

Management of Corrosive Injuries of the Upper Gastrointestinal Tract

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ABSTRACT

Introduction: A corrosive injury to the upper gastrointestinal tract is a common problem and has a wide spectrum of presentations. We have prospectively evaluated 16 patients who ingested corrosive substances for the location, extent and the severity of injury and its outcome. The best time to assess the injury is by 12-48 hours of ingestion of the corrosive substances. Upper gastrointestinal (GI) endoscopy is the single most important investigation which helps to grade the injury and to plan the further management.

Materials and Methods: All the patients who presented to the Casualty and to the Out patients Department of the H S K hospital, Bagalkot, during August 2009 to July 2010, with a history of corrosive agent ingestion were admitted and resuscitated. In the indicated cases, upper GI endoscopy was done to assess the severity of the injury. The following grading system was used. Grade 0- Normal mucosa, Grade1(superficial)- Superficial hyperaemia and oedema, Grade2A (Transmucosal)- Haemorrhage, exudates, linear erosions, blisters, shallow ulcers involving the mucosa and the submucosa, Grade2B- Circumferential burn present, Grade3-

Deep ulceration, eschar formation with necrosis, full thickness injury with and without perforation.

Results: Out of the 16 patients, 10 were females and most were of the age group of 10-30 years. 10 had consumed acid and 3 alkalis and in another 3 cases, the substance which was ingested was not elicitable. 15 patients had consumed the substances with suicidal intentions and in only one patient it was accidental. The predominant symptom was pain and most had oesophageal injuries. The grade 2 injury was the most common type of injury. 13 patients were managed conservatively and 3 required surgery. The most common complication was a stricture in the oesophagus.

Conclusion: The corrosive injury is more common in females. Most of the patients were of younger ages. Acid ingestion was more common than alkali ingestion, and most had suicidal intentions. Early upper G.I. endoscopy has a definite role in diagnosing the severity of the injury and in planning the management. Most of the patients with corrosive injuries can be managed conservatively with follow up for the stricture, which is the most common complication that is often treated by dilatation.

Key Words: Acid, alkali, endoscopy, corrosive substances

INTRODUCTION

Corrosive injuries to the upper gastrointestinal tract are still a major concern in developing countries like India, where the corrosive substances are easily accessible to common people including children. These substances are used commonly in the form of toilet cleaning agents, soaps, bleaches, disc batteries, etc.

The ingestion of corrosive substances has devastating effects on the upper gastrointestinal tract and present major problems in their management [1]. The severity of the resulting damage depends largely on the corrosive properties and the concentration of the ingested agent. These injuries occur as a result of accidental ingestion as in children or because of suicidal or homicidal intentions and under the influence of alcohol or drugs in case of adults [2]. Hence, a lot of medico legal issues are also associated in the management of such injuries.

Acids and alkalis in various forms cause different patterns of injuries depending upon the quantity which has been ingested and the concentration. The management of such injuries is multidisciplinary, which involves reducing the morbidity and mortality by accurate early diagnosis, aggressive treatment of the life threatening complications and an attentive, long term follow up [3].

Caustic ingestion can cause severe injury to the oesophagus and the stomach. The severity and the extent of the oesophageal and

the gastric damage which results from a caustic ingestion depends upon the following factors [4]

- Corrosive properties of the ingested substance
- Amount, concentration, and physical form (solid or liquid) of the agent
- Duration of contact with the mucosa

More than 5000 caustic ingestions are reported annually in the United States; these ingestions are the leading cause of oesophageal strictures in children [5].

MATERIALS AND METHODS

All the patients who presented to the Emergency Department or the Out Patients Department of the H S K hospital during August 2008 to July 2010, with a history of corrosive agent ingestion, were included in the study. The patients who had consumed other poisons were excluded. All the indicated cases underwent video endoscopy during the same period.

All the patients were admitted and adequate resuscitation was given. The medico legal aspects were taken due care of. The history was elicited to know as to what corrosive agent was ingested and the quantity and the concentration of the same. After resuscitation, upper gastrointestinal (GI) endoscopy was performed in the indicated cases, usually after 12-48 hours of ingestion or

as suitable for the case. The grades of the injury were assessed endoscopically and the management was planned suitably. The following grading system was used.

