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Analysis of gastric strictures presentation and their surgical management outcome

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Abstract: Background and Aim: Corrosive gastric strictures may require more frequent dilations compared to peptic ulcer-related strictures. Strictures occurring at the distal gastric site may necessitate sufficient dilatation to prevent obstructive symptoms, but this comes with an increased risk of perforation. The aim of the study was to determine the mean duration between corrosive consumption and the development of gastric stricture.
Material and Methods: The present study analyzed data collected from patients admitted to the surgical unit of Medical College & associated hospital following corrosive ingestion. Clinical data, including a history of difficulty in swallowing, cough with expectoration, difficulty in breathing, abdominal pain, abdominal distension, vomiting, and fever, were collected. Barium swallows were performed to assess and locate the stricture site in the stomach and assess the distal flow. Intraoperative findings of corrosive strictures and the nature of the performed surgery were analyzed. Barium meal studies were conducted for all patients to locate the level of stricture in the stomach, identify associated esophageal strictures, and detect coexisting trachea-esophageal fistulas.
Results: A total of 24 patients who met the inclusion and exclusion criteria were included in the study. Among the 24 patients, 6 had hyponatremia, 5 had type I strictures, 3 had type VII strictures, and 2 had type IV strictures with hyponatremia. Type I strictures were observed in 4 patients, 1 patient had type VII, and 1 patient each had other types of strictures with hypokalemia. Hypokalemia was present in 8 patients with type I strictures, 3 with type VII, and 1 each with type IIa, type IIb, type III, and type IV strictures. Arcade-preserving antrectomy was performed in 6 patients. One patient had type IIa corrosive gastric stricture and was managed with stricturoplasty. Two patients with type IIb corrosive gastric strictures were treated with Pylorus Preserving Antrectomy. Two patients had type III corrosive gastric strictures, and they underwent circumferential sleeve resection and gastro-gastrostomy.
Conclusion: Adequate preoperative nutritional optimization and evaluation to assess the extent of injury can significantly reduce the morbidity and mortality associated with gastric corrosive strictures.

Keywords: Gastric Strictures; Gastrostomy; Hyponatremia; Oesophagus.

1. Introduction

Corrosive substances are those that cause destruction or damage to living tissue on contact and can be classified into acids or alkalis. While children under the age of 5 years account for more than 80 percent of corrosive ingestions, and the majority of ingestions are accidental, in adults, suicidal attempts or gestures are often the reason for corrosive substance ingestion [1,2].

Corrosive ingestion, whether accidental or intentional, remains a significant problem in our society. The lack of legal regulations, easy accessibility, and unrestricted sale of acids contribute to acid poisoning cases. Corrosive injuries of the esophagus and stomach cause major morbidity, especially among younger

individuals. Full-thickness esophagogastric necrosis is a severe form of injury associated with considerable morbidity and mortality [1,3,4].

Symptoms may develop within 3 months of caustic ingestion, while strictures are known to develop between 1 to 6 years after the initial ingestion. Severe malnutrition is often present in a significant proportion of patients, requiring feeding jejunostomy or placement of a nasoduodenal feeding tube prior to definitive surgery. However, there are only a few reports highlighting the management of corrosive injury of the stomach [5,6].

The extent of esophageal and gastric involvement usually depends on the nature of the corrosive ingestion, the amount and concentration of the caustic substance, the duration of contact, and the swallowing act. Antibiotics, corticosteroids, nutritional support, endoscopic dilation and stenting, and surgical treatment are well-described modalities in managing corrosive injuries. However, the response to balloon dilation for corrosive gastric strictures is generally poorer compared to peptic strictures [7,8].

Corrosive gastric strictures may require more frequent dilations compared to peptic ulcer-related strictures. Strictures occurring at the distal gastric site may need sufficient dilatation to prevent obstructive symptoms, but this comes with an increased risk of perforation. Resistance to initial balloon dilation may indicate worse long-term results, and surgical correction has been recommended for these patients. Long-segment, tortuous, angulated, or edematous benign gastric outlet strictures tend to poorly respond to balloon dilation [9,10].

