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Original Article

A Clinical Study of the Use of Savary-Gilliard Dilators in Corrosive Esophageal Strictures without the Use of Fluoroscopy: A Reality in Resource-Limited Settings in a Developing Country

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Abstract

Context: Corrosive compounds are either acids or alkalis, and their ingestion can cause esophageal strictures which may be tortuous and multiple. **Aims:** The aim of study was to assess therapeutic efficacy and safety of dilatation using Savary-Gilliard dilators in these patients without the use of fluoroscopy. **Settings and Design:** A cross-sectional observational study, conducted for 18 months in a tertiary care teaching hospital in Western India. **Subjects and Methods:** Ten dysphagic patients who had a history of corrosive ingestion 2 months or more before presentation, who had documented esophageal strictures on endoscopy were included. Barium swallow and endoscopy confirmed the site, length, and number of strictures. Dilatation with Savary-Gilliard dilators was done without the use of fluoroscopy with the help of guide wire in "rule of threes." Patients were followed up immediately and for 12 months. Descriptive statistics, mean, and SD were applied in EPI info version 7 software. **Results:** The mean age of 29 + 6.5 years and 70% were females. About 80% had dysphagia Grades III and IV. On endoscopy, 40% had strictures at multiple sites and 60% of patients had strictures more than 5 cm in length. 50% strictures were very tight. Number of patients in whom there was the passage of one dilator more than the stricture in the first session were 80%. A mean of 8.28 sessions of dilatation were required. Adequate dysphagia relief was achieved in 8 (80%) patients, while there were 2 failures. A total of 180 dilatations were performed on these 10 patients of corrosive strictures over a period of 12 months. One minor perforation occurred in this study. **Conclusions:** In resource-limited settings such as India, dilatation without fluoroscopy can be considered as effective and safe initial management for corrosive strictures.

Keywords: *Corrosive, esophageal, fluoroscopy, Savary-Gilliard dilators, stricture*

Introduction

There are many causes of esophageal strictures, which can be divided according to location, whether they are motor or mechanical, and whether they are benign or malignant. In India, and other developing countries, suicidal, homicidal, or accidental poisoning is an ever-present cause of morbidity and mortality. Corrosives remain an important cause of poisoning in this country. Corrosive compounds are either acids or alkalis, and they cause severe acute and chronic morbidity in patients. They are relatively easily available as household cleaners and hence their rampant use as agents of death. The chronic consequence of corrosive poisoning is the development of esophageal

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strictures and stenosis, gastric stenosis of the antrum and pylorus, esophageal, and stomach cancers.[1,2] Dealing with these strictures can be difficult as they are often long, tortuous and multiple.[3] Guidewire directed hollow core polyvinyl dilators like Savary-Gilliard dilators are a good way to dilate benign esophageal strictures. These dilators are passed endoscopically in increasing calibers to achieve technical success which is either immediate, defined as passage of one dilator more than the stricture at the same sitting and long-term, which is the ability to maintain a solid or semisolid diet for more than 12 months, in settings where fluoroscopy is not used.[4,5] Effective dilatation is also dilating up to 15 mm with Grade 0 dysphagia when fluoroscopy is used.[3]

This study was done in dysphagic patients who had a history of corrosive ingestion 2 months or more before presentation, who had documented esophageal strictures on endoscopy. The aim was to elucidate the demography and type of corrosive ingestion, to assess the presenting grade and severity of dysphagia, to evaluate barium swallow and endoscopic findings in them, and to assess therapeutic efficacy and safety of dilatation using Savary-Gilliard dilators in those patients without the use of fluroscopy. The efficacy of dilatation in relieving the dysphagia was seen immediately and during a 12-month follow-up by subjective grading of dysphagia and by endoscopy.

Subjects and Methods

This was a cross-sectional observational study conducted over a period of 18 months in a tertiary care hospital in Western India. Institution Ethics Committee clearance was obtained. A written informed consent was taken from each patient.

Ten patients with a history of corrosive ingestion 2 months or more before the presentation, who presented with dysphagia and had documented esophageal strictures on endoscopy were included. Dysphagia due to motility disorders such as achalasia cardia, esophageal and tracheoesophageal fistulae, malignancy of esophagus and due to other causes such as acid peptic disease, post sclerotherapy, radiation, and postoperative were excluded on the basis of history, barium swallow, and endoscopy. The history of corrosive ingestion was recorded with the type of poison and quantity of it ingested. The duration of dysphagia was recorded. A predilation grading of dysphagia was done.

