

Caustic Ingestion

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Outline

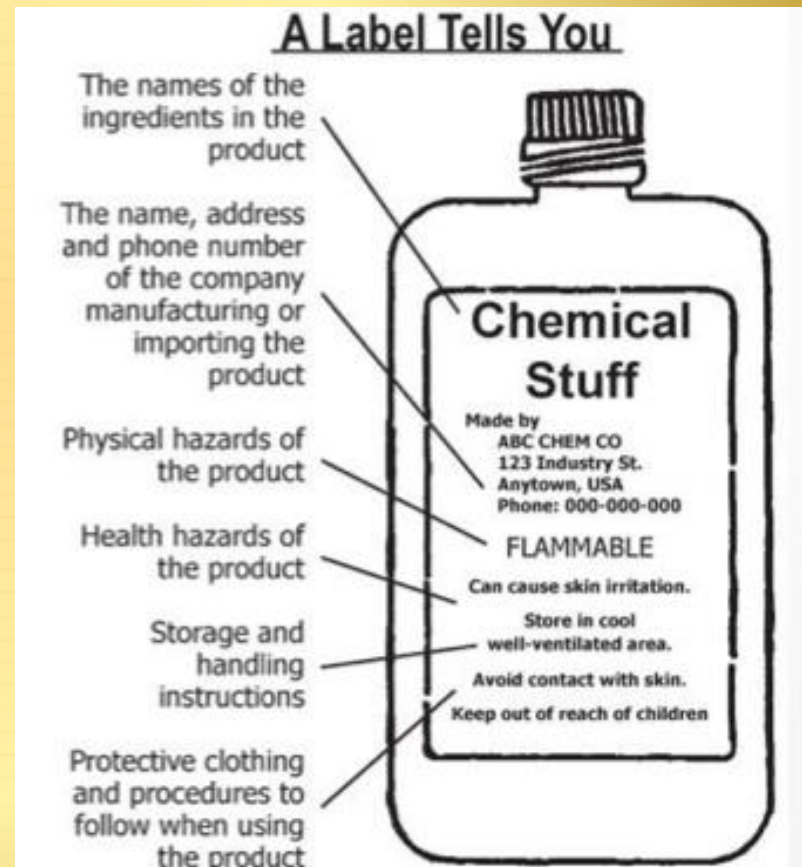
- ✦ Overview
- ✦ Alkaline Ingestion (consider laryngeal and esophageal)
- ✦ Acidic Ingestion
- ✦ Management
- ✦ Conclusion



✦ Chevalier Jackson in 1910 published 4 cases of “sloughing of the esophagus. From proprietary preparation.”

