



Dilation of benign esophageal strictures with balloon/bougie; a single center experience

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Abstract

Aim: Narrowing in the esophagus caused by benign conditions such as peptic injury, surgical anastomosis, radiation therapy, Schatzki rings, esophageal webs, erosive injury and eosinophilic esophagitis are called benign esophageal strictures. In the treatment of benign esophageal stricture, endoscopic dilation with balloon or bougie is the first priority.

Materials and Methods: The study included a total of 96 patients who were diagnosed with a benign stricture at the gastroenterology clinic of our university from May 2009 to October 2023. All patients were symptomatic, and their main complaint was dysphagia. The benign stricture was diagnosed through clinical examination, radiological imaging and endoscopy. Patient data were scanned retrospectively. The dilation method (bougie, balloon), the number of times the procedure was performed and any potential complications were recorded. Stents were applied to patients who did not provide adequate dilation.

Results: A total of 96 patients were included in the study. Forty-seven (49%) of them were women and 49 (51%) were men. The average age was 48 ± 17 years (the youngest was 18, the oldest was 81). A total of 198 dilation procedures were performed on 96 patients. The average follow-up period was 79 ± 54 (1-179) months. Strictures were divided into 4 groups according to etiology as anastomotic stricture, peptic stricture, caustic stricture and post-radiotherapy stricture. Of the cases with stricture, 76 (79.2%) underwent bougie dilation, 26 (27.1%) underwent balloon dilation, 5 (5.2%) underwent bougie and then balloon dilation, and in 5 (5.2%) cases, metallic stent was placed due to failed dilations.

Conclusion: This study shows the effectiveness of bougie and/or balloon dilation in treating most of the patients with benign esophageal strictures, with a low complication rate. It is less invasive, comfortable and cost-effective than the alternative surgical approach.



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Introduction

Narrowing in the esophagus caused by benign conditions such as peptic injury, surgical anastomosis, radiation therapy, Schatzki rings, esophageal webs, erosive injury and eosinophilic esophagitis are called benign esophageal strictures [1, 2].

The most common symptom associated with esophageal strictures is dysphagia for solids. In esophageal stricture, dysphagia is initially for solid foods rather than liquids. In esophageal motility disorders, difficulty in swallowing occurs when consuming liquids along with solid foods. Other symptoms are odynophagia and heartburn. Nutritional deficiency may develop in long-term dysphagia. Hoarseness and stridor may also develop in patients with caustic

injury [1,3].

It is thought that the pathogenesis of benign esophageal strictures is caused by fibrous tissue production and collagen deposition stimulated by chronic inflammation. In the treatment of benign esophageal stricture, endoscopic dilation with bougie or balloon is the preferred method of treatment [3].

Dilation has been used in the treatment of esophageal strictures for a long time. Up to 90% of benign esophageal strictures can be successfully treated with endoscopic dilation. However, there is a tendency for symptoms to recur in the first year of follow-up in 30-40% of patients successfully treated with endoscopic dilation [3,4].

This study aimed to share the findings of endoscopic dilation treatments conducted for benign esophageal strictures at the gastroenterology clinic of Inonu University Faculty of Medicine.

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Materials and Methods

The study included a total of 96 patients who were diagnosed with a benign stricture at the gastroenterology clinic of our university from May 2009 to October 2023. All patients were symptomatic, and their main complaint was dysphagia. The benign stricture was diagnosed through clinical examination, radiological imaging and endoscopy. Biopsies were taken from suspicious lesions. Patient data were scanned retrospectively. The dilation method (bougie, balloon), the number of times the procedure was performed and any potential complications were recorded.

