Surgical management of corrosive strictures of stomach
Shaleen Agarwal, Sadiq S Sikora, Ashok Kumar, Rajan Saxena, Vinay K Kapoor
Department of Surgical Gastroenterology, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow

Background: Corrosive injuries of the upper aerodigestive tract are a frequent cause of morbidity in India. We report here our institution’s experience in managing patients with corrosive strictures of the stomach. Methods: Records of 28 patients who underwent definitive surgery for corrosive strictures of the stomach in our institution over a 15-year period were reviewed. Results: The main presenting complaints were vomiting (75%), dysphagia (46%) and significant weight loss (100%). Pre-operative evaluation included barium and endoscopic studies. Most patients had antro-pyloric strictures (n=22); 6 patients, however, near-total or total gastric involvement was observed. Thirteen (46%) patients had associated strictures of the esophagus; of these, 7 responded to esophageal dilation. Strictures of the stomach were managed with resectional procedures like distal gastrectomy (n=16), subtotal gastrectomy (1) or total gastrectomy (3) and esophagogastrectomy (1) in 21 (75%) patients. The remaining 7 patients underwent bypass procedures like gastrojejunostomy (5), stricturoplasty (1), and colonic bypass of esophagus and stomach (1). Three patients had enterocutaneous fistulae in the postoperative period. One patient died in hospital of septicaemia and malnutrition. Conclusions: In patients with corrosive strictures of the stomach, surgery, tailored according to the extent of gastric involvement and presence of associated esophageal strictures, gives excellent results. [Indian J Gastroenterol 2004;23:178-180]

Key words: Gastric outlet obstruction, gastric surgery, injury, pyloric stenosis

Corrosive injuries of the upper aerodigestive tract, although uncommon in the West, still occur frequently in developing countries like India. These result mostly from the ingestion of corrosive substances with suicidal intent and affect young girls. Esophagus and stomach bear the major brunt. Cicatization of the stomach has been reported to develop in up to one-third of these cases.1 Though several publications have documented the profile and various methods of management of corrosive strictures of esophagus,1-4 there are only a few reports highlighting the management of corrosive strictures of the stomach.5-6

We describe our experience with surgical management of patients with corrosive strictures of the stomach.

Methods
Medical records of 40 patients with corrosive injuries of the upper aerodigestive tract, who underwent definitive surgery in our department located in a tertiary care center in northern India between January 1989 and June 2003, were reviewed retrospectively. Twelve patients had only esophageal strictures, whereas 28 patients had strictures involving the stomach, with or without stricture of the esophagus; the latter formed the study group. The site and extent of strictures had been assessed in all patients using barium studies of the upper gastrointestinal (GI) tract, upper GI endoscopy or both. Dilation of the associated esophageal strictures using the wire-guided Savary-Gilliard dilators (Wilson-Cook, Winston-Salem, NC, USA) had been attempted in 13 patients. Failure to relieve dysphagia or need for frequent dilation to maintain swallowing was considered as failure of dilation therapy. A feeding jejunostomy for nutritional support was performed prior to definitive surgery in 11 patients; decompressive gastrotomy was also done in 8 patients. The jejunostomy feeds used were either commercially available enriched enteral formulae or, more often, homemade preparations rich in proteins, fats and carbohydrates.

The choice of definitive surgical procedure was governed by factors like extent of cicatization of the stomach, concomitant esophageal involvement, and the patient’s general condition. Resection surgery was favored over bypass procedures.

Results
The study subjects (17 women, 11 men) were aged 16 to 48 years (mean 26 (SD 8.4)). The mean (SD) duration from the time of corrosive insult to presentation was 2.7 (1.7) (median 2) months. The corrosive agent responsible for the injury was an acid in 24 (66%) cases, adulterated liquor in 2, and pesticide and phenol in one patient each; the ingestion was with suicidal intent in 20 (71%) patients and was accidental in 8 (29%) patients.

All but 3 patients reported bouts of violent vomiting and severe retrosternal pain immediately after the ingestion of corrosive agent. In addition, 12 (43%) patients reported hematemesis. All patients had been initially managed conservatively elsewhere before referral to our institution. At presentation, the major complaints were gastric outlet obstruction (post-prandial vomiting,
Involvement of the stomach was in the form of a classical antro-pyloric stricture with proximal dilation in 22 (78%) patients. The gastric body was also involved in one patient; in 5 other patients, the entire stomach was cicatrized to produce a small-capacity non-contractile stomach. Associated esophageal strictures were present in 13 patients; dilation of these strictures had been successful in 7 of 12 (58%) patients in whom it was attempted. Pre-operative mean serum albumin level was 2.9 (0.7) g/dL (median 3.0, range 1.2-4.3) and mean hemoglobin level was 10.2 (2.1) g/dL (median 10, range 6.8-15.0).

The Figure shows the surgical procedures done in our patients. Of the resection procedures, distal gastrectomy was performed in 16 (57%) patients. In patients with more extensive gastric involvement, total (n=4) or subtotal (1) gastrectomy was performed. Gastrojejunostomy in a healthy region of the stomach, proximal to the stricture, was done in 5 patients. Additional procedures for concomitant esophageal strictures were done in six patients.

One patient, who underwent antrectomy, Billroth-II anastomosis and dismantling of gastrojejunostomy, died in the hospital of septicemia and severe malnutrition. Three patients had complications; these included two patients who had cervical esophago-colonic anastomotic leak following esophageal replacement surgery using colonic conduits, and one patient who had jejuno-jejunalostomy leak following Roux-en-Y esophago-jejunalostomy after total gastrectomy. The patients with cervical anastomotic leaks responded to conservative treatment. The patient with jejuno-jejunalostomy leak required re-exploitation and conversion to a controlled enter-to-cutaneous fistula, followed by resection of the small bowel segment containing the fistula.