✦ Safe Packaging Act of 1970

- protective packaging of hazardous materials





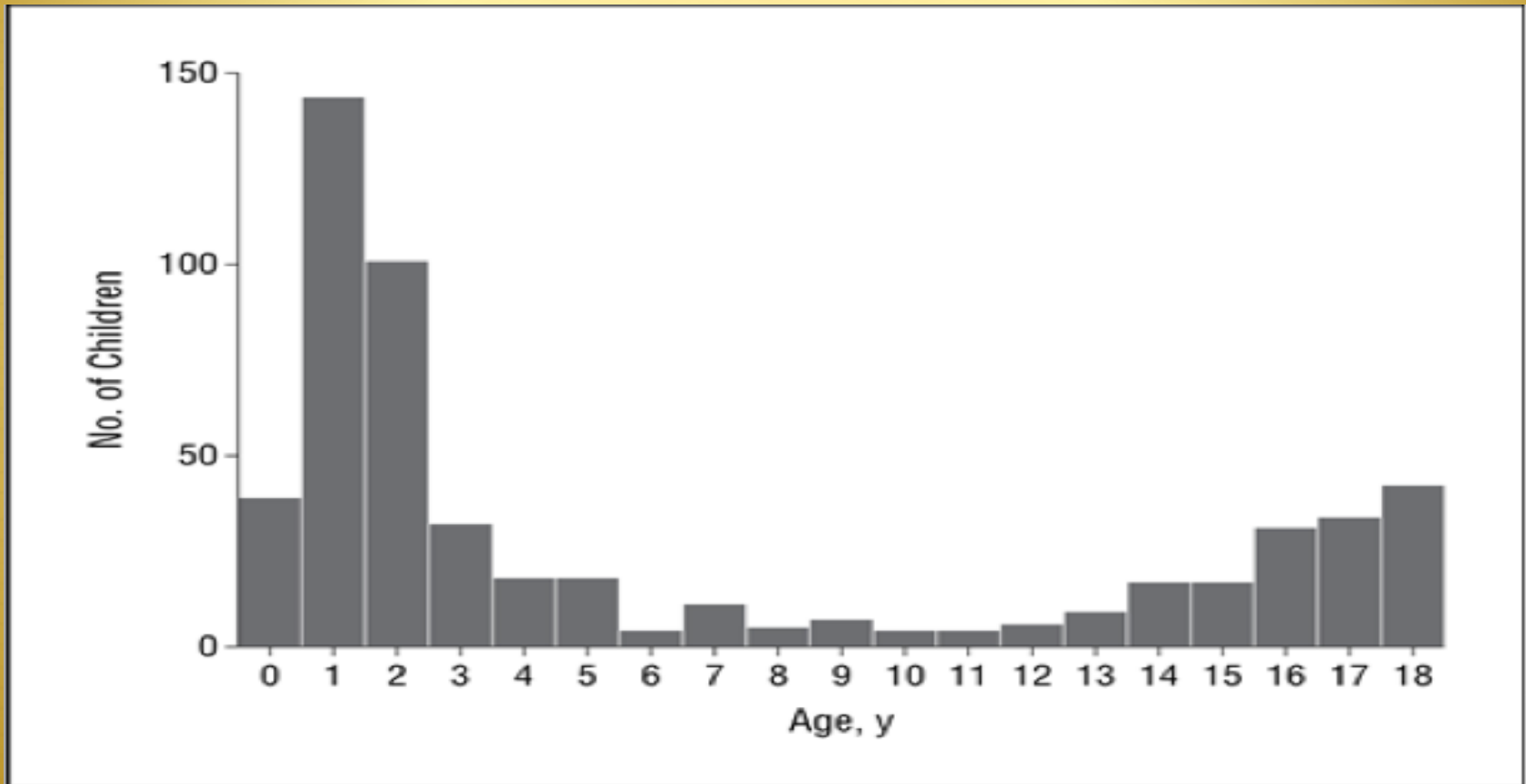
- ✦ Over 200,000 ingestions of cleaning solution per year are reported to poison control

- ✦ 5000-15000 caustic ingestions, a majority of which come from cleaning solutions



- ✦ 10% of ingestions result in severe injury
- ✦ Of those, 1-2% will develop esophageal strictures.
- ✦ 40% of caustic ingestion will involve the larynx

- Bimodal distribution of ingestion.





- ✦ Many caustic ingestions from adults are more severe, as they are suicide attempts, whereas children mainly drink the substances out of curiosity.

- ✦ Occupational exposure is oftentimes more severe given higher concentration of chemicals

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- ✦ Type of liquid ingested varies by geography
 - ✦ Alkaline in more developed countries
 - ✦ Acidic ingestion in developing countries



