Esophageal Perforation

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SUNY Downstate Surgery Grand Rounds
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HPI

- xxxx presents to ER xx hrs after ingesting boneless chicken breast at Popeye's restaurant resulting in foreign body sensation in chest and inability to swallow solids, liquids, or saliva. Multiple episodes of food impaction after swallowing large meaty food boluses in past resolved spontaneously or with fluid intake.

PMH

- Childhood asthma
- No prior surgery or endoscopy
- No medications
- NKDA
**PE**
- Vitals: 97.5 F, 144/87, 69, 96% RA
- O/P clear, no stridor
- Neck no tenderness or crepitus
- Lungs CTAB, chest no crepitus
- Abd soft, NT/ND

**Labs**
- CBC: 
  - WBC: 15
  - Hb: 9
  - PLT: 363
  - RBC: 46
- CHEM7: 
  - Na: 141
  - K: 104
  - Ca: 14
  - Cl: 109
  - Mg: 5
  - Phos: 27
  - BUN: 0.9
- Coags: 
  - INR: 1
  - PTT: /14/
  - PT: /28
8h: Laryngoscopy by ENT – no FB in O/P

11h: CT neck – WNL

13h: CXR – no radio-opaque FB or pneumomediastinum

16h: EGD by GI – impacted food bolus 30cm from gums, unsuccessful attempted removal with tripods, rothnet, and rat tooth forceps

18h: CT chest: dilated proximal esophagus, noncalcified FB distal esophagus at T7
• 20h: evaluated by CT surgery
• 22h: taken to OR
  – 35cm rigid esophagoscope: unable to visualize
  – 50cm rigid esophagoscope: meat at GE junction, unable to reach with laparoscopic instruments
  – Flexible endoscope under direct visualization: meat pushed into stomach. Retroflexion reveals nL GE junction and on withdrawal, small mucosal tear posterior esophagus 2cm length visualized just proximal to GE junction
Postoperative course

- NPO, Abx
- 4h: CXR – mediastinal & SQ emphysema
- 8h: Tm 99, chest wall crepitus, WBC 16
- 14h: gastrograffin swallow NEG
Postop course cont.

- 24h: CT chest
  R PTX, pneumo mediastinum, high attenuation in distal esophagus
- 32h: CXR R pleural effusion
- 36h: chest pain and episode desaturation
- 40h: EGD, R VATS, washout
Operative findings: posterior abrasion at 25cm, no perforation visualized

VATS revealed clear pinkish pleural fluid. Washout performed and chest tube placed

POD 1 esophogram: contained perforation distal esophagus

Chest tube removed POD 5

Discharged home HD 8
Esophageal Perforation

- Historical Perspective
- Etiology
- Algorithm for Diagnosis and Treatment
- Outcomes – Mortality
- Endoscopic Esophageal Stent Placement
Historical Perspective

- 1724: Boerhaave described symptoms, signs, and autopsy findings of esophageal perforation
- 1946: Barrett performed first surgical repair
- 1970s: Cameron described nonoperative approach
Causes of Esophageal Perforation

**Iatrogenic Perforation**

Endoscopy
- Rigid endoscopy 0.11%
- Flexible endoscopy 0.03%
- Bougie dilator 0.4%
- Pneumatic (achalasia) 1.7%
- Thermal (UGIB) 1-2%
- Sclerotherapy (varices) 1-6%
- Photodynamic Tx (Ca) 4.6%
- Stent (plastic >> metal) 5-25%
- EUS 0.1%

Surgery
- vagotomy
- pneumonectomy
- Heller myotomy
- mediastinoscopy
- ACDF

Esophageal Anatomy

• Depends on location, degree of containment, and elapsed time

• CERVICAL
  – Neck tenderness, odynophagia, SQ emphysema (60%)

• INTRATHORACIC
  – Dysphagia, pain (71%), tachycardia, fever (51%), dyspnea (24%), crepitus (22-30%)

• INTRA-ABDOMINAL
  – Peritonitis, free air
Water-Soluble or Barium Contrast Esophagography, Chest X-Ray, Computed Tomography

- **CXR**
  - 75-90% sensitivity
  - May be nL in first hour
  - Pneumomediastinum
  - Pleural effusions
    - Midesoph ➔ Rt
    - Distal esoph ➔ Lt

- **CT**
  - neg esophogram & high clinical suspicion, critically ill, atypical symptoms
  - Extraluminal or mediastinal air, esophageal thickening, pleural effusion, abscess