- Gr O: No dysphagia
- Gr I: Dysphagia intermittently occasionally to solids
- Gr II: Dysphagia to solids (at all times)
- Gr III: Dysphagia to semisolids
- Gr IV: Dysphagia to liquidized/pureed food
- Gr V: Inability to swallow saliva or liquids.[4]

A thorough clinical examination of the patient was carried out including weight, nutrition, hydration, general, and systemic examination. Routine investigations were done such as hemogram, liver and renal function tests, serum protein, X-Ray (chest) in the all cases and ECG wherever indicated. Barium swallow was done in all patients to confirm the presence of stricture. It gave information about site, approximate length of stricture, mucosal pattern, and tightness of stricture. Upper gastrointestinal diagnostic endoscopy was now carried out to note and confirm the stricture and its site and approximate length. Corrosive ulcerations and mucosal abnormalities were noted. A biopsy was taken from the stricture site and sent for histopathology. Once the stricture was identified, the guide wire with markings was passed through the biopsy channel of the scope (Savary Guide Wire with spring tip). The super-stiff Zebra Guidewire (0.38) was also used in some cases. The position of the distal spring tip was confirmed under vision through the scope. Once it was seen that the guide wire has passed beyond the stricture, the scope was withdrawn with traction applied to the wire so that it does not move. The dilation was started by inserting the first dilator equal to the diameter of the stricture; the dilator being passed over the guide wire. The feel of it going past the stricture was obtained, and then that dilator was removed. Usually, 3 dilators in increasing dimensions were passed in a single session (rule of three). In some strictures, once dilation up to 11 mm was done, the scope which had the outer diameter of 10.8 mm was again inserted after removing the guide wire, and it was assessed if the scope could be passed beyond the stricture; or if not to assess the decrease in narrowing. If the scope could be passed, maximum dilation was done to No. 14. When 12–14 mm was dilated, it was considered to be adequate.

Patients were observed for 6 h after procedure. Vital signs were recorded. Subjective reduction in the grade of dysphagia immediately after dilatation session was assessed 3–4 h after the procedure. A check chest X-ray was done 2 h after procedure to note any complication like perforation. Patients were enrolled for 6 months and later follow-ups were done.

If dysphagia was subjectively totally relieved at 1st session, then the patient was called for a follow-up once a month for at least 12 months and dilatation was done if dysphagia was present. If dysphagia was not totally relieved, the patient was reviewed every 7–15 days till adequate relief was obtained. Dilatation was always done based on a subjective assessment of dysphagia. The minimum period of follow-up was 12 months. Adequate dysphagia relief was said to occur if the patient could

maintain a solid or semisolid diet for 12 months, which could occur at dysphagia Grade II or less.

On each follow-up, the following points were assessed: (a) subjective grade of dysphagia, (b) body weight, and (c) endoscopy to see the narrowing. The procedure was then done.

Equipment used

- Upper Gastrointestinal, Forward viewing; PENTAXFG 29V fiberoptic endoscope
- Mouth Gags
- Dilators: Savary-Gilliard dilators from Wilson Cook, USA (polyvinyl hollow core) 100 cm (lumen 1.8 mm) set with outer diameters 5, 7, 8, 9, 10, 11, 12, 14, 15, and 17 mm
- Guidewire: 100 cm Savary metal guide wire with markings and distal spring tip. For tight strictures, super-stiff 0.38 zebra guide wire from Microvasive USA was used.

The data were collected and entered into MS Excel. Descriptive statistics, mean, and SD were applied in EPI info version 7.1.5.0, Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia.

Results

The age group of the patients was between 21 and 45 years with a mean age of 29 + 6.5 years. 7 (70%) patients were females and 3 (30%) were males [Table 1]. Of the 10 patients, 5 (50%) had a history of consumption of alkali and 5 (50%) said they had consumed an acidic corrosive agent. Eight (80%) said the consumption was suicidal while 2 (20%) said it was an accidental consumption. Nine (90%) patients had mouth burns and ulcers with throat pain as the initial symptom. The duration of dysphagia was 3–6 months in 7 (70%) patients and more than 6 months in 3 (30%) patients.

Four (40%) patients had Grade III dysphagia, 4 (40%) had Grade IV and 2 (20%) patients had Grade V dysphagia [Table 1]. Most of the patients (70%) complained of upper and upper middle esophageal dysphagia and the rest (30%) had mid sternal dysphagia. There was a history of vomiting in 7 (70%) patients. Three (30%) patients of corrosive stricture had regurgitation. Most patients were poorly built. The mean weight of patients in this study was 36.1 + 6.6 kg. Seven (70%) patients had a hemoglobin of <9 g/dl. Two (20%) had a hemoglobin of 9–11 g/dl. Eight (80%) patients had a serum albumin of <3.5 g/dl. None of them had liver disease.

