



LIQUID FIRE IN THE STOMACH A MINIMALLY INVASIVE APPROACH

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ABSTRACT

Corrosive injuries are common in developing countries. Acid ingestion is more common in developing countries when compared to alkali ingestion in developed countries. Ingestion may be accidental or suicidal. The nature of the corrosive ingested determines the extent of injury caused. Acidic injury commonly affects stomach than alkalis and it ranges from acute to chronic gastric injuries. In this article we discuss about the management of corrosive stricture of pylorus of stomach which was dealt by laparoscopy.

KEYWORDS : Corrosive injuries, Strictures, Gastric outlet obstruction, Laparoscopic Feeding Jejunostomy, Laparoscopic Gastro Jejunostomy.

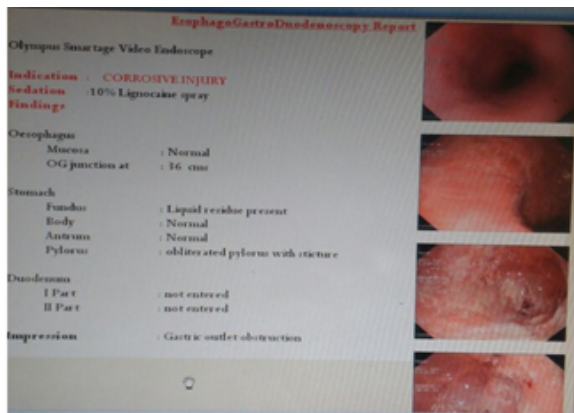
Introduction:

In the developing countries corrosive injuries to the stomach are very common. Acid ingestion is more common in developing countries when compared to alkali ingestion in developed countries(1). Ingestion may be accidental or suicidal. The occurrence of acid ingestion is attributed to the careless storage of chemicals and also the free availability of the caustic agents. The nature of the corrosive ingested determines the extent of injuries caused. Acidic injury more commonly affects the stomach than alkalis(2). Acids cause Coagulation necrosis while Alkalis cause Liquefaction necrosis(3).

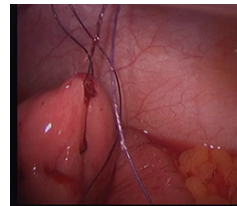
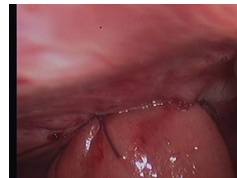
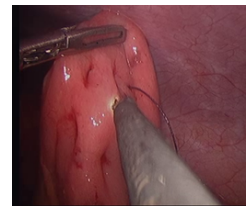
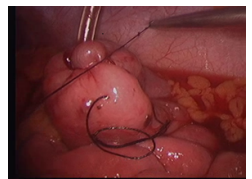
The spectrum of gastric injury varies from acute, partial or complete gastric mucosal or transmural necrosis to chronic gastric injuries like strictures and malignancy. Here we discuss about minimally invasive management of corrosive stricture of stomach.

Case discussion:

A 21 year old unmarried girl presented to us with history of consumption of corrosive poison 2 days back with a suicidal intent due to family circumstances. Her main presenting symptom was abdominal pain with vomiting. She was initially treated in ICU and reported to us for further management. Her abdominal x-ray was normal. Upper Gastro Intestinal endoscopy showed inflamed gastric mucosa with gastric outlet obstruction.



In view of the inflammatory oedema to get subsided and to have an enteral access we decided to proceed with Feeding Jejunostomy. Laparoscopic feeding jejunostomy was done and subsequently the patient was discharged.

Creation of purse string suture**Jejunostomy tube inserted****FJ fixed to abdominal wall****Jejunotomy made****Tube fixed with Jejunum**

After 6 weeks the patient was reassessed with UGI scopy which showed Gastric Outlet Obstruction due to stricture at pylorus.

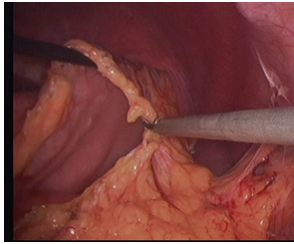


The Barium Swallow picture showed:

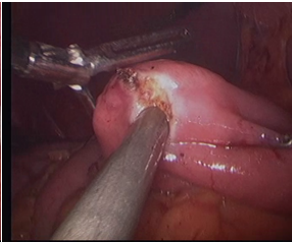


Since the patient had Type VI Stricture- distal gastric stricture causing gastric outlet obstruction with duodenal involvement and that a major Laparotomy may add on to the woes of the already depressed girl, it was decided to perform Laparoscopic Gastrojejunostomy.

