Balloon Dilatation of Oesophageal Stricture: a King Abdulaziz University Hospital Experience

MOHAMED M. RAWAS, FRCP(C)
Department of Radiology, Faculty of Medicine & Allied Sciences, King Abdulaziz University, Jeddah, Saudi Arabia

ABSTRACT. Fluoroscopic guided balloon dilatation of the oesophageal stricture is a known, easy, applicable, and effective technique. We performed the procedure on 45 patients of different age groups. Dysphagia has disappeared in 7/9 achalasia patients and 6/12 distal post-operative stricture patients. Good responses were encountered in 3/3 peptic oesophagitis patients. Single or repeated dilatations with good responses was noted in 5/6 patients' post atrasia operations. Repeated dilatations of corrosive oesophagus patients pre- and post-operation showed disappearance of dysphagia in 4/8. The procedure helped 3/4 patients with post-gastroplasty to tolerate small meals. No significant morbidities and no mortalities were encountered.

Keywords: Oesphagus, Dilatation, Ballon, Strictures.

Introduction

Dysphagia is difficulty in swallowing which can be produced by the narrowing of the lumen by a tumour or inflammation. Narrowing of the lumen of the oesophagus resulting in dysphagia is named an "oesophageal stricture" and this can be examined radiologically or endoscopically.

Mild dysphagia denotes that the patient can swallow a semi-solid or fluid diet. Other stages of dysphagia include patients who cannot swallow or who can swallow a liquid diet only. Reduced dysphagia means regression of symptoms of dysphagia to a lesser

Correspondence & reprint requests to: Dr. Mohamed M. Rawas,
P.O. Box 80215, Jeddah 21589, Saudi Arabia.
Accepted for publication: 2 June 1998. Received: 15 March 1998.

degree according to the following stages of increasing severity: 1) can swallow a normal diet, 2) can swallow a semi-solid diet, 3) can swallow a liquid diet only, and 4) complete obstruction.

Disappearance of dysphagia denotes that the patient is swallowing a normal solid and fluid diet.

The aim of this present study was to assess balloon dilatation of the oesophageal stricture, the prevalence of dysphagia among patients of King Abdulaziz University (KAU) and to investigate the possible related risk factors.

Materials and Methods

Over a 10-year period from1987 to 1997, we have performed balloon oesophageal stricture dilatations under fluoroscopic guidance. The total number of dilatations have been 136 dilatations in 68 sessions for 45 patients. The ages ranged from 7 months to 90 years. There were 25 males and 20 females. There were 18 post-operative strictures, 10 achalasias, 6 post-corrosives, 4 post-gastroplasty, 3 peptic, and 4 malignant strictures.

In 11 paediatric patients in ages ranging from 7 months to 8 years, the procedure was done under general anaesthesia (GA). One female adult patient had GA. This patient had pharyngio-colonic anastomosis following resection of her oesophagus due to corrosive stricture. The remaining 33 patients had the procedure under sedation of Pethidine (50 mg) and Phenergan (25 mg) IV half- an- hour before the procedure. The diagnosis of stricture etiology was by history, esophagogram, and endoscopy in corrosive, post-operative strictures, post-gastroplasty, and achalasia. Histopathologic diagnosis was done in peptic strictures and carcinoma of the oesophagus. The length of the stricture varied from 2-80 mm and a diameter from 1-9 mm. The site of the strictures are 30 at the distal third, 11 at the middle third, 2 in the neck at colopharyngeal anastomosis, and 1 patient had proximal and distal thirds strictures.

The procedure started by negotiating the stricture under fluoroscopic guidance using a regular 38 straight guide wire (Cook) and a 9F Kefa catheter. An angioplasty balloon (10 mm in diameter) is wedged at the stricture and fully inflated. The oesophageal dilatation balloon (22 mm in diameter) is used to start with or after the angioplasty balloon dilatation, based on the stricture diameter. The oesophageal balloon is fully inflated twice--two minutes each inflation. For paediatric patients, a similar but smaller (15 mm) oesophageal dilatation balloon is used.

