February 1st 2019,

10th Gastro Foundation Weekend for Fellows; Spier Resort Centre, Stellenbosch

Foreign bodies & chemical burns of the oesophagus

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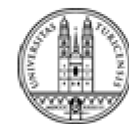

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Chemical burns of the esophagus

- **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

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Acidic — Neutral — Alkaline

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

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

pH 11 = 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 ag
- Painful when swallowing, bitter
- (superficial) coagulation necrosis with sloughing
- Damage in the stomach at pH <2

Bases

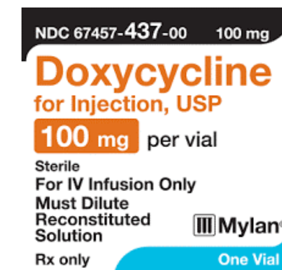
- e.g. Drain cleaner, household cleaner, grill cleaner
- Swallow painless, tasteless
- Often viscous
- Colliquative necrosis develops over 3-4 days
- Damage in the esophagus at pH> 11

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

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Contini S, World J Gastroenterol 2013
Havanond C, J Emerg Med 2007
Rodríguez G, An Pediatr 2011
Marsha K, Cur Opin Pediatr 2009

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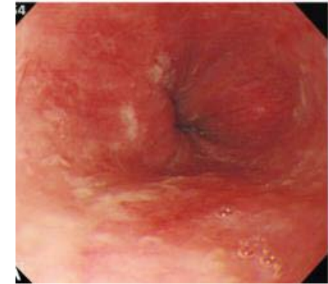
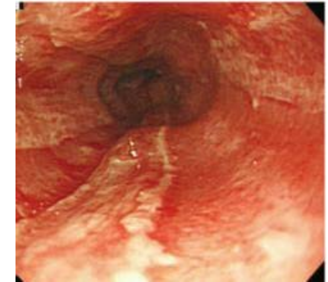
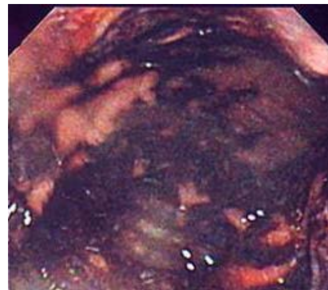
Diagnosis

Endoscopic staging according to Zargar

Grade	Finding
Grade 1	Edema, Hyperemia
Grade 2 A	Superficial ulcers, bleeding
B	Deep or circumferential ulcers
Grade 3 A	Focal necrosis
B	Extensive necrosis
Grade 4	Perforation

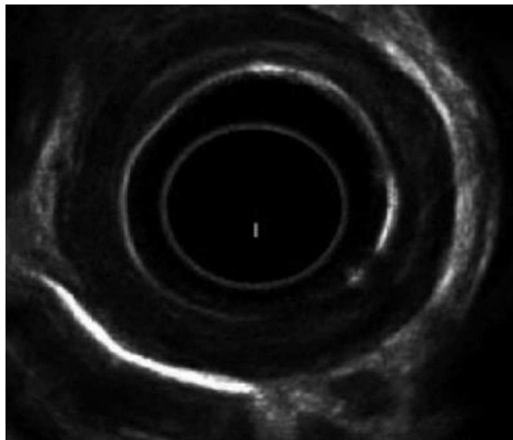


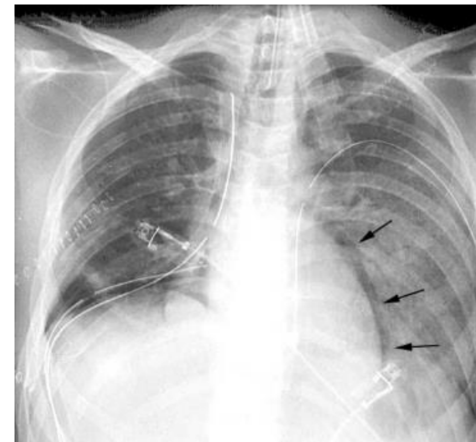




Zargar SA, Gastrointest Endosc 1991

Examinations





Endosonography:

