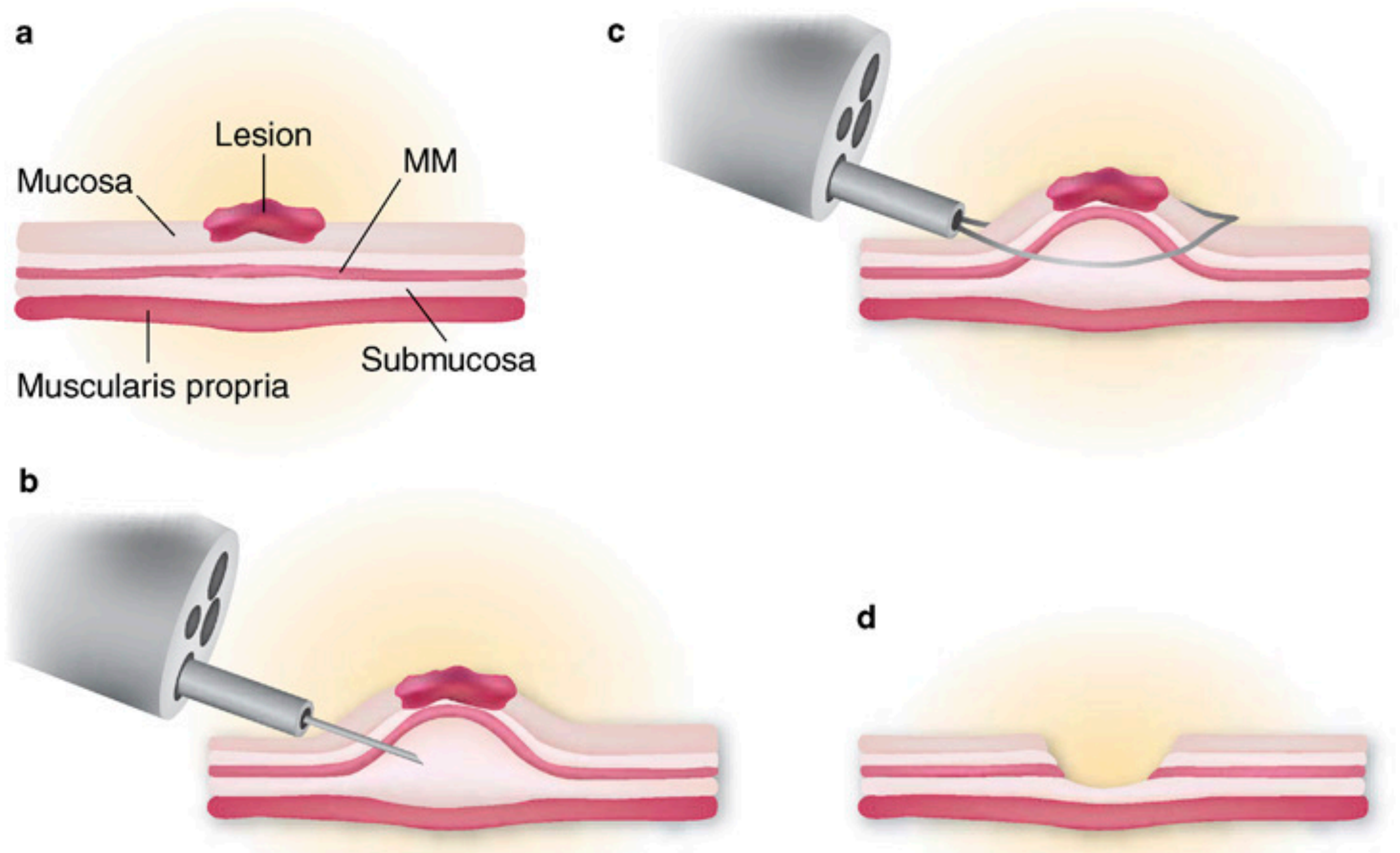


# Superficial (T1a) Esophageal Cancer Endoscopic Mucosal Resection

An adenocarcinoma involving just the top layer (mucosa) can be treated by endoscopy using endoscopic mucosal resection

Endoscopic mucosal resection (EMR) is appropriate for treatment of T1aN0 tumors

# Superficial (T1a) Esophageal Cancer Endoscopic Mucosal Resection



# Superficial (T1a) Esophageal Cancer Endoscopic Mucosal Resection

Endoscopic therapy is usually performed as an outpatient.

If the tumor cannot be completely removed with endoscopic therapy, additional therapy (such as surgery) may be required

Completeness of removal categorized:

- Favorable conditions
- Unfavorable conditions

# Esophageal Cancer Therapy

Radiation Therapy: High energy x-ray beams kill tumor cells in the esophagus and lymph nodes

Chemotherapy: Drugs given intravenously (or by mouth) which kill tumor cells in esophagus, lymph nodes, lungs, and liver

Surgery: Removal of esophagus and lymph nodes with reconstruction of esophagus

# Locally-advanced Esophageal CA

Chemotherapy  $\pm$  Radiation  $\rightarrow$  Surgery

Used for most  $T_2N_1$  or  $T_3N_0$  and some  $T_2N_0$

- Chemotherapy + Radiation (5-6 weeks)  
OR
- Chemotherapy (FLOT) – 8 weeks
- Repeat scans 4 weeks later (CT or PET)
- Surgery 6-10 weeks after end of radiation

# Radiation Therapy (if done)

Administered before (or after) surgery

Treatments 5 days per week x 6 weeks

May cause some inflammation in esophagus  
which can make swallowing temporarily  
worse (before it gets better).