- **Contrast esophagography**
  - 10% false negative rate

- **Gastrograaffin**
  - Rapidly absorbed
  - Necrotizing pneumonitis
  - Sensitivity: cervical 50%, thoracic 80%

- **Barium**
  - Retained after study
  - fibrosing mediastinitis
  - Sensitivity: cervical 60%, thoracic 90%
Contained Perforation
“Nonoperative Management”

- Cameron/Altorjay Criteria:
  - intraluminal dissection
  - transmural perforation that drains back into the esophagus
  - no associated distal obstruction
  - not intra-abdominal
  - no evidence of sepsis

- NPO
- IV broad-spectrum Abx
- NGT
- +/- TPN
- +/- Chest tube
- close observation for 72hrs
Determinants for Failure of Conservative Management (20% in 24hrs)

- Retrospective review of 119 pts
- Successful nonoperative Tx in pts with scores 2 or less
- Better outcomes with operative Tx for score 3 or more

Uncontained Perforation

**Pathophysiology**
- negative intrathoracic pressure sucks esophageal & gastric contents into mediastinum, inducing chemical burn. Saliva, oral bacteria and digestive enzymes initiate mixed necrotizing superinfection

**Treatment Principles**
- Evaluate site & severity via EGD
- Resect vs repair
- Establishment of enteric access distally (PEG, G-tube, or J-tube)
- Complete debridement with wide drainage
- 2 layer closure followed by buttressing to adjacent healthy tissue
Management of Cervical Perforation

Drainage alone

SCM flap
Surgical approach to thoracic or abdominal perforations

- Middle third of esophagus
  → Right thoracotomy sixth ICS
- Lower third of esophagus
  → Left thoracotomy seventh ICS
- Abdominal esophagus
  → upper midline laparotomy
Esophagectomy

- Malignancy
- Long-segment Barrett’s esophagus
- Severe stricture w/ prior dilations
- Long-standing dysphagia
- Severe reflux with regurgitation and aspiration
- Megaesophagus
- Caustic ingestion

- Early Dx, confined to mediastinum, minimal contamination → transhiatal esophagectomy with immediate reconstruction
- Delayed Dx, extensive mediastinal or pleural contamination → Transthoracic approach with staged reconstruction
Primary Repair

- Healthy esophagus
- Early diagnosis (24-48hrs)
- Debride necrotic tissue
- Vertical esophagomyotomy
- Secure closure of mucosa
- Irrigation and drainage of contaminated area
- Buttressing with adjacent healthy tissue
Diaphragmatic pedicle flap

Outcomes for Primary Repair

• Mortality 3-13%
• Without treatment of distal obstruction (stricture, achalasia) mortality nears 100%
• Leak rate 80% in pt presenting >24hrs after perforation
Controlled Fistula

- Critically ill or unstable
- Extensive tissue inflammation
- Debridement and washout followed by closure over T-tube
- T-tube Removal after 6wks
Exclusion and Diversion

- Wide drainage of contamination
- Proximal and distal diversion with exclusion of perforated segment
- Cervical esophagostomy
- Drainage gastrostomy
- Feeding jejunostomy
- Esophageal ligation with absorbable suture converts to single-stage procedure
Mortality after Esophageal Perforation

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# Endoscopic Esophageal Stent Placement

<table>
<thead>
<tr>
<th>Author</th>
<th>etiology</th>
<th># Pts</th>
<th>Stent</th>
<th>Seal</th>
<th>Compl</th>
<th>Mortality</th>
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<tr>
<td>Fischer et al 2006</td>
<td>Benign</td>
<td>15</td>
<td>cSEMS</td>
<td>100%</td>
<td>7%</td>
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<td>Freeman et al 2007</td>
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<td>14</td>
<td>polyfex</td>
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<tr>
<td>Kim et al 2008</td>
<td>Delayed</td>
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<td>Silicone</td>
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<td>35%</td>
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<td>Leers et al 2009</td>
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<tr>
<td>Radecke et al 2005</td>
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<td>Salminen et al 2009</td>
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<td>33</td>
<td>SEPS</td>
<td>97%</td>
<td>33%</td>
<td>15%</td>
</tr>
</tbody>
</table>

cSEMS = covered self-expanding metallic stent; SEPS = self-expanding plastic stent
THANK YOU
References

- Cameron JL. Current Surgical Therapy, 9th Ed.
- Fischer JE. Mastery of Surgery, 5th Ed.
- Zinner MJ, Ashley SW, eds. Maingot’s Abdominal Operations, 11th Ed.