In this study, we describe our experience in managing corrosive gastric strictures and propose a new working classification for managing such strictures. This classification will aid in determining the surgical strategy to be adopted for gastric strictures, whether isolated to the stomach or combined with esophageal strictures. Therefore, the aim of this study was to determine the mean duration between corrosive consumption and the development of gastric strictures.

2. Material and Methods

The present study involves the analysis of collected data from patients admitted with corrosive ingestion in the surgical unit of Medical College & associated hospital. The data was collected from admissions over a period of 5 years for departmental records. The study was conducted in accordance with ethical guidelines, and ethical clearance certificate was obtained from the institute's ethical committee prior to the commencement of the study.

The inclusion criteria for the study were as follows: patients with isolated corrosive gastric strictures, patients with gastric strictures extending into the duodenum, and patients with combined esophageal and gastric strictures. The exclusion criteria were as follows: patients with acute corrosive injury, patients who required emergency surgery for complications, and isolated esophageal strictures.

Clinical data, including the history of difficulty in swallowing, cough with expectoration, difficulty in breathing, abdominal pain, abdominal distension, vomiting, and fever, were collected. Additionally, the history of alcohol intake, including amount, frequency, and associated comorbid illnesses such as Diabetes Mellitus, Hypertension, Bronchial Asthma, and Tuberculosis, were noted. Basic biochemical investigations were performed.

To assess and locate the site of the stricture in the stomach and evaluate the distal flow, barium swallows were conducted. Intraoperative findings of corrosive strictures and the nature of surgeries performed were analyzed. Barium meal studies were conducted for all patients to determine the level of stricture in the stomach, the presence of associated esophageal strictures, and any coexisting tracheoesophageal fistulas. Upper gastrointestinal endoscopy was performed prior to surgery to confirm the findings of the barium swallow. Short-term postoperative follow-up was conducted and recorded.

3. Results

A total of 24 patients who satisfied the inclusion and exclusion criteria were included in the study. The most commonly affected age group with the maximum number of patients was 20–30 years. When analyzing the sex ratio, it was found that females were more affected compared to males, with a female-to-male ratio of 3:1.

Most patients accidentally ingested acids without being aware of the nature of the liquid being consumed. Among the various acids ingested, toilet cleaning acid containing hydrochloric acid was the most common. Acid ingestion was more common than alkali ingestion in our analysis. All patients had undergone hospital admission during the acute phase, either in our hospital or elsewhere.

The time interval between ingestion and admission varied among patients, as did the clinical presentation. The most common chief complaint was vomiting, followed by abdominal pain and dysphagia. Weight loss was observed in almost all included patients, and routine hemogram was performed for all patients.

Among the 24 patients, 6 had hyponatremia, 5 had type I strictures, 3 had type VII strictures, and 2 with type IV strictures had hyponatremia. Hyponatremia was corrected prior to surgery through appropriate fluid management.

Low potassium levels were found in 8 patients at the time of admission. Type I stricture was observed in 4 patients, 1 patient with type VII stricture, and 1 patient each with other types of strictures had hypokalemia.

Of the 24 patients, 14 had isolated strictures in the stomach, while 10 had associated esophageal strictures. Surgical management was decided based on barium meal, upper gastrointestinal endoscopy, and intraoperative findings. Surgery was determined according to the level of the stricture.

We had 10 patients with type I corrosive gastric strictures. These patients were managed by:

- Arcade preserving antrectomy
- Conventional antrectomy

Arcade preserving antrectomy was performed in 6 patients whenever possible. This technique can be helpful in the future for using the stomach as a conduit for managing esophageal strictures if the colon is unavailable. Antrectomy without arcade preserving was done in 4 patients. Reconstruction was performed using:

- Billroth I - 7 patients
- Billroth I - 7 patients

We had one patient with type II A corrosive gastric stricture who was managed by stricturoplasty. Two patients with type II B corrosive gastric strictures were treated with Pylorus Preserving Antrectomy.