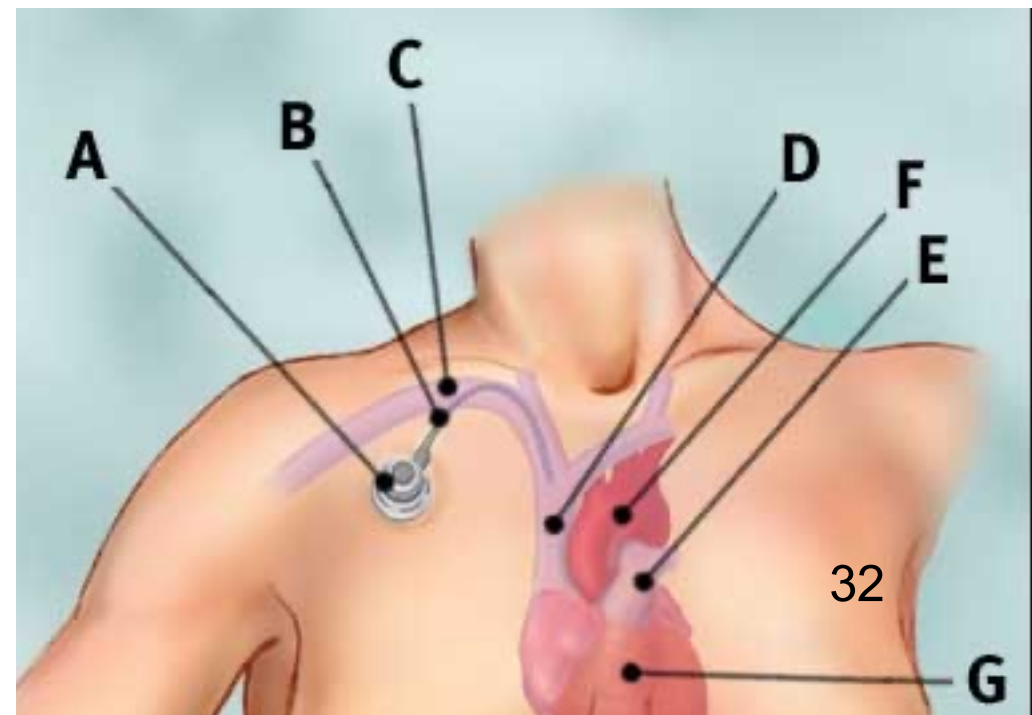
# Chemotherapy

Administered along with radiation therapy

Variety of different regimens

- Most commonly once per week

May require a central venous port for administration of intravenous medicines





# Central Venous Port

Outpatient procedure

Completely implanted (can shower, bathe)

Risks

- Infection (requires removal of port)
- Blood clot under skin
- Clotting of catheter (tube)
- Thrombosis (clotting) of the vein

Removed as outpatient procedure when no longer needed

# Smoking and Cancer Therapy

## Radiation therapy

- Smoking increased the risk of complications such as mucositis (inflammation of the mouth and throat)
- Radiation therapy is not as effective in smokers

## Surgery

- Smoking increases the risk of heart and lung complications after surgery AND makes it more difficult for wounds to heal

**Critical to stop smoking *today***

# Nutrition and Cancer Therapy

Good nutrition is important for cancer therapy:

- Cancer therapy is more effective in patients who can maintain nutrition during therapy
- Cancer therapy can make eating more difficult
- Our goal is to avoid weight and muscle loss during therapy

*Some patients with difficulty taking enough nutrition by mouth will need a feeding tube before chemotherapy/radiation therapy*

# Nutrition Essentials

Protein → wound healing and muscle

- Average woman needs 60 grams/day
- Average man needs 75 grams/day
- Weight loss often means muscle loss

Carbohydrates → energy

- Starches are healthier than sugars

Fats → help food taste good

- American diet usually has too much fat

# Nutritional Supplements

## Protein shakes:

- Contain protein (only)
- Usually have very little sugar
- OK for people with lactose intolerance

## Ensure/Boost

- Protein + carbohydrates + vitamins
- Tend to contain a lot a sugar/corn syrup
- May not be as palatable as protein shakes

# Protein Shakes

Protein shakes:

- Pre-mixed (in cartons or cans)
- Protein powder  
(requires blender bottle)

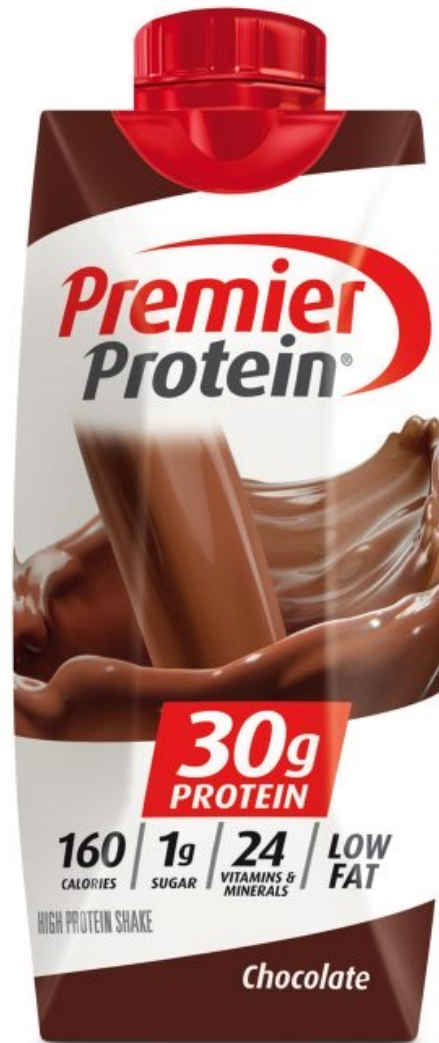
Protein shakes will be  
an important part of  
recovery after surgery

May be helpful to find  
a “favorite flavor” before surgery





# Protein Shakes



# Making your own Protein Shake

Fill bottle half full of water  
(or almond milk)

Add powder (usually two scoops)

Stir to dissolve

Add water

Add shaker ball (optional)

