Foreign bodies & chemical burns of the oesophagus

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Chemical burns of the esophagus

- **Incidence**
  - USA: 5,000 to 15,000 cases per year

- **Children**
  - 80% of cases, about 0.3% of all pediatric emergencies,
  - peak age at 2 years
  - mostly accidental and smaller quantities
  - rather bases

- **Adults**
  - rather suicidal, larger quantities
  - rather acids

Pace F, Curr Opin Gastroenterol 2009
Kay M, Curr Opin Pediatr 2009
Rodríguez GL, An Pediatr 2011
Contini S, World J Gastroenterol 2013
Agents and pH

The pH Scale

Acidic
- pH 0 = Battery Acid
- pH 2 = Lemon Juice
- pH 2.5 = Soda

Neutral
- pH 4.3 = Acid Rain
- pH 5.6 = Clean Rain
- pH 7 = Distilled Water
- pH 7.4 = Blood
- pH 8.1 = Sea Water
- pH 9 = Baking Soda

Alkaline
- pH 10 = Ammonia
- pH 12.6 = Bleach
- pH 14 = Liquid Drain Cleaner
Agents and pH

**Acids**
- e.g. Pool cleaner (pH 2.2-2.6), tile cleaner, anticorrosion agent
- Painful when swallowing, bitter
- (superficial) coagulation necrosis with sloughing
- Damage in the stomach at pH <2

**Bases**
- e.g. Drain cleaner, household cleaner, grill cleaner
- Swallow painless, tasteless
- Often viscous
- Colliquative necrosis develops over 3-4 days
- Damage in the esophagus at pH >11

**Button batteries**
- depending on size and charge
- Burns within 4-6 h, perforation possible within 6 h

**Drugs**
- dissolved acids pH <3: doxycycline, tetracycline, vitamin C, iron sulfate, aspirin
- Damage whs. by local hyperosmolarity: KCl, clindamycin, bisphosphonates

Kay M, Curr Opin Pediatr 2009
Cheng HT, BMC Gastroenterology 2008
Symptoms

Depends on substance, quantity and concentration, physical form and period of presentation

- Painful oropharyngeal, retrosternal, back pain, acute abdomen
- Dysphagia, odynophagia, hypersalivation (esophagus)
- Hoarseness, stridor, dyspnoea (upper respiratory tract, larynx / epiglottis)
- Epigastric pain, hematemesis (more likely stomach)

Missing lesions or pain in the oropharynx do not exclude severe lesions in the esophagus / stomach

Poor correlation between clinic and tissue damage

Contini S, World J Gastroenterol 2013
Rodríguez G, An Pediatr 2011
Marsha K, Cur Opin Pediatr 2009
Diagnosis

Endoscopic staging according to Zargar

**Grade 1**

- Edema, Hyperemia

**Grade 2 A**

- Superficial ulcers, bleeding
- Deep or circumferential ulcers

**Grade 3 A**

- Focal necrosis
- Extensive necrosis

**Grade 4**

- Perforation

Zargar SA, Gastrointest Endosc 1991
Examinations

Endosonography:
EUS safe, but not additional benefit with respect to prognosis

Conventional X-ray:
Low specificity for perforation

Chiu HM, Gastrointest Endoscopy 2004
Ananthakrishnan N, ISRN Gastroenterol 2011
Contini S, World J Gastroenterol 2013
Ryu HH, Clin Toxicol 2010; Lurie Y, Clin Toxicol 2013
CT Scan

A: No esophageal swelling (grade 1)
B: Edematous swelling of the Oe. (Grade 2)
C: surrounding soft tissue affected (Grade 3)
D: Free liquid (Grade 4)

Computed Tomography:
- Better for detecting perforations vs. reg X ray
- More sensitivity to strictures vs. endoscopy

Chiu HM, Gastrointest Endoscopy 2004
Ananthakrishnan N, ISRN Gastroenterol 2011
Contini S, World J Gastroenterol 2013
Ryu HH, Clin Toxicol 2010; Lurie Y, Clin Toxicol 2013
Endoscopy

Whom?

- Basically all patients
- Possibly not necessary if asymptomatic, small amount, low concentration / no extreme pH

Whom not?

- Asymptomatic children (except button batteries always & immediately!)
- Suspected perforation
- Unstable patients
- Hoarseness, stridor, dyspnea -> laryngoscopy

When?

- As early as possible (decision further procedure), within 24h
- Extent of damage better defined after 2-3 days
- Safe up to 4 days after ingestions

When not?

- Day 5 -15 (reparative phase> increased risk of perforation!)
Prognosis

- **Grade 1**: No permanent damage, may drink, early discharge
- **Grade 2 A**: Strictures / pyloric stenosis in 70 - 100%
- **Grade 3 A**: 65% early mortality
- **Grade 4**

References:
- Zargar SA, Gastrointest Endosc 1991
- Cheng HT, BMC Gastroenterology 2008
Clinical management I

- Acute burn/ingestion
  - Do not induce vomiting, no neutralizing agents
  - CT thorax and abdomen, clinical evaluation
  - Circulatory and respiratory management
    - Laryngeal edema? ➔ Tracheostomy
    - peroration, mediastinitis, peritonitis

Antibiotics, diet by gastric or duodenal tube, after 48 h liquid p.o. Barium swallow / EGD: always after 1-3 weeks, with symptoms of stricture even after years no therapy

Liquid food
Normal food after 24-48 h
Dismissal

Contini S, World J Gastroenterol 2013
Javed A, World J Gastrointest Surg 2012
Clinical management I

Acute burn/ingestion

Do not induce vomiting, no neutralizing agents

CT thorax and abdomen, clinical evaluation

No lesions I/IIa

Dismissal

EGD

Prognosis?

