ORIGINAL ARTICLE J. Med. Sci. (Peshawar, Print) October 2012, Vol. 20, No. 4: 198-202

OUTCOME OF THROUGH-THE SCOPE (TTS) BALLOON DILATATION FOR BENIGN ESOPHAGEAL STRICTURES

Abbas Khan, Hashmatullah Khan, Muhammad Kamran Hassan, Aamir Ghafoor Khan, Naimatullah Khan, Ahmad Nawaz, Zaffar Saifullah

Department of Gastroenterology, Lady Reading Hospital, Peshawar-Pakistan.

ABSTRACT

Objective: To know the outcome of through-the-scope (TTS) balloon dilatation of benign esophageal strictures.

Material and Methods: This prospective study was carried out at the Gastroenterology Department, Government Post-Graduate Medical Institute, Lady Reading Hospital, Peshawar from January 2011 to June 2012. Patients with dysphagia due to benign esophageal strictures like peptic, caustic rings and webs underwent through-the-scope (TTS) balloon dilatation after an informed consent. Pre and post dilatation dysphagia grade was determined according to Atkinson's score and were compared. A P value of less than 0.05 was considered significant.

Results: A total of 25 cases of benign esophageal strictures were included in the study with a male to female ratio of 1.5:1. Mean age was 20±15 years while mean dysphagia grade before dilatation was 3.4. Most of the strictures were of peptic nature (52%). Only 4 patients (16%) have corrosive strictures. Strictures at the previous gastroesophageal anastomosis were seen in 4 patients (16%). Benign webs & rings were the cause of dysphagia in 2(8%) patients while postradiotherapy strictures were noted in 2 patients. Overall successful dilatation to a luminal size of 15mm was achieved in 88% of patients while dilatation remained unsuccessful in 2 patients. Mean dysphagia score in successfully dilated patients was 1.07 ($p<0.05$). Perforation occurred in one patient (4%). No patient had upper GI bleed.

Conclusion: Endoscopic through the scope balloon dilation is a safe, effective and easy therapy for the management of esophageal strictures.

Key Words: TTS balloon dilatation, Benign esophageal dilatation, Dysphagia, Atkinson's score.

INTRODUCTION

Benign esophageal strictures are a common problem encountered by Gastroenterologists. The most common causes of benign esophageal strictures include peptic injury, Schatzki's ring, esophageal web, radiation injury, caustic injury and anastomotic strictures[1]. Upper endoscopy is the diagnostic procedure of choice for the detection of an esophageal stricture and its underlying cause. Nevertheless, it is mandatory that biopsy samples are taken to confirm whether the stricture is benign or malignant in nature[2].

Most patients with benign esophageal stricture present with dysphagia which interferes with the basic body process of acquiring nutrition. The primary aim of treatment in these patients is to relieve dysphagia and prevent its recurrence with minimal morbidity and mortality, and thus improve their quality of life. The available therapeutic modalities for esophageal strictures are dilatation with bougienage or balloons, endoprosthesis intubation, laser therapy, microwave electrocoagulation therapy and surgery[3].

Dilatation stands as one of the oldest interventions performed for esophageal strictures. Esophageal dilation can be accomplished with tapered dilators or through-the-scope (TTS) hydrostatic inflatable balloons. Recently the balloon dilators of varying sizes, commonly inflated with water or air are being used instead of rigid or mercury filled dilators. Either "through-the-scope" or "endoscope-guided" balloon-dilators are available and these dilators may be inflated either with water or air for dilatation. While conventional push type dilators exerts both axial (mainly) and radial forces to dilate the stricture, the balloon type dilators exerts only radial forces against the stricture site, so that traumatic rupture and perforation are less likely complications of the balloon dilatation[4-6].