Shake

May taste better if kept in the refrigerator

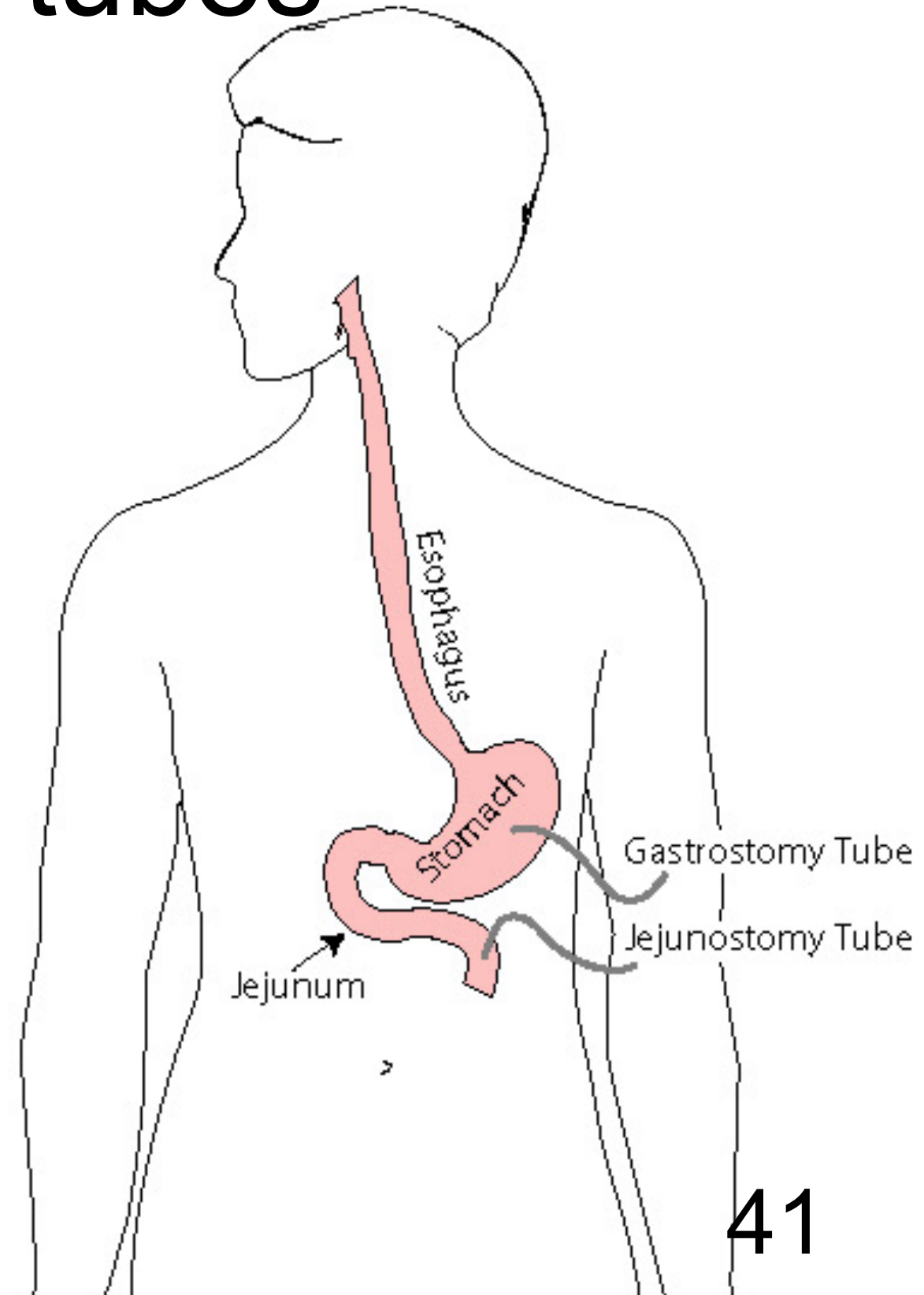




# Feeding tubes

## Gastrostomy tube

- Placed into stomach
- Can frequently be removed after chemo + radiation has been completed



# Feeding Tubes

## **Gastrostomy Tube**

Placed in stomach

Bolus feedings can be done with a syringe for several 'meals' per day

Requires precise placement if surgery is planned to remove the tumor in the esophagus

## **Jejunostomy Tube**

Placed in small intestines

Feedings require several hours to administer (12-16 hours) with a pump (usually given overnight)

Bolus feedings not possible

Placed *after* esophagectomy

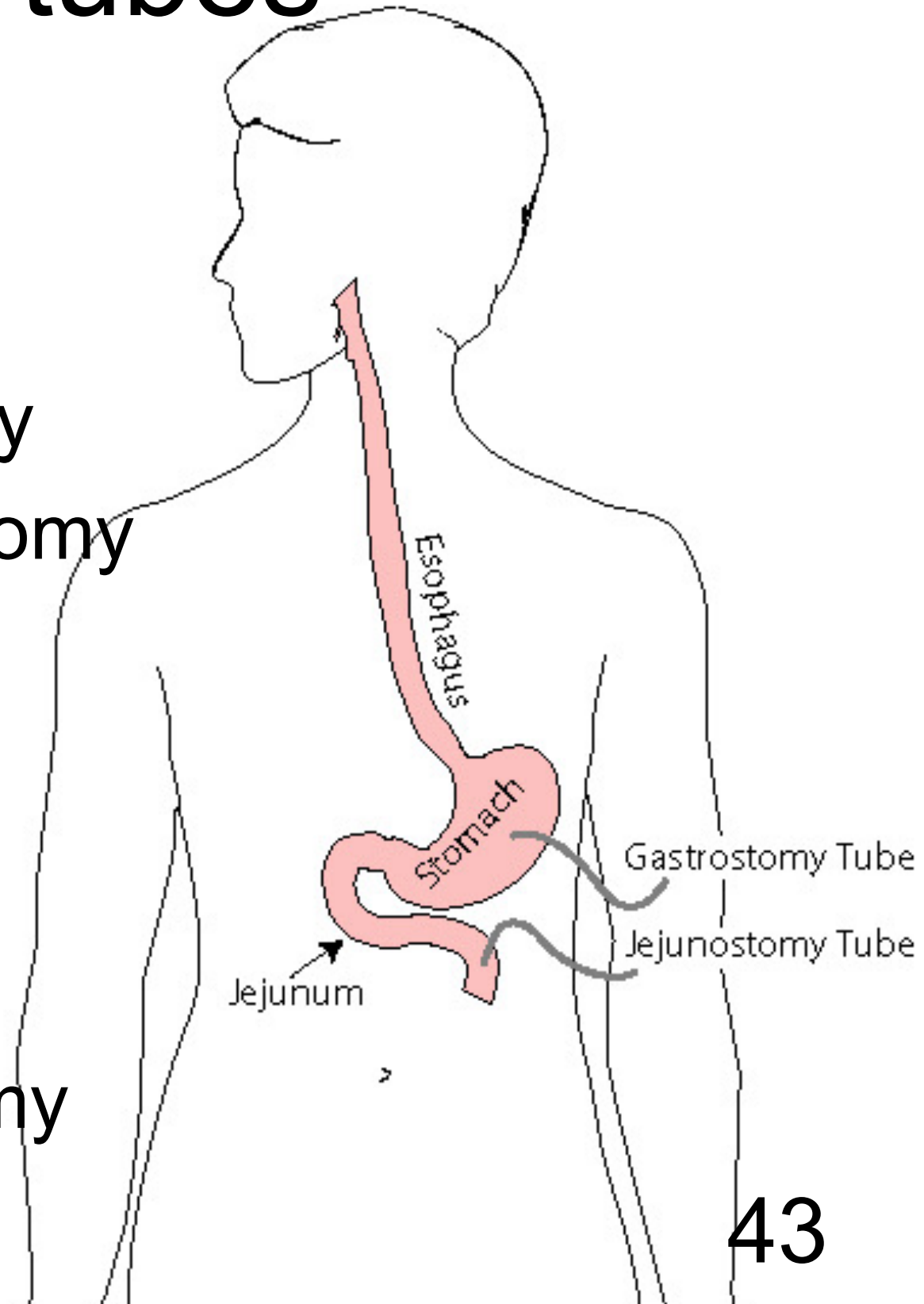
# Feeding tubes

## Gastrostomy tube

- More convenient
- Bolus feedings during day
- Used *before* esophagectomy

## Jejunostomy tube

- Requires a pump
- Feeding overnight
- No bolus feedings
- Used *after* esophagectomy



# Feeding Jejunostomy

Jejunostomy – Placed in small intestine

- Leaves stomach undisturbed (ideal for patients who will undergo esophagectomy)
- Pump feedings (12-16 hours – overnight)
- Laparoscopic placement (in OR)
- Overnight hospital stay

<https://www.youtube.com/watch?v=jjPP4zENP9g>

“Your Feeding Jejunostomy”

# Feeding Jejunostomy Video

## QR Code for YouTube



# Jejunostomy Feedings with Diabetes

Jejunostomy feedings may cause blood sugars to be elevated

- Insulin may be required along with feeds

Typical Pattern for tube feeds

- Feeds run via pump from 6pm to 10am
- Insulin at 6pm (70/30 insulin)
- Insulin at Midnight (70/30 insulin)
- *No insulin if tube feedings are not run*

# Feeding Gastrostomy

Gastrostomy – Placed in stomach

- Convenient bolus feedings with syringe *OR* gravity bag
- Placed in operating room *OR* in endoscopy
- Generally done as an outpatient

