

## OESOPHAGEAL DILATION OF NON-MALIGNANT STRICTURES USING PNEUMATIC (BALLOON) DILATORS

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### ABSTRACT

**Background:** In contrast to motility and some neuromuscular disorders; the initial presentation of patients with organic strictures of the oesophagus are usually with dysphagia for solid materials rather than liquids. Many congenital or acquired disorders and agents are responsible for stricture formation like reflux oesophagitis, congenital strictures, webs and rings, post-operative, radiation, drugs, etc. Balloon dilation has been widely used nowadays as a selective method for most of the non-malignant strictures.

**Objective:** The objective of this study is to investigate the effectiveness of balloon dilation for treating patients with non-malignant strictures.

**Setting:** Endoscopy unit-Ibn Sena Teaching Hospital.

**Design:** Case series study.

**Patients and method:** Ninety-two dilation procedures have been performed on 16 patients (11 males and 5 females) whose ages ranged between 4–70 years with non-malignant strictures as an outpatient procedure under intravenous sedation and local xylocaine spray. They were referred to endoscopy unit at Ibn Sena teaching hospital during a period from Jan 2011 – Nov 2013. The intention was to dilate all strictures beyond 15 - 20 mm. with gradually increasing balloon diameters.

**Results:** Strictures were due to reflux esophagitis in 8 cases, congenital in 3 cases, Schatzki's ring in 2 cases, anastomotic stenosis in 1 case, unknown in 1 case, and pemphigus in 1 case. The distribution of strictures was as follow; 2 in upper, 2 in middle and 12 in lower thirds. All patients needed several sessions of dilation with an interval of weeks – months depending on length, the severity of stricture and patient's response. All patients were discharged home on the same day after about one hour following the procedure.

No major complications were encountered, however, some minor complications had been observed in 3 patients.

**Conclusion:** The present study addresses that balloon dilation is an effective and relatively safe procedure for non-malignant esophageal strictures.

**Keywords:** balloon dilatation; dysphagia, esophageal stricture.

### INTRODUCTION

**A**dult oesophagus is 25 cm long. It has 3

natural constrictions at 15, 23, and 40 cm from the upper incisor teeth. The first constriction is at area where the oesophagus commences at

the cricopharyngeal sphincter; this is the narrowest portion of the oesophagus, the second where it is crossed by the aortic arch and left main bronchus and the third where it pierces the diaphragm; the lower oesophageal sphincter (LES) is situated at this level (1, 2). The formation of benign strictures of the oesophagus is believed to be caused by the production of fibrous tissue and deposition of collagen stimulated by deep oesophageal ulceration or chronic inflammation (3). The normal inner diameter of oesophagus is 2 -3 cm; diameter < 12 mm is considered critical and sometimes called complex stricture, while stricture of > 12 mm is named simple stricture and it is usually focal and straight (4). Reflux induced strictures still contribute to highest percentage of causes of benign oesophageal strictures which may approach 75%(5), but its incidence has been decreased in a parallel with increasing use of proton pump inhibitors in recent years (6, 7) The remaining causes of stricture (about 25%) are distributed by webs and rings (8) , radiation therapy, congenital, caustic ingestion, anastomotic, reaction to a foreign body or pill, infectious esophagitis, and eosinophilic esophagitis and those following sclerotherapy(9,10,11).

The other category is malignant strictures that may result either from intrinsic luminal tumor growth or from extrinsic oesophageal compression. During the endoscopic evaluation of an oesophageal stricture, biopsy

specimens should be taken to exclude malignancy particularly when this diagnosis is suspected on the basis of clinical presentation or endoscopic appearance (12). Patients with an oesophageal stricture characteristically have dysphagia to solids and generally have no difficulty in swallowing liquids, this is in contrast to those with an oesophageal motility disorder in whom dysphagia for both liquid and solid occurs. Symptoms in the latter group of patients are generally not improved with oesophageal dilation, with achalasia being the most notable exception (13). The etiology of oesophageal stricture can usually be identified using oesophago-gastroduodenoscopy (OGD) and/or barium swallowing imaging but the former is essential for stricture visualization and tissue biopsy (14, 15). Regardless to underlying cause; dysphagia is an indication for oesophageal dilation (16). In patients who have a non-malignant oesophageal stricture a variety of treatment options are available. In most patients, however, through the scope (TTS) balloon or Savary- Gilliard dilation is the treatment of choice, which will restore the ability to eat a normal diet (16).

The aim of this study is to evaluate the effectiveness of pneumatic dilators for treatment of non-malignant oesophageal strictures.

### **PATIENTS AND METHODS**

This is a case series study of 16 consecutive patients (11 males and 5 females) with non-malignant oesophageal strictures who are referred to endoscopy unit in Ibn Sena teaching hospital in Mosul during a period from January 2011 – November 2013. The patient's ages ranged between 4 –70 years. The study cases underwent therapeutic oesophageal balloon dilation.