Follow-up information was available for 16 (57%) patients, up to 2-37 (mean 18) months after the surgery. Four of the 13 (31%) patients with associated esophageal strictures had dysphagia, which responded to intermittent esophageal dilation. There were no problems related to the surgical procedures for gastric strictures.

**Discussion**

Ingestion of corrosive agents is a common cause of benign strictures of the upper aero-digestive tract in India. Easy availability of a cheap toilet cleaner makes hydrochloric acid the most frequent cause of corrosive injury in India. An unusual corrosive agent that we encountered in two of our patients was adulterated country liquor.

Acids produce 'coagulative necrosis' with eschar formation at the site of injury. These injuries result in segmental or extensive strictures involving the upper aero-digestive tract. Stomach is more likely to be injured by acids. Acids induce spasm of pyloric musculature, thereby prolonging the contact time with the stomach wall, and produce a variety of gastric deformities like prepyloric stenosis, antral stricture, hour-glass deformity, or contracted small capacity stomach. Injuries to both stomach and esophagus are common, as was seen in almost half of our patients.

Most of our patients developed symptoms within 3 months of corrosive ingestion. This was similar to what was reported from Taiwan. However strictures are known to develop up to one year after the initial insult. A significant proportion of our patients had severe nutritional depletion at the time of initial presentation, making them unfit for major surgery and necessitating a feeding jejunostomy prior to definitive surgery.

Dilation of corrosive strictures of esophagus is a well-established procedure. Contrary to this, dilation of corrosive strictures of the stomach, although reported, is not practiced widely. Moreover the long-term results of balloon dilation of non-malignant pyloric strictures

**Fig: Flow chart for management of corrosive strictures of stomach**

<table>
<thead>
<tr>
<th>Corrosive strictures of stomach + esophagus (n=28)</th>
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<tbody>
<tr>
<td>Stricture stomach + esophagus (n=13)</td>
</tr>
<tr>
<td>Esophageal dilatation</td>
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<tr>
<td>Failed (n=6)</td>
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<tr>
<td>Successful (n=7)</td>
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<tr>
<td>Antro pyloric (n=18)</td>
</tr>
<tr>
<td>Distal gastrectomy (n=16)</td>
</tr>
<tr>
<td>Gastrojejunostomy (n=2)</td>
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<td>Bypass (n=3)</td>
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<tr>
<td>Subtotal gastrectomy (n=1)</td>
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<tr>
<td>Total gastrectomy (n=3)</td>
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<tr>
<td>Transhiatal esophagectomy (n=3) + Gastrojejunostomy (n=2) or total gastrectomy (n=1)</td>
</tr>
<tr>
<td>Bypass (n=3) + Gastrojejunostomy (n=1), coludodenostomy (n=1) or stricturoplasty (n=1)</td>
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are conflicting. Thus, surgery remains the mainstay of therapy for corrosive strictures of the stomach. The choice of the definitive surgical procedure is governed by several factors including extent of cicatrization of the stomach, concomitant involvement of the esophagus, and the general condition of the patient.

Gastric resection, whether distal or total, was the surgical procedure of choice in our experience. Whereas distal gastrectomy sufficed in patients with antro-pyloric strictures, total or subtotal gastrectomy was required in patients with more significant injuries. In our experience, the resection surgery was safe and free of significant complications, both in the short term and in the long run. In addition, resection of the cicatrized portion of the stomach may eliminate the long-term risk, if any, of malignant transformation. In a similar study on corrosive strictures of the stomach by Chaudhary et al., resection surgery was performed in 59% (20/34) of patients whereas gastrojejunostomy was performed in 11% (32%) patients. Poor nutritional status, extensive peri gastric adhesions and unhealthy duodenal were taken as indications for bypass surgery by them. In another series of 31 patients with isolated corrosive strictures of the stomach operated within 2 months of injury, gastric resection was done in 29% (29) patients without any anatomic leaks or other significant postoperative complications, indicating that gastric resection is feasible and safe in this scenario. In contrast, Hsu et al. favored gastrojejunostomy (80%) over gastric resection in their series of 30 patients; they however did not cite any reason for this preference. In this series, a few patients who underwent gastrojejunostomy developed bile reflux esophagitis.

The choice of surgical procedure is even more complex in patients with concomitant long and tight esophageal stricture. In such cases, colon is the best option for bypassing or replacing the diseased esophagus and stomach, as was done in six of our patients. A major source of morbidity in such patients was leaks from the esophago-colonic anastomosis in the neck; however, most of these closed on conservative management.

Our study has an inherent referral bias in favor of gastric strictures since these are usually not amenable to dilation. Thus, the 70% frequency of gastric involvement in corrosive injuries of the upper aero-digestive tract observed in our study does not represent the true picture. Another drawback is the lack of long-term follow up in most patients; therefore, no firm conclusion can be drawn regarding the long-term outcome of surgery in these patients.

In conclusion, corrosive injuries resulting from acid ingestion lead to benign strictures of the stomach, which are often associated with strictures of the esophagus. Surgical procedures, individualized according to the site and extent of gastric involvement and presence of associated esophageal strictures, give excellent results.

References

Correspondence to: Dr Sikora. E-mail: sadiqas@sgpgi.ac.in. Fax: (522) 266 9017

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