Alkali Ingestion



✦ Bases

✦ 7.4 - Human Blood

8.3 - Baking Soda

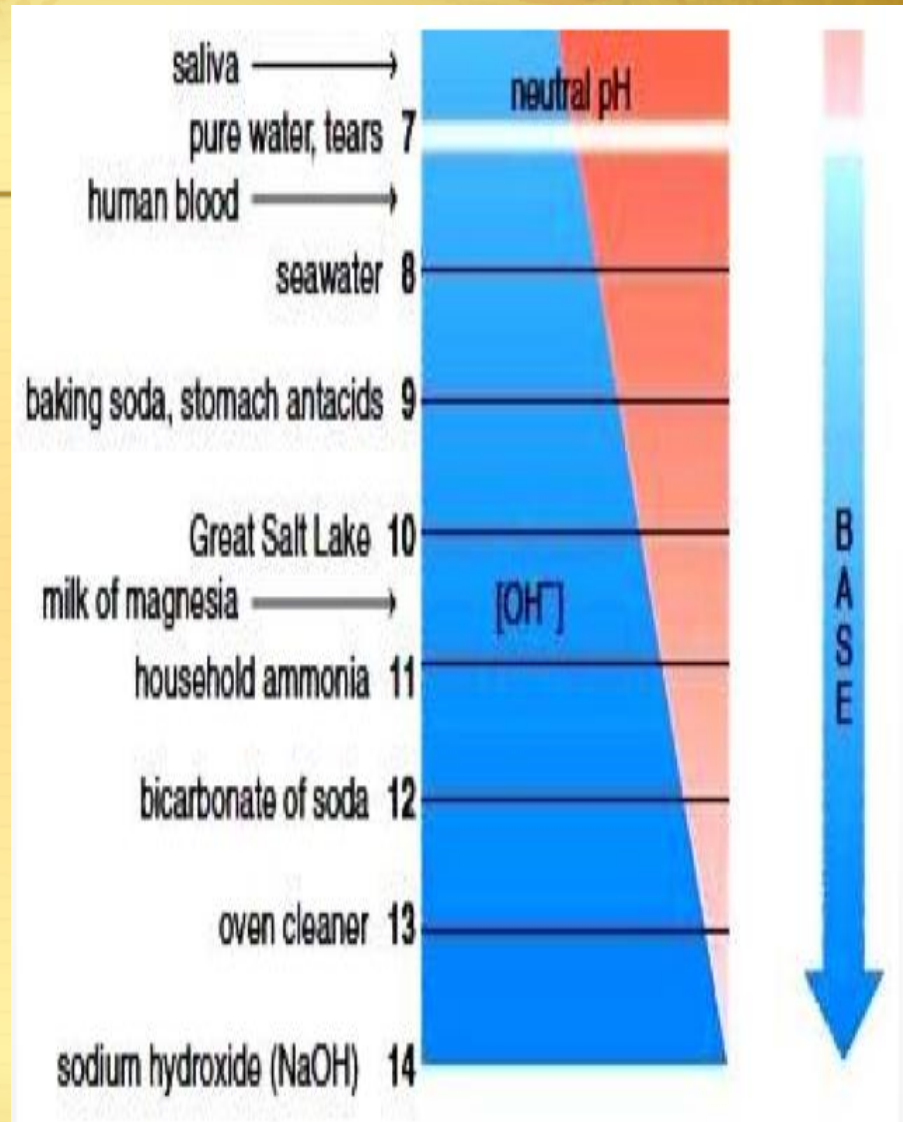
✦ 10.5 - Milk of Magnesia

11.6 - Ammonia

12.4 - Lime (Calcium Hydroxide)

13.0 - Lye

14.0 - Sodium Hydroxide (NaOH)





- ✦ Leads to liquefactive necrosis
- ✦ Saponification of fats
- ✦ Solubilizing of proteins
- ✦ Emulsification of cellular membranes



✦ Damage is dependent on :

Dose

Time

Solid v liquid

Titratable reserve

✦ $\text{pH} > 11.5$ is needed for damage to occur

✦ Injuries from alkali occur more rapidly, with oral cavity/oropharynx oftentimes being more affected