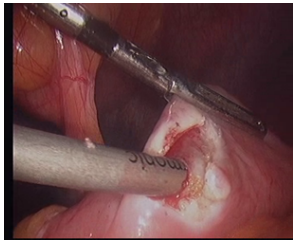
Creation of omental window



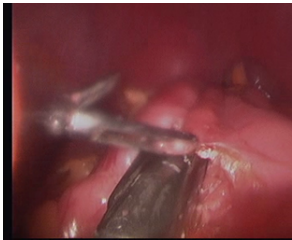
Jejunotomy made



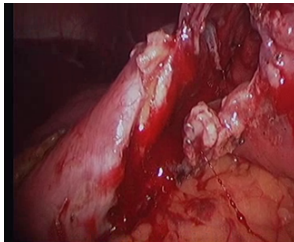
Gastrotomy made



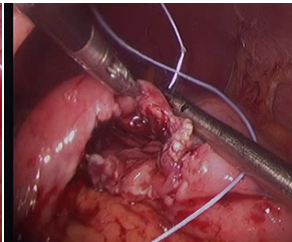
Stapler applied



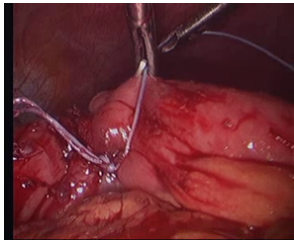
Stapler fired



Enterotomy closed



Completion of Posterior GJ



The patient was discharged and FJ tube was removed subsequently. Patient is tolerating oral feeds well. She is on regular follow up and has been advised UGI scopy annually to assess changes in the pylorus.

Discussion:

It was simple fire in liquid form !!!

In the developing countries corrosive injuries to the stomach are very common. Acid ingestion is more common in developing countries when compared to alkali ingestion in developed countries(1). Ingestion may be accidental or suicidal. The occurrence of acid ingestion is attributed to the careless storage of chemicals and also the free availability of the caustic agents. The nature of the corrosive ingested determines the extent of injuries caused. Acid injury more commonly affects the stomach than alkalis(2).

Acids cause Coagulation necrosis with eschar formation that limits further penetration and depth of injury which in turn produce Gastric mucosal damage. Acid requires a longer contact time(3).

Acid gets pooled in the prepyloric area because of the corrosive induced pylorospasm(6-8), which when prolonged causes strictures. Strictures are common in the antrum, body and pyloroduodenal area. A diffusely contracted stomach will be the result of a large quantity of the corrosive ingested.

On the other side of the spectrum, alkalis cause Liquefaction necrosis(3), leading to a deeper penetration into tissues. Additionally, alkali absorption can lead to thrombosis in blood vessels, impeding blood flow to already damaged tissue and since they are more viscous they tend to adhere to oesophageal mucosa with only a small quantity entering into the stomach. Hence alkalis cause more Oesophagel damage than acids.

Classification of corrosive poisons:

1. Mineral Acids- Sulphuric acid

- Nitric acid
- Hydrochloric acid

2. Organic Acids - Oxalic acid

- Carbolic acid
- Acetic acid
- Salicylic acid

3. Vegetable acids – Hydrocyanic acid

4. Alkalis

- Caustic potash and soda
- Ammonium hydroxide

The most common corrosives used in India are the acids and among them Concentrated Hydrochloric acid which is used as bathroom cleaner and aqua regia are common.

In southern parts of India, where jewellery making is a common profession, aquaregia is a common offending agent. Lye is a general term used for alkali found in cleaning agents [27,28]. Solutions with a pH of less than 2 or greater than 12 are highly corrosive.