On barium swallow, all had a narrowing. Of these, 3 (30%) had lower esophageal strictures, 4 (40%) had mid esophageal, while 3 (30%) had strictures at multiple sites [Table 1]. Seven (70%) had long strictures, while 3 (30%) had short ones. Six (60%) had mucosal irregularities while 4 (40%) had relatively smooth mucosa. Two (20%) patients had a very thin streak of dye passing beyond the stricture and 2 had diverticula [Figure 1].

On endoscopy, site of stricture was confirmed. Four (40%) had strictures at multiple sites, 3 (30%) had lower esophageal strictures, while 3 (30%) had mid esophageal strictures [Table 1]. Six (60%) patients had strictures more than 5 cm in length. Six (60%) strictures were tight (7–10 mm) and 4 (40%) were tight (<6 mm). Fibrosis and nonspecific inflammatory infiltrate were the most common findings on histopathology in all patients. There was no dysplasia noted. Number of patients in whom there was the passage of one dilator more than the stricture in the first session were 8 (80%) patients. That was considered immediate technical success [Table 1]. In 6 (60%) patients, the last dilator passed in first session was 9–12 mm, while in 4 (40%), it was <9 mm. Out of 4 patients with Grade III dysphagia, after first session, all 4 reached grade I (reduced by 2). Out of 4 patients having Grade IV dysphagia, 2 reached Grade II (reduced by 2) and 2 reached Grade III. Out of 2 patients having Grade V dysphagia, both reached Grade IV (reduced by 1) dysphagia [Table 1]. The patients were followed up for 12 months. A mean of 8.28 sessions of dilatation were required for these strictures. Adequate dysphagia relief, that is, Grade II dysphagia or less by which patients could maintain a solid or semisolid diet for 12 months, was achieved in

Figure 1: Barium image of corrosive stricture

Table 1: Summary of observations

Age	Sex (%)	Stricture at imaging Site: *n* (%)	Stricture at endoscopy Site: *n* (%)	Dysphagia grade at presentation Grade: *n* (%)	Dysphagia grade after intervention Grade decreased by: *n* (%)	Last dilator passed Diameter: *n* (%)	Technical success, *n* (%)	Complication Complication: *n* (%)	Follow up/efficacy Adequate relief: *n* (%)
29±6.5 years	Males: 7 (70)	Lower: 3 (30)	Lower: 3 (30)	III: 4 (40)	Decreased by II: 6 (60)	12–14 mm: 6 (60)	Success: 8 (80)	Pain: 8 (80)	Adequate dysphagia relief (Grade II or less): 8 (80)
	Female: 3 (30)	Middle: 4 (40)	Middle: 3 (30)	IV: 4 (40)		10–12 mm: 2 (20)	Failure: 2 (20)	Perforation: 1 (10)	
		Multiple: 3 (30)	Multiple: 4 (40)	V: 2 (20)	Decreased by I: 4 (40)	<10 mm: 2 (20)		Minor bleed: 2 (20)	Failure: 2 (20)

8 patients (80%). There were 2 failures at 12 months of follow-up, in whom adequate relief could not be achieved. They both had Grade V dysphagia with tortuous and multiple strictures [Table 1].

A total of 180 dilatations were performed on these 10 patients of corrosive strictures over a period of 12 months. In 6 (60%) patients, the last dilator passed in the last session was 12–14 mm and dysphagia grade was 0–I while in 2 (20%) patients, last dilator passed was 10–12 mm and dysphagia grade was I–II. Two (20%) patients could not be dilated beyond 10 mm [Table 1]. One esophageal perforation occurred during the procedures, while there were two minor bleeds. The pain was the most common complication which occurred in 80% patients [Table 1]. No life-threatening major bleed occurred during the procedure.

Discussion

In the present study, the age group of the patients was between 21 and 40 years with a mean age of 29 + 6.5 years. 70% of patients were females and 80% said the consumption was suicidal while 20% said it was an accidental consumption. In a study by Dey *et al*., the mean age of the patients was 29.8 + 11.04.[6] Most of the cases belonged to 20–30 years of age. It revealed a female preponderance of esophageal strictures which were mostly suicidal attempts, facts similar to the present study. In the present study, 50% of patients had a history of alkali and 50% of acid consumption. In a study by Thomas *et al*., the offending agents were acids in 55.1%.[7] In a study done by Ilkin *et al*., the most frequently ingested substance was alkaline (48.2%).[8] In the present study, 90% of patients had mouth burns and ulcers with throat pain as the initial symptom. In a study by Dey *et al*., acute symptoms like perioral ulceration was present in 17 (26.15%) cases.[6] In our study, the presenting grade of dysphagia was severe in 80%, that is to semisolid and pureed foods (Grade III and IV) and Grade V (who could not swallow saliva) in 20%. In a study by Dey *et al*., dysphagia to solids was found to be the most common presentation and was reported by 53.8% patients, followed by absolute/severe dysphagia in the rest (46.2%).[6] In our study, the mean weight of patients was 36.1 + 6.6 kg. In a study done by Harlak *et al*. on 28 patients of corrosive strictures, 53.57% of patients suffered from excessive weight loss.[9]