✦ Dose/concentration, time

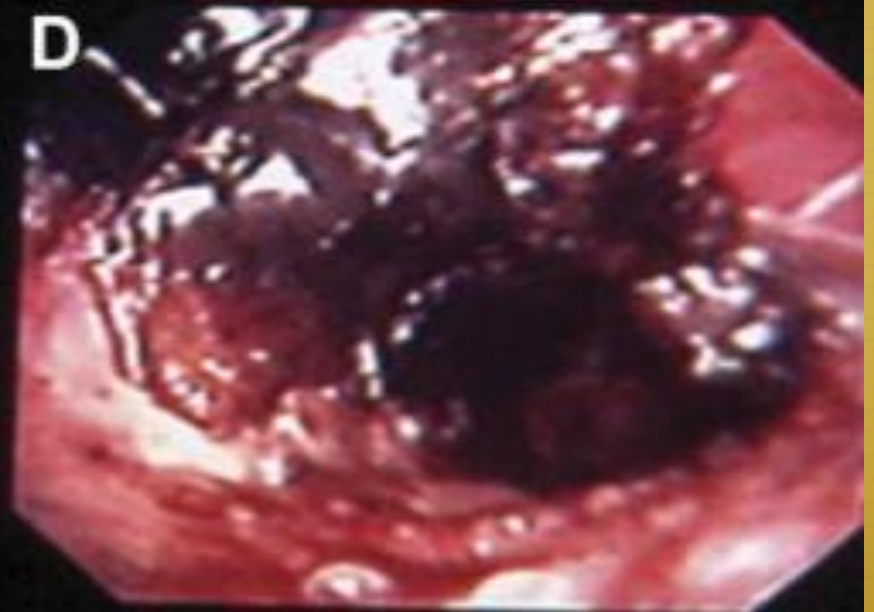
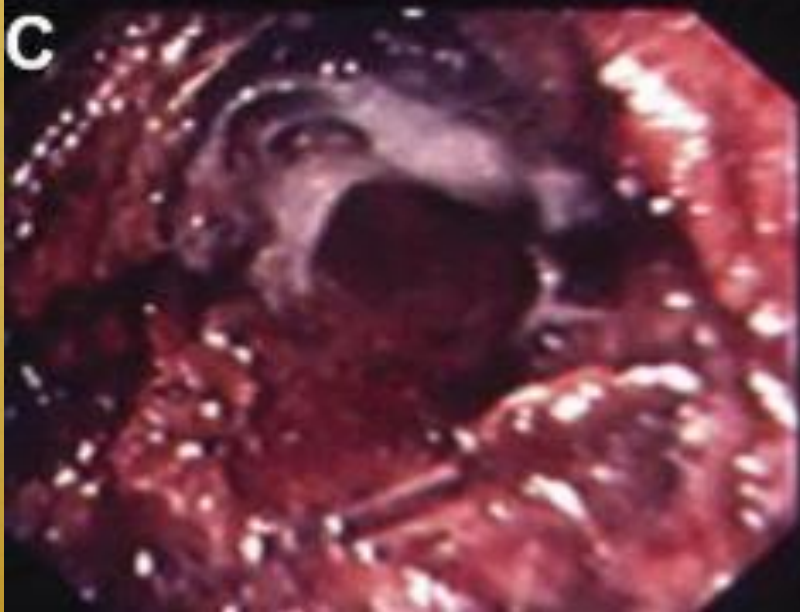
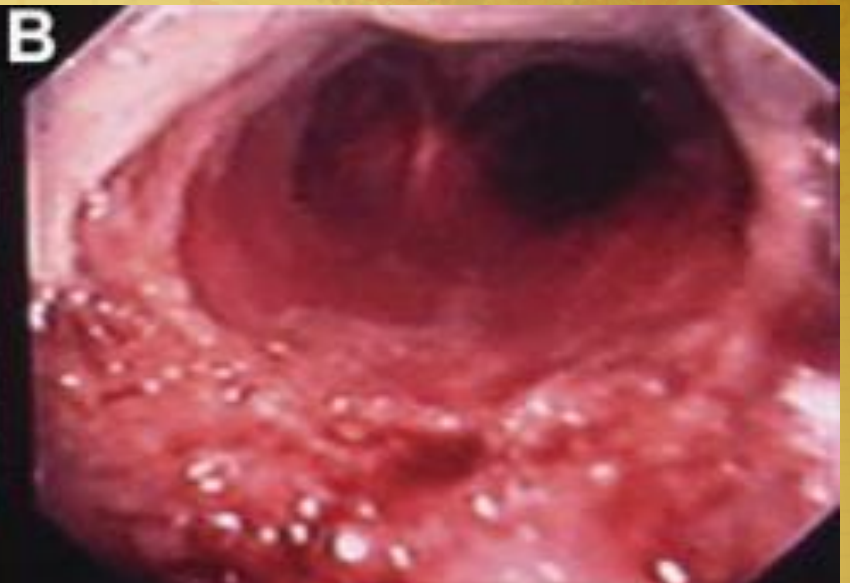
✦ Tissue edema occurs immediately, which can lead to airway obstruction.