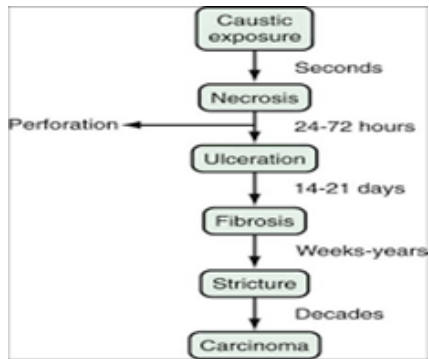
Clinical Presentation:

The clinical presentation depends upon the type, amount, and physical form of the substances. Solid alkali adheres to the mouth and pharynx producing maximum damage to these areas while relatively sparing the esophagus. Liquid rapidly passes through the mouth and pharynx and produces its greatest caustic effect on the esophagus. Hoarseness and stridor suggest a laryngeal or epiglottic involvement, and may be a harbinger for aerodigestive and high pharyngeal sequelae. Respiratory complications from caustic ingestion may result in laryngeal injury and upper airway edema, which may ultimately require a tracheotomy. Only 10- 30 percent of patients with esophageal burns have no oropharyngeal damage [29,31,36,37].

Epigastric pain and hematemesis may be manifestations of stomach involvement. Bleeding following corrosive ingestion is usually self-limiting. Severe bleeding typically occurs at 2 weeks, after ingestion [29,36,37]. However, the absence of pain does not preclude significant gastrointestinal damage.

Perforation of the stomach or the esophagus can occur at any time during the first 2 weeks. Hence, any worsening of abdominal pain or the appearance of chest pain should promptly be investigated with a high index of suspicion. No one sign or group of signs is 100% accurate in predicting positive or negative endoscopies.

Late sequelae of corrosive ingestion, include stricture formation, gastric outlet obstruction and malignancy involving the injured segment of gastrointestinal tract. Strictures may become symptomatic within 3 months or may even manifest a year later. Ingestion of a liquid agent is most likely to induce stricture formation, which tend to be long.

The sequence of events is:**Investigations:**

In the acute phase, a plain chest radiograph may reveal air in the mediastinum or below the diaphragm suggesting esophageal or gastric perforation. To confirm and localize a perforation, water-soluble contrast agents like gastrograffin are used as they are less of an irritant to the mediastinum compared to barium sulfate [29,38-40]. Barium studies may be helpful as a follow-up measure and for the evaluation of complications. It is radio opaque, provides greater radiographic details than water-soluble contrast agents, and has lower risk of aspiration pneumonitis. A CT scan offers a more detailed information regarding the transmural damage and the extent of necrosis [29].

Esophagogastroduodenoscopy is considered crucial and usually recommended in the first 12-48 hours after caustic ingestion, though it is safe and reliable up to 96 hours after the injury; gentle insufflation and great caution are mandatory during the procedure [29,37,43-45]. This aids in planning for early intervention if needed. Early endoscopy in the setting of extensive hyperemia may not help in complete evaluation of transmural damage. Every attempt must be made to assess the esophagus, stomach, and duodenum provided it can be done safely. [29,37,43-45].

Apart from accurately assessing the degree and extent of the corrosive injury, endoscopy predicts the risk of systemic complications and death; with each increased injury grade correlated with a 9-fold increase in morbidity and mortality [29,37,43-45].

ZARGAR Endoscopic Classification of Caustic Injuries

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

KIKENDALL Endoscopic Grading

GRADE	FEATURES
1	Oedema and erythema of the mucosa
2 A	Haemorrhage, erosions, blisters, superficial ulcers
2 B	Circumferential lesions
3 A	Deep grey or brownish black ulcers
3 B	Perforation

Working Classification of Corrosive Strictures of Stomach

TYPE	LOCATION OF STRICTURE IN STOMACH
1	Stricture < 5 cms from pyloroduodenal ring
2	Stricture > 5 cms from pyloroduodenal ring
2 A	Stricture < 1 cm

2 B	Stricture > 1 cm
3	Mid body stricture
4	Diffuse gastric stricture
5	Proximal or gastroesophageal junction stricture
6	Distal gastric stricture involving Duodenum
7	Double stricture (GE junction and antrum)

Contraindications to endoscopy are a radiologic suspicion of perforation or supraglottic or epiglottic burns with edema, which may be a harbinger of airway obstruction and a third degree burn of the hypopharynx [29,37,43-45].