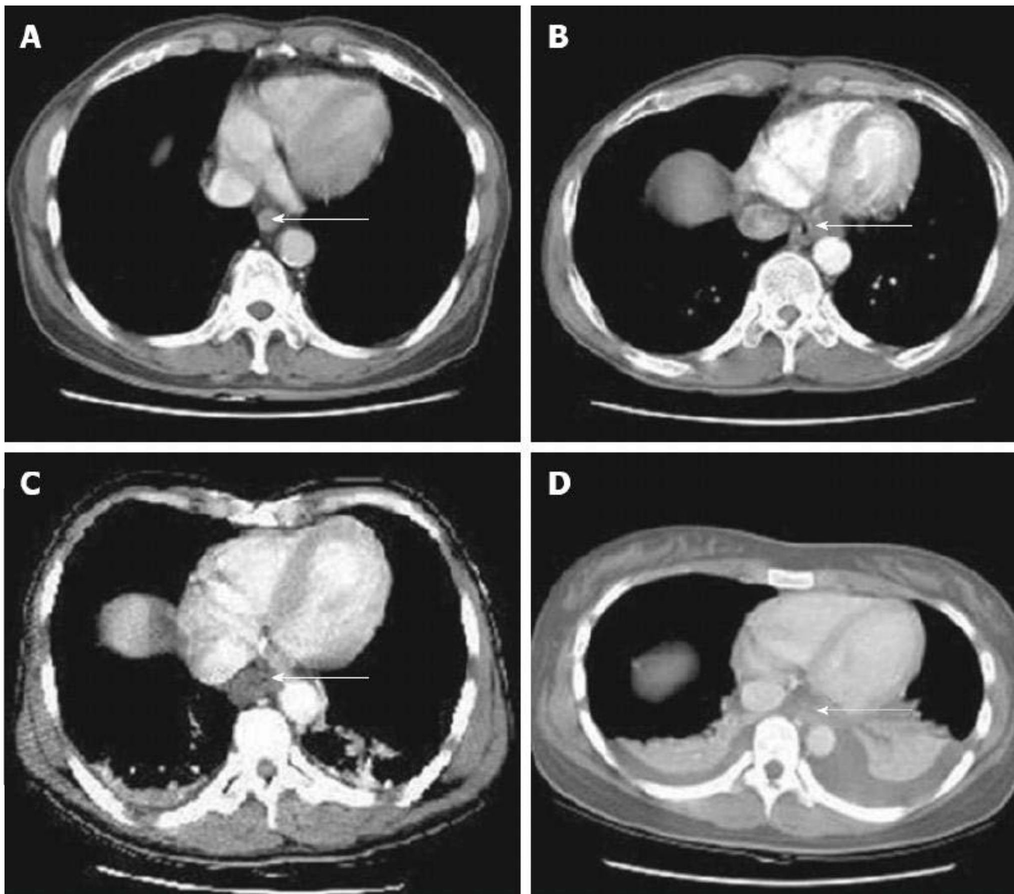
EUS safe, but not additional benefit with respect to prognosis

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!)

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Kay M, Curr Opin Pediatr 2009
Betalli P, Diagn and Ther Endosc 2009
Cabral C, Surg Endosc 2012