Various types of balloons are available to dilate the esophagus. The two main types are Controlled Radial Expansion & Wire Guided Balloon Dilators (CRE TM, Controlled Radial Expansion, Boston Scientific Cork Ltd, Cork, Ireland, and Eclipse® Wire Guided

Address for Correspondence:
Dr. Abbas Khan
Department of Gastroenterology
Lady Reading Hospital,
Peshawar - Pakistan
Contact: 0334-9241540
E-mail: abbaskhan.khattak@yahoo.com

Balloon Dilators Cook Ireland Ltd). The probable complications of balloon dilatation are gastrointestinal bleeding, esophageal perforation, esophageal hematoma and aspiration pneumonia. The aim of this study is to describe our experience using TTS balloon dilators (through-the-scope) in the management of benign esophageal strictures.

MATERIAL AND METHODS

This prospective study was carried out at the Gastroenterology Department of Government Post-graduate Medical Institute, Lady Reading Hospital, Peshawar from January 2011 to June 2012.

All patients presenting with dysphagia underwent a thorough history and physical examination about the onset and grade of dysphagia, history of corrosive substance abuse, radiation exposure and concomitant symptoms like throat pain, dyspnea, heart burn and regurgitation. Patients who were on anticoagulant or antiplatelet agents were excluded from the study. Upper GI endoscopy and biopsy was done to confirm the diagnosis of benign nature of the stricture and patients with malignant strictures were excluded. A barium swallow was done to determine the extent of the stricture. Patient with corrosive stricture were only included if they have stricture length less than 4cm on barium radiography. Dysphagia was graded according to Atkinson's score: grade 0: ability to eat normal diet; grade 1: ability to eat some solid food; grade 2: ability to eat some semisolid food; grade 3: ability to swallow liquids only; and grade 4: complete obstruction.

Technique of TTS dilatation:

After informed consent was obtained, the patient was not allowed to take anything orally for 6 hours before the procedure. The procedure was performed under local anesthetic spray, with intravenous sedation (I/V midazolam 2-4 mg) as and when required. Olympus GiF-140 endoscope was introduced into the esophagus and under direct vision a deflated through-the-scope balloon (Boston Scientific Cork Ltd Endoscopic Polyethylen Balloon Dilation Catheter) was passed through the 2.8 mm biopsy channel of the endoscope and was positioned within the stricture. The balloon was inflated with water and the pressure was monitored to maintain a level of 40 psi for 60 seconds Balloons of increasing diameter were used, varying from 4 mm to 20 mm. This procedure was performed every two weeks until a luminal diameter of 15mm was achieved. After each session, the patient was put on bed rest for 4 hours and was not allowed to eat anything for 6 hours after which a soft diet for 1 day was started. All patients were watched for signs and symptoms of esophageal perforation like chest pain, back pain, shoulder pain, subcutaneous emphysema, epigastric tenderness and tachycardia. X-ray chest was done 6-8 hour after dilatation in all cases. Patients were also put on Omeparazol 40mg + sucralfate 2 g/day. They were then followed up weekly for one month and monthly for two months. At each follow up visit, dysphagia score of each patient was determined according to Atkinson's score as mentioned.

Data was analyzed by SPSS version 10. Outcomes were expressed in terms of rates of successful and unsuccessful dilatation and complications including perforation and bleeding rate. Chi-square test was used for comparison of pre and post dilatations mean dysphagia score. A p-value of <0.05 was considered significant.

RESULTS

A total of 25 cases of benign esophageal strictures were included in the study with a male to female ratio of 1.5:1. Characteristics of the patients are given in Table 1.

Table 1: Baseline characteristics of patients

S. No.	Patient characteristics	No. (%)
1.	Total number of patients	25
	Male	15 (60)
	Female	10 (40)
2.	Mean age (years)	20±15
3.	Mean dysphagia grade (before dilatation)	3.4
4.	Mean length of strictures (cm)	2±1.7
5.	Mean distance from incisors teeth (cm)	30.2±4.57

Most of the strictures were of peptic nature (52%). Only 4 (16%) patients have corrosive strictures because of the exclusion of longer corrosive strictures. Strictures at the previous gastroesophageal anastomosis were seen in 4 (16%) patients. Benign webs & rings were the cause of dysphagia in 2 (8%) patients while post radiotherapy strictures were noted in 2 patients (Figure 1).

