Acute and chronic oesophageal injury following caustic ingestions in a 27 year cohort.

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caustic
ˈkɔːstɪk, ˈkɒst-/  
 adjective
adjective: caustic
1. able to burn or corrode organic tissue by chemical action.
pH

Physical state

Intent

Volume

Concentration

Background  Aims  Methods  Results  Conclusions
Background

Aims

Methods

Results

Conclusions

Stricture

- Poley et al 2004
  - 5-75% rate across different studies

- Bautista et al 1997
  - 201/2844 (7%) in 13 pooled studies

Outcomes

• Primary
  – Stricture within 2 years

• Secondary
  – Mortality
    • In-hospital
    • All cause
  – Endoscopy results
  – Symptoms
  – Stricture at any time
  – Length of stay in hospital
  – Presence of dysphagia at follow-up
Patient selection

- Hunter Area Toxicology Service (HATS) database established 1987
- 800-1000 admissions per year
- Inclusion criteria
  - Caustic exposure
  - Admitted under toxicology
A review of the medical records...

- Confirm ingestion
- Demographics
- Intent
- Caustic agent
- Symptoms
- Length of stay
- Endoscopy findings
### The Zargar criteria


<table>
<thead>
<tr>
<th>Grade</th>
<th>Endoscopic findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal examination</td>
</tr>
<tr>
<td>1</td>
<td>Oedema and hyperaemia of mucosa</td>
</tr>
<tr>
<td>2a</td>
<td>Friability, erosions, haemorrhages, blisters, whitish membranes, exudates and superficial ulceration</td>
</tr>
<tr>
<td>2b</td>
<td>Grade 2a plus deep discrete or circumferential ulceration</td>
</tr>
<tr>
<td>3a</td>
<td>Small scattered areas of necrosis</td>
</tr>
<tr>
<td>3b</td>
<td>Extensive necrosis</td>
</tr>
</tbody>
</table>
The Mayo Dysphagia Questionnaire

The Mayo Dysphagia Questionnaire

120 caustic exposures

89 caustic ingestions

including:
- 3 deaths
- 2 strictures

17266 admissions

- Median age 31 years (1-87)
- Female 52%
- Intentional 82%
89 ingestions

- Other domestic n=30
- Domestic bleach n=29
- Strong alkali n=13
- Strong acid n=8
- Non-domestic n=6
- Unknown n=3

Total = 89
Ingestant related to injury

Patients

<table>
<thead>
<tr>
<th></th>
<th>Strong alkali (12/13)</th>
<th>Strong acid (6/8)</th>
<th>Domestic bleach (6/29)</th>
<th>Other domestic (3/30)</th>
<th>Other non-domestic (2/6)</th>
<th>Unknown (1/3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3b</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grade 3a</td>
<td>10</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grade 2b</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grade 2a</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grade 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Grade 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Background   Aims   Methods   Results   Conclusions
Caustic Ingestions

89

Asymptomatic

24

Inpatient endoscopy

2

No endoscopy

22

Symptomatic

65

Died in hospital

3

Inpatient endoscopy

1

Survived to discharge

62

Inpatient endoscopy

26

No endoscopy

36

Stricture in hospital

1

Delayed stricture

1

Outcomes

Median length of stay 1 day, (0.1-66, IQR 1-2)
Follow-up

- 12/89 patients died
- 2 patients with stricture
- 46/75 remaining patients successfully contacted
- Median 7.7 years to interview
  - 29 normal questionnaire
  - 5 unable to complete
  - 12 abnormal questionnaire
    - 8 reflux symptoms only
    - 4 dysphagia symptoms
Limitations... and possibilities

- Retrospective
- Loss to follow-up
- Population-specific
- Mayo questionnaire
- Prospective follow-up
Morbidity in non-catastrophic ingestions was LOW

Stricture formation was RARE

3

key points:

Endoscopy did NOT predict stricture
I would like to acknowledge the Calvary Mater Department of Clinical Toxicology & Pharmacology and the NHMRC Translational Australian Clinical Toxicology Program for assistance with travel and registration, as well as the Calvary Mater Hospital toxicologists for their mentorship and support.
Mayo results

Caustic ingestions 89

Deceased 12
Unable to contact 29

Patients contacted 48

Confirmed stricture 2
Normal questionnaire 29
Unable to complete questionnaire 5

Abnormal questionnaire 12
Swallowing difficulties 4
Reflux symptoms 8

Background  Aims  Methods  Results  Conclusions
“Long-term complications include stricture formation in the esophagus, antral stenosis and the development of esophageal carcinoma”


“There is a 1000- to 3000-fold increase in the incidence of esophageal carcinoma after lye ingestion”

“The latent period between the time of ingestion and the development of carcinoma may be as long as 58 years.”

