

## **Vesalius SCALpel™ : Esophagus (see also: esophageal folios)**

### **Anatomy/physiology**

upper 1/3 striated, lower 2/3 smooth muscle

LN drainage:

upper: paratracheal, supraclavicular

lower: subcarinal, inferior pulmonary lig., occasionally to abdominal nodes

abdominal: superior gastric, celiac, supraclavicular

LES press > 6mm, length > 2cm: less promotes reflux

decreased pressure: ETOH, nicotine, chocolate, fat

increased pressure: protein

reflux: normal < 7% of day, > 26% with Barrett's

### **Motility disorders**

normal esophageal motility

progressive peristaltic waves in body of esophagus

12mm proximal amplitude, 30mm distal

resting LES pressure > 6mm Hg, relaxation with arrival or peristaltic wave

fluoroscopic evidence of disordered motility is indication for manometry

manometric identification of LES for positioning of pH probe

achalasia

most common of esophageal motility disorders

progressive loss of ganglion cells (autoimmune destruction?)

70% of patients with scleroderma have esophageal involvement

replacement of smooth muscle with fibrosis

aperistalsis and tonic contraction of LES after swallowing

early symptoms: heartburn (47%), mild dysphagia, chest pain

late: increasing dysphagia, chest pain, wt loss, regurgitation of undigested food (esp after meals and lying down)

solids then liquids (esophagus accommodates: dysphagia, wt. loss late signs)

pts. augment swallowing: raising arms, straighten back, stand, jump

air swallowing: pumps up esophagus, increases pressure, weakens wall, dilates

LES spasm, bird-beak (smooth tapering v tumor/pseudoachalasia; more rapid hx with tumor)

disordered or no contractions on manometry, no relaxation LES

scope: inflammation, candida, taper, exclude Ca

10% incidence Ca @ 20y

drugs: bridge to surgery

amyl nitrate, sublingual NTG, theophylline, Ca<sup>++</sup> channel blockers

relax LES, help 30% of pts; tachyphylaxis decreases effectiveness

botox:

85% effectiveness relaxing LES, transient, 50% recurrence 6mo-1y

terminal axons regrow, new synapses

less success with retreatment

use for pts who are not surgical candidates

causes tissue reaction which predisposes to perforation at surgery

balloon dilatation to 3-4cm, 90% effective, 70% recurrence at 1y, repeat 1-2X

rapid relapse predicts less success with subsequent dilatations

disrupts distal esophageal muscle; OK before surgery

success and completeness increases w size of balloon to 4cm max

1-2% perforation risk with each dilatation

pain; get gastrografin, if neg follow w barium

if perf. immediate surgery, close perf, do myotomy, buttress w partial wrap

(Toupe, Dor)

Heller myotomy

now done mostly laparoscopically, 95% excellent response

6-7cm on esophagus, 2cm onto stomach

can do intraop scope, balloon to better visualize lower esophagus

addition of fundoplication reduces reflux 9X; more likely if done abdominally than thoracoscopically

associated with increased incidence of squamous Ca mid esophagus even after surgical treatment

monitor (only esophageal motility disorder associated with cancer)

diffuse esophageal spasm/nutcracker esophagus

multiple areas of circular muscle spasm, dysphagia

long myotomy

scleroderma

inadequate esophageal motility without increased LES pressure

## Mucosal disorders

GERD

20% incidence in general pop, 55% in obese (bariatric surgery for morbidly obese as effective as fundoplication to treat GERD)

mucosal damage -> Barrett's -> cancer progression

chronic, mimics other diseases (Gb)

evaluate: atypical symptoms (dysphagia, swallowing disorders), failure of medical Rx, treatment longer than 10y, hi dose drug Rx, multiple drugs

scope, 24h pH monitor, manometry, Ba study, gastric emptying (<5%)

progressive medical management: lo dose H2 blocker -> hi dose -> multiple -> PPI

surgery: alternative to medical therapy or failure of med Rx (especially young pt who needs more than minor medication)

if less than 30mm peak LES pressure, do partial wrap over large bougie

recent technique of endoscopic plication (for GERD, not for Barretts)

## Barrett's

found in 10% of patients with GERD

10% of Barretts progress to adenocarcinoma

long (greater or less than 3cm) and short segment

intestinal metaplasia at or above the GE jct; incompletely understood

medical treatment (PPI) equivalent to surgery; won't progress if control GERD

lo grade: 1-2% cancer risk per year, screen/scope yearly for dysplasia

hi grade: 7% risk per year, screen Q3mo if focal

multifocal or mucosal irregularity requires intervention

non-surgical ablation:

multipolar electrocoagulation (MPEC), 1% stricture

argon plasma coagulation (APC) (causes dessication), perforation risk

photodynamic (PDT):

5-aminolevulinic acid (5ALA) dye sensitizer of rapidly proliferating cells

laser causes O<sub>2</sub>-mediated cytotoxicity/mucosal destruction

incomplete

36% stricture rate

PDT + omeprazole decreases progression to carcinoma from 28 to 13%

with hi grade

Endoscopic mucosal resection, piecemeal, risks stricture, perforation

cryoablation, YAG additional modalities

esophagectomy in medically fit with hi grade dysplasia

## Neoplasm

benign: cyst, leiomyoma, fibroma, myxofibroma, fibrolipoma

remove if symptomatic; if asymptomatic consider malignant potential risk v

benefit surgery; most are operated on

malignant: squamous, adeno, sarcoma

symptoms: dysphagia of solids progressing to liquids

odynophagia: retrosternal pain on swallowing, 2<sup>nd</sup> most common symptom

squamous

no longer the most common in US

blacks 5X Caucasian (squamous)