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Prognosis

Grade 1

Grade 2 A

No permanent damage
may drink, early discharge

B

Grade 3 A

Strictures /
pyloric stenosis in 70 - 100%

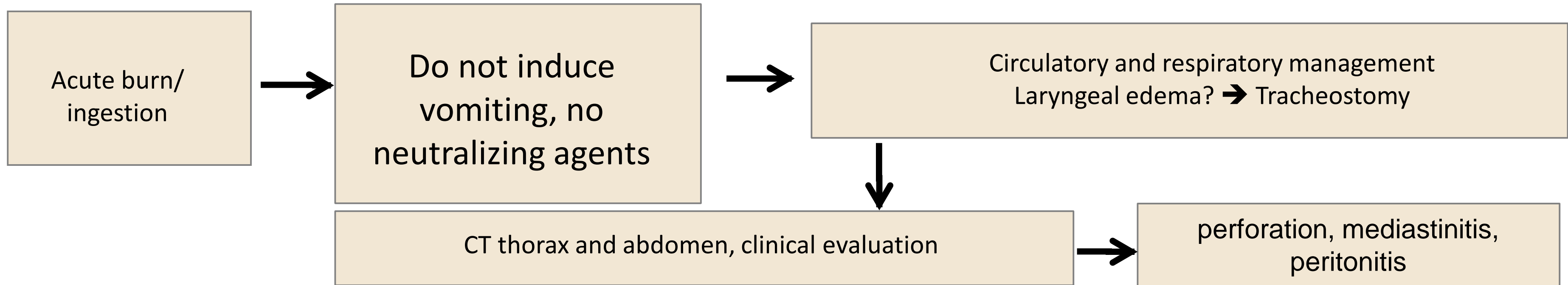
B

Grade 4

65% eraly mortality

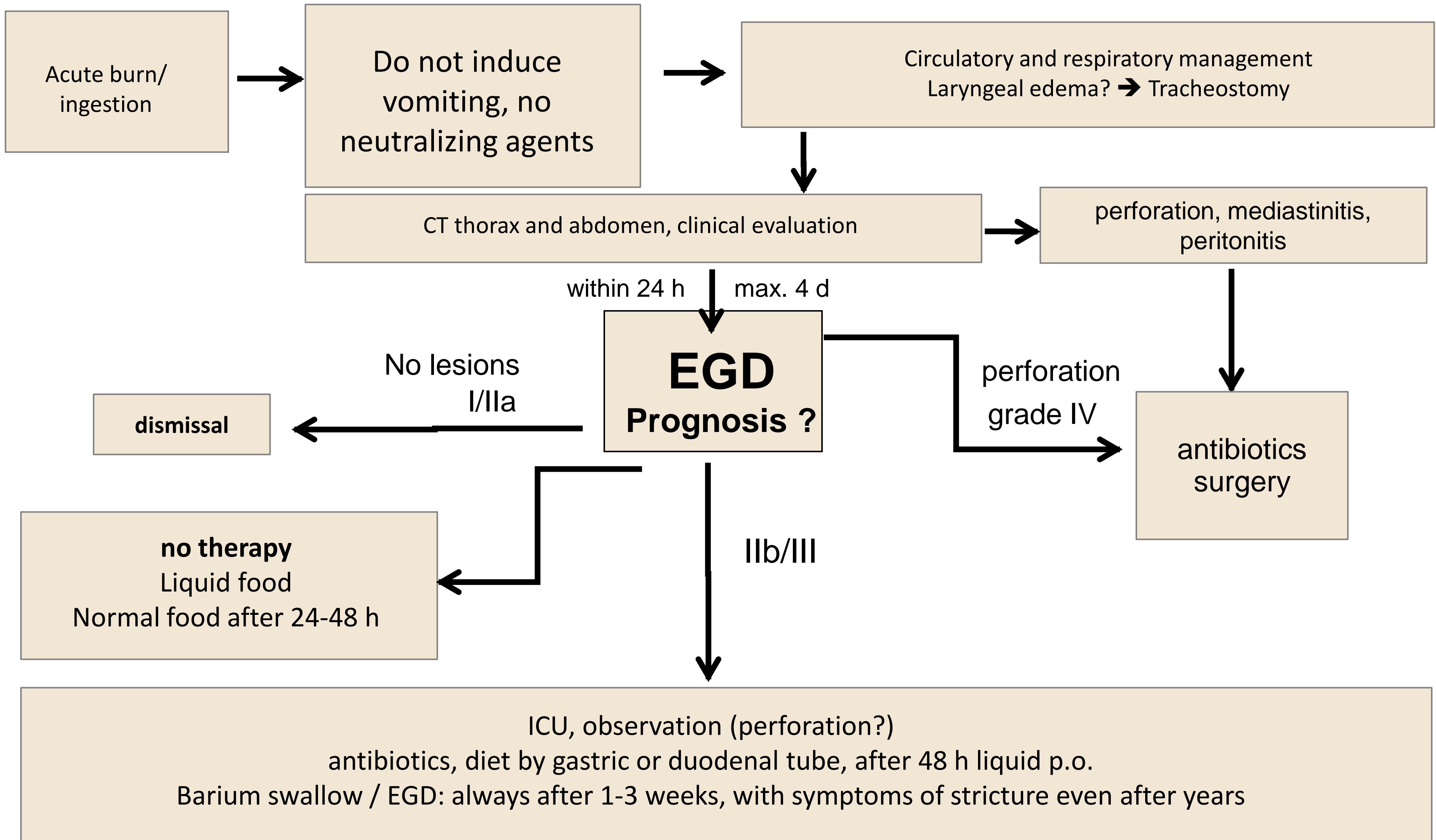
Zargar SA, Gastrointest Endosc 1991
Cheng HT, BMC Gastroenterology 2008