Correlation between laboratory values and the severity/outcome of injury is poor. A high white blood cell count (> 20000 cells/mm³), elevated serum C-reactive protein, age and the presence of a gastric ulcer have been considered predictors of mortality in adults [49,50].

Management:

The management of acute corrosive injury is mainly conservative. Gastric lavage or induced emesis is contraindicated because re-exposure of the esophagus to the corrosive agent may produce additional injury. Milk and water have been used as antidotes but the heat generated by the chemical reaction may increase damage. Milk may also obscure subsequent endoscopy. Activated charcoal is also contraindicated for the same reason [29,38-40]. Hemodynamic stabilization and adequacy of the patient's airway are priorities. Airway control is of paramount importance. Airway may most commonly be compromised by laryngeal edema or direct corrosive injury to the laryngeal apparatus. Airway control may be achieved by simple postural maneuvers or in cases of severe compromise, intubation or a tracheostomy may be indicated [37,38-40].

Surgery plays a key role as both an emergency measure and later also in delayed reconstruction.

Emergency surgical intervention is needed if there are signs of perforation, peritonitis, massive uncontrolled haematemesis (16,53-56). Early identification of perforation, supportive care with nutrition, control of sepsis are the mainstay of management in acute phase. Diagnostic Laparoscopy acts as an ideal bridge between a formal laparotomy and conservative management. It helps to assess the abdominal viscera in patients who have equivocal abdominal findings in a background of features of sepsis. Laparoscopy has been proposed when gastric perforation is highly suspected and when the stomach cannot be evaluated by endoscopy. Patients with acute gastric injury are often critically ill and hence cannot withstand lengthy reconstructive procedures. The morbidity and mortality of acute gastric injuries are high and are dependent on the severity of the initial damage.

Once the acute phase is managed well, a thorough assessment, adequate preoperative preparation and a planned protocol approach regarding definitive management remain the mainstay of treatment in the chronic phase.

Management of chronic sequelae comprises of Surgery either by Laparoscopic or open methods. The ideal time for surgical intervention for a chronic corrosive gastric injury is debatable. It is better to postpone surgery resort to jejunostomy feeds to improve the general fitness status and allow the gastric stricture to stabilize. This may take up to several months. This period also enables the mucosal lesions to heal, so that surgical anastomosis can be carried out with greater safety. The preferred operation depends on several factors: (1) the general condition of the patient, (2) the need for a concomitant esophageal reconstruction, and (3) the type of chronic gastric injury [69-71].

Management Protocol as per Zargar's classification:

Grade 1 – Endoscopy, conservative management
 Grade 2 – Endoscopy, PPI, Steroids
 Grade 3 – Endoscopy, Surgery
 Grade 4 – Emergency Surgery

Surgical options as per Working Classification:

TYPE	LOCATION OF STRICTURE IN STOMACH	TREATMENT OPTIONS
1	Stricture < 5 cms from pyloroduodenal ring	Limited resection with Gastroduodenal reconstruction
2	Stricture > 5 cms from pyloroduodenal ring	Distal Gastrectomy and Antecolic Polya reconstruction
2 A	Stricture < 1 cm	Distal Gastrectomy and Antecolic Polya reconstruction
2 B	Stricture > 1 cm	Distal Gastrectomy and Antecolic Polya reconstruction
3	Mid body stricture	Distal Gastrectomy and Antecolic Polya reconstruction
4	Diffuse gastric stricture	Total Gastrectomy and Esopagojejunostomy
5	Proximal or gastroesophageal junction stricture	Total Gastrectomy and Esopagojejunostomy
6	Distal gastric stricture involving Duodenum	Dependant Gastrojejunostomy
7	Double stricture (GE junction and antrum)	Total Gastrectomy and Esopagojejunostomy

Conclusion:

In the developing countries corrosive injuries to the stomach are very common. The most common corrosives used in India are the acids. The most useful investigation in the evaluation of corrosive injury is the Upper GI Endoscopy. The management of acute corrosive injury is mainly conservative. A thorough assessment, adequate preoperative preparation and a planned protocol approach regarding definitive management remain the mainstay of treatment in the chronic phase. Laparoscopic surgeries in these kind of situations offer a great relief to these set of patients who are already in a state of mental agony by the avoidance of big laparotomy scars, early recovery and early rehabilitation.

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