All procedures were performed by experienced gastroenterologists. A consent form was obtained from all patients before the procedure. Upper gastrointestinal system endoscopy procedures were performed on the patient lying in the left lateral position under light sedation with midazolam, fentanyl or propofol using a flexible gastroscope (Olympus) with a diameter of 11 mm. The patient was hospitalized for 24 hours to observe post-procedure complications. Savary-Gilliard bougie and/or TTS balloon dilation were applied to the patients. When using the Savary-Gilliard bougie, the soft end of the guide wire was inserted through the working channel of the endoscope once the gastroscope reached the narrow area. The wire was then pushed into the stomach and placed in the gastric antrum. The guide wire was left in its place while the endoscope was removed. The bougie, lubricated using lubricating gel, was inserted to the stricture area over the guide wire. Dilation was started with the smallest diameter bougie appropriate to the diameter of the stricture. The diameter of the bougie was then increased depending on the indications of strain, signs of bleeding and the development of pain. All procedures were performed under fluoroscopy. When performing balloon dilation, if the endoscope could pass through the stricture, the balloon catheter was inserted through the working channel and positioned at the stricture site for dilation. If the endoscope could not pass through the stricture, dilation was performed with guide wire under fluoroscopy. Dilation was considered successful when the patient was given a 45 F dilator for the bougie and a 15 mm dilation for the balloon. For patients in whom adequate dilatation could not be achieved, a stent with a diameter of 18 to 24 mm and a length of 8 to 16 cm was applied.

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Ethics committee approval was granted from our institution (Inonu University Health Sciences Clinical Research Ethics Committee) with decision number 2023/2570, and informed consent was obtained from all participants.

Statistical analysis

Data were summarized as mean±standard deviation, Median (Min-Max) and number (percentage). The compliance of the distribution with normal distribution was determined by the Shapiro-Wilk test. One-Way Analysis of Variance, Kruskal-Wallis and Pearson Chi-Square tests were used in statistical analyses, where appropriate. A

value of $p < 0.05$ was considered statistically significant. IBM SPSS Statistics 26.0 program was used in the analyses.

Results

A total of 96 patients were included in the study. 47 (49%) of them were female and 49 (51%) were male. The average age was 48 ± 17 (the youngest was 18, the oldest was 81). A total of 198 dilation procedures were performed on 96 patients. The mean follow-up period was 79 ± 54 (1-179) months (Table I). Strictures were divided into 4 groups according to etiology as anastomotic stricture, peptic stricture, caustic stricture and post-radiotherapy stricture. Strictures were divided into 3 groups as upper, middle and lower esophagus according to their location. The stricture was observed to be mostly in the lower esophagus. The distribution is shown in detail in Table 2.

Of the cases with stricture, 76 (79.2%) underwent bougie dilation, 26 (27.1%) underwent balloon dilation, 5 (5.2%) underwent bougie and then balloon dilation, and in 5 (5.2%) cases, metallic stent was placed due to failed dilations (Table 2). In patients who cannot pass the stenosis area endoscopic, the procedure was considered unsuccessful. Of the cases that underwent bougie and balloon dilation, 4 had anastomotic stricture and 1 had peptic stricture. Of the cases in which metallic stents were placed, 4 involved anastomotic stricture and 1 involved peptic stricture, and bougie dilation was performed in 2 cases, balloon dilation was performed in 2 cases, and both bougie and balloon dilation were performed in 1 case.

Caustic strictures were statistically observed in younger adults and the number of procedures was more (Table 3). Table 3 shows the etiologies of stenosis, the average age according to the etiology of stenosis, the average number of procedures according to etiology, and the number of female men according to etiology.

No serious complications such as bleeding or perforation developed in any of our patients. Gradual spark plug was made. Since the control endoscopy was performed after the procedure, no complication that could cause life-threatening was not followed.

Discussion

This study shows the effectiveness of bougie and/or balloon dilation in treating most of the patients with benign esophageal strictures, with a low complication rate. It is less invasive, comfortable and cost-effective than the alternative surgical approach.

After radiotherapy, upper esophageal stricture may develop, which can reach up to 4% in head and neck cancers and up to 16% in lung cancer [5]. Radiation strictures cause recurrent resistant strictures along with anastomotic and caustic strictures despite bougie and balloon dilation [6]. Despite dilation, dysphagia symptoms may recur at a rate of up to 40% [7]. A study conducted by Agerwalla et al., including 63 patients, showed that strictures recurred at a rate of 33% after dilation for esophageal stricture that developed due to radiation [8]. In a study conducted by Tuna et al., including 31 patients, repeated dilations were performed in 23 (77%) patients [9]. Consistent with the

Table 1. Procedure information.

