

# Corrosive-Induced Gastric Outlet Obstruction

Robin Kaushik, Rajdeep Singh, Rajeev Sharma, Ashok K. Attri, and A.S. Bawa

*Department of Surgery, Government Medical College and Hospital, Chandigarh, India.*

Ten patients with gastric scarring and an outlet obstruction secondary to ingestion of corrosive substances were referred to our department for surgical management, between May 1999 and April 2003. Hydrochloric acid was the most common corrosive ingested (4 cases), although many were not aware of the nature of the ingested substance. An associated esophageal stricture was present in 5 cases (50%). All the patients initially underwent feeding jejunostomy, with definitive surgery performed at a later date. A partial gastrectomy was found to be the most satisfactory procedure, and was performed in 90% of the cases (9 patients).

**Key Words:** Pyloric stenosis, gastric outlet obstruction, corrosive substance, hydrochloric acid, esophageal stricture, feeding jejunostomy, partial gastrectomy, total gastrectomy

## INTRODUCTION

Gastric outlet obstruction, arising as sequelae of corrosive ingestion, is rare.<sup>1,2</sup> The damage that follows ingestion of a corrosive may present acutely, as a perforation or necrosis of the stomach that requires emergency surgery, or may manifest later, with progressive scarring of the stomach (in about one-third of the patients)<sup>3</sup> leading to an outlet obstruction. Although the conservative management of this form of stenosis has been described, the majority of these strictures require surgery.

The patterns of involvement of the esophagus and stomach depend upon the nature of the corrosive ingested (acid or alkali), and may be extensive or segmental. It is well documented that

acids damage the stomach and alkalis damage the esophagus. This "preferential" damage occurs, because of the rapid transit of acid through the esophagus, the resistance of the esophageal squamous epithelium, and the reflex pyloric spasms of the stomach, in response to the entry of acid.<sup>4</sup> Conversely, alkalis tend to coat the esophagus, thereby causing more damage in this site. However, injuries to both the esophagus and stomach are common with both groups of corrosives.

Our experience in managing corrosive induced gastric outlet obstructions is presented.

## MATERIALS AND METHODS

A total of 10 patients with a gastric outlet obstruction, secondary to ingestion of corrosive substances, were referred to our Department for surgical management, between May 1999 and April 2003. The case files of these patients were retrospectively reviewed to determine the natures of the ingested corrosives, whether the ingestion was suicidal, accidental or homicidal, the initial management, endoscopy and barium findings, and details of surgery, hospital stay, morbidity and mortality.

The patients' data is tabulated in Table 1.

### Feeding jejunostomy

All the patients initially underwent a feeding jejunostomy using the Witzel technique, 15 cm distal to the duodeno-jejunal flexure. This was performed under general anesthesia in 7 cases, with local anesthesia preferred in the other cases due to airway involvement by the corrosive.

Post-operatively, the jejunostomy feeds were

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Reprint address: requests to Dr. Robin Kaushik, House No. 132, Sector 6, Panchkula 134 109 Haryana, India. Tel: 91-0-172-570944, Fax: 91-0-172-570944, E-mail: robinkaushik@yahoo.com

**Table 1.** Patient Data

S. No	Year	Age (Yrs)	Sex	Ingested Substance	Site of stricture	Surgical Procedure	Follow up
1	1999	35	F	Hydrochloric acid	Pylorus	Billroth I gastrectomy	Not available
2	1999	20	F	Cough Syrup	Esophagus (35 cms); Stomach scarred and contracted	Total gastrectomy with pedicled jejunal pouch - esophageal / duodenal anastomosis	Lost to follow up after 6 months
3	2000	25	M	Hydrochloric acid	Pylorus	Billroth I gastrectomy	Well
4	2001	25	F	Not known	Esophagus (39 cms); Pylorus	Billroth I gastrectomy	Well
5	2001	46	M	Hydrochloric acid	Antrum	Billroth I gastrectomy	Well
6	2002	21	M	Not known	Pylorus; 1 <sup>st</sup> part of duodenum	Billroth I gastrectomy	Well
7	2002	24	F	Not known	Antrum	Billroth I gastrectomy	Well
8	2002	29	M	Not known	Esophagus (34 cms); Pylorus; 1 <sup>st</sup> part of duodenum	Billroth II gastrectomy	Adhesive small bowel obstruction. Presently well
9	2002	45	F	Hydrochloric acid	Esophagus (18 cms); Pylorus	Billroth II gastrectomy	Post-operative wound infection and partial burst abdomen; Presently well
10	2003	35	M	Not known (? Local alcohol)	Cricopharynx; Esophagus - lower end Antrum	Billroth I gastrectomy	Well

started in a sequential pattern, until the patients were on full strength jejunostomy feeds (calculated as per the weight of the patient). They were then discharged after teaching about jejunostomy care and on how to prepare home based feeds.

#### OPD follow up

When seen at the OPD, the patients were evaluated for their hemoglobin and serum albumin levels. In addition, a barium meal study was performed, and a repeat endoscopy requested, especially in those with esophagus involvement. Only when the hemoglobin was more than 10 gms % and the albumin was more than 3 gms % were the patients deemed suitable for definitive surgery, at which point, pre-anesthetic clearance was sought. Patients with associated esophageal strictures were endoscopically dilated prior to their gastric resection.

#### Definitive surgery

All 10 patients underwent a gastric resection. An antrectomy and a Billroth I anastomosis (gastro-duodenal) were performed in 7, an antrectomy and a Billroth II (gastro-jejunal) in 2, and a total gastrectomy in 1. Reconstruction was performed after the total gastrectomy by a pedicled jejunal pouch, one end of which was anastomosed to the lower esophagus, with the other to the first part of the duodenum.