✦ Edema may persist





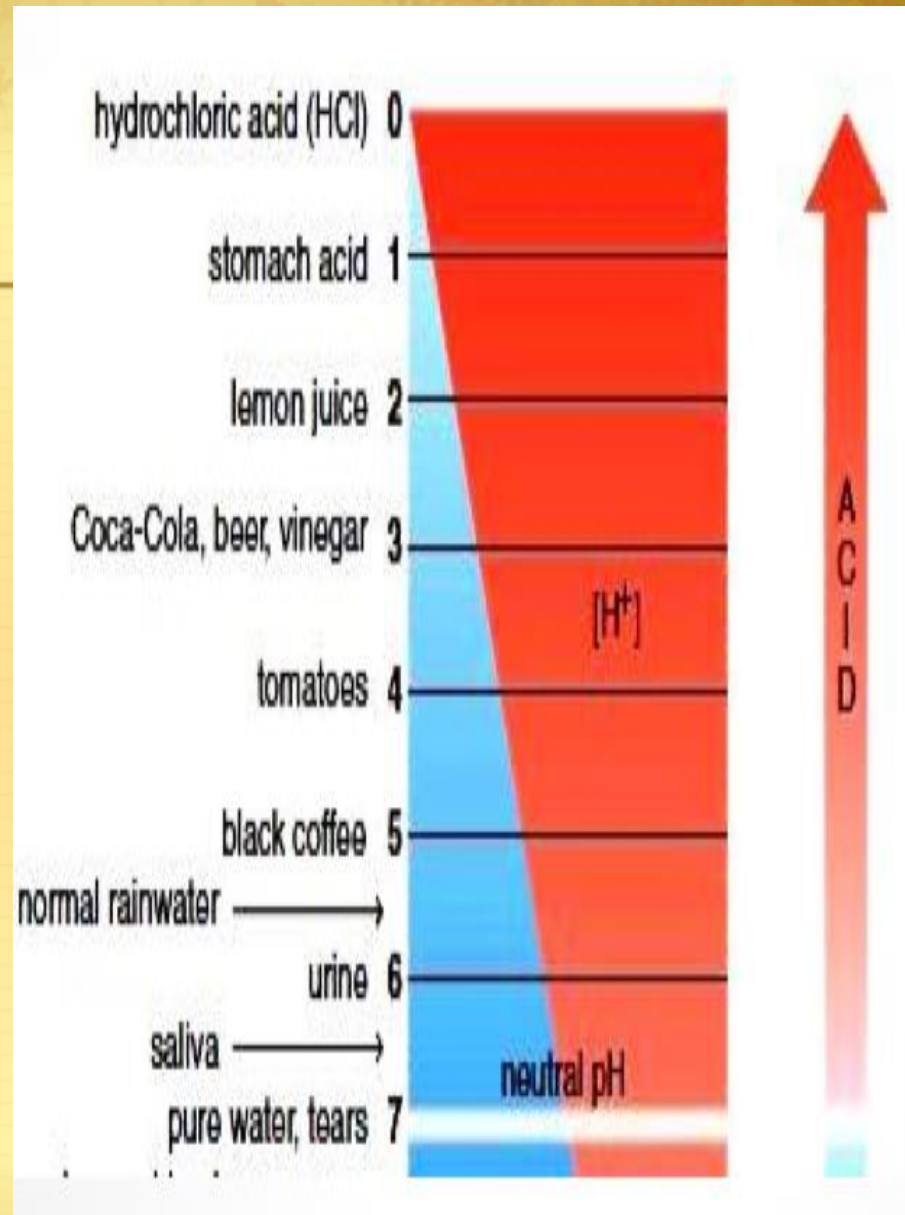
- ✦ Caustic aspiration is less common.
- ✦ Increased damage over time.
- ✦ Stricture formation of the pharynx and esophagus over the next 2-4 weeks
- ✦ Formation dependent on the depth of the burn



Acidic Ingestion



- ✦ Less common than alkaline ingestion
- ✦ Toilet bowl cleaning products
- Car battery acid
- Rust removal
- Cement cleaning products
- Soldering flux (zinc chloride)





- ✦ Injury occurs with substances whose pH is <2
- ✦ Leads to Coagulative Necrosis
- ✦ Dessication and denaturation of superficial layers
- ✦ Eschar formation



- ✦ Usually less severe compared to alkaline ingestion
- ✦ Distal tissues are oftentimes more injured (esophagus, stomach, intestine)
- ✦ Increased absorption, which can lead to severe metabolic acidosis.

Management



- ✦ Accurate history defining what and amount of
- ✦ ingestion occurred.
 - o MSDS
 - o Poison Control
- ✦ • ABCs
 - o Treat like a burn
- ✦ • Evaluate for hoarseness, stridor, drooling, odynophagia, refusal of food.



- ✦ Palpate for subcutaneous air
- ✦ Rigidity and substernal chest pain more severe signs/symptoms
- ✦ Assess for emesis.
- ✦ Increased laryngeal/esophageal exposure



✦ Test the pH of the saliva.
o Neutral pH does NOT mean caustic ingestion did not occur

