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Endoscopic Procedures for Upper Gastrointestinal Tract Lesions and a Brief Review of Literature

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ABSTRACT

Introduction: We evaluated the efficacy, safety, short- and long-term results of balloon, bougie dilatations and self-expandable metallic stent (SEMS) procedures in benign and malignant obstruction of upper gastrointestinal tract (UGIT) in the last 6 years of the tertiary referral center.

Methods: This study is a retrospective review of all patients who underwent bougie, balloon dilatation and SEMS procedures because of benign or malignant lesions of UGIT from January 2014 to 2020 in a tertiar referral center. The demographics of patients, indications, technical and clinical success, complications and surveillance records were collected from the hospital database system.

Results: In the last 6 years, a total of 530 procedures, including 209 SEMS (152 SEMS placement, 57 SEMS removal), 297 bougie dilatation (Savary-Gilliard), 20 balloon dilatation and 4 percutan endoscopic gastrostomy procedures, were performed for 140 patients in our clinic. Eighty-nine patients were male and 51 patients were female and the median age of the patients was 59.6 years. The technical success rate with SEMS was 98% and the clinical success rate was 93.5% when it was provided for oral intake and purpose. The complication rate was 12% (n=64), immediate and early complication rates were 7.16% (n=38), and the late complication rate was 4.9% (n=26).

Conclusion: Serial dilatation with a balloon or bougie and SEMS can be successfully applied to UGIT fistulas and strictures without increasing complication rates.

Keywords: Endoscopic balloon and bougie dilatation, self-expandable metallic stent, upper gastrointestinal strictures

Introduction

Obstructions due to benign or malignant lesions or external compression of upper gastrointestinal tract (UGIT) cause symptoms such as nausea, vomiting, difficulty in swallowing, impaired oral intake and weight loss (1). Bougie or balloon dilation and self-expandable metallic stent (SEMS) procedures are used to remain the luminal patency for due to a carcinoma which narrows and completely obstructs the UGIT directly or externally. They are also used in benign conditions such as gastroesophageal reflux disease, peptic injury, esophageal webs, radiation damage, caustic injury and anastomotic stricture. Ingestion of caustic material or postoperative cicatrization or stricture of the esophagus and stomach are difficult complications to treat (2).

Endoscopic balloon and bougie dilatations are the gold standard treatment options used in peptic esophageal strictures (3). Although there is no difference between the two techniques in terms of success, recurrence and complication rates, 40% of patients require recurrent dilatations due to recurrence symptoms and dysphagia (4-6).

Endoscopic balloon dilation is a minimally invasive procedure with reliable, short- and long-term results and acceptable complication rates, particularly in caustic injury and chron-induced UGIT strictures (7,8). Perforation rates have been reported to be up to 0.4% due to recurrent dilatations (9). Therefore, stents are also used for iatrogenic perforations due to endoscopic procedures or for the purpose of bridging up for patients who are planned for palliative or definitive surgery, in cases such as trachea-esophageal fistula (TEF) and gastrointestinal fistula after RT or surgery and achievement of hemostasis in refractory variceal bleeding (10). Although surgical procedures have serious complications, such as wound infection, bleeding, anastomotic leakage, and dumping syndrome, it should be performed if the repeated stenting and dilatation fail (11-14). Despite the advantages of stents, this procedure has some disadvantages such as stent obstructions, bleeding, pain, fistulas, or stent-related complications (15). In the esophageal cancer group, up to %50 of patients have advanced stages and the SEMS is a reliable alternative to surgical procedures, such as feeding gastrostomy, jejunostomy, by-pass surgery. Endoscopic or oncological procedures such as balloon or bougie dilatation, chemoradiotherapy, ethanol injection, brachytherapy,

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endoluminal laser ablation and photodynamic therapy also used for palliative purposes (16-18).

This study aimed to evaluate the efficacy, safety, technical and clinical success with short- and long-term results of our experience with patients who have been successfully treated with balloon and bougie dilatations and SEMS procedures for the benign and malignant scatrization, stricture and fistula for UGIT considering current literature.