Circulatory and respiratory management

Laryngeal edema? → Tracheostomy

perforation, mediastinitis, peritonitis

within 24 h max. 4 d

No therapy

Liquid food
Normal food after 24-48 h

IIb/III

ICU, observation (perforation?)

antibiotics, diet by gastric or duodenal tube, after 48 h liquid p.o.

Barium swallow / EGD: always after 1-3 weeks, with symptoms of stricture even after years

perforation grade IV

antibiotics surgery

Barium swallow / EGD: always after 1-3 weeks, with symptoms of stricture even after years

Contini S, World J Gastroenterol 2013
Javed A, World J Gastrointest Surg 2012
Medical therapy

Yes

• PPI (hardly any data)
• Antibiotics at grade III / IV burns (... and at any uncertainty)

No

• No emetics, no neutralizing substances, no steroids

In discussion

• Topical mitomycin C > less strictures
• Ranitidine / ceftriaxone, parenteral nutrition +/- methylprednisolone at II B

Cakal B, Dis Esophagus 2013
Anderson KD, NEJM 1990
Pelclova D, Tox Rev, 2005
Betalli P, Diagn Ther Endosc 2009
Usta M, Pediatrics 2014
El-Asmar KM, Dis Esophagus 2014
Complications I

Acute problem

- systemic complications (infections, acid-base balance, coagulation)
- perforation
- bleeding
- esophago-tracheal fistulae
- esophageal dysmotility / dysphagia

Weeks, months to years

- Pyloric stenosis and gastric outlet obstruction
- Stenosis / strictures in the esophagus

After decades

- esophageal carcinoma

Contini S, World J Gastroenterol 2013
Siersema PD, Endoscopy 2009
Karakan T, Dis Esophagus 2013
Complications II

Esophageal carcinoma

- Risk increased 1,000-3,000 times
- Incidence of 2-30%
- no correlation to severity of strictures
- Start surveillance after 10-15 years (ASGE), interval 1-3 years respectively early endoscopic evaluation for dysphagia

Kiviranta NK, Acta Otolaryngol 1952
Kay M, Curr Opin Pediatr 2009
Foreign bodies
Foreign bodies

• "Real" foreign bodies are more common in children (about 75%)
  • Coins, buttons, batteries, magnets, plastic toys

• Diet bolus is more common in adults

• 80-90% spontaneous discharge; 10-20% endoscopy; 1% surgery

• Body packers!

• Switzerland: incidence 23 / 100'000 per year
Anatomy
Symptoms

- dysphagia
- odynophagia
- retrosternal pain
- sore throat
- foreign body sensation (localization of foreign body sensation often does not correlate with the localization of the impaction)
- vomit
- hypersalivation and inability to swallow fluids are suspicious for the presence of complete esophageal obstruction
Diagnostic procedures

Native-X-ray
- Clarification regarding detection, localization, size and number
- Neck, thorax and abdomen, usually one level, possibly 2nd level
- No x-ray in food bolus without evidence of perforation (87% false negative)
- CAVE: Thin metals, wood, plastic, glass, fish and chicken bones
- Not suitable to exclude a perforation because often only little free air

No contrast X-ray
- Barium: endoscopy complicates, mediastinitis in perforation
- Gastrografin: CAVE in aspiration > pneumonitis

Computed Tomography
- Indicated in case of suspected perforation
- in complications, which is an operative procedure
Endoscopy

Localisation

Eosophagus

Eosophagus

Stomach/Duodenum

Stomach/Duodenum

More distal

More distal

Emergency (0-2h, max 6)
  - Complete obstruction (saliva shaking possible?)
    - sharp objects
    - batteries
    - Urgent (12-24h)

Urgent (12-24h)
  - Sharp objects
  - Magnets and batteries
  - Diameter> 2-2,5cm (IC-flap)
  - Length> 5cm (duodenal knee)

As soon as possible (72h)
  - Smaller dull objects

Follow-up

Sharp objects
  - daily Rx
  - Evaluate surgery after 3 days

Batteries
  - Rx every 3-4 days
  - Evaluate surgery after 5 days

Localisation

Esophagus

Stomach/Duodenum

More distal

Follow-up

Sharp objects
  - daily Rx
  - Evaluate surgery after 3 days

Batteries
  - Rx every 3-4 days
  - Evaluate surgery after 5 days
Endoscopy

- Endoscopy success rate 94-98%, complications <1%
- Tools: grasping forceps, graspers, polypectomy loops, mesh, Dormia-basket
- Guidelines recommend for sharp objects
- "Protective devices" and in case of high risk of aspiration intubation
Meat-bolus

• Most common foreign body in adults (> 50%) ➔ EoE (Eosinophilic esophagitis??)

• endoscopy
  • "Gentle push" allowed if no passage of the bolus possible
  • if not possible, then piece by piece or en bloc

• medical
  • Glucagon iv for relaxation of lower esophageal sphincter shows no benefit to placebo.
  • Underlying pathology
  • 88-97% is an underlying pathology
  • Even if the meat bolus disappears spontaneously
  • Most common diseases: esophageal stricture, eosinophilic esophagitis, esophageal carcinoma, dysmotility of the esophagus (achalasia, nutcracker)
Bodysacker

Imaging
X-ray abdomen: sensitivity 85-90%
CT: sensitivity 96%

TicTac Sign

Double condom sign

avoid endoscopy!!!
Thank you for your attention