✦ Labs

CBC,

ABG

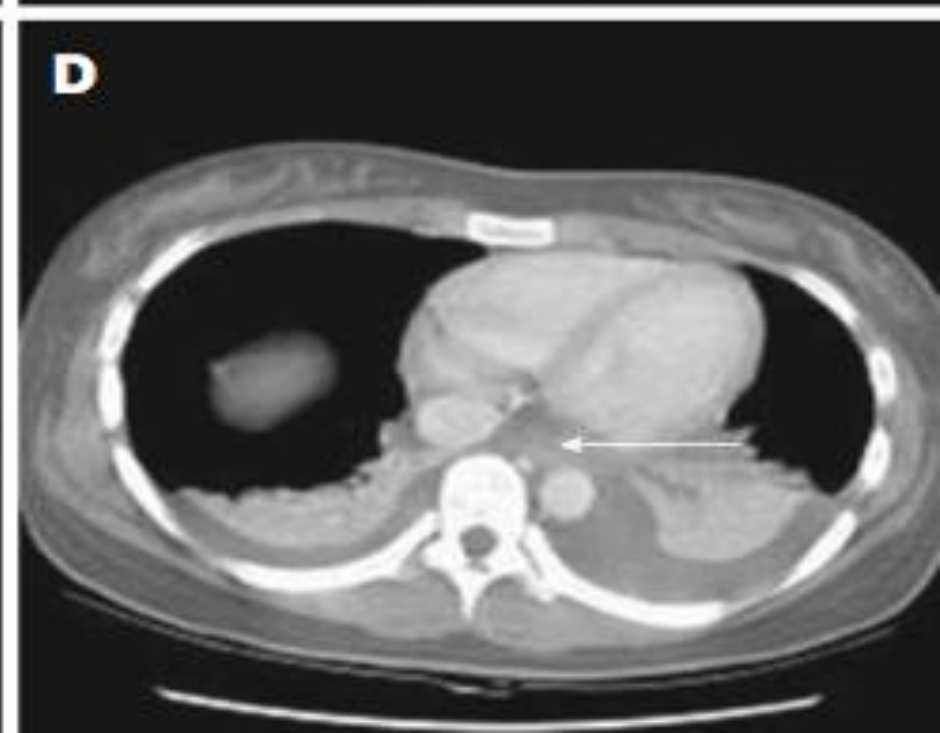
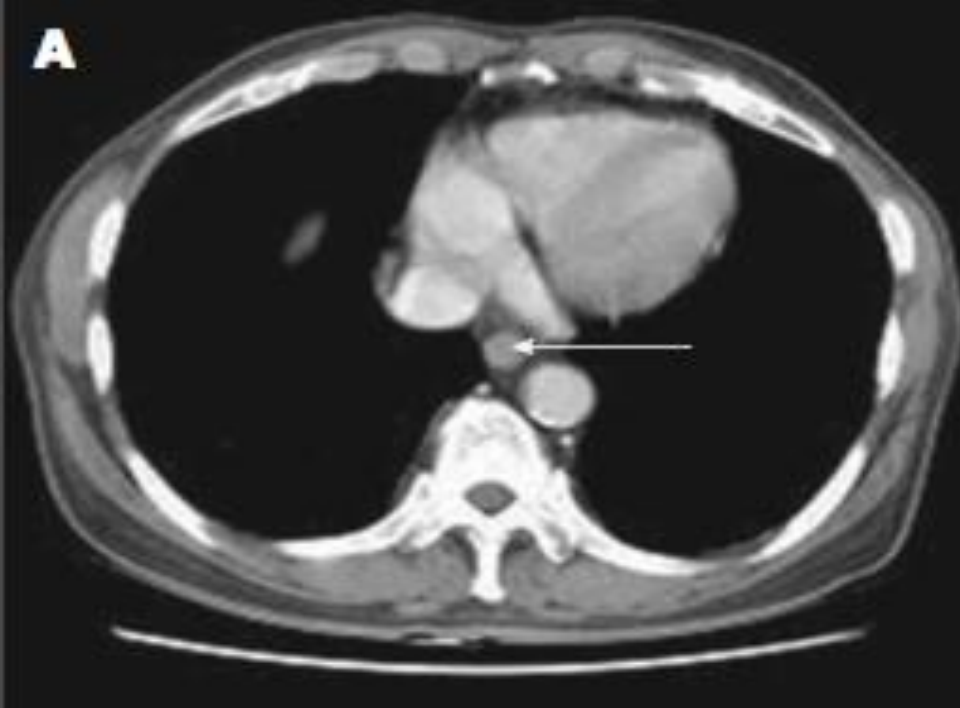
Urine



- ✦ CXR
Pneumediastinum
- ✦ KUB
Pneoperitoneum
- ✦ CT scan
Use water soluble contrast
- ✦ A CT scan may offer a promising role in assessing the evolution of the injury and impending perforations.

