Caustic Esophageal Injury

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Case presentation

- 3F with no PMH presented to outside facility after drinking unmarked bottle containing oven cleaner (September 2012)
- EGD – inflammation only
- Discharged and lost to follow up
- December 2012- Dysphagia
Case presentation

- Esophagram - severe stricture at proximal and distal esophagus

- EGD for balloon dilatation fails due to inability to pass scope or wire
Case presentation

- Referred to LICH for evaluation

- January 2013- ER with severe dysphagia and inability to tolerate any PO
Case presentation

1/25/13- Esophagoscopy with attempted dilatation

2/1/13- Esophagoscopy, dilatation and Stamm gastrostomy

3/1/13- Esophagoscopy, dilatation and insertion of esophageal string
Esophagram
Case presentation

- POD#2 - Tolerated clears and gastrostomy feeds.
- POD#4 - Discharged home
Caustic Esophageal Injuries
Caustic Esophageal Injury

- Children, typically small amounts of:
  - cosmetics, bleach, oven cleaner, lye
  - accidents

- Adults, large amounts
  - suicide attempts
Caustic Esophageal Injury

- Mechanism based on:
  - Type
  - Concentration
  - Amount
  - Transit time
Caustic Esophageal Injury

● Alkali
  ○ liquefactive necrosis
  ○ higher viscosity, slower transit, adherent
  ○ severe mucosal injury → more likely to perforate

● Acid
  ○ coagulative necrosis
  ○ typically lesser injury due to eschar formation
  ○ lower viscosity, faster transit
  ○ may still perforate
Pathophysiology

Phases of injury:

- **24h**
  - Hemorrhage, thrombosis, inflammation, edema

- **After 48h**
  - Necrosis, gangrene, bacterial overgrowth
  - May progress to delayed perforation!

- **3 days to 2 weeks**
  - Sloughing, neovascularization, edema reduction

- **3 weeks +**
  - Fibroblast proliferation = stricture formation
Caustic Esophageal Injury

Clinical Signs and Symptoms
- Drooling
- Mucosal inflammation
- Agitation, Tachycardia
- Airway compromise
- Pain
- Hematemesis
Initial Management

- Airway!
- Do NOT induce vomiting
  - Risk aspiration
  - Alkali neutralized by gastric acid
  - Acid contained well in stomach
- Identify ingested agents
- Confer with local poison control
- CXR/AXR demonstrates perforation → OR
Evaluation

- Physical exam - inaccurate to gauge injury
- If symptomatic proceed to endoscopy
- Radiolabelled sucralfate esophagram
  - Screening to determine need for endoscopy (asymptomatic)
- Endoscopy sufficiently grades injury
  - Proceed early due to delayed perforation risk

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Grading

- I  – Hyperemia
- IIa – Superficial localized ulcerations
- IIb – Circumferential or deep ulceration
- IIIa – Multiple deep ulcerations or scattered necrosis
- IIIb – Extensive necrosis
- IV  – Perforation
Grading

- I, Ila – usually no strictures
- IIb – 50% stricture rate
- IIIb and higher denotes severe injury
Treatment - Grades I to IIIa

History
(substance ingested)
Examination
Admission to hospital

Potent caustic agent
Buccal/pharyngeal injury
Dysphagia

Mild corrosive
No external signs
Tolerating feeds

Endoscopy
(General anesthetic)

Technetium-99m
Isotope scan

Positive

Grade 1
(outpatient follow-up)

Negative

Discharge

Grade 2a
Oral sucralfate
Mycostatin, omeprazole
Contrast meal at 10-14 days
Nasogastric tube feed until tolerates oral feeds

Grade 2b and 3
As grade 2a + antibiotics

If stricture is demonstrated,
commence weekly dilations (balloon,
bougie, or string guided)
Decision for replacement at 12 weeks
Treatment - Grades IIIb to IV