Methods

This study is a retrospective review of all patients who underwent bougie and balloon dilatation and SEMS procedures because of benign or malignant lesions of UGIT at a referral center from January 2014 to 2020. The demographics of patients, indications, technical and clinical success, complications, and surveillance records were collected from the hospital database system.

Technical success was defined as successful dilation of the stenosis, placement of the stent in the correct position for the purpose, and successful passage of the endoscope through the stenosis. Clinical success was defined as providing of the short- and long-term passage, closure of the fistula tract, and oral intake of the patient. In the long term, passage and stent patency were evaluated in patients who underwent stenting and dilatation. Complications were defined as perforation, bleeding and stent migration.

Dilatation or type of stent, width, length were chosen on the basis of preoperative clinical, radiologic, fluoroscopic, or endoscopic findings. Dilatation was performed initially by Savary-Gilliard 7 to 9 mm dilators over a guidewire and if necessary, the stent was deployed through the guidewire under the control of endoscopy or fluoroscopy. Stent positioning was confirmed by an endoscope or X-ray after deployment.

Covered stents were used for benign strictures or fistulas and were removed at the end of the 6th week and non-covered stents were used under benign conditions and removed after 4th week in accordance of instutional policy. The degree of dysphagia and clinical success was evaluated by Cowling's scoring system before and after the procedure (Table 1) (19). Oral intake was initiated according to the patient's tolerance, within the first 24 hours with liquids and then progression to semisolid.

Complications such as perforation bleeding and stent migration during the procedure are described as procedural, complications seen in the first 24 hours were defined as immediate, complications seen in the first 72 hours were defined as early and complications seen after 72 hours, such as food impaction, migration, perforation, stent-related fistula have defined as late complications (20,21).

The local ethical committee approval was obtained from University of Health Sciences Turkey, İstanbul Training and Research Hospital (approval number: 2640, date: 25.12.2020). Well written detailed informed consent was obtained from all patients included in this study. Data were collected from a hospital database system under the control of administration. Funding This study was conducted according to with the Declaration of Helsinki.

Statistical Analysis

Descriptive statistical methods, such as mean ± standard deviation and/or median (minimum-maximum) and frequency and percentage, were used for data evaluation. The statistical analysis was performed using the Statistical Package for Social Sciences (SPSS®) software package for Windows, version 17.0 (SPSS Inc. Chicago, Illinois, USA).

Results

In the last 6 years, a total of 530 procedures were performed, including 209 SEMS (152 SEMS placement, 57 SEMS removal), 297 bougie dilatation (Savary-Gilliard), 20 balloon dilatation and 4 percutan endoscopic gastrostomy (PEG) procedures in 140 patients. Eighty-nine patients were male and 51 patients were female and the median age of the patients was 59.6 years.

In our series, 62 patients had esophageal tumors; 83 sessions of bougie dilatation, 4 sessions of balloon dilatation and 69 SEMS placement were performed. 17 sessions of bougie dilatation were performed in 13 patients due to proximal and distal esophageal web.

Fifty-one bougie dilatations and 13 SEMS procedures were performed in a patient with caustic material-related esophagus and gastric injury. Thirty-nine bougie dilatation and 17 SEMS procedures were performed in another patient with HSV esophagitis-induced stricture and TEF.

Five times balloon dilatations were performed in 4 patients for achalasia. Three times balloon dilatations were performed in 2 patients with stenosis following Nissen fundoplication.

There were 22 patients who underwent surgery and/or radiotherapy (RT) for hypofarenx and larynx cancer and 4 patients with RT-related stenosis. 73 bougie dilatation and 27 SEMS were performed in these cases.

Eleven patients underwent 11 SEMS procedures, 10 bougie dilatations and 1 PEG procedure due to the lung cancer related mediastinal invasion, esophageal compression and TEF.

Thirteen patients who underwent surgery for gastric cancer and gastric localized gastro-intestinal stromal tumor developed stricture of esophago-jejunostomy anastomosis and 3 of them, which considered inoperable, underwent 12 dilatation and 14 SEMS procedures. Eight balloon dilatations were performed in 6 patients due to pyloric stenosis and duodenal apical stenosis.