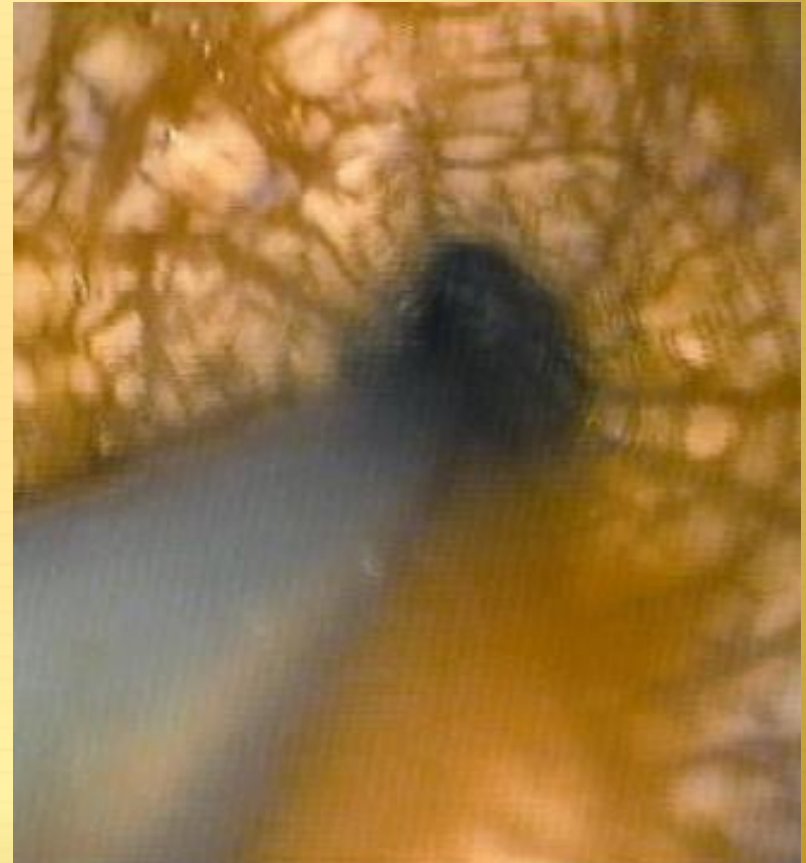
Computed tomography grading system for caustic lesions

Grade	Features
Grade 1	No definite swelling of esophageal wall
Grade 2	Edematous wall thickening without periesophageal soft tissue involvement
Grade 3	Edematous wall thickening with periesophageal soft tissue infiltration plus well-demarcated tissue interface
Grade 4	Edematous wall thickening with periesophageal soft tissue infiltration plus blurring of tissue interface or localized fluid collection around the esophagus or descending aorta



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- ✦ NG tube placement if the ingestion is severe

Opens the esophagus in an attempt to reduce the risk of stricture formation





- ✦ NG tube
- ✦ Antibiotics
- ✦ PPI
- ✦ Steroids?
- ✦ Think about nutritional needs o TPN/PPN
- ✦ Soft diet


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- ✦ Barium esophagram if serious burn at 2-3 weeks to assess baseline prior to dilation



How should you dilute what was ingested?



- ✦ You should not dilute in caustic ingestion because it can lead to emesis and/or more deliverance of caustic material to tissues
- ✦ Large amounts of water or milk after NG tube has been placed to assist in lavage
- ✦ Diluents:
Water or milk

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- ✦ Small amounts may be beneficial if given within the first 30 minute of ingestion


Best for alkali granule ingestion

- ✦ **Concern for inducing emesis**, which would reexpose the already injured tissues

Also increases risk of aspiration of caustic material

Should not give with acidic or liquid alkali ingestion

- ✦ **Gastric lavage** should not be performed



✦ When do you perform an esophagoscopy to evaluate the severity of damage?

24-48 hours

- ✦ Scoping prior to that may not adequately show the extent of the damage. Too long risks perforation.



- ✦ Esophagoscopy should not be performed in hemodynamically unstable patients, evidence of GI perforation, and those with significant airway edema.
- ✦ If the patient presents >48 hours after initial ingestion, barium swallow may be considered instead of esophagoscopy



- ✦ Anatomical areas of narrowing oftentimes receive the most damage:

Cricopharyngeal area (UE)