- Early minor perforations
  - NPO, IV Antibiotics and TPN

- Delayed or major perforations
  - Surgery
Treatment IIIb to IV

- Surgery
  - Reserved for severe disruption, delayed recognition
  - Trans-esophageal water irrigation, with thoracostomy as adjunct to non-operative
  - Cervical esophagostomy, gastrostomy followed by esophageal replacement
Esophageal replacement

- Colonic interposition (most common)
- Gastric tube
- Gastric pull up
- Jejunal interposition
Reverse Gastric Tube

Left gastroepiploic artery
Gastric Transposition
<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Colon</td>
<td>Adequate length</td>
<td>Precarious blood supply</td>
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<tr>
<td></td>
<td>Reflux seldom occurs</td>
<td>Graft necrosis</td>
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<td>High incidence of leaks and strictures</td>
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<td>Involves three anastomoses</td>
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<td></td>
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<td>Redundancy over long-term</td>
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<td>Slow transit of food</td>
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<td>Long suture line</td>
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<tr>
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<td></td>
<td>High incidence of leaks and strictures</td>
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<tr>
<td>Gastric tube</td>
<td>Adequate length</td>
<td>Reflux—Barrett syndrome</td>
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<tr>
<td></td>
<td>Good blood supply</td>
<td>Bulk of stomach in thorax</td>
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<td></td>
<td>Size of conduit appropriate</td>
<td>Reflux common early on</td>
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<tr>
<td></td>
<td>Rapid transit</td>
<td>Poor gastric emptying</td>
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<tr>
<td>Stomach</td>
<td>Adequate length easily attained</td>
<td>Affects pulmonary function</td>
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<tr>
<td></td>
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<td>Affects growth</td>
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<tr>
<td></td>
<td></td>
<td>Precarious blood supply</td>
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<tr>
<td>Jejunum</td>
<td>Excellent blood supply</td>
<td>Three anastomoses</td>
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<tr>
<td></td>
<td>Single anastomosis</td>
<td>Specialized technique for microvascular anastomosis</td>
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<tr>
<td></td>
<td>Ease of procedure</td>
<td>Prolonged operating time</td>
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<td>Appropriate size</td>
<td>Precarious blood supply</td>
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<tr>
<td></td>
<td>Retention of peristaltic activity</td>
<td>High failure rate</td>
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<tr>
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<td>Length can be a problem</td>
<td></td>
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<tr>
<td>Free jejunal</td>
<td>Appropriate size</td>
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</tr>
<tr>
<td>graft</td>
<td>Good peristaltic activity</td>
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<table>
<thead>
<tr>
<th>Route</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Retrosternal</td>
<td>Ease of procedure</td>
<td>Longest route from neck to abdomen</td>
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<td>Useful when transpleural and mediastinal routes are unavailable because of inflammation or previous surgery</td>
<td>Angulation of graft</td>
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<tr>
<td>Transpleural</td>
<td>Convenience and ease of procedure</td>
<td>Problems with access if cardiac surgery required</td>
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<td>Displacement of lung</td>
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<td>Posterior Mediastinal</td>
<td>Most direct route</td>
<td>Requires thoracotomy</td>
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<td>Organ contained in mediastinum</td>
<td>Mediastinum may be unavailable because of previous surgery, fibrosis, or inflammation</td>
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<td>Little or no compression of lung</td>
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<td>Thoracotomy not always required</td>
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Follow Up

- Routine endoscopy for early stricture dilatation

- Up to 40% malignant transformation
  - Delayed onset – 15 to 40 years
  - Also see Barrett’s
Follow Up

- Early esophageal replacement- Due to high risk of carcinoma in patients with significant stricture
Conclusions

- If in doubt, proceed to early endoscopy
- Contained mucosal injuries or subclinical perforations may be managed non-operatively
Conclusions

- Routine, early and frequent endoscopy required in all patients
- Surgical options should be tailored to the patient

