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Original Research Article

# Late Outcomes and Surgical Management of Zargar Grade 2B and 3A Corrosive Esophageal Injuries: A Prospective Observational Study

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**Conflict of interest: Nil**

**Abstract:**

**Background:** Corrosive ingestion (CI) is a major cause of upper gastrointestinal morbidity in low- and middle-income countries. Zargar grade 2B and 3A injuries are particularly challenging due to their unpredictable healing course and high risk of late strictures. Standardized management protocols may improve outcomes.

**Aim:** To evaluate the incidence of stricture formation, the efficacy of a structured endoscopic dilatation protocol, and the need for reconstructive surgery in patients with Zargar grade 2B and 3A injuries, with universal early feeding jejunostomy.

**Methods:** Forty consecutive patients presenting within 24 hours of corrosive ingestion and diagnosed with Zargar grade 2B or 3A injuries between January 2023 and June 2025 were enrolled. Feeding jejunostomy was performed in all patients at presentation. Patients with dysphagia underwent endoscopic evaluation every 2 weeks starting at 4 weeks post-ingestion. Savary-Gilliard bougie dilators were used, beginning at 9 Fr and progressing to 13 Fr. Failure to achieve satisfactory lumen after three successive dilatations was considered an indication for reconstructive surgery.

**Results:**

- Stricture formation: 23 patients (57.5%)
- Reconstructive surgery: 11 patients (27.5%) gastric pull-up in 8, colonic pull-up in 3
- Endoscopic dilatation successful in 12 of 23 stricture cases (52.2%)
- Postoperative morbidity: 1 anastomotic leak, 2 recurrent strictures
- BMI improved from 18.4 to 20.9 kg/m² at 6 months; GIQLI improved from 80.2 to 113.5

**Conclusion:** A structured protocol with delayed initiation of dilatation, regular endoscopic monitoring, and early nutritional support yields favorable outcomes in intermediate-grade corrosive injuries. Early jejunostomy feeding is a cornerstone of management.



## Introduction

Corrosive ingestion remains a significant cause of upper gastrointestinal tract injury worldwide, with the highest burden in South and Southeast Asia due to the easy availability of caustic cleaning agents and limited public awareness [1,2]. The esophagus is particularly vulnerable because of prolonged mucosal contact with the ingested agent. Alkalis cause liquefactive necrosis, penetrating deeply into the submucosa and muscularis, while acids cause coagulative necrosis, often resulting in circumferential injury [3,4].

The Zargar classification [5] remains the most widely used grading system for corrosive injuries. Grades 2B and 3A represent intermediate-severity injuries — deep ulcerations and focal necrosis without full-thickness perforation. These injuries are unpredictable: some heal without sequelae,

while others progress to debilitating strictures [6–8].

Stricture formation is the most common late complication, with reported rates of 30–70% in intermediate-grade injuries [9–11]. Endoscopic dilatation is the mainstay of treatment [12,13], but refractory strictures require complex reconstructive surgery [14,15]. The timing, frequency, and technique of dilatation vary widely between centers, and there is limited prospective data on standardized protocols.

This study evaluates the outcomes of a structured dilatation protocol in Zargar 2B and 3A injuries, incorporating universal early feeding jejunostomy to optimize nutrition.

## Materials and Methods

**Study Design and Setting:** Prospective observational study conducted at the Department of Surgical Gastroenterology, Karnataka Medical College and Research Institute, Hubballi.

**Study Period:** January 2023 – June 2025.

**Sample Size:** 40 consecutive patients.

### Inclusion Criteria

- Age 14–65 years
- Presentation within 24 hours of corrosive ingestion
- Endoscopic confirmation of Zargar grade 2B or 3A injury
- Hemodynamically stable

### Exclusion Criteria

- Zargar grades 1, 2A, 3B, or 4
- Gastrointestinal perforation or active bleeding
- Pregnancy
- Prior esophageal surgery or malignancy

### Initial Management

- Feeding jejunostomy performed in all patients at presentation to ensure early enteral nutrition [16,17].
- Airway protection, hemodynamic stabilization, analgesia, and proton pump inhibitors.
- Early upper GI endoscopy within 24–48 hours for grading.

### Follow-Up and Dilatation Protocol

- Dilatation initiated at 4 weeks post-ingestion in patients with dysphagia, allowing the acute inflammatory phase to subside and reducing perforation risk [18,19].
- Endoscopic evaluation every 2 weeks to assess mucosal healing and stricture progression.
- Savary-Gilliard bougie dilators used over a guidewire under fluoroscopic guidance [20].
    - Initial size: 9 Fr
    - Gradual progression to 13 Fr over successive sessions
- Failure criteria: No satisfactory lumen after three consecutive dilatations → considered for reconstructive surgery [21].