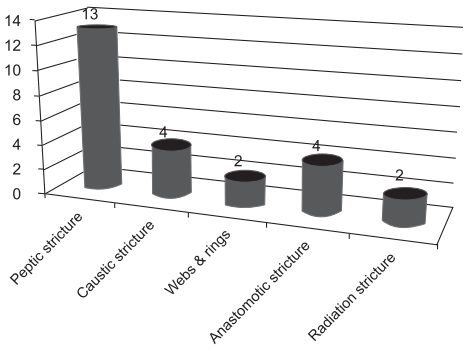

Fig. 1: Etiology of strictures

Overall successful dilatation to a luminal size of 15 mm was achieved in 88% of patients while dilatation remained unsuccessful in 2 patients. Mean dysphagia score in successfully dilated patients were 1.07 ($p<0.05$). Pre and post dilatation score according to Atkinson scoring system for dysphagia were compared using chi-square test and the *p* value was less than 0.05. Perforation occurred in one patient (4%). No patient had upper GI bleed. (Table 2)

Table 2: Outcome of TTS dilatation

Successful dilatation	22 (88%)
Unsuccessful dilatation	2 (8%)
Post dilatation mean Dysphagia score	1.07
Total No. of sessions	95
Average no: of sessions per patient	3.8±1.8
Perforation	1 (4%)
Bleeding	0

DISCUSSION

Through-the-scope balloon dilatation therapy of esophageal strictures was introduced by London et al in 1980 and currently has become the 1st line therapy[7]. As compared to rigid and mercury filled dilators TTS balloons exert only radial force to dilate the stricture. So, traumatic rupture and perforation due to longitudinal stretching is less common with balloon dilation therapy. The probable complications of balloon dilatation are gastrointestinal bleeding, esophageal perforation, esophageal hematoma and aspiration pneumonia[8]. The main disadvantages are that it requires a large channel endoscope and the balloons currently used are relatively fragile and expensive.

Through-the-scope (TTS) inflatable polyethylene balloons are designed to be inflated with a combination of water and radiopaque contrast medium to specified pressure with or without fluoroscopic guidance. Inflation to this pressure expands the balloon to a specified diameter. Constant radial expansion (CRE) balloons expand in a step-wise fashion to multiple diameters (usually three stages at 1- or 1.5-mm increments) depending on the inflation pressure, thus relieving the need for passing multiple balloons. Newer balloons are also more transparent, enabling visualization of the stricture and development of mucosal tears through the balloon as it expands.

Peptic strictures are found commonly as a result of scarring from prolonged gastro esophageal reflux disease[9]. It is the most common cause of stricture in the lower esophagus. Most of the published literature is on the experience of dilatation in peptic strictures as this constitutes the majority of esophageal strictures[10-13]. Two local studies by Khokar et al and Qureshi et al reported peptic strictures in 63.7% and 59.3% of their patients respectively[14,15].

The most common stricture type in our series was also of peptic nature, being found in 52% of patients. 4 of our patients (16%) have strictures due to corrosive injury which is less than that reported by Qureshi et al (59.3%). This is because of the exclusion of patients with longer and tortuous corrosive strictures. Significant number of patients (16%) has strictures at gastroesophageal anastomosis. Local data regarding the frequency and endoscopic management of anastomotic strictures is scarce. Worldwide it is a common complication of esophageal resection[16]. This trend is also reflected in our study due to increased number of esophagectomies performed in our hospital. Other causes included post radiation strictures, webs & rings.

Majority of the strictures (88%) were successfully dilated to luminal size of 15mm. Dilatation was unsuccessful in only two patients. In successfully dilated patients mean dysphagia score significantly improved from 3.4 (pre-dilatation) to 1.07 (post-dilatation) ($p<0.05$). Although local data regarding the efficacy of balloon dilatation in benign esophageal strictures is lacking, our results are comparable to international data in terms of success rate[17-22].