Two patients with type III corrosive gastric strictures were treated with circumferential sleeve resection and gastro-gastrostomy. Three patients with type IV corrosive gastric strictures underwent total gastrectomy, and reconstruction was performed using the Roux-en-Y technique.

One patient with type V gastric stricture underwent limited esophagogastrectomy. Intraoperative endoscopy was necessary to define the extent of the gastroesophageal junctional stricture.

One patient with type VI gastric stricture was managed with gastrojejunostomy. Since these patients had involvement of the first part of the duodenum, bypass procedures were performed instead of resection. Five patients with type VII gastric strictures in our series were managed as follows:

- Antrectomy, Coloplasty - 2
- Gastrojejunostomy, Coloplasty - 2
- Antrectomy, Retrograde dilatation – 1

Table 1. Distribution of the patients with the type of strictures

Sr. No.	Type of stricture	No. of patients
1.	Type I	10
2.	Type II	4
3.	Type III	2
4.	Type IV	2
5.	Type V	1
6.	Type VI	1
7.	Type VII	5

3.1. Postoperative Period

Patients who underwent reconstructive procedures were managed in the intensive surgical care unit during the immediate postoperative period. Select patients who underwent coloplasty received elective ventilation. Extubation was planned thereafter based on the patient's general condition, in consultation with the anesthesiologist.

4. Discussion

Corrosive injuries leading to cicatrisation of the esophagus and stomach are common in India. In developed Western countries, corrosive injuries typically involve accidental ingestion in children. However, in India, young adults often consume different acids easily available for household cleaning purposes with suicidal intent [11].

The latter scenario produces symptoms when there is narrowing in the antropyloric area or diffuse cicatrisation [1]. Presenting symptoms range from frequent nonbilious vomiting to marked weight loss [7]. In a recent study, the mean period between ingestion and the development of initial signs and symptoms was 26 days (range 15–45 days). Most patients develop obstruction within 3 months of corrosive ingestion, although it has been reported to occur between 19 days and 20 years [9]. In our study, patients presented with gastric outlet obstruction between 6 weeks and 26 months following caustic ingestion.

In India, acid ingestion is more common than alkali ingestion, as concentrated acids are much cheaper than alkaline toilet cleaners. The majority of our patients consumed toilet cleaning acid. Both acid and alkali can cause reflex pyloric spasm, leading to acid pooling, antral stenosis, hourglass-type deformity, or linitis plastica. Zargar et al. described that acute gastric injury was present in 85.4% of their patients who had consumed acid, mainly involving the distal stomach, and 44% had late complications such as pyloric or antral strictures and linitis plastica [12].

In our series, the majority of caustic accidents involved acids (92.8% of cases), with hydrochloric acid being the most frequently ingested agent (50%). Contrary to the traditional belief that the esophagus is spared in acid ingestion, we found esophageal damage in the majority of patients with acid ingestion. Dailwar et al. [13] also observed esophageal involvement in 13 out of 15 patients with acid ingestion.

Most of the patients were young females in their second or third decades of life. The majority of them ingested toilet cleaning acid (83.3%). The majority of patients ingested acid with suicidal intention (87.5%). The duration between corrosive ingestion and the development of stricture varied from 2 months to 35 months.

The optimal timing and type of surgery for gastric strictures are still unclear. However, Hwang et al. proposed early definitive operation to manage these injuries. In corrosive strictures of the stomach, surgery is tailored according to the extent of gastric involvement and the presence of associated esophageal strictures [14].

All patients are being followed at regular intervals in the outpatient department, with assessment of changes in the grade of dysphagia, weight gain, return to work, and clinical examination. Their quality of life (QOL) is being analyzed. Endoscopy is routinely performed at 3 and 6 months postoperatively for all these patients.

5. Conclusion

The morbidity and mortality of gastric corrosive strictures can be significantly reduced by adequate preoperative nutritional optimization and evaluation to assess the extent of injury.

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