OUTLINE:

• WHAT IS THE UPPER GI TRACT?
• ANATOMY OF ESOPHAGUS
• BENIGN DISEASE OF THE ESOPHAGUS
  – Achalasia
  – Gastro-esophageal Reflux Disease-GERD
  – Zenker’s Diverticulum

ESOPHAGUS-ANATOMY

EMBRYOLOGY –
Longitudinal grooves fuse to form TE septum. Incomplete fusion = TE fistula grows, recanalizes. Striated muscle upper enervated by vagus, smooth muscle in middle supplied by visceral nerve plexus, vagus nerve position because of unequal growth of greater curve of stomach.
[ Left vagus Anterior, right vagus posterior- LARP ]
ESOPHAGUS ANATOMY

Cervical esophagus
- Below cricopharyngeus muscle, continuation of pharyngeal constrictors
- Potential space posteriorly = Zenker's diverticulum

Cervical esophagus = 5cm - C6-T1
- Recurrent laryngeal nerve in groove esophagus and trachea

ESOPHAGUS-ANATOMY

Total length incisors to GE junction: 35-40cm
Thoracic esophagus:
- Upper part stuck to posterior trachea, courses right of aorta, then left
- Covered only by flimsy mediastinal pleura, sight of Boerhaave's syndrome (perforation)

Lower esophagus:
- Easiest access through L chest
- Good for Heller myotomy, fundoplication
- Entire esophagus needs right side of chest

ESOPHAGEAL ANATOMY

• Abdominal esophagus via diaphragmatic hiatus
  – Surrounded by phrenoesophageal ligament
  – Lower esophageal sphincter is zone of high pressure 3-5 cm long at end of esophagus
  – Hiatus is surrounded by right and left crus, a sling of muscular fibers

• Blood supply - segmental
  – Cervical- inferior thyroid artery
  – Thoracic-bronchial and aorta
  – Abdominal-left gastric and inferior phrenic

Blood supply:
- Segmental
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ESOPHAGEAL PHYSIOLOGY

Food needs to get from the mouth to the stomach. Swallowing is a reflex once initiated:

1. The tongue pushes the bolus into the posterior pharynx, the soft palate elevates (keeping food from going up nose)
2. Epiglottis covers opening of larynx
3. Pressure in hypopharynx can be 60 mm hg
4. Food goes into upper esophagus-closes and contracts in a peristaltic wave with high closing pressure which prevents reflux
5. The upper sphincter relaxes

ESOPHAGEAL PHYSIOLOGY

Peristalsis pushes food down 2-4 cm/s-9 Seconds to distal esophagus. The lower sphincter opens by relaxation coinciding with pharyngeal swallow. Alpha Adrenergic transmitters or beta blockers stimulate LES.

Lower Esophageal Sphincter

- INCREASE
  - gastrin, motilin
  - bombesin, B-enkephalin, substance P
  - antacids, cholinergics
  - metoclopramide, PGF2

- DECREASE
  - cholecystokinin, estrogen, glucagon, progesterone, somatostatin, secretin, calcitonin, neuropeptideY, VIP, anticholinergics, barbiturates, calcium channelblockers, PGE1, E2, theophylline, caffeine, chocolate, ethanol, peppermint, coffee, fat
Gastro Esophageal Reflux Disease - GERD

- Incidence - 4-7%
- Role of H. Pylori - probably not
- Clinical - heartburn, regurgitation, occasionally dysphagia
  - Heartburn = substernal “burning” like chest pain, worsened by coffee, liquor 1-2 hours post prandial, relieved by antacids, H2 blockers
  - Regurgitation - spontaneous, esp lying down
  - Dysphagia - food getting stuck low down

GERD-manometry normals

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Median</th>
<th>2.5th %</th>
<th>97.5th %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure (mmHg)</td>
<td>13</td>
<td>5.8</td>
<td>27</td>
</tr>
<tr>
<td>Overall length cm</td>
<td>3.6</td>
<td>2.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Abd. Length cm</td>
<td>2</td>
<td>0.9</td>
<td>4.7</td>
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</table>
HIATAL HERNIAS

- Type I-sliding hiatal hernia- GE junction in chest
- No hernia sac
- Most common
- 50% patients with GERD have sliding HH
- Repair-fix crus or pull stomach into abdomen
- Do a wrap

- Type II-paraesophageal-GE junction at the esophageal hiatus, gastric fundus herniates into chest
- Has hernia sac "upside down stomach-can twist-gastric volvulus
- Pull stomach into abdomen, fixate it
- ? Do a wrap

GERD

- If pressure is low, length is short, or sphincter not in abdomen, increased abdominal pressure can overcome the sphincter and you reflux
- Gastric distension greater than 20 mmHg can force open the sphincter. Hiatal hernia open at lower pressures
- Fundic distension from high fat diet causes sphincter to get exposed to acid. repeated exposure leads to inflammation
GERD

- Process can lead to a Schatzki’s ring-fibrotic mucosal ring at the squamocolumnar junction
- Condition in which tubular esophagus is lined with columnar rather than squamous epithelium described by Norman Barrett in 1950
  - Intestinal metaplasia > 3cm long
- Occurs in 7-10% patients with GERD. Metaplasia-dysplasia-carcinoma sequence
  - 5-10% dysplasia converts to dysplasia/year and 1% progress to adenocarcinoma