The most serious complication of esophageal dilatation is perforation. Perforation after esophageal dilation usually occurs at the site of the stricture. The perforation rate for esophageal strictures after dilation has been reported to range from 0.1% to 0.4%[22-30]. Although improved outcomes have been reported with the use of antibiotics and better nutritional support and postoperative care, the management of patients with esophageal rupture remains problematic and is associated with high morbidity and mortality. Surgical repair has been the traditional treatment of esophageal perforation and should be commenced soon after diagnosis because of the high mortality associated with esophageal perforation. In our study, only one patient (4%) had a transmural esophageal perforation which was managed surgically in cardiothoracic department. The perforation rate of 4% seems higher as compared to the world literature due to small sample size. Gastrointestinal bleed is another complication associated with TTS dilatation[31-34], which may be difficult to control, especially in patients with coagulopathies or with portal hypertension. None of our patients had any significant bleed.

CONCLUSION

In our experience endoscopic through-the-scope balloon dilatation is a safe, effective and easy therapy for the management of esophageal strictures. Therefore, balloon dilatation must be tried before

embarking upon surgical intervention like esophagectomy.

REFERENCES

1. 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(6): 46-49.
2. Siersema PD. Treatment options for esophageal strictures. Nat Clin Pract Gastroenterol Hepatol 2008; 5: 142-52.
3. Lieberman DA, Keeffe EB: Dilation of benign esophageal strictures. Advanced Therapeutic Endoscopy. New York: Raven Press. 1990.
4. Kozarek R: Hydrostatic balloon dilation of gastrointestinal stenosis. Gastrointest Endosc 1986; 32: 15-19.
5. Lindor KD, Ott BJ, Hughes RW: Balloon dilation of upper digestive tract strictures. J Gastroenterol. 1985; 89: 545-48.
6. Patterson DJ, Graham DY, Smith JL, et al: Natural history of benign esophageal stricture treated by dilatation. J Gastroenterol. 1983; 85: 346-50.
7. London RL, Trotman BW, Dimarino AJ et al: Dilation of severe esophageal strictures by an inflatable balloon catheter. J Gastroenterol. 1981; 80: 173-75.
8. Hernandez LJ, Jacobson JW, Harris MS. Comparison among the perforation rates of Maloney, balloon, and Savary dilation of esophageal strictures. Gastrointest Endosc 2000; 51: 460-62.
9. Marks RD, Richter JE. Peptic strictures of the esophagus. Am J Gastroenterol 1993; 88: 1160-73.
10. Andreollo NA, Lopes LR, Inogutti R, Brandalise NA, Leonardi LS. Conservative treatment of benign esophageal strictures using dilation. Analysis of 500 cases. Rev Assoc Med Bras 2001; 47: 236-43.
11. Drábek J, Keil R, Námesný I. The endoscopic treatment of benign esophageal strictures by balloon dilatation. Dis Esophagus 1999; 12: 28-29.
12. Piotet E, Escher A, Monnier P. Esophageal and pharyngeal strictures: report on 1,862 endoscopic dilatations using the Savary-Gilliard technique. Eur Arch Otorhinolaryngol 2008; 265: 357-64.
13. Spechler SJ. AGA technical review on treatment of patients with dysphagia caused by benign disorders of the distal esophagus. Gastroenterology 1999; 117: 233-54.
14. Khokar N, Gill ML, Khan MM. Endoscopic dilation of esophageal strictures. J Coll Physicians Surg Pak 2003; 13: 555-57.
15. Qureshi S, Ghazanfar S, Leghari A, Tariq F, Niaz SK, Quraishy MS. Benign esophageal strictures: Behaviour, pattern and response to dilatation. JPMA 2010; 60: 656.
16. Barthel JS, Kelly ST, Klapman JB. Management of persistent gastroesophageal anastomotic strictures with removable self-expandable polyester silicon-covered (Polyflex) stents: an alternative to serial dilation. Gastrointest Endosc 2008 Mar; 67: 546-52.
17. Ahlawat SK, Al-Kawas FH. Endoscopic management of upper esophageal strictures after treatment of head and neck malignancy. Gastrointest Endosc. 2008 Jul; 68(1): 19-24. Epub 2008 Mar 19.
18. Lisý J, Hetková M, Snajdauf J, Vyhnánek M, Tùma S. Long-term outcomes of balloon dilation of esophageal strictures in children. Acad Radiol. 1998 Dec; 5(12): 832-35.
19. Ikeya T, Ohwada S, Ogawa T, Tanahashi Y, Takeyoshi I, Koyama T, Morishita Y. Endoscopic balloon dilation for benign esophageal anastomotic stricture: factors influencing its effectiveness. Hepatogastroenterology. 1999 Mar-Apr; 46(26): 959-66.
20. Chiu YC, Hsu CC, Chiu KW, Chuah SK, Changchien CS, Wu KL, Chou YP. Factors influencing clinical applications of endoscopic balloon dilation for benign esophageal strictures. Endoscopy. 2004 Jul; 36(7): 595-600.
21. Kim JH, Song HY, Kim HC, Shin JH, Kim KR, Park SW, Jung HY, Lee GH, Park SI. Corrosive esophageal strictures: long-term effectiveness of balloon dilation in 117 patients. J Vasc Interv Radiol. 2008 May; 19(5): 736-41. Epub 2008 Mar 17.
22. Wang C, Wang CL, Chen CX. Four-year experience in the treatment of upper gastrointestinal strictures with balloon dilatation. Chin Med J (Engl). 1991; 104(2): 114-18.
23. Allmendinger N, Hallisey MJ, Markowitz SK, Hight D, Weiss R, McGowan G. Balloon dilation of esophageal strictures in children. J Pediatr Surg. 1996; 31: 334-36.
24. Hegedüs V, Poulsen PE. Balloon dilatation of alimentary tract strictures. Acta Radiol Diagn (Stockh). 1986 Nov-Dec; 27(6): 681-86.
25. de Lange EE, Shaffer HA Jr. Anastomotic strictures of the upper gastrointestinal tract: results of balloon dilation. Radiology.1988; 167: 45-50.
26. Chen PC. Endoscopic balloon dilation of esophageal strictures following surgical anastomoses, endoscopic variceal sclerotherapy, and corrosive ingestion. Gastrointest Endosc.1992; 38(5): 586-89.
27. Kim CG, Choi IJ, Lee JY, Cho SJ, Lee JH, Ryu KW, Park SR, Bae JM, Kim YW. Effective diameter of balloon dilation for benign esophagojejunal anastomotic stricture after total gastrectomy. Surg Endosc. 2009 Aug; 23(8): 1775-80. Epub 2008 Dec 6.