Clinical management I



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

Clinical management I



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

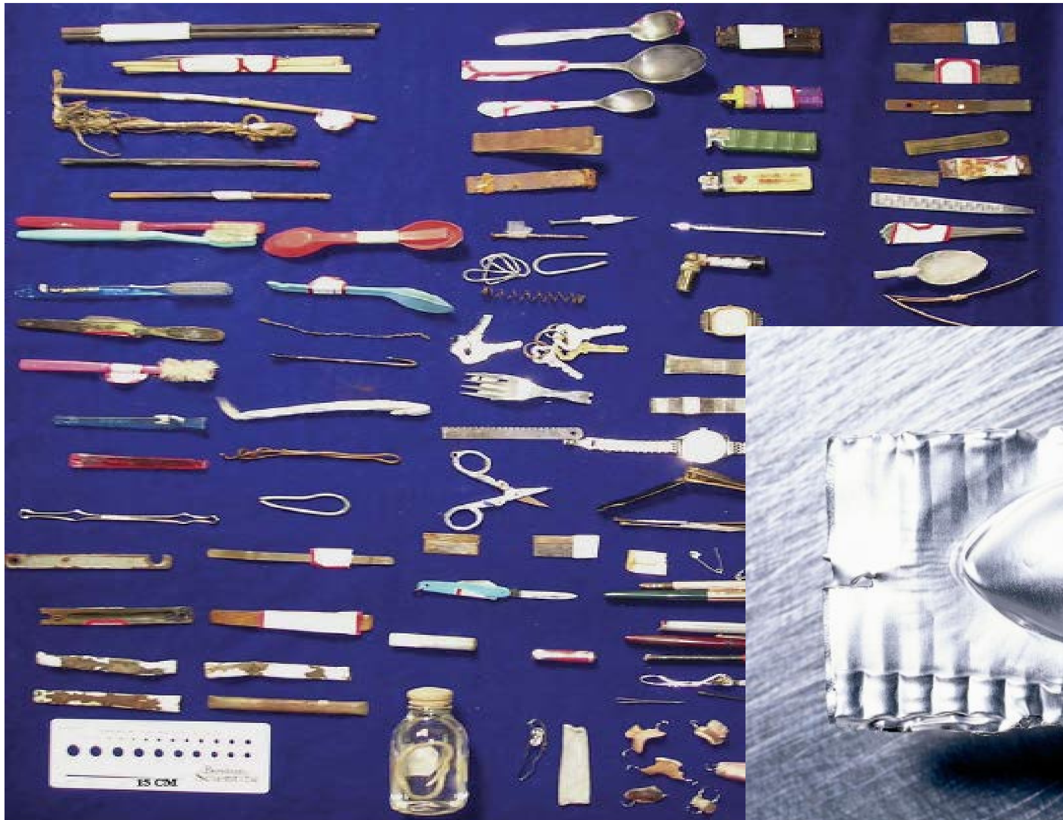
Complications II

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

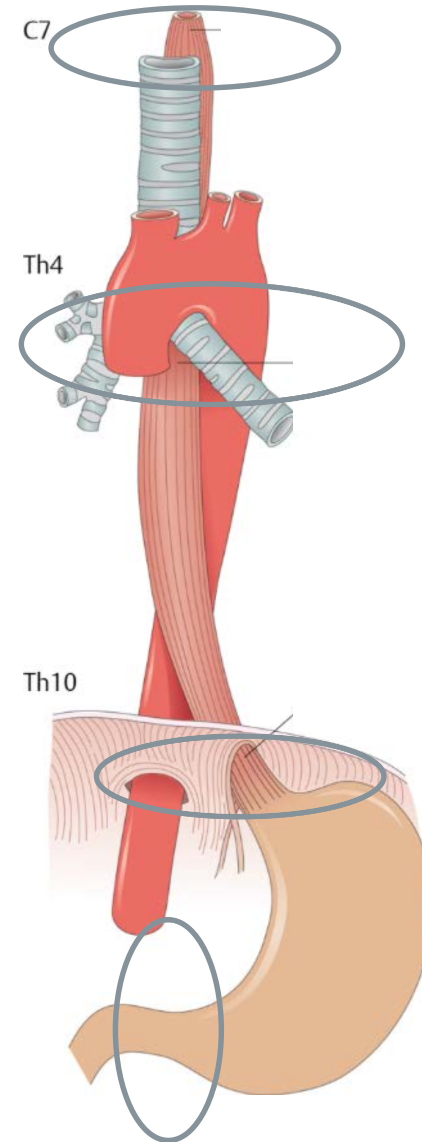


Foreign bodies

- "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

ASGE Guidelines Gastrointest Endosc, 2011
Sugawa C, World J Gastrointest Endosc 2014