Stenting and dilation procedures failed in 8 patients (5.8%). When cowling dysphagia score was compared with pre- and post procedure, 3 patients receiving RT to the cervical region and 1 patient receiving RT due to lung tumor were achieved to feed with bougie dilatation followed

Table 1. Cowling dysphagia scores

Score	Oral intake	Before the procedure (n)	After the procedure (n)
0	Able to normal diet	25	136
1	Semi-solid only	10	0
2	Liquid diet only	37	0
3	Complete dysphagia	68	64

by PEG procedure. Demographic information of the patients and interventions for lesions are summarized in (Table 2, 3). Complications are summarized in (Table 4).

In 3 patients, the stent could not be placed where it should be, and the procedure was repeated and the stent was properly placed. The technical success rate of passage through SEMS was 149 out of 152 (98%). The clinical success rate was 93.5% when oral intake and purposeful oriented were examined.

Balloon dilatation failed in 5 patients with duodenal apical stenosis and pyloric stenosis and these patients underwent surgery. Overgrowft developed in 9 patients on average 232.5 days. In 3 patients ingrowft developed and re-stenting procedure was performed.

Discussion

Endoscopic interventions such as balloon or bougie dilatation are recommended for treating benign peptic structures (3). SEMS is generally recommended for palliative or definitive purposes in benign conditions and patients with short life expectancy and when recurrent dilatation failures (22,23).

In our previous series, the overall complication rate was 26% (n=19), the immediate and early complication rates were 9.6% (n=7), and the late complication rate was 16.4% (n=12) (24). In this series, the overall complication rate was 12% (n=64), the immediate and early complication rates were 7.16% (n=38), and the late term complication rate was 4.9% (n=26). When these results are compared, we have seen that despite the increasing number of complicated procedures, our complication rates have decreased considerably with increased experience in the last 2 years.

Seventeen SEMS and 39 bougie dilatations were performed in the patient with HSV-induced esophagitis and 13 SEMS procedures were successfully performed in the patient with caustic material-induced injury.

These two patients had been followed up for 5 years because they did not want surgery and bougie dilatation was performed at intervals of 3-4 weeks and treatment was continued with intermittent SEMS procedures if it failed or needed. Our experience with these two patients; No matter how difficult the strictures, multiple SEMS and bougie dilatations can be used multiple times and persistently without increasing complications in the treatment of benign strictures.

Table 2. Esophageal lesions

Pathology	Operability		Stent placement (n)	Stent removal (n)	Balloon dilatation (n)	Perfo-ration (n)	Over-growft (n)	Mig-ration (n)	Mal-position (n)	Failure (n)	Bleeding (n)	HGAS (n)	EJAS (n)	TEF (n)	EGF (n)	PEG (n)
	Yes (n)	No (n)														
Hypofarenx cancer	-	2	-	-	3	-	-	-	-	-	-	-	-	-	-	1
Larynx (Ca)	18	2	28	23	64	-	1	3	1	2	-	3	1	4	-	1
Esophageal cancer (cervical)	-	3	1	-	8	1	-	-	-	-	-	-	-	-	-	1
Esophageal cancer (middle)	15	11	28	5	72	-	2	2	-	-	-	9	-	-	1	-
Esophageal cancer (distal)	5	16	28	1	6	-	7	1	-	1	-	1	-	1	-	-
EGJC	1	10	13	-	5	-	1	-	-	-	-	-	-	-	-	-
Lung cancer	-	11	10	2	9	-	-	2	-	-	-	-	-	1	-	1
RT-induced stricture (tyroid Ca)	-	-	-	1	5	-	-	1	-	-	-	-	-	-	-	-
Proximal esophageal web	-	-	-	-	14	-	-	-	-	-	-	-	-	-	-	-
Schatzki's ring	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-
Achalasia	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-
Nissen fundoplication stricture	1	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
Caustic injury	-	1	13	11	51	-	-	-	-	-	-	-	-	1	-	-
HSV Esophagitis	-	1	17	13	39	-	-	-	-	-	-	-	-	1	-	-