#### Post-operative period

Oral intake was allowed by the 4<sup>th</sup> to the 6<sup>th</sup> day in all cases. By and large, the post-operative period was uneventful, with the exception of one patient that developed wound infection and a partially burst abdomen.

Follow-up: 8 patients regularly followed up, for 5 to 35 months. One patient presented with an adhesive small bowel obstruction 4 months after

the antrectomy, which required a laparotomy and adhesiolysis, and has remained well after the second surgery.

## RESULTS

The patients comprised of 5 females and 5 males, with an average age of 30 years, ranging from 20 to 46 years. The most common implicated corrosive was hydrochloric acid (4 patients), but the majority were unaware of the nature of the ingested substance. One claimed to have ingested cough syrup (after expiry date) that lead to extensive burns of the esophagus and stomach, which eventually required a total gastrectomy. Ingestion was accidental in the majority of patients (9 cases) and homicidal in 1. However, it must be mentioned that the information given by the patient and the relatives was accepted at face value, and no further questioning performed.

As part of the evaluation, all the patients underwent an upper gastrointestinal endoscopy to assess the extent of damage. 5 had associated esophageal involvement, and were taken for definitive gastric surgery, only after dilatation of the esophagus had been achieved.

Definitive surgery was performed at an average of 161.55 days following the corrosive ingestion, ranging from 74 to 378 days. A Billroth I anastomosis was favoured, but in situations where this could not be safely carried out, a Billroth II anastomosis was performed. An average of less than 1 unit of blood was required intra-operatively, with a total of 8 units transfused in the 10 patients. The average operating time was nearly 3 hours (Billroth I - 2 hours 39 minutes; Billroth II - 3 hours 37 minutes; pedicled jejunal pouch - 4 hours).

The overall results of surgery, in our experience, have been good. The 8 patients that have regularly followed up are doing well, with good appetites, weight gains and normal lifestyles. One patient required a re-laparotomy for an adhesive small bowel obstruction four months after the antrectomy, but is now doing well on follow up.

## DISCUSSION

Gastric damage following corrosive ingestion commonly occurs along the lesser curvature and the pre-pyloric regions.<sup>2,5,6</sup> This has been attributed to a reflex pylorospasm, stasis of acid in the antrum and an increased sensitivity of the antral epithelium.<sup>2</sup> Other factors that may influence the severity and site of involvement include the nature of the ingested corrosive, its concentration, a fasting or fed state and the position of the patient at the time of the event.<sup>7</sup> It is well known that acids cause maximal damage to the stomach, whereas alkalis tend to cause more damage to the esophagus. Sulfuric acid, although more commonly available and ingested, rarely causes gastric outlet obstruction, as very few patients survive the initial gastric insult. For this reason, hydrochloric acid has been more commonly implicated in the literature.<sup>2</sup>

Associated esophageal strictures have been reported in 6% to 63% of patients with corrosive gastric injury.<sup>2,5</sup> When present, the symptoms of the esophageal stricture predominate, and the gastric lesion remains hidden until the stricture is resolved, either endoscopically or surgically. Therefore, a jejunostomy is recommended for feeding purposes, rather than a gastrostomy.<sup>5</sup> If the esophageal stricture cannot be dilated endoscopically, a thorough endoscopic assessment of the stomach also will not be possible, and assessment at the time of feeding jejunostomy becomes mandatory in such patients. In our experience, dilatation of associated esophageal strictures is usually possible in these patients, who tend to do well after a gastric resection, without requiring further dilatation in the post-operative period. Probably, the food bolus itself acts to maintain the patency of the esophageal lumen on resumption of oral feeds.

The development of a gastric outlet obstruction occurs from 7 days to 6 years after corrosive ingestion, and is signaled by post prandial epigastric fullness, persistent non-bilious vomitings, visible gastric peristalsis and a succussion splash.<sup>1,2,7</sup> The sequence of events following a gastric acid injury has been described as the "delayed gastric syndrome". This is characterised by full recovery, up to 2 weeks after the ingestion, followed by the

development of early satiety, weight loss and vomiting, after 2 to 6 weeks.<sup>1</sup> The history, coupled with the typical radiological features, allows diagnosis.

The nature and timing of surgery for corrosive induced pyloric stenosis is not clear. Although there have been a few reports of early surgery,<sup>8</sup> surgery is often deferred until the full extent of scarring is visible, with the patient in a nutritionally acceptable state. Various surgical procedures have been described to deal with obstructions arising from corrosive injury. These include pyloroplasty, a gastrojejunostomy and a partial or total gastrectomy. Most centres (including ours) prefer some form of gastric resection to remove the scarred stomach, bearing in mind the potential risk of malignant change. Although a Billroth I has been our favoured option,<sup>9</sup> a Billroth II is acceptable if gastro-duodenal anastomosis is not possible. However, keeping in mind the experience of Hsu, et al, who experienced no case of malignancy arising from a background of corrosive ingestion in more than 750 esophageal and 2000 gastric cancers, a gastrojejunostomy may be an acceptable option.<sup>4</sup> This is a lesser grade of surgery compared to all forms of gastric resection, with a minimal risk of stomal ulceration due to the histamine fast achlorhydria in these patients (the so called "physiological antrectomy").<sup>5</sup>

To conclude, the ingestion of corrosives carries a high morbidity. Based on our results, it is believed that the treatment of such patients should be staged, in order to allow the full extent of scarring to develop, and to also enable adequate

nutrition of these patients. In the absence of any definite evidence of the malignant potential of these lesions, and also because the patients may be lost to follow up, the treatment of choice, in our experience, is resection of the involved areas.

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