Barretts Esophagus

- Treatment- aggressive esp. if dysplasia 60-80 mg proton pump inhibitor x 3 months
- Biopsy
- Follow up frequently
- New data – surgery (Nissen fundoplication) may cure
  - High grade dysplasia - 50% chance cancer - esophagogastrectomy - 90% curable
GERD-treatment surgical

TABLE 19.2. COMPARISON OF COSTS FOR OPEN AND LAPAROSCOPIC FUNDOPLICATION

<table>
<thead>
<tr>
<th>Authors [ref.]</th>
<th>Access</th>
<th>Operative costs ($)</th>
<th>Hospital costs ($)</th>
<th>Total costs ($)</th>
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<tbody>
<tr>
<td>Aschner et al. [179]</td>
<td>Open</td>
<td>13,838</td>
<td>3,801</td>
<td>17,639</td>
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<td>Arrese et al. [180]</td>
<td>Laparoscopic</td>
<td>13,871</td>
<td>16,901</td>
<td>30,772</td>
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<td>Arrese et al. [180]</td>
<td>Open</td>
<td>4,400</td>
<td>19,241</td>
<td>23,641</td>
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<tr>
<td>Bouchard et al. [177]</td>
<td>Open</td>
<td>6,447</td>
<td>7,037</td>
<td>13,484</td>
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<tr>
<td>Bouchard et al. [177]</td>
<td>Laparoscopic</td>
<td>2,430</td>
<td>6,900</td>
<td>9,330</td>
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<tr>
<td>Hussein et al. [181]</td>
<td>Open</td>
<td>3,060</td>
<td>6,900</td>
<td>9,960</td>
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<td>Hussein et al. [181]</td>
<td>Laparoscopic</td>
<td>1,908</td>
<td>3,143</td>
<td>5,051</td>
</tr>
</tbody>
</table>

Includes operating room costs. Estimates the PPS reimbursement of $11,925 to 1 American dollar. Costs are given in American dollars.

SURGERY for GERD-COMPLICATIONS

- Death - 0.5%
- Temporary swallowing problems 50%
- Dysphagia > 3 months 7%
- Increased flatus 47%
- Bloating 44%
- Inability to belch 20%
- Inability to vomit 25%
GERD-treatment results

- Surgical results – 87 - 96% negative pH tests at 3 months. 88% patients no or minimal reflux at 5 yrs.
- Quality of Life all better post-surgery
- Cost - med vs. surg - short term medicine/long term surgery
- SURGERY WORKS.
- Minimally invasive surgery works well!
- WHEN THEY FAIL MEDICAL THERAPY, OPERATE!!!!

ACHALASIA

- Absence of esophageal peristalsis and failure of the LES to completely relax upon swallowing
- Loss of myenteric ganglion cells
- Low incidence (most patients in 20-40's)
- Squamous cell Cancer develops in 5% over 20 years

ACHALASIA

- Diagnosis-solid food dysphagia and some liquid dysphagia, esp. cold liquids
- Average length symptoms 2 yrs
- Regurgitation frequent
- X-ray “birds beak”
- Endoscopy - dilated esophagus with closed LES, but opens easily for scope
- Manometry - incomplete sphincter relaxation

ACHALASIA

- Treatment-Pharmacotherapy with smooth muscle relaxants include calcium channel blockers, nitrates, anticholinergic. Each reduces LES pressure, but do not effect symptoms, don’t work long term
- Botulism toxin-BOTOX- inhibits acetylcholine from presynapse nerve terminals. Injected into LES, decreases tone, effective short term, safe?, long term-60-80% effective

ACHALASIA

- Esophageal dilatation-standard non-operative therapy. Breaks muscle fibers of LES. Pneumatic dilatation response-60-80%
- Risk of perforation. Long term?
- Best results- operative myotomy. Divide muscles, keep mucosa. May need antireflux as well. 2000 CASES, 2 DEATHS, 47-90% SUCCESS
ESOPHAGEAL DIVERTICULA

- Diverticulum - epithelial lined mucosal pouch that protrudes from the esophageal lumen. Most are acquired. Most are PULSION diverticula because of increased intraluminal pressure forces mucosa to herniate through muscles.

ZENKER’S DIVERTICULUM

- 1878- Zenker reported 27 cases of pharyngo-esophageal diverticulum. Most common, usually 7th or 8th decade
- Arise within the inferior pharyngeal constrictor, point of traction in posterior pharynx (Killians triangle)
- Sx-cervical dysphagia, regurgitation of undigested food, aspiration, gurgling, halitosis, voice changes

ZENKER’S DIVERTICULUM

- Dx-Barium esophagogram
- Treatment - relieve the neuromotor abnormality, lower pressure, manage diverticulum.
- Endoscopic division?
- Myotomy and diverticulectomy
- Myotomy and diverticulopexy
- Myotomy
SURGERY FOR BENIGN DISEASE OF THE UPPER GASTROINTESTINAL TRACT

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