# Gastrostomy Tube

## QR Code for YouTube





# Central Venous Port

## Feeding tube

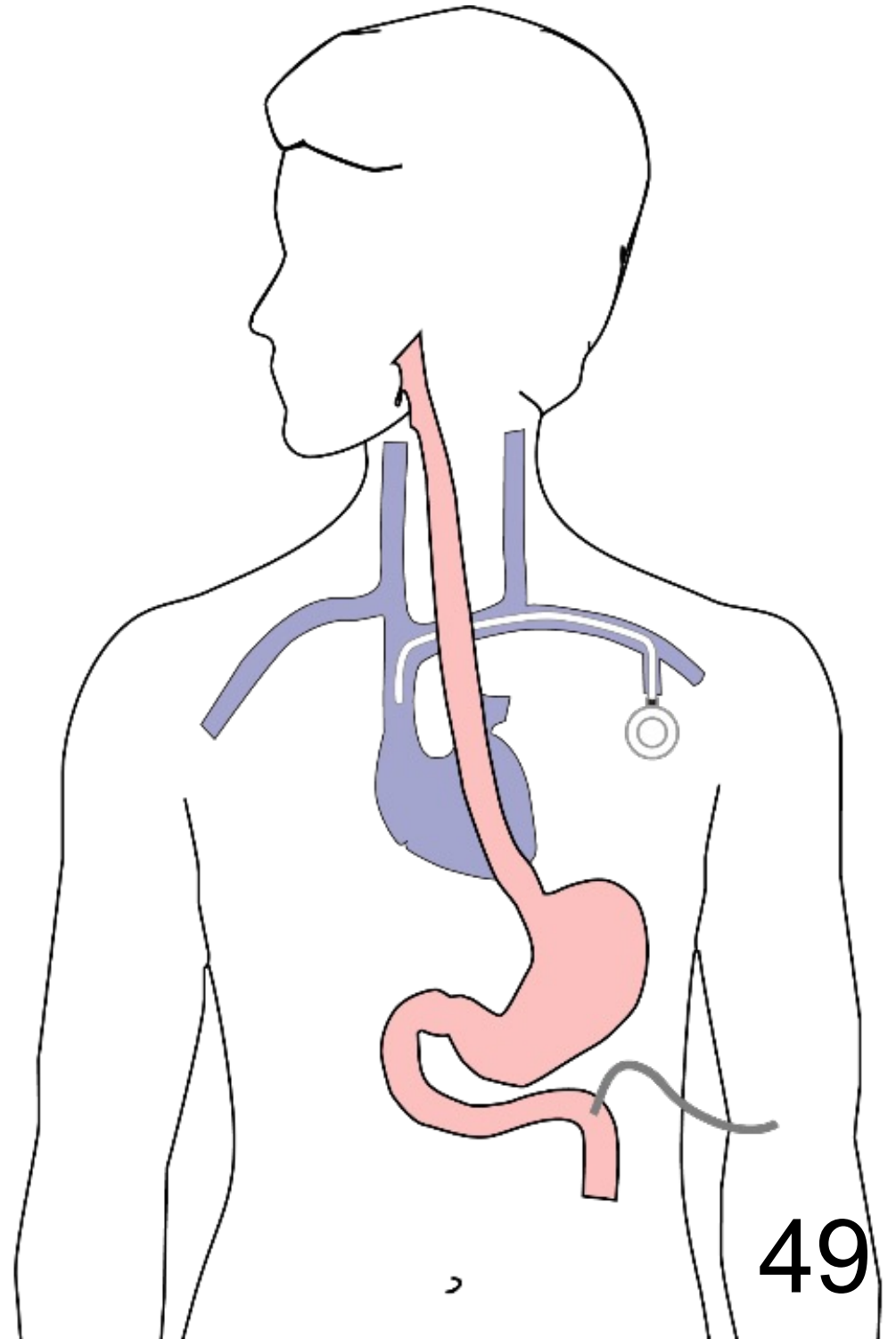
Placed at same time in  
operating room

General anesthesia

Home care nursing to  
assist with tube feeds

Jejunostomy- overnight

Gastrostomy - outpatient



# Muscle Loss in Cancer Therapy

Muscle loss is a particular problem in the patient with cancer:

- Chemotherapy
- Radiation
- Difficulty eating and weight loss

All these factors can make muscle loss worse.



# Rebuilding Muscle Loss prior to Surgery

Muscle strength is extremely important in recovery from surgery:

- Walking (prevents blood clots in legs)
- Deep breathing and coughing (prevents pneumonia)

*Extremely important to rebuild muscle loss before surgery*

# Exercise and Cancer Therapy

Exercise prior to cancer surgery can reduce the risk of complications by almost half.

Need 30 minutes per day 6 days per week

- Vigorous: Working hard enough that conversation is difficult
- Exercise bike is inexpensive and doesn't require favorable weather
- Important to start immediately

# Nurse Navigators

Expedite scheduling for appointments, tests, surgeries or therapies

Make delivery of care more efficient by working with your team of doctors

Help you find appropriate resources during and after treatment

Ensure that important needs such as access to cancer counselors, nutritionists and local support agencies are met

Explore and assist with work-related or financial concerns you may have regarding treatment

# LCI Cancer Support

Individual and group counseling

Support groups for patients and caregivers

Financial counseling

Assistance from patient resource navigators

Pastoral care

Psychiatric assessment/referral

Social work needs assessment/referral

# Integrative Oncology

‘A holistic way to promote wellness while reducing cancer's impact and maximizing quality of life’

Physicians trained in integrative oncology work to address the physical, emotional and spiritual needs of patients and their family members throughout treatment.

- Reduce side effects of cancer treatment
- Review use of vitamins and supplements
- Develop a plan to reduce cancer risk factors
- Ask questions regarding alternative or complementary care
- Improve health and wellness

# Next Steps

## Stop smoking

- No nicotine patch within 3 weeks of surgery

## Optimize nutrition

- Goal is to avoid further weight loss
- May need a feeding tube prior to surgery

## Exercise

- Vigorous exercise 30min/day, 6 days per week

## Sign up for MyAtriumHealth [my.atriumhealth.org](http://my.atriumhealth.org)

- Secure patient portal (desktop or phone)



# Prior to Surgery

Preoperative therapy (if needed):

- Chemotherapy (Medical Oncologist)
- Radiation Therapy (Radiation Oncologist)
- Re-staging scans (PET) 4 weeks after chemo/radiation

Lung Function Tests (PFTs)

Cardiology evaluation (if needed):