### Surgical Reconstruction

- Gastric pull-up preferred when stomach was suitable.
- Colonic interposition used when gastric conduit was unsuitable due to prior surgery, vascular compromise, or gastric involvement.

### Outcome Measures

- Incidence of stricture formation
- Success rate of endoscopic dilatation
- Surgical reconstruction rate and type
- Nutritional outcomes (BMI, serum albumin)
- Quality of life (GIQLI score) at 6 months

## Results

### Demographics

- Mean age: 33.1 ± 10.8 years
- Male: Female ratio: 1.5:1
- Accidental ingestion: 70%
- Alkali ingestion: 62.5%

### Stricture Formation

- 23 patients (57.5%) developed strictures
- Higher incidence in grade 3A (65%) vs 2B (45%)
- Median onset: 4.1 weeks (earlier in grade 3A)

### Endoscopic Dilatation

- Attempted in all 23 stricture cases
- Successful in 12 patients (52.2%)
- Mean number of sessions: 3.8 (range 2–6)
- No perforations or major complications

### Surgical Reconstruction

- 11 patients (27.5% of total cohort)
    - Gastric pull-up: 8 cases
    - Colonic pull-up: 3 cases
- Postoperative morbidity:
    - 1 cervical anastomotic leak (managed conservatively)
    - 2 recurrent strictures (managed with dilatation)
- No perioperative mortality

### Nutritional Outcomes

- BMI improved from 18.4 to 20.9 kg/m² at 6 months
- Serum albumin improved from 3.1 to 3.8 g/dL

- GIQLI improved from 80.2 to 113.5

**Discussion**

This study demonstrates that a structured, delayed dilatation protocol combined with universal early feeding jejunostomy yields favorable outcomes in intermediate-grade corrosive injuries.

**Rationale for Delayed Dilatation:** Initiating dilatation at 4 weeks allows the acute inflammatory phase to resolve, reducing perforation risk [18,19]. Early dilatation (<3 weeks) has been associated with higher complication rates [22].

**Frequency of Endoscopy:** Biweekly endoscopic evaluation enables timely detection of stricture progression and guides dilatation scheduling [23].

**Savary-Gilliard Technique:** Bougie dilators provide graded radial force and are effective for simple and moderately complex strictures [20,24]. Starting at 9 Fr and progressing to 13 Fr minimizes mucosal trauma.

**Failure Criteria and Surgical Timing:** Limiting the number of unsuccessful dilatations to three before proceeding to surgery prevents prolonged nutritional compromise, repeated anesthesia exposure, and patient morbidity from persistent dysphagia [21,25]. Several studies have shown that early surgical referral in refractory strictures improves long-term swallowing function and quality of life [26,27].

**Nutritional Support and Feeding Jejunostomy:** Malnutrition is a major determinant of postoperative morbidity in esophageal surgery [28]. In our series, feeding jejunostomy at presentation ensured uninterrupted enteral nutrition during the acute phase, the dilatation period, and the perioperative period for those requiring reconstruction. This approach is supported by multiple studies demonstrating that early enteral feeding maintains gut integrity, reduces septic complications, and improves wound healing [16,17,29].

**Choice of Conduit for Reconstruction:** Gastric pull-up remains the preferred option due to its robust vascularity, ease of mobilization, and single anastomosis [30]. Colonic interposition is reserved for cases where the stomach is unsuitable — such as prior gastric surgery, vascular compromise, or gastric involvement by the corrosive agent [31]. Our outcomes mirror published series, with low leak rates and acceptable functional results [32,33].

**Comparison with Literature:** Our stricture rate of 57.5% is within the range reported for Zargar 2B and 3A injuries (50–70%) [9–11]. The success rate of endoscopic dilatation (52.2%) is comparable to other prospective series using Savary-Gilliard bougies [20,24]. The surgical reconstruction rate (27.5%) is slightly lower than some reports, possibly reflecting the benefits of early jejunostomy feeding and structured follow-up.