*EGJC: Esophago-gastric junction cancer, HGAS: Hypopharingo-gastostomy anastomosis stricture, TEF: Tracheo-esophageal fistula, EJAS: Esophago-jejunostomy anastomosis stricture, EGF: Esophago-gastrostomy fistula, EJF: Esophago-jejunostomy fistula, PEG: Percutan endoscopic gastrostomy

Table 3. Gastric lesions

Pathology	Operability		Stent placement (n)	Stent removal (n)	Balloon dilatation (n)	Overgrowft (n)	Migration (n)	Malposition (n)	Failure (n)	EJAS (n)	EJF (n)
	Yes (n)	No (n)									
GIST	2	-	1	-	6	-	1	-	-	2	-
Gastric cancer	11	3	13	1	6	1	1	1	-	7	1
Pylor stenosis	-	1	-	1	8	-	-	-	5	-	-

*GIST: Gastrointestinal stromal tumor, EJAS: Esophago-jejunostomy anastomosis stricture, EJF: Esophago-jejunostomy fistula

Table 4. Complications of endoscopic procedures

Complications	Immediate (5.84%) (n)	Early (1.32%) (n)	Late (4.9%) (n)
Perforation	2	-	-
Hemorrhage	15	-	-
Malposition	6	-	-
Migration	-	5	6
Food Impaction	-	-	4
Over/ingrowft	-	-	12
Fistula	-	2	4
Failure	8	-	-
*Retrosternal pain	-	128	-

We have also evaluated esophageal and gastric strictures separately, and we believe that balloon dilatation fails, especially in gastric localized strictures and duodenal apical stenosis and surgical treatment should be performed for these patients.

Caustic induced damage is more difficult to treat than other benign strictures and requires multiple dilatations (25,26). In a study examining the effectiveness of multiple balloon dilatations in caustic induced gastric outlet obstructions, a clinical success rate of 97.3% was reported (27).

In a cohort study examining the results of balloon dilatation in patients with crohn disease-associated upper GIT stricture, multiple use of balloon dilatation to the same stenotic segment was shown to be safe and effective and did not increase the complication rate (28). Although this study was conducted in a specific patient group such as crohn disease, it was shown that multiple dilatations can be successfully performed without increasing the complication rates.

When the partial and full-covered SEMS (FC-SEMS) are compared according to migration rates, it is reported as 36% versus 12% (9,29). The most common complication in our patients was pain that responded to analgesics, especially after stenting and which was reported 16.2% rate in the literature (27).

Iatrogenic esophageal perforations are life-treating complications of endoscopic procedures and FC-SEMS placement and drainage are the treatment option. We encountered 2 cases and one of them was improved with FC-SEMS.

Pharyngo-esophageal strictures (PES) is a frequent cause of dysphagia in head and neck cancer patients. Although the exact prevalence is unknown, several retrospective series estimates that upper cervical stricture is present in 1% to 23% of the cases. The initial approach to PES is endoscopic dilatation, with a reported success rate ranging from 76% to 96% (30,31).

What do our results contribute to the literature? Especially with the experience has obtained from 2 patients, we found that stent and bougie dilatations can be performed in series without major complications in benign strictures and the most successful segments for bougie dilatations are hypopharingo-gastrostomy and gastro-enterostomy anastomosis strictures.

In addition, we demonstrated that multiple stent and dilatation procedures, which we performed especially in 2 patients, could be performed safely in the long term, and were not an alternative to surgery, and were mandatory because of the unwillingness of the patients for surgical treatment. However, these procedures have shown that multiple bougie dilatation and stenting can be performed safely in such patients.

Study Limitations

This study has several limitations that should be acknowledged. First, we didexperienced of intra-lesionar steroid injection, which reported that the success rates were significantly increased when was applied with dilatation, especially in refractory benign strictures and caustic-induced injury (32). Also, we have no experience with the method that sphincterotoms or needle-knife radial incisions combined with balloon dilatation, used for refractory pyloric stenosis (33-35).

Conclusion

Balloon or bougie serial dilatation and self-expendable metallic stent can successfully treat fistulas and strictures without increasing complication rates and can eliminate the need for emergency or definitive surgery.