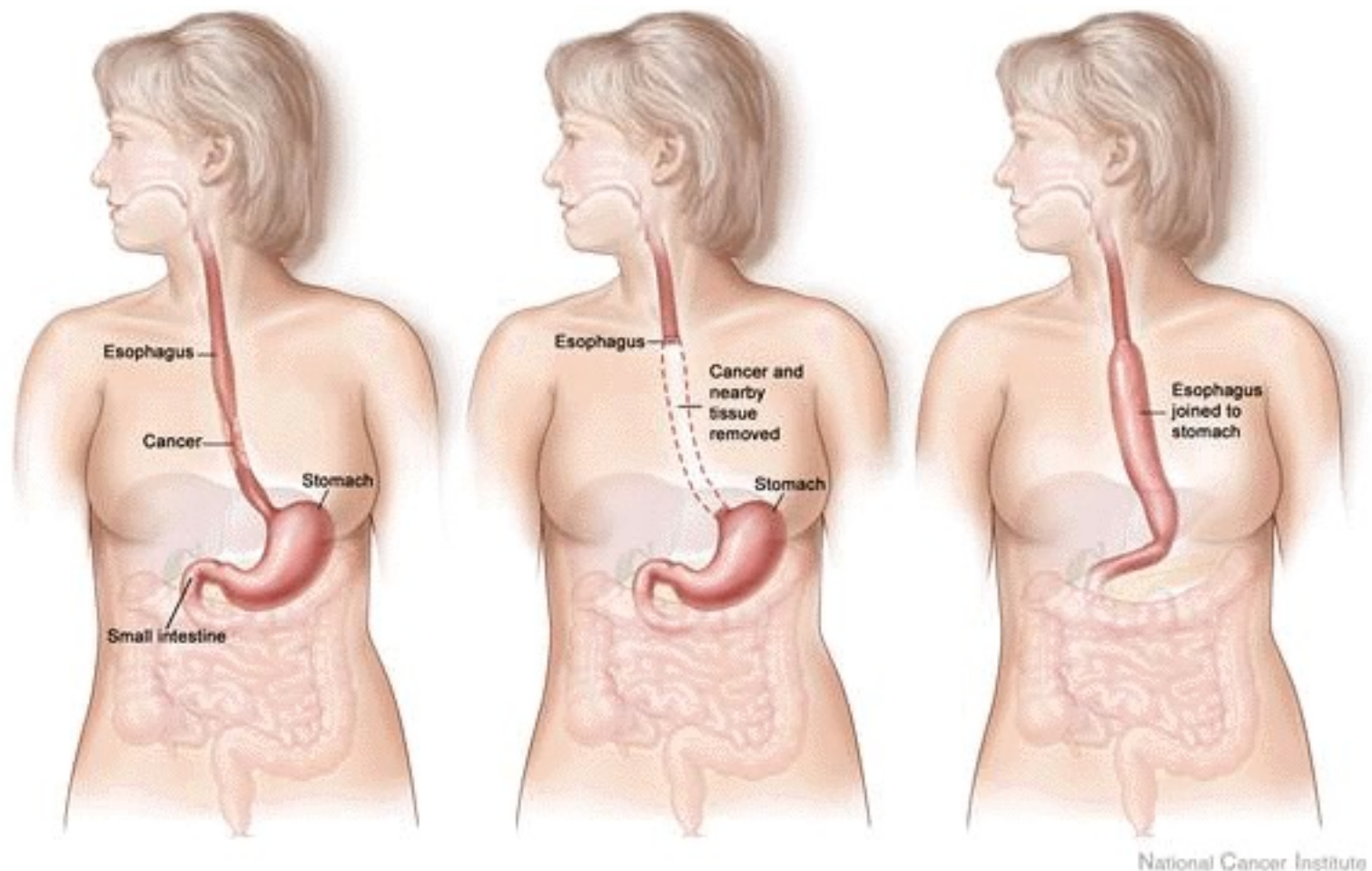
- Echocardiogram
- Stress Test

# Esophagectomy

Esophagus  
removed

Stomach brought  
into chest as a  
replacement

Connection either  
in chest or in  
neck



# Minimally-invasive Esophagectomy

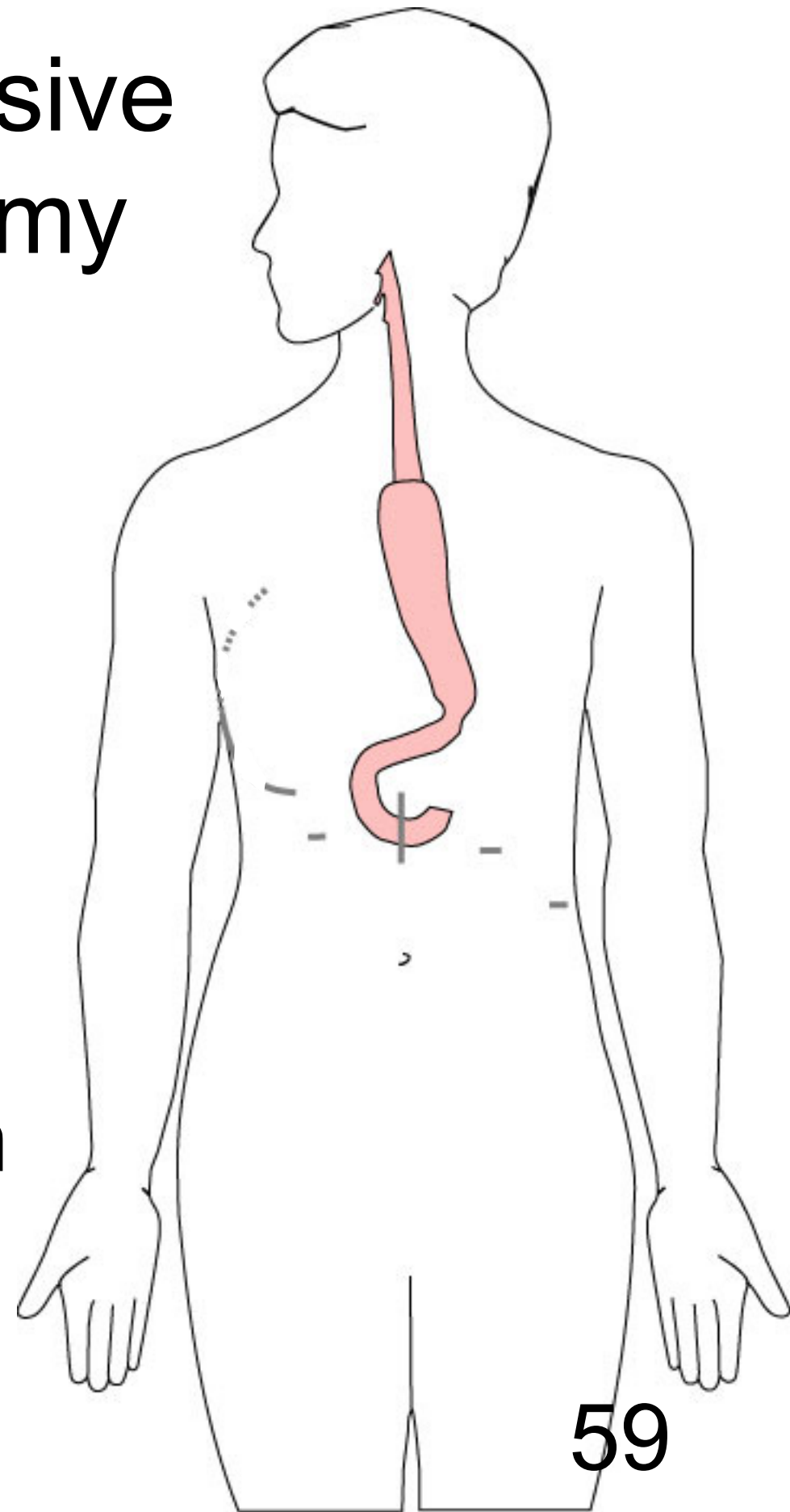
Abdominal laparoscopy

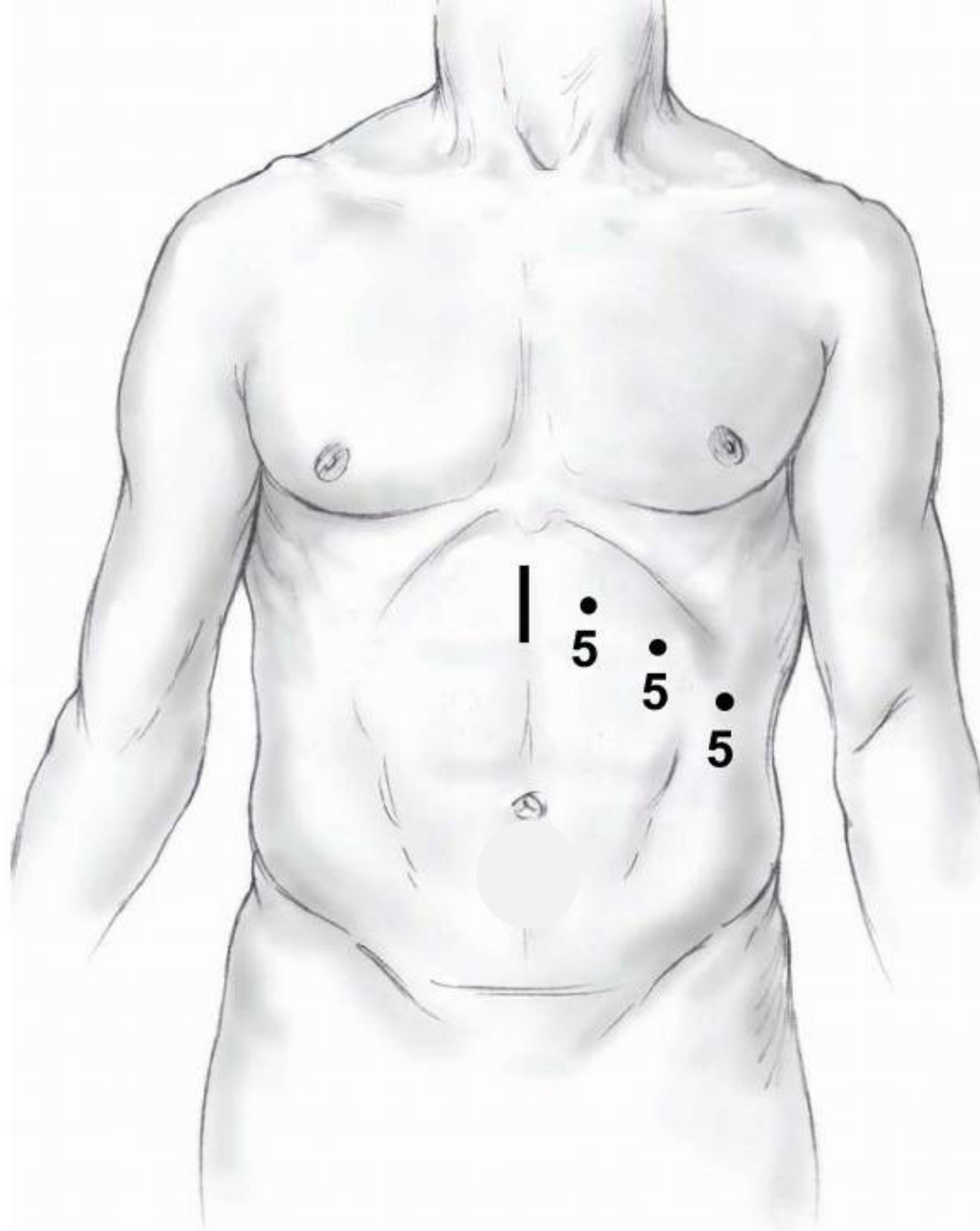
Stomach formed into tube

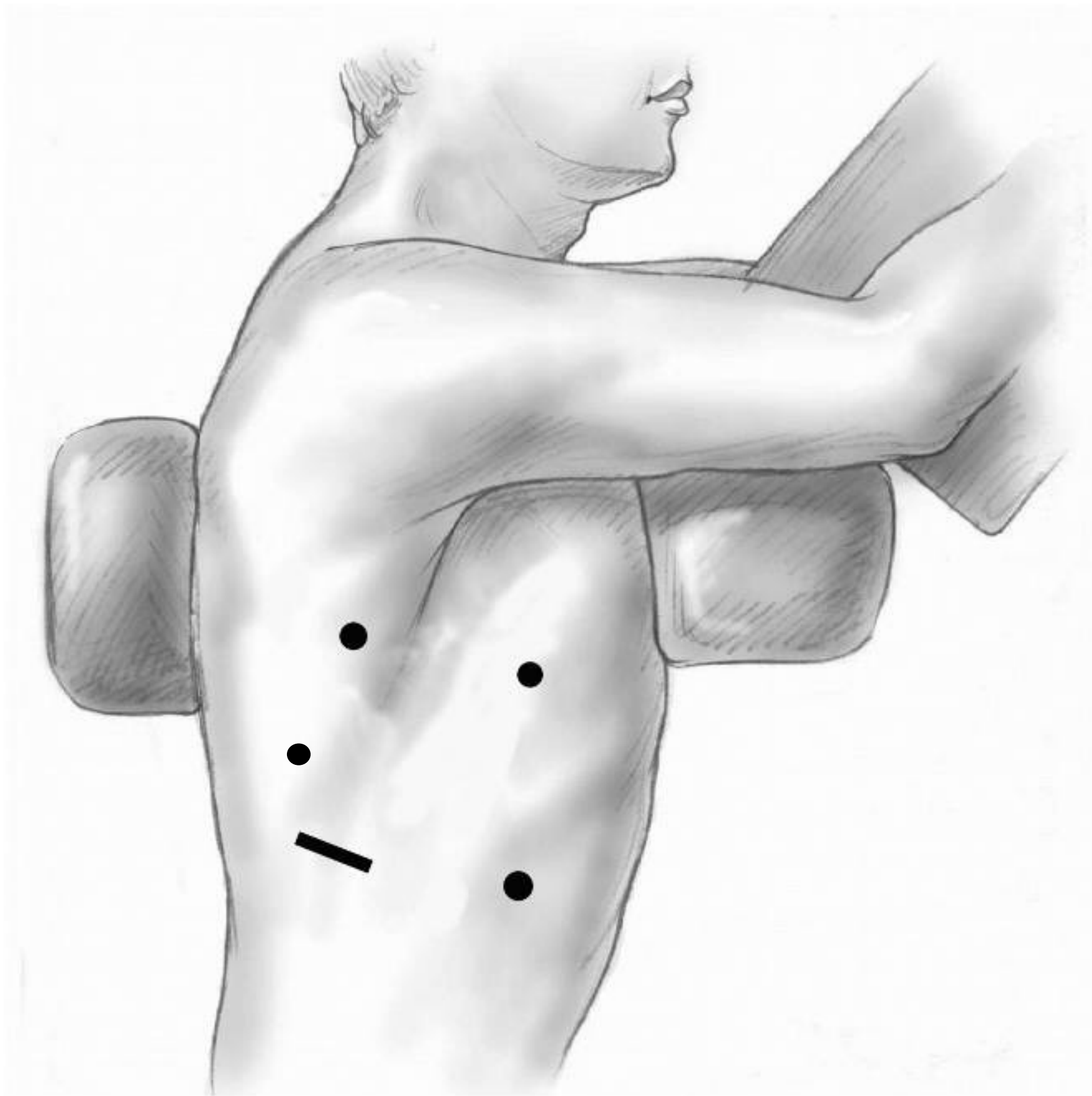
Right thoracoscopy

Stomach connected to  
esophagus in chest

Minimally-invasive  
techniques mean less pain  
and faster recovery







# Risks - Anesthesia

## Risks related to anesthesia

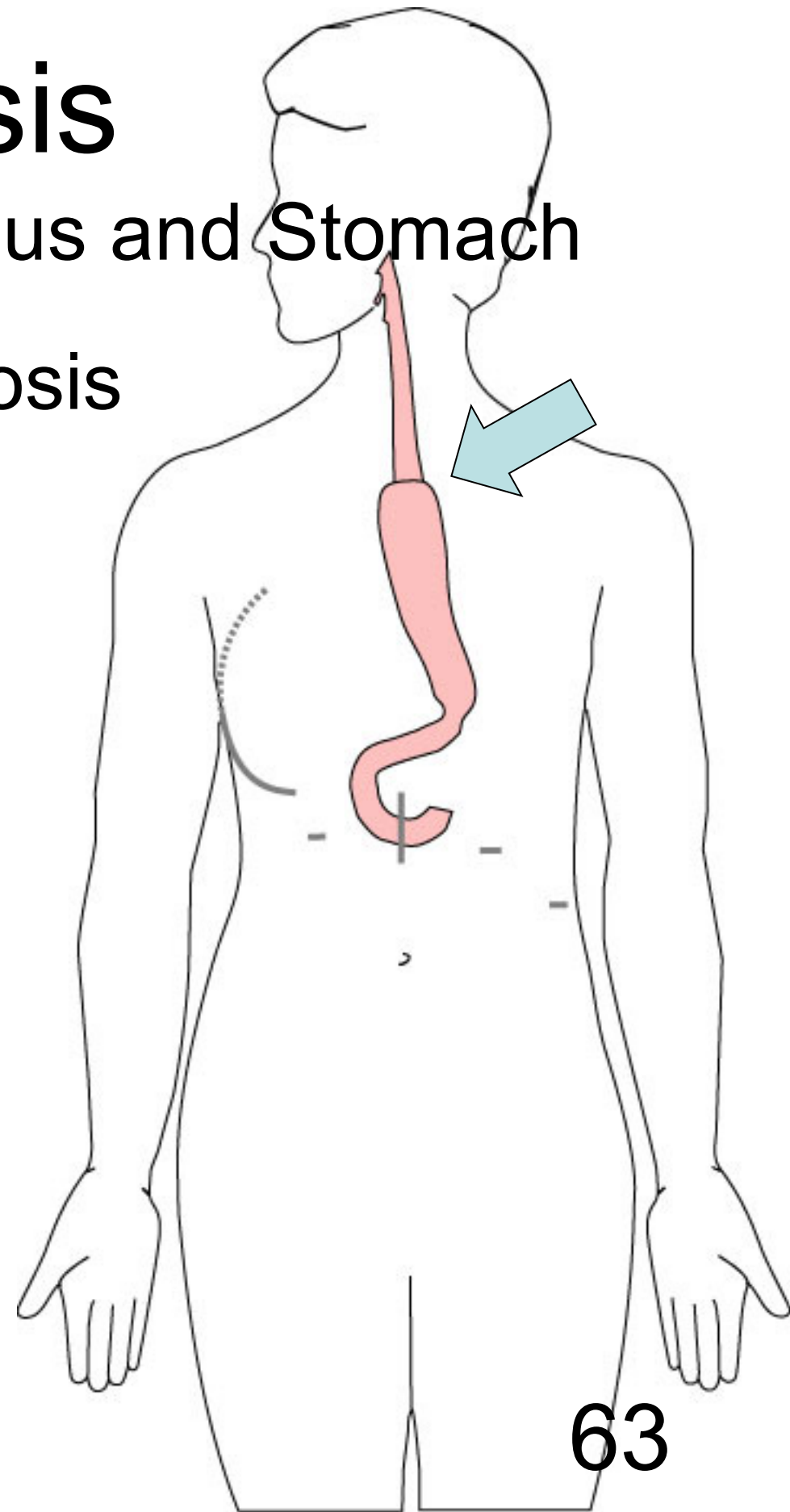