Injury	Findings
Grade 0	Normal mucosa
Grade1 (superficial)	Superficial hyperaemia and oedema
Grade2A (Transmucosal)	Haemorrhage, exudates, linear erosions, blisters, shallow ulcers involving the mucosa and submucosa
Grade2B	Circumferential burn present
Grade3	Deep ulceration, eschar formation with necrosis, full thickness injury with and without perforation

[Table/Fig-1]: Grading of the oesophageal burns which were caused by caustic injury

The grade1 and 2 injuries were managed conservatively and the patients were advised follow up. The grade 3 and 4 injuries required surgery and follow up.

OBSERVATIONS AND RESULTS

Age	No. of patients
10-20	4
21-30	6
31-40	2
41-50	1
51-60	1
61-70	2

[Table/Fig-2]

A total number of 16 patients were included for the study. The age of the patients ranged from 14 yrs to 67yrs. Most of the patients were of younger ages of 10 to 30 years (62.5%).

Sex	No. of patients	Percentage
Females	10	62.5%
Males	6	37.5%

[Table/Fig-3]

Out of 16 patients, 10 were females (62.5%) and 6 were males (37.5%).

Type of corrosive	No. of patients	Percentage
Acid	10	62.5%
Alkali	3	18.5%

[Table/Fig-4]

10 patients out of the 16 consumed acids (62.5%), 3 patients consumed alkalis (18.75%) and 3 patients consumed substances which were difficult to find out (18.75%).

Mode of injury	No. of patients	Percentage
Suicidal	15	93.75%
Accidental	1	6.25%
Homicidal	–	–

[Table/Fig-5]

In 15 patients, the corrosive ingestion was suicidal (93.75%) and in one patient it was accidental (6.25%). However, no cases of homicidal injuries were seen.

The predominant symptoms in the early cases were pain, haematemesis and retching. In the late cases, the symptom was difficulty in swallowing.

Other symptoms were the drooling of saliva, anxiety, cough and hoarseness of the voice.

Clinical feature	No. of patients	Percentage
Pain	15	93.75%
Hematemesis	8	50%
Retching	8	50%
Dysphagia	12	75%
Others	6	37.5%

[Table/Fig-6]

Site of lesion	No. of patients	percentage
Oral cavity, Pharynx	6	37.5%
Oesophagus	15	93.75%
Stomach	5	31.25%
Duodenum	2	12.5%

[Table/Fig-7]

Upper GI endoscopy was the most important investigation in both the early and the late cases. Most of the cases had oesophageal injury, whether the case was an early or late one or whether it was caused by acid or alkali. The duodenum was involved in 2 cases. Barium studies were done in 4 cases to delineate the strictures.

Grade of injury	No. of patients	Percentage
Grade 1	2	12.5%
Grade 2a	3	18.75%
Grade 2b	2	12.5%
Grade 3	2	12.5%

[Table/Fig-8]

The most common injury endoscopically was the grade 2 injury which involved the oesophagus and the stomach together. 5 grade 2a and 2b injuries were seen (31.25%). In 2 cases, the duodenum was also injured. No cases of perforations were seen in our series.

Management	No. of patients	Percentage
Conservative	13	81.25%
Oesophagectomy	–	–
Proximal/Distal gastrectomy	2	12.5%
Enteral access	1	6.25%
Oesophageal. dilatation(late)	8	50%

[Table/Fig-9]

The initial management was conservative in 13 cases (81.25%).

Three cases underwent surgery for the initial management. One case underwent antrectomy and Billroth 1 gastro-duodenostomy. One more patient needed antrectomy with anterior gastrojejunostomy. Another patient underwent feeding jejunostomy and oesophageal dilatation. The same patient developed tracheo-oesophageal fistula on follow up and needed definitive surgery.

Complications	No. of patients	Percentage
Stricture	10	62.5%
Gastric outlet obstruction.	2	12.5%
Tracheo-esophagealfistula	1	6.25%
Hiatus hernia , GERD	–	–
Carcinoma	–	–
Chest complications	1	6.25%

[Table/Fig-10]

The most common complication was stricture in the oesophagus (62.5%), two cases developed an antral stricture and chest complications were seen in one case. No patient developed hiatus hernia or malignancy during this study period, but however, further follow up was necessary.

DISCUSSION

Corrosive injuries to the upper gastrointestinal tract are a complex clinical challenge. The signs and symptoms alone are an unreliable guide to the injury. Early endoscopy has a crucial role in both diagnosing and managing the cases of corrosive injuries. Most of the patients can be managed conservatively with follow up for the late complications. High grade injuries require operative management.