Aortic arch

LES

Antrum/body of stomach

- ✦ These are also the most common sites of stricture formation



- ✦ Stricture can be seen starting as early as 3 weeks after ingestion
- ✦ Dysphagia can start around 2 months after ingestion
- ✦ 30% of children who ingest an alkali will have an esophageal burn
- ✦ 50% of these patients will have stricture formation

classification of mucosal injury caused by ingestion of caustic substances

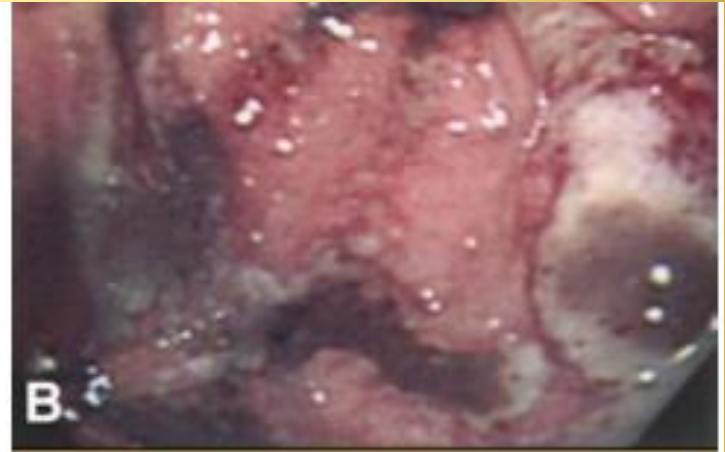
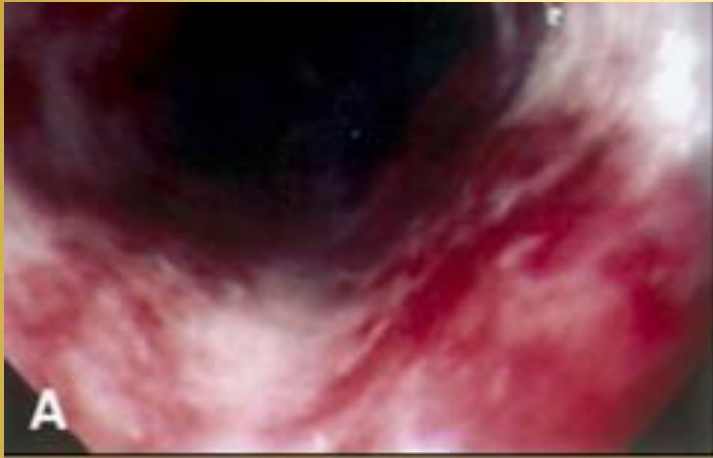
Zargar's grading classification of mucosal injury caused by ingestion of caustic substances



Grade	Features
Grade 0	Normal
Grade 1	Superficial mucosal edema and erythema
Grade 2	Mucosal and submucosal ulcerations
Grade 2A	Superficial ulcerations, erosions, exudates
Grade 2B	Deep discrete or circumferential ulcerations
Grade 3	Transmural ulcerations with necrosis
Grade 3A	Focal necrosis
Grade 3B	Extensive necrosis
Grade 4	Perforations

Esophagoscopy.

A. Grade 2A. B Grade 2B of stomach C 3A of stomach D. 3B of stomach



Steroids???



- ✦ Steroids have been shown to be beneficial in which circumstances?
- ✦ Only in grade 2 and 3a disease to reduce stricture formation
- ✦ It's controversial.



- ✦ Use of steroids has been controversial.
Some argue that it reduces healing and increases stricture formation

- ✦ Some argue that it minimizes stricture formation • Less granulation tissue and scarring



- ✦ **Evaluated use of steroids in grade II burns**
- ✦ 1956-1991 study recommended steroid use in grade II esophageal burns
- ✦ 1991-2003 did not find a benefit in grade II/III
- ✦ **Steroids used included** dexamethasone, Depo- medrol, prednisone, prednisolone, methylprednisolone, cortisone, and hydrocortisone.



- ✦ If steroids are to be given, it is recommended to give antibiotics concurrently
- ✦ One study showed that dexamethasone 1mg/kg may be more effective than prednisone 2mg/kg
- ✦ Must heavily weigh the side effects of steroids

Treatment



- ✦ Esophageal dilation mainstay for stricture formation
- ✦ Some studies recommend esophageal stents short term
- ✦ If unsuccessful, patient may need esophageal replacement

Long term outcomes



- ✦ **Stricture formation**- esophageal and laryngeal

- ✦ **GERD**

- ✦ **Cancer:**

 - Esophageal carcinoma Even up to 50 years after the ingestion

- ✦ Recommend continued surveillance

- ✦ Gastric carcinoma is rare

Conclusion



- ✦ Prevention is the key
- ✦ Approximately 20% without oral injuries have esophageal injuries (usually acidic ingestion)
- ✦ Endoscopy is considered a cornerstone in the diagnosis of corrosive ingestions
- ✦ Steroids are controversial for grade II injuries, but are usually not needed for grade I. They are usually not indicated for grade IIIa. Contraindicated in grade IIIB.