60% N+ at Dx

alcohol, smoking risk factors

usually upper to mid, radiosensitive

adeno

rapidly increasing frequency

associated with Barrett's

radioresistant

T stage: 1 lamina propria or submucosa, 2 invades muscle, 3 through adventitia, 4 into adjacent structures

stage survival

I (T1) 85% rare to find except if scening for Barretts

IIA (T2,3) 35%

IIB (T2 or N1) 35%  
III (T3,4) 15%  
IV (metastasis) 0

overall 20% cure rate all stages

chemotherapy alone poor response, but sensitizes for RT

CT/RT 30-50% complete clinical response as induction/neoadjuvant Rx

radiotherapy

squamous sensitive: 50-60 Gy for cure, 5% 5y when used alone

surgery:

for Barretts or T1 lesion resection alone

T2 (into muscularis propria, N0M0): neoadjuvant radiotherapy, post op chemorad no added benefit

T3 (periesophageal fat), T4 (adjacent organs)

> 5 nodes positive correlates with systemic spread

goal of neoadjuvant is to reduce disease in the bed of surgical resection

complete pathological response improves survival (59% 3y survival)

distant mets: surgery not indicated; chemo +/- radiation; stent

liver met resection no survival advantage v colon cancer

resection with stomach pull up or interposition if stomach not usable

anastomosis in chest or neck: leak in neck less morbid than chest

neoadjuvant chemoradiation

85% resection rate

25-30% complete pathological response

average survival 29mo (v 14 mo without, double)

57% 2y, 34% 5y survival selected pts

complete pathological responders 60% 5y

if residual tumor, 34%

sarcoma

large polypoid mass

no benefit chemoradiation

epidermal (carcinosarcoma), leiomyoSA, fibroSA, rhabdoSA

only treatment is surgery

tylosis: autosomal dominant, hyperkeratosis palms and soles

only genetic disorder associated with esophageal cancer

95% incidence of esophageal cancer with tylosis

## Injury

caustic/chemical (acid or alkali)

no attempt at neutralizing: exothermic reaction causes more damage

examine mouth and upper esophagus (may be little evidence, short contact)

acid: stomach contact time longer than esophagus, risk of gastric perforation, later gastric outlet obstruction

associated with squamous cancer, 5% incidence at 6y

early endoscopy to identify necrosis; small caliber scope

H2 blocker/PPI

antibiotics, steroids?  
most adult cases psychiatric  
feeding tube, TPN  
no early surgery  
most heal with stricture, alkali more likely to produce esophageal stricture  
increased risk for esophageal carcinoma  
usually long stricture not amenable to dilatation  
late surgery with colon interposition (injured stomach cannot be used for conduit)  
cancer secondary to caustic burn more favorable than sporadic

#### perforation

75% iatrogenic (from therapeutic esophagoscopy), 20% mortality  
20% barotrauma: Mallory-Weiss (tear), Boerhaave (rupture, usually L chest)  
5% trauma, other (infection)

non-operative management well defined selected group  
contained leak documented on gastrografin then Ba  
hemodynamically stable  
NPO, 7-10d antibiotics  
parenteral nutrition  
Ba study no leak -> feed

#### surgery

primary repair if early, good tissue, minimal inflammation, mild edema,  
no malignancy  
mucosa, 2 layer muscle repair  
buttress: low use fundus, chest pleural or intercostal flap  
primary repair decreases mortality by 50-70%  
late: drainage alone, T-tube, exclusion/diversion, esophagectomy alternatives  
24h delay 40% mortality

## Anatomic abnormalities

### diverticula

Zenkers: pulsion, regurgitate undigested food, mostly at night, aspiration  
small: cricomyotomy alone  
large: excise, staple (endoscopic staple)  
mid-esophageal: traction, granulomatous mediastinal disease; simple excision  
epiphrenic: distal 1/3, pulsion, rarely symptomatic; Rx diverticulectomy with long myotomy to relieve pressure area

### hiatus hernia

50% sliding (type I), age > 50 (50% of people > 50 have)  
paraesophageal  
type II: EG junction normal location, fundus in chest  
type III: EG jct and fundus in chest (phreno-esophageal ligament disrupted)  
type IV: abdominal organ also in chest  
danger: gastric volvulus, gangrene

elective repair: 1% mortality, emergency repair: 20% mort.  
elderly, multiple medical problems  
asymptomatic low risk of incarceration, symptomatic, hi risk  
operate on all, must excise sac

esophageal web: Plummer-Vinson (sideropenic dysphagia)  
cervical esophageal dysphasia + iron deficiency anemia  
older edentulous women  
atrophic oral mucosa, glossitis, brittle spoon-shaped nails  
pre-malignant: 10% squamous oral, hypopharynx, esophagus  
Rx: esophageal dilatation, break web, treat iron deficiency

#### Shatzki ring

distal esophagus at squamocolumnar jct  
indicates hiatus hernia, not necessarily GERD  
differentiate from stricture caused by GERD  
periodic dilatation effective when not GERD related  
treat GERD if present

#### esophageal varices

33% of patients with cirrhosis and varices bleed  
Endoscopic banding more effective than sclerotherapy, reduces risk of first bleed  
endoscopic Rx of bleed 90% successful  
beta blockade decreases bleeding frequency  
TIPS for poor operative candidate or possible transplant candidate (does not disrupt  
extrahepatic vasculature)  
octreotide (somatostatin analog) 50mc. bolus -> 50/h X 24 decreases splanchnic  
blood flow -> decreased variceal pressure

#### References:

Williams V, Peters J. Achalasia of the esophagus: a surgical disease. JACS, 208 (1), Jan. '09, 151-162.