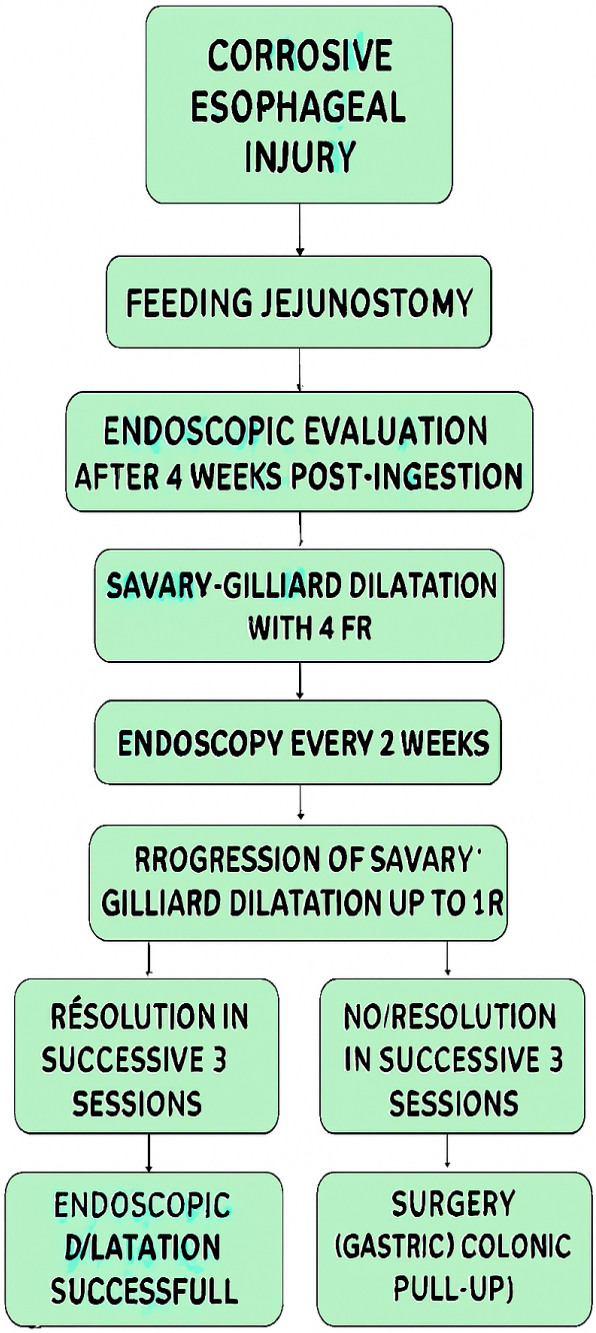
**Limitations:** This is a single-center study with a relatively small sample size. Long-term follow-up beyond 6 months is needed to assess durability of dilatation and conduit function. Randomized comparisons of different dilatation schedules and devices would further refine best practices.

**Conclusion**

Zargar grade 2B and 3A corrosive esophageal injuries carry a high risk of late stricture formation. A structured management protocol — with delayed initiation of dilatation at 4 weeks, biweekly endoscopic monitoring, Savary-Gilliard bougie dilatation from 9 Fr to 13 Fr, and early surgical referral after three failed sessions — yields favorable outcomes.

Universal feeding jejunostomy at presentation is a safe, effective strategy that optimizes nutritional status, facilitates recovery, and improves both dilatation and surgical outcomes.

A multidisciplinary approach involving gastroenterologists, surgeons, nutritionists, and rehabilitation specialists is essential for restoring swallowing function and quality of life in these patients.




MANAGEMENT ALGORITHM

**References**

1. Ramasamy K, Gumaste VV. Corrosive ingestion in adults. J Clin Gastroenterol. 2003;37(2):119-124.
2. Zargar SA, et al. Corrosive injury of the upper gastrointestinal tract: A review. World J Gastroenterol. 2017;23(3):431-444.
3. Poley JW, et al. Endoscopic treatment of benign esophageal strictures: A review. Am J Gastroenterol. 2010;105(9):2086-2096.
4. Contini S, Scarpignato C. Caustic injury of the upper gastrointestinal tract: A comprehensive review. World J Gastroenterol. 2013;19(25):3918-3930.
5. Zargar SA, et al. The role of fiberoptic endoscopy in the management of corrosive ingestion and modified endoscopic