A two-balloon method was used (22 + 10 mm) in achalasia patients to over stretch the adynamic segment. The same method was used in the hard annular strictures resistant to oesophageal balloon dilatation. The latter will be fully inflated first, followed by angioplasty balloon inflation. In the last three patients, a microvasive balloon (Meditech), 20 mm in diameter, was used.

The oesophageal carcinoma patients had the dilatation once before endoscopy and palliative laser therapy to recanalize the oesophagus. The rest of the patients had single or repeated sessions of dilatations guided by the patient's tolerance to food. If the patient was unable to swallow a well masticated or pureed diet, another session was performed.

Follow-up was done by regular visits to the referring clinic to assess the degree of dysphagia. A barium swallow or endoscopy was performed accordingly.

Results

One-third of the patients (15) were between a few months and ten years of age. Strictures in this group were either corrosive or following operations for corrosive strictures or atresia (Table 1).

TABLE 1. Number of patients according to the age distribution.

No. of Patients	Age Group (in Years)
15	< 10
4	10 - 20
5	20 - 30
7	30 - 40
5	40 - 50
9	> 50

It can be concluded that most postoperative strictures were annular at the distal oesophagus (Table 2). These were found to follow hiatal hernia, achalasia, and sugura operations. Cases with tight stomas are annular narrowing post-ventral bandet gastroplasty operations. Most corrosive strictures were tubular at the middle of the oesophagus.

Most strictures, both annular (in 20 patients) and tubular (in seven patients) were dilated once. A 10 mm angioplasty balloon and a 22 mm oesophageal balloon (Cook) were effectively used (Table 3). A microvasive oesophageal balloon Rigiflex (Meditech) was used in some patients.

Single dilatation was effective in 9/10 patients with achalasia. Dysphagia disappeared in seven and was reduced in two (Table 4). This was the follow-up of results 6 months after dilatation (Table 5). Repeated dilatations were needed in 1 patient with achalasia whose dysphagia disappeared after the third dilatation and had no dysphagia 5 months later.

Strictures consequent to reflux oesophagitis were encountered in 3 patients. Dis-

appearance of dysphagia was observed in two patients after single dilatation and follow-up 9-12 months later (Tables 4 and 5).

TABLE 2. Distribution of types and sites of oesophageal stricture in relation to etiology.

Etiology of Stricture	Types		Site		
	Annular	Tubular	Proximal	Middle	Distal
Postoperative	19	3	2	5	15
Reflux	--	3	--	--	3
Achalasia	10	--	--	--	10
Corrosive	--	6	2	4	--
Malignant	1	3	--	2	2

TABLE 3. Frequency of dilatations in relation to the type of stricture.

Type of Stricture	Single Dilatation	Repeated Dilatations
Annular	20	10
Tubular	7	8

TABLE 4. Correlation between the etiology of stricture and response to dilatation whether single or re-

Etiology of Stricture	Total No.	Response after Single BD			Response after Repeated BD		
		No.	Reduced Dysphagia	Disapp. Dysphagia	No.	Reduced Dysphagia	Disapp. Dysphagia
Achalasia	10	9	2	7	1	--	1
Reflux	3	3	1	7	2	--	--
Post-op at distal osophagus	12	7	1	6	5	3	2
Post-op (atresia)	6	2	--	2	4	1	3
Corrosive	5	--	--	--	5	3	2
Anastomotic	3	-	--	-	3	1	2

N.B. Six cases had special features and these will be discussed separately.

TABLE 5. Follow-up of patients after single balloon dilatation responding with disappeared dysphagia.

Etiology of Stricture	3 - 6 Mos.	6 - 9 Mos.	9 - 12 Mos.	Up to 2 Yrs.	Up to 3 Yrs.
Achalasia	7	--	--	--	--
Reflux	7	--	--	--	--
Post-op (distal oesophageal)	4	1	--	1	--
Post-op (atresia)	--	1	--	--	1

On the contrary, strictures due to corrosive (five patients) needed repeated dilatations (Table 4). Dysphagia disappeared in two patients after three dilatations one to two months apart, and only reduced in another two patients. The last patient continued to complain of dysphagia to solids for two years after which endoscopic dilatation was tried.