“Up to 3% of patients with carcinoma of the esophagus may have history of caustic ingestion.”


“Injury and stricture formation predispose to esophageal carcinoma, with an estimated increase in risk by a factor of 1000, which continues for 10 to 25 years after injury and requires careful follow-up.”

— Lupa et al Update on the Diagnosis and Treatment of Caustic Ingestion The Ochsner Journal 9:54–59, 2009

“Unfortunately, neither oesophageal balloon dilatation treatment nor oesophageal bypass surgery can prevent the development of oesophageal carcinoma, the incidence of which is high after caustic substance ingestion.”

Examples of ingested substances

• Strong alkalis
  – NaOH drain cleaner, caustic soda, degreasing agent, KOH

• Strong Acids
  – Toilet cleaner, hydrochloric acid, metal cleaner, phosphoric acid rust remover

• Domestic substances
  – Stain remover, peroxide hair dye, disinfectant, floor cleaner, chrome cleaner, pool pH testing tablets, paint,

• Non-domestic substances
  – Brick adhesive, phenol, truck wash, sodium azide
<table>
<thead>
<tr>
<th>Sign or symptom (n/N)</th>
<th>Underwent endoscopy (%)</th>
<th>Grade 2b injury or greater (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oropharyngeal mucosal abnormality (28/89)</td>
<td>16 (57)</td>
<td>5 (18)</td>
</tr>
<tr>
<td>Sore mouth or throat (50/89)</td>
<td>25 (50)</td>
<td>7 (14)</td>
</tr>
<tr>
<td>Chest pain (17/89)</td>
<td>10 (59)</td>
<td>5 (29)</td>
</tr>
<tr>
<td>Dysphagia in hospital (13/89)</td>
<td>9 (69)</td>
<td>4 (31)</td>
</tr>
<tr>
<td>Abdominal pain (21/89)</td>
<td>10 (48)</td>
<td>4 (19)</td>
</tr>
</tbody>
</table>
## In-hospital mortality

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>Substance ingested</th>
<th>Oesophageal injury at endoscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>M</td>
<td>Sodium azide</td>
<td>Not performed</td>
</tr>
<tr>
<td>42</td>
<td>M</td>
<td>80% phenol</td>
<td>Not performed</td>
</tr>
<tr>
<td>81</td>
<td>M</td>
<td>32% hydrochloric acid</td>
<td>Grade 2b</td>
</tr>
<tr>
<td>Cause of death</td>
<td>Sex</td>
<td>Age at time of ingestion (years)</td>
<td>Age at time of death (years)</td>
</tr>
<tr>
<td>---------------------------------------------------------</td>
<td>-----</td>
<td>---------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Massive stroke</td>
<td>F</td>
<td>76</td>
<td>91</td>
</tr>
<tr>
<td>Ruptured cerebral aneurysm</td>
<td>M</td>
<td>44</td>
<td>56</td>
</tr>
<tr>
<td>Upper airway obstruction secondary to squamous cell carcinoma</td>
<td>M</td>
<td>53</td>
<td>57</td>
</tr>
<tr>
<td>Cardiac arrest</td>
<td>M</td>
<td>41</td>
<td>45</td>
</tr>
<tr>
<td>ST elevation myocardial infarction and cardiac arrest *</td>
<td>F</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>Heart failure</td>
<td>M</td>
<td>87</td>
<td>91</td>
</tr>
<tr>
<td>Unknown cause (history of recurrent opiate overdose)</td>
<td>F</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td>Unknown cause (history of spinocerebellar ataxia)</td>
<td>F</td>
<td>50</td>
<td>56</td>
</tr>
<tr>
<td>Unknown cause</td>
<td>F</td>
<td>74</td>
<td>Unknown</td>
</tr>
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</table>