- Heart attack (5%) Beta blockers
- Irregular heart rhythm (15%) Beta blockers
- Pneumonia (15%) Pain control
- Blood clots in legs (<5%) Blood thinners and
- Pulmonary embolism (2%) pneumatic stockings

# Anastomosis

Connection between Esophagus and Stomach

## Potential Problem with Anastomosis

- Leak at anastomosis  
(risk 5-8%) **Stop Smoking**
- Stricture (narrowing)  
at anastomosis  
May require dilation  
(risk 15%) **Stop Smoking**



# Risks - Surgery

## Risks related to surgery

- Bleeding
- Infection
- Mortality (average 5% at 90 days after surgery)
  - High risk patients: 10% mortality at 90 days (8%)
  - Low risk patients: 2% mortality at 90 days (70%)

450+ Esophagectomy operations at Carolinas Medical Center by Dr Salo since 2007



# Day Prior to Surgery

Clear liquids for 24 hours  
prior to surgery

Check with Pre-op nurse  
regarding medicines day  
prior to surgery

No tube feedings the night  
before surgery



# Day of Surgery

Arrive at 5am – nothing to eat or drink after midnight. OK to take medicines with a sip of water (or coffee) *but no cream*. Surgery may be cancelled if you take even a sip of cream or milk the morning of surgery.