Ethics Committee Approval: The local ethical committee approval was obtained from University of Health Sciences Turkey, İstanbul Training and Research Hospital (approval number: 2640, date: 25.12.2020).

Informed Consent: Well written detailed informed consent was obtained from all patients included in this study.

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References

1. Didden P, Spaander MC, Bruno MJ, Kuipers EJ. Esophageal stents in malignant and benign disorders. Curr Gastroenterol Rep 2013; 15: 319-20.
2. Contini S, Scarpignato C. Caustic injury of the upper gastrointestinal tract: a comprehensive review. World J Gastroenterol 2013; 19: 3918-30.
3. Sami SS, Haboubi HN, Ang Y, Boger P, Bhandari P, Caestecker J, et al. UK guidelines on oesophageal dilatation in clinical practice. Gut 2018; 67: 1000-23.
4. Buyukkarabacak BY, Taslak SA, Pirzirenli MG, Basoglu A. Recurrent dilatation in resistant benign esophageal strictures: timing is significant. Turk J Med Sci 2016; 46: 79-83.
5. Saeed ZA, Winchester CB, Ferro PS, Michaletz PA, Schwartz JT, Graham DY. Prospective randomized comparison of polyvinyl bougies and through-the-scope balloons for dilation of peptic strictures of the esophagus. Gastrointest Endosc 1995; 41: 189-95.
6. Kabbaj N, Salihoun M, Chaoui Z, Acharki M, Amrani N. Safety and outcome using endoscopic dilatation for benign esophageal stricture without fluoroscopy. World J Gastrointest Pharmacol Ther 2011; 2: 46-9.