Dray X, Best Pract Res Clin Gastroenterol 2013

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

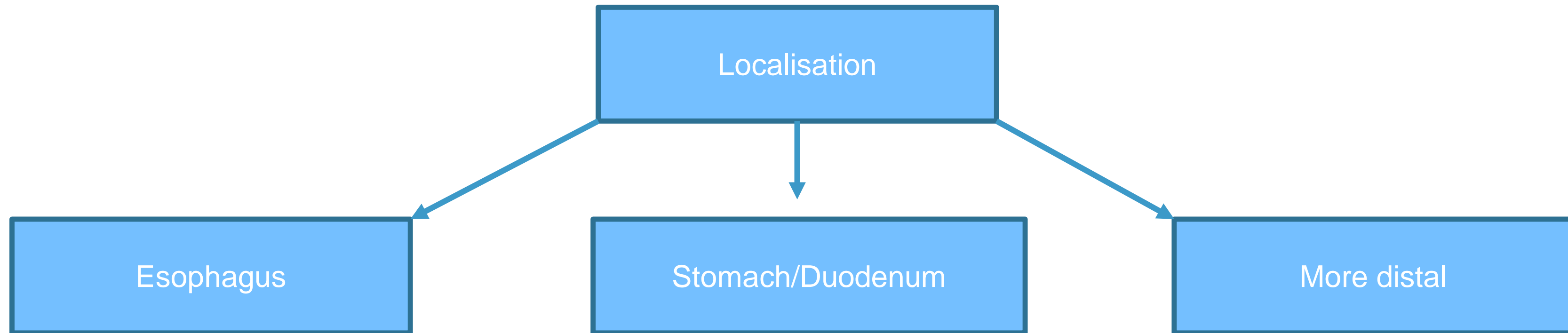
- Barium: endoscopy complicates, mediastinitis in perforation
- Gastrografin: CAVE in aspiration> pneumonitis

Computed Tomography

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

ESGE Clinical Guidelin; Endoscopy 2016
ASGE Guidelines Gastrointest Endosc 2011
Fisher J, Pediatrics 2013