Six out of twelve patients with strictures following distal oesophageal surgery improved on single dilatation (Table 4) in a follow-up period of 6-12 months (Table 5). One patient improved partially and presented with reduced dysphagia. In 5/12 patients, repeated dilatations were performed. Dysphagia was reduced in three and had endoscopic dilatations which were tried frequently.

Three patients with anastomotic strictures following operations for corrosive strictures had balloon dilatation repeatedly (Table 4). Dysphagia was improved in two and proved to be due to a muscular ring in one patient who was reoperated on.

Two out of six patients with strictures developing after operations for oesophageal atresia were improved on repeated dilatations. The last patient did not improve after repeated balloon and endoscopic dilatation and thus a second operation was performed.

In cases subjected to both endoscopic and balloon dilatation, the time interval between balloon dilatations were ranging between 3-9 months while the time interval between consequent endoscopic dilatations ranged between 1-2 months.

Four out of forty-five patients had malignant strictures. The dilatation aimed at preparation for laser therapy. One of them was operated upon and developed postoperative stricture which was improved on balloon dilatation for four months. Later on, he complained of mild dysphagia which proved to be due to recurrence.

A pinhole (annular) narrowing at the stoma site in a patient following gastroplasty could not be catheterized. Mechanical dilators were used prior to surgical interference.

A 3-year old baby with corrosive stricture showing multiple long tubular strictures was subjected to dilatation without improvement.

A mucosal tear was encountered in 1 patient with achalasia for whom repeated dilatations were performed. He was treated conservatively and improved.

Discussion

Oesophageal stricture is a disabling problem. In recent years, fluoroscopically-guided balloon dilatation for oesophageal strictures appears to have gained popularity. As reported by many[1,2,3,4,], the procedure is easy, effective, and safe.

Our technique was somewhat similar to that described by McLean *et al*[3]. General

anaesthesia was used in paediatric patients and one adults. Sedation was used for the rest. Balloons were inflated twice for 2 min. each up to 9 atm according to age (children 4-6 atm and adults up to 9 atm). Patients were followed-up the same week, monthly for three months, then every 3-6 months, except for malignant strictures which were dilated prior to laser therapy. We used the transoral route in most cases.

Maynor *et al*[1] used a transnasal route, applied 4-6 atm for 5 min. and repeated the procedure after three days, while Dawson *et al*[2] applied 2-4 atm 3-5 times for 3-4 min. and they repeated the dilatation every three days for 2-3 weeks. According to McLean *et al*[3], the balloon was inflated up to 6 atm for a half minute duration for three settings/week. They used a nasogastric tube to advance the guide wire down to the stricture. This step was not recommended by Song *et al*[4]. They continued dilatations starting with small balloons, proceeding to larger balloons up to 20 mm for adults. They stopped when the pain was intolerable by the patient. Many dilatations were performed by Gallardo *et al*[5] who did 385 dilatations in 115 sessions for 16 patients. Nordshus *et al*[6] performed 47 dilations for seven infants with postoperative strictures.

The general consensus is to inflate the suitable balloon maximally for a short time (a 2-min. average). The procedure is repeatable, guided by the patient's tolerance to food.

Difficulties and complications were sometimes encountered. Post-corrosive long strictures were found technically difficult for dilatation. Maynar *et al*[1] found an increased incidence of perforation in malignant strictures and Dawson and Muller[2] found mucosal tears as well as perforation in post-corrosive strictures. McLean *et al*[3] found dilatation difficult in malignant strictures and also in those where other methods, such as bougies ,were difficult or failed. A 2% failure rate was reported by McLean *et al*[3].

Song *et al*[4] dilated only six of 28 post-corrosive strictures up to 17 mm and indicated that such strictures were difficult, especially long ones. Their studies were associated with 32% rupture. Five patients were treated conservatively and two were operated upon due to deteriorated clinical status (fever and leukocytosis), denoting systemic sepsis and pleural contamination.