28. Kim IO, Yeon KM, Kim WS, Park KW, Kim JH, Han MC. Perforation complicating balloon dilation of esophageal strictures in infants and children. Radiology. 1993 Dec; 189(3): 741-44.

29. Fan Y, Song HY, Kim JH, Park JH, Ponnuswamy I, Jung HY, Kim YH. Fluoroscopically guided balloon dilation of benign esophageal strictures: incidence of esophageal rupture and its management in 589 patients. Am J Roentgenol. 2011 Dec; 197(6): 1481-86.

30. Karnak I, Tanyel FC, Büyükpamukçu N, Hiçsönmez A. Esophageal perforations encountered during the dilation of caustic esophageal strictures. J Cardiovasc Surg 1998; 39: 373-77.

31. Xinopoulos D, Kypreos D, Bassioukas SP, Korkolis D, Mavridis K, Scorilas A et al. Comparative study of balloon and metal olive dilators for endoscopic management of benign anastomotic rectal strictures: clinical and cost-effectiveness outcomes. Surg Endosc. 2011; 25: 756-63.

32. Hanna SC, Jackson C, Rendon S. Laparoscopic Roux-en-Y gastric bypass complicated by a mesocolic jejunal stricture successfully treated with endoscopic TTS balloon dilation. Obes Surg. 2010; 20: 1734-36.

33. Ukleja A, Afonso BB, Pimentel R, Szomstein S, Rosenthal R. Outcome of endoscopic balloon dilation of strictures after laparoscopic gastric bypass. Surg Endosc. 2008 Aug; 22(8): 1746-50. Epub 2008 Mar 18.

34. Kochhar R and Kochhar S. Endoscopic balloon dilation for benign gastric outlet obstruction in adults. World J Gastrointest Endosc. 2010 January 16; 2(1): 29-35.