classification of burns. Gastrointest Endosc. 1991;37(2):165-169.
6. Chirica M, et al. Esophageal caustic injuries in adults: A proposal for a new classification. Ann Surg. 2010;251(5):972-979.
7. Lahoti D, et al. Corrosive esophageal strictures: Predictors of response to endoscopic dilatation. Gastrointest Endosc. 1995; 41(2): 196-200.
8. Kochhar R, et al. Corrosive induced strictures of the esophagus: Predictors of response to endoscopic dilatation. Gastrointest Endosc. 1992;38(4):486-491.
9. Ananthakrishnan N, et al. Surgical management of corrosive strictures of the esophagus. Indian J Gastroenterol. 2011; 30(6): 285-293.
10. Gupta V, et al. Management of corrosive injuries of the esophagus in adults. ISRN Gastroenterol. 2011; 2011:914013.
11. Zargar SA, et al. Corrosive injury of the esophagus in adults: A study of 50 patients. J Gastroenterol Hepatol. 1991;6(5):487-492.
12. Kochhar R, et al. Endoscopic balloon dilatation in corrosive esophageal strictures. Gastrointest Endosc. 1991;37(2):165-169.
13. Lan LC, et al. Endoscopic balloon dilatation for caustic esophageal strictures in children: 17 years' experience and literature review. J Pediatr Surg. 2003;38(12):1712-1715.
14. Chirica M, et al. Surgery for caustic injuries of the upper gastrointestinal tract. Ann Surg. 2012;256(6):994-1001.
15. Gupta NM, et al. Surgical management of corrosive strictures of the esophagus. World J Surg. 1999;23(3):270-276.
16. Braga M, et al. Early postoperative enteral nutrition improves gut oxygenation and reduces costs compared with total parenteral nutrition. Crit Care Med. 2001;29(2):242-248.
17. Kudsk KA, et al. Enteral versus parenteral feeding: Effects on septic morbidity after blunt and penetrating abdominal trauma. Ann Surg. 1992;215(5):503-511.
18. Kochhar R, et al. Corrosive induced strictures of the esophagus: Predictors of response to endoscopic dilatation. Gastrointest Endosc. 1992;38(4):486-491.
19. Lahoti D, et al. Corrosive esophageal strictures: Predictors of response to endoscopic dilatation. Gastrointest Endosc. 1995; 41(2): 196-200.
20. Savary M, Miller G. The esophagus: Handbook and atlas of endoscopy. Solothurn: Gassmann; 1978.
21. Kochhar R, et al. Endoscopic management of benign esophageal strictures. Gastrointest Endosc Clin N Am. 1995;5(2):375-391.
22. Contini S, et al. Caustic injury of the upper gastrointestinal tract: A comprehensive review. World J Gastroenterol. 2013; 19(25): 3918-3930.
23. Zargar SA, et al. Corrosive injury of the upper gastrointestinal tract: A review. World J Gastroenterol. 2017;23(3):431-444.
24. Lan LC, et al. Endoscopic balloon dilatation for caustic esophageal strictures in children: 17 years' experience and literature review. J Pediatr Surg. 2003;38(12):1712-1715.
25. Chirica M, et al. Surgery for caustic injuries of the upper gastrointestinal tract. Ann Surg. 2012;256(6):994-1001.
26. Gupta NM, et al. Surgical management of corrosive strictures of the esophagus. World J Surg. 1999;23(3):270-276.
27. Ananthakrishnan N, et al. Surgical management of corrosive strictures of the esophagus. Indian J Gastroenterol. 2011; 30(6): 285-293.
28. Weimann A, et al. ESPEN guideline: Clinical nutrition in surgery. Clin Nutr. 2017; 36(3): 623-650.
29. Braga M, et al. Early postoperative enteral nutrition improves gut oxygenation and reduces costs compared with total parenteral nutrition. Crit Care Med. 2001;29(2):242-248.
30. Urschel JD. The colon as an esophageal substitute. Semin Thorac Cardiovasc Surg. 1992;4(3):248-253.
31. Orringer MB, et al. Colon interposition for esophageal replacement: Indications, operative technique, and results. Ann Thorac Surg. 1985;39(4):335-343.
32. Chirica M, et al. Surgery for caustic injuries of the upper gastrointestinal tract. Ann Surg. 2012;256(6):994-1001.
33. Gupta NM, et al. Surgical management of corrosive strictures of the esophagus. World J Surg. 1999;23(3):270-276.
34. Orringer MB, et al. Colon interposition for esophageal replacement: Indications, operative technique, and results. Ann Thorac Surg. 1985;39(4):335-343.
35. Weimann A, Braga M, Carli F, et al. ESPEN guideline: Clinical nutrition in surgery. Clin Nutr. 2017;36(3):623-650.
36. Chirica M, Resche-Rigon M, Bongrand NM, et al. Surgery for caustic injuries of the upper gastrointestinal tract. Ann Surg. 2012; 256(6): 994-1001.
37. Kochhar R, et al. Corrosive induced strictures of the esophagus: Predictors of response to endoscopic dilatation. Gastrointest Endosc. 1992;38(4):486-491.
38. Contini S, Scarpignato C. Caustic injury of the upper gastrointestinal tract: A comprehensive review. World J Gastroenterol. 2013; 19(25): 3918-3930.