	Mean± Standard Deviation	Median (Min-Max)
Age at first procedure	48±17	51(18-81)
Number of procedures	2±2	1(1-10)
Average follow-up period in months	79±54	74(1-176)

Table 2. Demographic data and procedure details.

		Count	Percent
Gender	Woman	47	49.0%
	Man	49	51.0%
Reason	Anastomotic stricture after surgery/radiotherapy	51	53.1%
	Caustic substance	8	8.3%
	Peptic esophagitis	22	22.9%
	After	15	15.6%
Anatomical localization of stricture	Middle esophagus region	19	19.8%
	Esophageal lower end	59	61.5%
	Proximal esophagus	18	18.8%
Bougie	Yes	76	79.2%
	No	20	20.8%
Balloon	Yes	26	27.1%
	No	70	72.9%
Balloon + bougie	Yes	5	5.2%
	No	91	94.8%
Was stent placed after the procedure	Yes	5	5.2%
	No	91	94.8%

Table 3. Comparison of the variables in the study in terms of groups.

Variable	Group*				p-value	
	Anastomotic stricture after surgery	Caustic substance	Peptic esophagitis	After radiotherapy		
	Mean±SD	Mean±SD	Mean±SD	Mean±SD		
Age at first procedure	48 ^a ±15	33 ^b ±14	47 ^a ±22	57 ^a ±13	0.018	
	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)		
Number of procedures	1 ^a (1-5)	3.5 ^b (1-6)	1 ^{ac} (1-6)	2 ^{bc} (1-10)	0.028	
	Number (Percentage)	Number (Percentage)	Number (Percentage)	Number (Percentage)		
Gender	Woman	25 ^a (49.02%)	3 ^a (37.50%)	10 ^a (45.45%)	9 ^a (60.00%)	0.739
	Man	26 ^a (50.98%)	5 ^a (62.50%)	12 ^a (54.55%)	6 ^a (40.00%)	

* There is a statistically significant difference in group categories that do not contain the same letter.

literature, all strictures except 1 (middle esophagus) were in the upper esophagus in our patient group. Adequate dilation was achieved in all patients. However, more than one dilation was performed in 10 (66.6%) of our patients.

In a study by Choi et al., including 21 patients, only balloon dilation was applied to 14 patients with anastomotic stricture, while balloon + bougie dilation was applied to 7 patients. Technical success was 100%, clinical success was 76.2%, and refractory stricture was found to be 28.6%. No major complications were detected in any patient [10]. In a study conducted by Altıntaş et al., including 21 patients, esophageal stricture occurred after surgery in 9 cases. Ad-

equately dilation was achieved in all these cases. In our patient group, successful dilation was achieved in 47 (92.2%) of 51 patients with anastomotic stricture. More than one dilation was performed in 18 (35.2%) of these cases. Metallic stent was placed in 4 (7.8%) patients due to failure of dilation.

Strictures that develop due to acid reflux are called peptic strictures. When acid reflux becomes chronic, it can cause esophagitis and subsequent scarring of the mucosa. They constitute 70-80% of esophageal strictures. Symptoms can improve with proton pump inhibitors and dilation. However, 50% of cases require more than one dilation

procedure [11]. In a study conducted by Ayyıldız et al., which included 76 cases with 26 peptic structures, bougie and balloon dilation were found to be effective in all patient groups [12]. We successfully performed dilation in 21 cases in the peptic stricture patient group. More than one dilation protocol was applied in 9 (42.8%) of these cases. In 1 case, a metallic stent was placed due to failure of dilation.

In 90% of the cases, the intake of caustic substances by adult population is linked to suicidal intentions. If the swallowed substance contains acid, it causes coagulation necrosis, thus preventing the effect of the acid on the deep tissues. On the other hand, if the substance contains alkali, it causes liquefactive necrosis, which causes full-thickness damage [13]. In a study conducted by Francis Modeste et al., including 83 patients who underwent dilation, dilation was performed 469 times. The average number of dilations per patient was 5.58. Good results were obtained in 50 (60.2%) of these patients [14]. In our patient group, 8 patients suffered caustic injuries. More than one dilation was performed in 6 (75%) of these patients. Caustic stricture was observed to be statistically significantly higher in young individuals. Again, in patients with caustic stricture, the number of procedures was found to be significantly higher.