The ingestion of caustic substances can cause devastating injuries to the oesophagus and the stomach. The involvement of the duodenum and the perforation of the viscera which causes peritonitis, suggests the severity of the injury. The morbidity and the mortality in the cases of corrosive injuries is due to the immediate effect of the severe burns to the upper gastrointestinal tract or due to the late complications.

It has been said that strong alkalis “bite the oesophagus and lick the stomach” while strong acids “lick the oesophagus and bite the stomach” [6]. Typically, alkali ingestions do result in more oesophageal than gastric damage, while strong acids cause more severe injury to the stomach than to the oesophagus. However, the ingestion of either type of corrosive agents can inflict a serious injury on the oesophagus, stomach and even the duodenum. The Toxic Exposure Surveillance System (TESS) compiles data annually from a population of approximately 290 million people who are served by the American Association of Poison Control Centres [7]. In 2002, more than 1.5 million toxic exposures in children occurred, accounting for 66 percent of all the toxic exposures. The severity and the site of the injury depends on the substance which is ingested, its quantity, the residual food in the stomach and the duration of the tissue contact.

The goals for the management of such injuries are to limit and treat the immediate life threatening consequences of the corrosive ingestion and to control the subsequent stricture formation.

Plain radiographs of the chest and abdomen are taken to rule out pneumomediastinum or pneumoperitoneum. Upper GI endoscopy is the single most important investigation which helps to grade the injury and to plan the further management. Endoscopy should be performed within 12-24 hours of the corrosive ingestion. But its requirement in every case is controversial, due to its invasive nature. A case report by Sunil H V et al illustrates the importance of pertechnetate SPECT-CT as a non invasive, physiological investigation to delineate the integrity and viability of the mucosa in cases of corrosive gastric injuries [8]. Barium studies have an important role in the late follow up to delineate the strictures. CT scan helps to differentiate the necrosis and to assess the stricture.

The acute phase management focuses on assessing and treating the dyspnoea, strider, dysphagia, bleeding, ulceration, necrosis and the perforation. Surgery in the acute phase depends on the site and the extent of the injury. Oesophago gastrectomy with cervical oesophagostomy and delayed reconstruction, distal gastrectomy, total gastrectomy and enteral access are the surgeries of choice. Oesophagectomy with colonic interposition may be required for patients with severe strictures. Minimally invasive oesophagectomy

through a combined thoracoscopic and laparoscopic approach is preferred because it is associated with a decreased hospital stay and a more rapid return to the normal activities as compared to standard oesophagectomy. The most important factors which guarantee a successful outcome for the surgery are a good vascular supply and the absence of tension at the anastomosis [9]. Gastric transposition may be an acceptable alternative in the paediatric population, but one report showed a 5 percent mortality rate and a 12 percent leak rate, while 20 percent required dialation for the stricture formation [10]

Chronic phase management is done to limit and treat the stricture, gastric outlet obstruction, hiatus hernia, gastro oesophageal reflux disease, tracheo-oesophageal fistula, and the carcinoma. The chances for the development of the stricture is about 10-30% in the grade 2 injury and about 40-70% in the grade 3 injury. Its evaluation is done by barium swallow studies, upper GI endoscopy and CT scan.

Oesophageal dilatation is the primary treatment. The dilatation produced will be 4mm (or) 8 mm less than the dilating bougie. Most of the patients swallow when the oesophageal diameter is 12 mm. An attempt to dilate the stricture stagewise to a maximum diameter of 17 to 20 mm without excessive force is advisable. Fluoroscopically guided oesophageal balloon dilatation is generally considered as a safe, easy, and effective means of treating a variety of oesophageal strictures in children [11]

Our study also confirmed these findings. According to the studies of Spiegel J et al [12], the signs and symptoms of the corrosive injuries do not reliably indicate the severity of the injury to the oesophagus and the stomach. In our study, two patients had minimal symptoms and signs, but they had endoscopically grade 2 injuries.

Sex incidences were variable in various studies, but in our study, the corrosive injury was more common in females than in males, which can be accounted to the more suicidal tendencies in females due to social atrocities.

The incidence of acid and lye ingestion in our study was found to be similar to that in the study of Youn et al [11]. In our study, the substance which was ingested was not known in 3 patients.

Type of corrosive	No. of patients	Percentage	Youn et al [11]	Percentage
Acid	10	62.5%	9	64.28%
Alkali	3	18.5%	5	35.7%

[Table/Fig-11]

Early, diagnostic, upper GI endoscopy is the critical component of the initial evaluation, based on which the clinical decisions can be made. In our study, endoscopy helped in the diagnosis and the management of both the early and the late cases. Howkins et al [13] and Zergar et al [14] had similar conclusions.