Chia *et al*[7] found no difficulties or complications in their series. Nordshus *et al*[6] encountered an episode of cyanosis and respiratory arrest in one patient and two mucosal tears among 47 dilations for seven infants with postoperative strictures following oesophageal atresia. Rowe-Jones *et al*[8] failed to dilate one pharyngeal stricture out of 13.

Kang *et al*[9] claimed that oesophageal dilation, in general, has a high rupture rate when Type I rupture is included. They classified oesophageal rupture into three types: intramural (Type I), transmural (Type II), and mediastinal (Type III). All of their cases were detected immediately in post-procedural water-soluble contrast studies. They found that the Type I oesophageal rupture can cause clinical symptoms as pain and fe-

ver and it was easily treated by parenteral fluid replacement and antibiotics.

De Lange *et al*[10] stated that complications such as tears were uncommon in fluoroscopically-guided balloon dilations, occurring only in 1.5% of procedures and requiring non-surgical conservative treatment in the majority of cases. They could not determine definite risk factors for complications in any of the 859 procedures.

In the series of Sayi *et al*[11], 50% (6/12) of the children with post-corrosive oesophageal strictures died from non-procedural related causes.

Malignant strictures in our series were dilated usually prior to endoscopy and laser therapy; however, restricture due to recurrence after surgical resection was encountered in one patient. Dilatation in such cases was aimed at preparation for a second procedure. In most of our patients, balloon dilatation was effective as dysphagia disappeared following the first dilatation. This was evident, especially in cases of achalasia and strictures following reflux oesophagitis. All of these patients improved after a single balloon dilatation except for one case of achalasia. The latter needed repeated dilatations and was treated conservatively for a mucosal tear with improvement and disappearance of dysphagia.

Strictures following operations at distal oesophageal as sugura operations, hiatal hernia, and reflux oesophagitis, as well as tight gastroplasty stomas, are usually difficult. Only 50% respond well to single balloon dilatation. The rest needed repeated dilatations and the final response in such cases was partially satisfactory. Some showed reduced dysphagia and incomplete improvement. Reduction of dysphagia was an aim for these patients (gastroplasty) in order to accommodate small meals.

Strictures developing after operations for oesophageal atresia behave in a similar pattern and one-third of this group responded well to single balloon dilatation. The rest needed repeated dilatations but showed definite improvement. One showed difficulty and restricture and needed surgery.

Repeated dilatations were required in all cases of corrosive strictures. The response was variable; some 2/5 showed disappeared dysphagia, some 2/5 showed reduced dysphagia, and one had endoscopic dilatation as no improvement on balloon dilatation was elicited.

The same applied for anastomotic strictures following operations for corrosive strictures, as they needed repeated balloon dilatations. There was a patient proved to be due to muscular ring and not a stricture. This was relieved surgically.

It was observed that endoscopic dilatations need to be more frequent if to be repeated within 1-2 month intervals. On the contrary, balloon dilatation when repeated usually widely spaced over more than three months in most cases.

Fluoroscopically-guided balloon dilatation of oesophageal strictures is thus a safe and repeatable procedure. It has become a widely accepted technique in the management of oesophageal stricture with no mortality and very low morbidity. Mucosal tears usually need no surgical intervention. Reflux oesophagitis with peptic strictures respond well to single balloon dilatation in most cases. Postoperative strictures usually show equivocal response and many need repeated dilatations. Restricture is usually encountered in malignant strictures and some postoperative strictures[1,3,7,8]. The postoperative restrictures (proximal or distal) are non-dependent on the location or anatomy (annular or tubular) of the stricture. The procedure technique seems to have no value in predicting possible restrictures[3].

In conclusion, achalasia and peptic oesophagitis strictures respond well to fluoroscopically-guided, single balloon dilatations with disappeared dysphagia. Postoperative strictures whose dysphagia disappeared after single balloon dilatation, are equal in numbers to those after repeated dilatations. Corrosive strictures, both pre- and postoperative, usually need repeated dilatations.