The most common complications due to dilation for esophageal stricture are bleeding and perforation. They are seen more commonly in blind passage of guide wire dilators [7]. None of our patients developed major complications such as bleeding or perforation. Conclusion

Conclusion

As seen in this study, endoscopic bougie and/or balloon dilation is both safe and successful in benign esophageal strictures. However, we believe that it should be supported by larger population and prospective studies.

Competing interests

The authors declare that they have no competing interests.

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There is no specific funding related to this research.

Consent for publication

The original article is not under consideration by another publication, and its substance, tables, or figures have not been published previously and will only be published elsewhere.

Data availability

The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Ethical approval

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Ethical

approval was received from Inonu University Health Sciences Clinical Research Ethics Committee (Decision number: 2023/5270). As this was retrospective research, no informed consent has been obtained from participants.

References

1. Boregowda U, Goyal H, Mann R, et al. Endoscopic management of benign recalcitrant esophageal strictures. *Ann Gastroenterol.* 2021;34(3):287-299.
2. Zhang YW, Wei FX, Qi XP, et al. Efficacy and Safety of Endoscopic Intralesional Triamcinolone Injection for Benign Esophageal Strictures. *Gastroenterol Res Pract.* 2018 Aug 6:2018:7619298.
3. Lew RJ, Kochman ML. A review of endoscopic methods of esophageal dilation. *J Clin Gastroenterol.* 2002;35:117-26.
4. Rana SS, Sharma R, Kishore K, et al. High-frequency miniprobe endoscopic ultrasonography in the management of benign esophageal strictures. *Ann Gastroenterol.* 2020;33:25-29.
5. Maple JT, Petersen BT, Baron TH, et al. Endoscopic management of radiation-induced complete upper esophageal obstruction with an antegrade-retrograde rendezvous technique. *Gastrointest Endosc.* 2006;64:822-8.
6. Lew RJ, Kochman ML. A review of endoscopic methods of esophageal dilation. *J Clin Gastroenterol.* 2002;35:117-26.
7. Boregowda U, Goyal H, Mann R, et al. Endoscopic management of benign recalcitrant esophageal strictures. *Ann Gastroenterol.* 2021;34:287-299.
8. Agarwalla A, Small AJ, Mendelson AH, et al. Risk of recurrent or refractory strictures and outcome of endoscopic dilation for radiation-induced esophageal strictures. *Surg Endosc.* 2015;29:1903-12.
9. Tuna Y, Koçak E, Dinçer D, et al. Factors affecting the success of endoscopic bougie dilatation of radiation-induced esophageal stricture. *Dig Dis Sci.* 2012;57:424-8.
10. Choi CW, Kang DH, Kim HW, et al. Clinical Outcomes of Dilation Therapy for Anastomotic Esophageal Stricture. *Korean J Gastroenterol.* 2017;69:102-108.
11. Wong V, Manoharan A, Panchal D, et al. Unique Case of a Refractory Esophageal Peptic Stricture in an Uncontrolled Diabetic. *Cureus.* 2022;14:e30236.
12. Ayyıldız T, Nak GS, Nizamoglu A, vd . Özefagus benign darlıklarına yönelik yapılan dilatasyon işlem verilerimiz ve literatürün gözden geçirilmesi. *Uludağ üniversitesi tıp fakültesi dergisi.* 2012;38:135-138.
13. Gambardella C, Allaria A, Siciliano G, et al. Recurrent esophageal stricture from previous caustic ingestion treated with 40-year self-dilation: case report and review of literature. *BMC Gastroenterol.* 2018 May 22;18:68.
14. Francis Modeste OS, Thiombiano K, Damba JJ, et al. Caustic oesophageal stricture treated by instrumental dilation: A review of 6 years of practice at the pediatric university hospital charles de gaulle of Ouagadougou. *Afr J Paediatr Surg.* 2023;20:116-119.