On barium swallow, 30% had lower esophageal strictures, 40% had mid esophageal, while 30% had strictures at multiple sites. 70% had long strictures while 60% had mucosal irregularities. 90% patients had a very thin streak of dye passing beyond the stricture and 20% had diverticula. In a study done by Nagi *et al*. on 155 patients,

long smooth strictures were seen in 68 patients and short ones in 25. Short and multiple strictures were noted in 35 patients. The strictures were smooth in outline in the majority of cases. Associated intramural pseudodiverticula were present in 45 patients.[10]

On endoscopy, 40% had strictures at multiple sites, 30% had lower esophageal strictures, while 30% had mid esophageal strictures. About 60% patients had strictures more than 5 cm in length. 40% strictures were very tight (<6 mm) and 60% were tight (7–10 mm).

In a study done by Rehman *et al.* on 20 patients with caustic strictures, 65% had strictures at multiple sites. In another study done by Ilkin *et al*., the most common location of stricture was middle esophagus (50%), and severe stricture was the most common one among all stricture grades (46.7%).[8] In a study done by Broor *et al*. on 52 patients, 18 had multiple strictures and 24 had long ones (>5 cm).[3]

In our study, in 60% patients, the dysphagia grade reduced by 2 (whatever the presenting grade was). A mean of 8.28 sessions of dilatation were required. Adequate dysphagia relief, that is Grade II dysphagia or less by which patients could maintain a solid or semisolid diet for 12 months, was achieved in 8 (80%) patients. There were 2 failures at 12 months of follow-up. A total of 180 dilatations were performed on these 10 patients of corrosive strictures over a period of 12 months. In 60%, last dilator passed in the last session was 12–14 mm while in 2 (20%) patients; it was 10–12 mm. Two (20%) patients could not be dilated beyond 10 mm. In various studies, endpoints were varied. In some, adequate dysphagia relief was said to be Grade II dysphagia or less by which patients could maintain a solid or semisolid diet for 12 months, similar to our study.[5] However, this study included all causes of benign strictures including corrosive strictures. In a study by Broor *et al*. and Rehman *et al*. on corrosive strictures, dilatation up to 15 mm and dysphagia Grade 0 was considered adequate. However, these studies used fluoroscopic guidance.[3,11] Our study did not use fluoroscopy, hence we needed to be more cautious about the extent of dilatation, especially in multiple strictures where each had to be dilated in the same session and therefore depended on the subjective dysphagia grading. In the study by Broor *et al*., 93.6% patients were dilated successfully. In the study by Rehman *et al*., the success rate was 60%.[3,11] In a study by Lahoti *et al*., patients required a mean of 5.70 ± 1.42 sessions for achieving adequate dilation.[12] In another study by Broor *et al*., the total number of sittings required to achieve adequate dilatation was median of 14. Good response to dilatation was seen in 63.6% and satisfactory response in 18.2%.[13] In our study, in 180 dilatations in a mean of 8.28 sessions, one esophageal perforation occurred, while there were two minor bleeds. This patient had long, multiple, and tortuous stricture. The procedure was abandoned, and a small leak detected. She was managed conservatively and improved within a few days. She was not subjected to dilatation again and was referred for surgery. In a study by Broor *et al*., 9 perforations occurred in 990 sessions of dilatation.[3]

Conclusions

The main limitation of the study was a small sample size. This study showed that in countries like India, corrosive poisoning, mostly of suicidal intent, is a major cause of esophageal strictures. This leads to severe morbidity due to weight loss and hypoalbuminemia. Esophageal dilatation with Savary-Gilliard dilators even without fluoroscopy is an effective and safe way to deal with these strictures. 80% of our patients could maintain a solid or semisolid diet for 12 months and did not require surgery. Apart from one minor esophageal perforation, which was managed successfully and the patient recovered, there were no major complications. Two patients with multiple tortuous strictures could not be dilated and hence were referred for surgical management. However, in resource-limited settings such as India, dilatation without fluoroscopy can be considered as a safe and effective initial management for corrosive strictures.

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Conflicts of interest

There are no conflicts of interest.

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