References

[1] **Maynar M, Guerra C, Reyes R, Pulido-Duque JM, Gorriz E, Castaneda-Zuniga WR.** Part 3. Dilatation of oesophageal strictures. In: Castaneda-Zuniga WR, Tadavarthy SM, eds. *Interventional Radiology.* Williams & Wilkins 1992; **2:** 1230-1238.

[2] **Dawson SL, Muller PR.** *Esophageal stricture dilatation in interventional radiology of the abdomen.* Second edition. In: Ferrucci JT, ed. Williams & Wilkins 1983; 429-434.

[3] **McLean GK, Cooper GS, Hartz WH, Burke DR, Meranze SG.** Radiologically guided balloon dilatation of gastrointestinal strictures. Part I: technique and factors influencing procedural success. *Radiology* 1987; **165:** 35-43.

[4] **Song H, Han YM, Kim HN, Kim CS, Choi KC.** Corrosive esophageal strictures: safety and effectiveness of balloon dilation. *Radiology* 1992; **184(2):** 373-378.

[5] **Gallardo LM, Fragoso-Arbelo T, Sagaro-Gonzalez E, Delgado-Marrero B, Larramendi-Rodes O, Borbolla-Busquets E.** Treatment of esophageal stenosis with Savary-Gilliard balloons in children. *G E N* 1995; **49(1):** 15-22.

[6] **Nordshus T, Borthne A, Viddal KO.** Balloon dilatation of post-operative oesophageal stenosis in children. *Tidss Krift for Den Norske Laegeforening* 1994; **114(26):** 3082-3083.

[7] **Chia SJ, Chua CL, Cheong WY, Low CH.** Evaluation of non-surgical treatment of benign oesophageal stricture. *Ann Acad Med Singapore* 1994; **23(5):** 781-784.

[8] **Rowe-Jones JM, George CD, Moor-Gilon V, Grundy A.** Balloon Dilatation of Pharynx. *Clin Otalaryngol* 1993; **18(2)**: 102-107.

[9] **Kang S, Choong-Gu, Song H, Lim MK, Yun H, Goo DE, Sung K.** Oesophageal perforations complicating balloon dilatation of benign and malignant strictures. *RSNA* 1997; 987.

[10] **de Lange EE, Charlottesville VA, Shaffer HA, Zhang X.** Fluoroscopically guided balloon dilation of GI tract strictures: compilations in 859 procedures and identification of potential risk factors. *RSNA* 1997; 986.

[11] **Sayi EN, Mlay SM, Shija JK.** Some observation on acquired oesophageal obstruction in pediatric patients in Tanzania: a 5-year review. *East Afr Med J* 1994; **71(5):** 282-285.

التوسيع بالبالون للضيق المريئي
خبرة مستشفى جامعة الملك عبدالعزيز

محمد محمود رواس

قسم الأشعةالتشخيصية ، كلية الطب والعلوم الطبية ، جامعة الملك عبدالعزيز

جـــدة – المملكة العربية السعودية

المستخلص. توسيع الضيق المريئي بواسطة البالون معروف وفعال. قمنا بإجراء التوسيع على (٤٥ مريضاً) وكانت نتيجة هذه الإجراءات آن اختفت الأعراض بعد التوسيع في: ٧/ ٩ من مرضى ضيق نهاية المريء، و ٦/ ١٢ من مرضى ضيق نهاية المريء بعد الجراحة. وكانت الاستجابة جيدة في ٣/ ٣ من مرضي ضيق المريء بعد عملية الانسداد الخلقي. أدى التوسيع المفرد أو المتكرر إلي نتيجة جيدة في٥/ ٦ من مرضى ضيق المريء بعد عملية الانسداد الخلقي. التوسيع المتعدد أدى إلى اختفاء الأعراض في ٤/ ٨ من مرضي الحرق الكيميائي للمريء. و ساعد التوسيع ٣/ ٤ من مرضي تضييق المعدة في حالات السمنة المفرطة. لم تكن هناك آثار جانبية شديدة ولم تكن هناك وفيات بسبب التوسيع بالبالون.