7. Bettenworth D, Gustavsson A, Atreja A, Lopez R, Tysk C, van Assche G, et al. A pooled analysis of efficacy, safety, and long-term outcome of endoscopic balloon dilation therapy for patients with stricturing Crohn's disease. Inflamm Bowel Dis 2017; 23: 133-42.
8. Navaneethan U, Lourdusamy V, Njei B, Shen B. Endoscopic balloon dilation in the management of strictures in Crohn's disease: a system- atic review and meta-analysis of non-randomized trials. Surg Endosc 2016; 30: 5434-43.
9. van Boeckel PG, Siersema PD. Refractory esophageal strictures: what to do when dilation fails. Curr Treat Options Gastroenterol 2015; 13: 47-58.
10. Holm AN, de la Mora Levy JG, Gostout CJ, Topazian MD, Baron TH. Self-expanding plastic stents in treatment of benignesophageal conditions. Gastrointest Endosc 2008; 67: 20-5.
11. Tseng YL, Wu MH, Lin MY, Lai WW. Early surgical correction for isolated gastric stricture following acid corrosion injury. Dig Surg 2002; 19: 276-80.
12. Gupta V, Wig JD, Kochhar R, Sinka SK, Nagi B, Doley RP, et al. Surgical management of gastric cicatrisation resulting from corrosive ingestion. Int J Surg 2009; 7: 257-61.
13. Ray D, Chattopadhyay G. Surgical management of gastric outlet obstruction due to corrosive injury. Indian J Surg 2015; 77: 662-5.
14. Kluger Y, Ishay OB, Sartelli M, Katz A, Ansaloni L, Gomez CA, et al. Caustic ingestion management: world society of emergency surgery preliminary survey of ezpert opnion. World J Emerg Surg 2015; 10: 48-50.
15. Kang HW, Kim SG. Upper gastrointestinal stent insertion in malignant and benign disorders. Clin Endosc 2015; 48: 187-93.
16. Christie NA, Patel AN, Landreneau RJ. Esophageal palliation--photodynamic therapy/stents/brachytherapy. Surg Clin North Am 2005; 85: 569-82.
17. Simmons DT, Baron TH. Endoluminal palliation. Gastrointest Endosc Clin North Am 2005; 15: 467-84.
18. Luketich JD, Christie NA, Buenaventura PO, Weigel TL, Keenan RJ, Nguyen NT. Endoscopic photodynamic therapy for obstructing esophageal cancer: 77 cases over a 2-year period. Surg Endosc 2000; 14: 653-57.
19. Cowling MG, Hale H, Grundy A. Management of malignant oesophageal obstruction with self-expanding metallic stents. Br J Surg 1998; 85: 264-66.
20. Jee SR, Cho JY, Kim KH, Kim SG, Cho JH. Stent Study Group of the Korean Society of Gastrointestinal Endoscopy. Evidence-based recommendations on upper gastrointestinal tract stenting: a report from the Stent Study Group of the Korean Society of Gastrointestinal Endoscopy. Clin Endosc 2013; 46: 342-54.
21. Moura EGH, Ferreira FC, Cheng S, Moura DT, Sakai P, Zilberstain B. Duodenal stenting for malignant gastric outlet obstruction: prospective study. World J Gastroenterol 2012; 18: 938-43.
22. van Halsema EE, Wong Kee Song LM, Baron TH, Siersema PD, Vleggaar FP, Ginsberg GG, et al. Safety of removal of self-expandable stents after treatment of benign esophageal diseases Gastrointest Endosc 2013; 77: 18-28.
23. Spaander MC, Baron TH, Siersema PD, Fuccio L, Schumacher B, Escorsell À, et al. Esophageal stenting for benign and malignant disease: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline. Endoscopy 2016;48-939-48.
24. Bektaş H, Gürbulak B, Düzköylü Y, Çolak Ş, Gürbulak EK, Çakar E, et al. Clinical Outcomes of Upper Gastrointestinal Stents and Review of Current Literature. JSLS 2017; 21: 00058.
25. Solt J, Bajor J, Szabo M, Horváth OP. Long-term results of balloon catheter dilation for benign gastric outlet stenosis. Endoscopy 2003; 35: 490-5.
26. Maharshi S, Puri AS, Sachdeva S, Kumar A, Dalal A, Gupta M. Aetiological spectrum of benign gastric outlet obstruction in India: new trends. Trop Doct 2016; 46: 186-91.
27. Kochhar R, Malik S, Reddy YR, Mallick B, Dhaka N, Gupta P, et al. Endoscopic balloon dilatation is an effective management strategy for caustic-induced gastric outlet obstruction: a 15-year single center experience. Endosc Int Open 2019; 7: 53-61.
28. Singh A, Agrawal N, Kurada S, Lopez R, Kessler H, Philpott J, et al. Efficacy, Safety, and Long-term Outcome of Serial Endoscopic Balloon Dilation for Upper Gastrointestinal Crohn's Disease-associated Strictures-A Cohort Study. J Crohns Colitis 2017; 11: 1044-51.
29. Hindy P, Hong J, Lam-Tsai Y, Gress FA. Comprehensive review of esophageal stents. Gastroenterol Hepatol 2012; 8: 526-34.
30. Gillespie MB, Day TA, Sharma AK, Brodsky MB, Martin-Harris B. Role of mitomycin in upper digestive tract stricture. Head and Neck 2007; 29: 12-7.
31. Daher P, Riachy E, Georges B, Georges D, Adib M. Topical application of mitomycin C in the treatment of esophageal and tracheobronchial stricture: a report of 2 cases. J Pediatr Surg 2007; 42: 9-11.
32. Randhawa FA, Butt NF, Talat SO, Sabir SH, Qamar MA. Effectiveness of intralesional steroid injections with dilatation in corrosive oesophageal strictures - A Randomized Control Trial. J Pak Med Assoc 2018; 68: 1556-9.
33. Boron B, Gross KR. Successful dilatation of pyloric stricture resistant to balloon dilatation with electrocautery using a sphinctertome. J Clin Gastroenterol 1996; 23: 239-41.
34. Siddappa P, Reddy YR, Gupta P, Gulati A, Gupta V, Sinha SK, et al. Application of a diathermic dilator for negotiating near-total antropyloric strictures. Endoscopy 2016; 48: 365-6.
35. Hagiwara A, Sonoyama Y, Togawa T, Yamasaki J, Sakakura C, Yamagishi H. Combined use of electrosurgical incisions and balloon dilatation for the treatment of refractory postoperative pyloric stenosis. Gastrointest Endosc 2001; 53: 504-8.