Waiting room on 5<sup>th</sup> floor

Post-operative care in STICU (11<sup>th</sup> floor)

# Anesthesia

Epidural catheter for pain control

- Remains in place for 2-5 days
- Dose can be adjusted as needed
- Can make it more difficult to empty the bladder
- May require foley (bladder) catheter to stay in place until epidural removed

# ICU Stay

## 1 or 2 days

Multiple lines and tubes:

- NG tube in nose (stays in 2-7 days)
- Catheter in bladder (2-5 days)
- Chest tube right chest (2-4 days)
- Abdominal drains (2 or 3)
- Feeding jejunostomy (stays in for  $\pm$  8 weeks)

# ICU

Catheter in bladder removed → check to make certain the bladder empties properly

Chest tube removed (day 2-4) → follow-up chest x-ray

Fluid emptied from drains every few hours

Start tube feedings by feeding tube

# Feeding Jejunostomy

Jejunostomy – Placed in small intestine

- Leaves stomach undisturbed (ideal for patients who will undergo esophagectomy)
- Pump feedings (12-16 hours – overnight)
- Laparoscopic placement (in OR)
- Overnight hospital stay

<https://www.youtube.com/watch?v=jjPP4zENP9g>

“Your Feeding Jejunostomy”

# Feeding Jejunostomy Video

## QR Code for YouTube



# Ward 6Tower

Tube feeds – will start continuous, then  
convert to night-time only (6pm to 10am)

Water administered through the feeding tube  
during the day (usually 8oz 4x per day)

Diabetic patients may need insulin at 6pm  
and Midnight



# Jejunostomy Feedings with Diabetes

Jejunostomy feedings may cause blood sugars to be elevated

- Insulin may be required along with feeds

Typical Pattern for tube feeds

- Feeds run via pump from 6pm to 10am
- Insulin at 6pm (70/30 insulin)
- Insulin at Midnight (70/30 insulin)
- *No insulin if tube feedings are not run*

# Ward Activity

Up in chair most of the day

Walking in halls with help from nurse/physical therapist

Goals:

1. Improve lung function (reduce need for supplemental oxygen)
2. Prevent muscle weakness (particularly 'core' muscles needed for walking)

# Ward

## Swallowing Evaluation

Upper GI X-ray on 2<sup>nd</sup> or 3<sup>rd</sup> day after surgery

If Upper GI OK → NG tube removed  
(tube in nose)

Modified barium swallow after NG tube out

If OK → start water by mouth

1 ounce per hour



# Ward Discharge

Goal: ready to leave day #6 after surgery

- Night-time tube feedings (6pm to 10am)
- Some nutrition by mouth (70% of patients)
  - 1 oz of water per hour by mouth *OR*
  - Protein shakes 4oz every 2 hours in some
- Water through tube 8oz four times per day
- Home care nursing (feeding tube teaching)
- Home infusion (tube feeding supplies)

# Medicines at Home

## Pain Control

Acetaminophen (Tylenol) 4000mg/day (1000mg 4 times/day)

Gabapentin 300mg 3 times/day

- Gabapentin works best if it is taken every day

Oxycodone

- Take as needed in addition to Tylenol and gabapentin
- Will begin reducing dosage at first postoperative visit
- Most patients can discontinue by 4 weeks after surgery
- NO DRIVING WHILE ON OXYCODONE

Non-steroidal anti-inflammatories (Celebrex)

- 200 mg every 12 hours starting 2 weeks after surgery
- NO GOODY POWDERS OR BCs (Can cause permanent scarring at the surgery site)

# Medicines at Home

## Acid blocker (Omeprazole, Nexium, etc)

- Will stay on for at 1-2 years to prevent acid reflux
- Important in preventing scarring at anastomosis (new connection between esophagus and stomach)
- To administer through feeding tube, open capsule and resuspend beads in 60mL (2oz) of water

# Medicines at Home

Reglan – Helps stomach empty

- Will plan to stop after six weeks
- 0.1% risk of tardive dyskinesia (nervous tic)

Remeron – Helps improve appetite

- Can cause vivid dreams
- Used for several weeks after surgery
- Will stop within first three months of surgery

# Medicines at Home

## Metoprolol – Beta Blocker

- Slows heart rate and lowers blood pressure
- Used around the time of surgery to prevent fast heart rhythms
- In patients who were not taking a beta blocker prior to surgery, will plan to wean over a few weeks after surgery
- For patients who were taking a beta blocker medicine prior to surgery, will return to prior dosage and drug after surgery



# Nutrition Plan After Surgery

At discharge home:

- Protein shakes 4oz every 2 hrs
- Tube feeds 4-5 cans at night (6pm-10am)

10-12 Days: Increase protein shakes

- Tube feeds 4-5 cans at night

Three weeks: Post-esophagectomy Diet

8-12 weeks: Remove feeding tube (in office)

# Transition from tube feeds → Eating

Dietitian will calculate daily protein goal

- Typically 60-75 grams protein/day
- Each carton of tube feeding has 15 grams
  - 75 grams protein = 5 cartons/night
- As protein intake by mouth increases, tube feeds can be reduced
- Important that protein intake be spread out during the day (20gm/meal)
- Three meals + 2-3 high-protein snacks

# Nutrition After Esophagectomy

Protein → wound healing and muscle

- Average woman needs 60 grams/day
- Average man needs 75 grams/day
- Spread out during the day (20gm/meal)

Carbohydrates → energy

- Sugary liquids can cause 'dumping'

Fats → help food taste good

- High fat foods may not be digested well

# Post-esophagectomy Diet

Soft Consistency

High Protein

Avoid sugary liquids (can cause 'dumping')

Avoid raw vegetables (and salads)

Eating

- Small, frequent meals
- Sit up for 30-45 minutes after eating
- Avoid eating within 2 hours of bedtime

# Typical Day at Home after Surgery

| Time | Activities   |
|------|--|
| 8am  | Morning Medicines (by mouth or into feeding tube)    |
| 10am | Stop Jejunostomy feedings, flush tube, disconnect    |
|      | Breakfast  |
|      | Walk   |
| 10am | Snack – Protein shake or high-protein snack          |
| Noon | Lunch  |
|      | Nap  |
| 2pm  | Snack – Protein shake or high-protein snack          |
|      | Walk   |
| 4pm  | Dinner   |
| 6pm  | Start Jejunostomy tube feedings. (Insulin if needed) |
| MN   | (Insulin if needed)                                  |

# 30 Degree Wedge Pillow



Surgery to remove the esophageal tumor will lead to a tendency for reflux. The most helpful strategy is a 30 degree wedge pillow. This should be half as high as it is long.

Available at [Walmart.com](https://www.walmart.com)

# Postoperative Visit

Check surgical site

- Remove staples (if needed)

Adjust medicines as needed

- Insulin (for diabetic patients on insulin)
- Reduce beta blocker medicines

Advance diet

# After Surgery

Wean off medicines added after surgery

- (pain medicines, beta blockers, Reglan)

Immunotherapy to prevent recurrence

- Patients with residual disease (in the pathology specimen) found at the time of esophagectomy (after chemo + radiation) are candidates for immune therapy (nivolumab or Optivo) for a year after surgery



# Survivorship

## Survivorship Visit

- Cancer surveillance (CT scan + EGD)
- Survivorship plan for healthy living
- Nutrition Monitoring
  - Iron, Vitamin D, Vitamin B12

# Team Members

Primary Care Physician

Gastroenterologist

Medical Oncologist (chemotherapy)

Radiation Oncologist (radiation therapy)

Surgeons – Jonathan Salo MD

– Jeffrey Hagen MD

– Michael Roach MD

Dietician – Liz Koch RD

Nurses – Brandon Galloway & Mychal LaCombe

Schedulers – Stacey Singleton & Tony Bethea