Endoscopy



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

Folow-up

Sharp objects

- daily Rx
- Evaluate surgery after 3 days

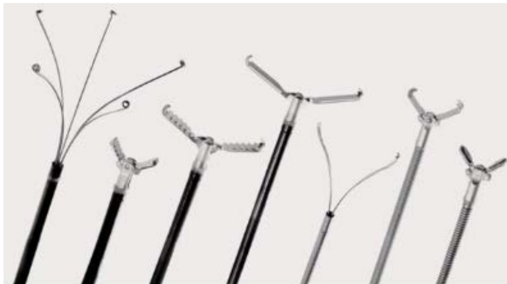
Batteries

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

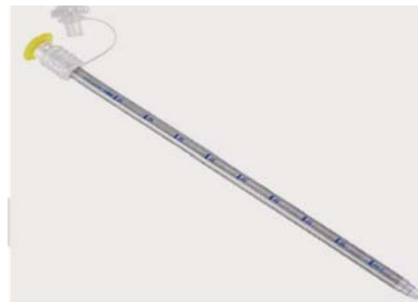
ESGE Clinical Guidelin; Endoscopy 2016
ASGE Guidelines Gastrointest Endosc 2011

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



ESGE Clinical Guidelin; Endoscopy 2016
Li ZS, GI Endoscopy 2006
Katsinelos P, J Clin Gastroenterol 2006
Adler DG, Gastrointest Endosc 2006

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)

ASGE Guidelines Gastrointest Endosc 2011
Sugawa C, WJGE 2014
Sodeman TC, Dysphagia 2004
Pfau PR, Gastrointest Endosc 2014

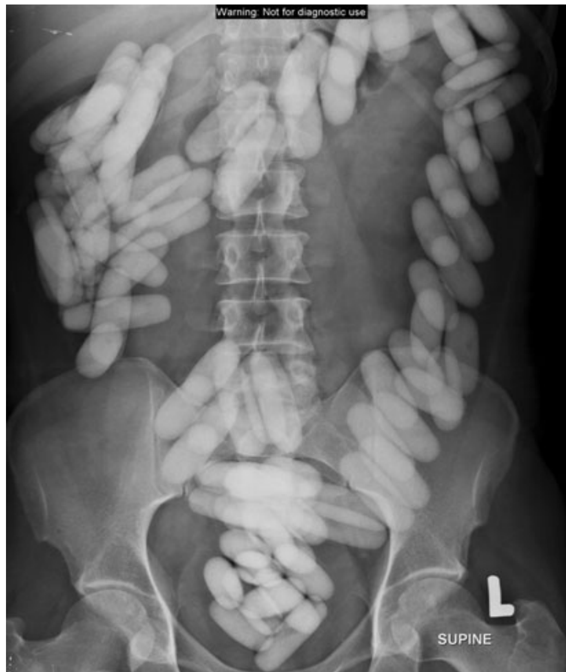
Bodypacker

Imaging

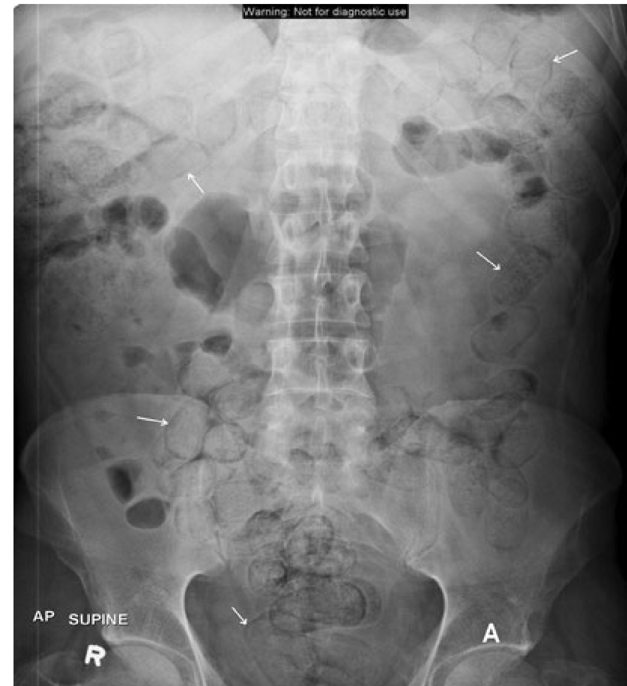
X-ray abdomen: sensitivity 85-90%

CT: sensitivity 96%

avoid endoscopy!!!



TicTac Sign



Double condom sign

Hamid et al, Jpn J Radiol. 2012

Thank you for your attention