Most of patients with the grade 1 and 2 injuries can be managed conservatively with a late follow up. Grade 3 injuries also can be managed conservatively unless there is clinical deterioration.

No patient in our study had corrosive perforation. The commonest late sequel of the corrosive ingestion in our study was stricture of the oesophagus and the next common one was pyloric stenosis.

All the patients with corrosive strictures were managed by graduated, serial oesophageal dilatations by using Savary-Gillard dilators. Two patients required surgery for pyloric stenosis.

No mortality was observed during our study period. The study period may be insufficient to completely assess the validity of the various surgical modalities for the treatment and their complications. A long term study with a follow-up is however needed.

CONCLUSION

In our study, the corrosive injury was more common in females than in males. Most of the patients were of younger ages. Social factors may have been the reason for the ingestion of the corrosive substances. Acid ingestion was more common than alkali ingestion, and most of the patients had suicidal intentions. Early upper G.I. endoscopy has a definite role in diagnosing the severity of the injury and in planning the management. Most of the patients with corrosive injuries can be managed conservatively with follow up for the stricture, which is the most common complication that is often treated by dilatation. Patients who developed the oesophageal stricture underwent multiple dilatations.

BIBLIOGRAPHY

- [1] Hughs TB, Kelly MD. Corrosive ingestion and the surgeon. *J Am Coll Surg* 1999; 50: 5-22.
- [2] Spechler SJ, Taylor MB. Caustic ingestion. In, Mark B. Taylor(ed). *Gastrointestinal emergencies*, 1st edition. *Williams and Wilkins*, 1997; 19-28.
- [3] Spiegel JR., Sataloff RT. Caustic injuries of the esophagus. In, Donald O. Castell, Joel E. Richter (ed). *The esophagus*, Fifth Edition, USA, *Lippincott Williams and Wilkins*, 2003; 659-69.
- [4] Goldman LP, Weigert JM. Corrosive substance ingestion: A review. *Am J Gastroenterol* 1984; 79: 85.
- [5] Kikendall JW. Caustic ingestion injuries. *Gastroenterol Clin North Am* 1991; 20: 847.
- [6] Muhletalen CA, Gerlock AJ, Desoto L, Halter SA. Acid corrosive esophagitis; radiographic findings. *AJR* 1980; 134: 1137-40.
- [7] Watson WA, Litovitz TL, Rodgers GC Jr, et al. The 2002 annual report of the American Association of Poison Control Center's Toxic Exposure Surveillance System. *Am J Emerg Med* 2003; 21: 353.
- [8] Sunil HV, Mittal BR, Bhattacharya A, Singh B, Kochhar R. Pertechnetate SPECT-CT in corrosive gastric injury. *Indian J Gastroenterol* 2010; 29(6): 244-46.
- [9] Han Y, Cheng QS, Li XF, Wang XP. Surgical management of esophageal strictures after caustic burns: 30 years of experience. *World J Gastroenterol* 2004; 10: 28-46.
- [10] Spitz L, Kiely E, Pierro A. Gastric transposition in children – a 21-year experience. *J Pediatr Surg*. 2004; 39: 276.
- [11] Youn BJ, Kim WS, Cheon JE, Kim W Y, Shin SM, Kim IO, Yeon KM et al. Balloon dilatation for corrosive oesophageal strictures in children: radiologic and clinical outcomes. *Korean J Radiol* 2010; 11(2): 203-10.
- [12] Spigel J, Satalof R. Caustic injuries of the esophagus. In, *Advanced therapeutic endoscopy*. 2nd ed. New York, Raven, 1994; 659
- [13] Hawkins DB, Demeter MJ, Barnett TE. Caustic ingestion: controversies in its management. A review of 214 cases. *Laryngoscope* 1980; 90: 98-109.
- [14] Shaikat Ali Zergar, Kochhar R, Mehta S et al. Role of fibre optic endoscopy in the management of corrosive ingestion and the modified endoscopic classification of burns. *Gastrointestinal endoscopy* 1991; 37: 165-69.

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DECLARATION ON COMPETING INTERESTS:

No competing Interests.

Date of Submission: **Jul 26, 2011**
Date of peer review: **Aug 07, 2011**
Date of acceptance: **Aug 25, 2011**
Online first: **Aug 31, 2011**
Date of Publishing: **Oct 05, 2011**