A short, concentrated history with clinical examination was performed for all patients. Medications that are suspected to increase the chance of bleeding like anti-coagulant drugs were searched for. Additional comorbidities like heart, liver, kidney, blood disease, etc. were also excluded. Patients were presented with dysphagia for solid food as the main initial symptom. Those patients who are suspected or proved to have malignant stricture or achalasia and other motility disorders were excluded from the study. Patients with a history of erosive medication, corrosive agents like strong acids and alkali ingestion were excluded, too. The procedure was performed in the morning following an overnight fasting; formal consent from the patients and/or their families was obtained and the details of oesophageal dilatation and its possible complications, was explained to them prior to the procedure. In the absence of contraindications; the addition of intravenous sedation using "midazolam" with dose adjustments according to patient's age and

weight coupled with local xylocaine spray of mouth and throat were mandatory pre-medications before such procedures. Oesophageal dilation started by using 8-cm long, graded-size pneumatic (balloon) dilator(s) with a guide wire that was introduced through the therapeutic channel of gastroscope (Olympus CV 260) whilst the patient is on left lateral posture. The diameter and degree of balloon inflation were adjusted by a gauge-controlled air pushing. The maximum time of balloon inflation was not exceeded 60 seconds. In some patients, a second or even a third inflation was performed at the same session. In all patients, the mid-portion of the dilator was placed over the stricture. The intention was to dilate all strictures to restore the oesophageal lumen beyond 15 - 20 mm. with gradually increasing balloon diameters; at that degree of dilation the dysphagia is usually resolving. In a single patient, Savary-Gilliard dilators were used too. In all study series, tissue biopsy of the involved area(s) was taken to exclude malignancy. The degree of dilation was checked again after 1-3 weeks of procedure regardless of presence or absence of symptoms and a schedule for future dilations was arranged.

The percentage, frequency, means, standard deviation values were calculated by using "Excel" Microsoft program.

## RESULTS

The mean age was  $38.3 \pm 22.95$  years. Male patients constituted 68.8% compared to 31.2% females.

Table 1 exhibits distribution of study cases by causes of stricture. Half of the patients (50.0%) proved to have gastro-oesophageal reflux disease (GERD). Just less than one-fifth (18.8%) have congenital stricture, 12.5% Schatzki's ring. The rest have pemphigus oesophageal bullae, post-surgical (anastomotic) and unknown causes, (6.2%) each. The average ages were:  $51.3 \pm 9.5$ ,  $4 \pm 1$ ,  $57.5 \pm 17.7$ , 48, 17 and 10 for the mentioned causes respectively.

Table 2 shows the location of the strictures among study cases. Three-quarters (75.0%) were in the lower third and 25% equally distributed in the middle and upper thirds (12.5% for each).

In all, except one, the strictures were single. According to the definition for simple and complex strictures (4); strictures were simple in 15 patients and complex in a single patient with anastomotic type.

Patients were needed repeated sessions of dilations with intervals ranged from 2 weeks - 3 months depending on the cause, the severity, the length of stricture and the patient's response. The sum of dilations performed for all patients was approximate 92 procedures. Nine patients feel an immediate relieve of dysphagia after the procedure, whilst in the

remaining seven patients, a partial relieve was felt.

No major complications were encountered during or following the procedure. Three patients developed minor complications in the form of immediate odynophagia in a single patient, a post-procedure temporary disturbance of consciousness related to the sedation in a second patient and a short term mild bleeding in a third patient (table 3). Patients were discharged home in approximately 1 hour after the procedure. All patients were asked to give their feedbacks whenever the symptoms recur and, in addition, we offered a scheduled continuous follow-up for all patients.

## DISCUSSION

Balloon dilation became a standard method for oesophageal stricture treatment. It was described by many studies to be more convenient, safe, and rapid as well as it is associated with less patient's discomfort (3,17). In comparison with balloon dilators, bougies are associated with higher complication rate as they have a shearing effect on oesophageal mucosa which endangers the normal tissue but otherwise they may be the treatment of choice in certain circumstances (18). Pneumatic balloon technique was introduced in the present study setting in late 2010, although the facility for

using Savary bougies was available since 1990.

In more than two-thirds of study cases (75%) strictures were located in the lower third; a site that is considered a natural anatomical and/or physiological oesophageal restriction. One reason for this distribution is simply because 50% of cases were due to reflux esophagitis of lower oesophagus (5,7). The lower third of oesophagus is also the predilection site for other lesions that cause strictures like Schatzki's rings (8).

As in other countries, gastro-oesophageal reflux disease (GERD) is a common condition in Iraq (19). Strictures due to such a cause founded in 50% of the patients in present study. They needed fewer dilation sessions and have an infrequent recurrence in comparison with strictures due to some other causes; this may be explained to a certain extent by the healing effects of proton pump inhibitors that all patients had been regularly received for an unlimited time following their first dilation. This observation is consistent with two studies by Dunne et al (20) and Guda et al (21) who have shown a dramatic decrease in the number of stricture dilation since the introduction of proton pump inhibitors (PPIs) in the market.

The impact of age in patients with peptic stricture is very clear as most cases of this type of stricture occur in older people, usually over the ages of 60 years for multiple reasons which were clarified in studies of Watson and

Richter (22, 23), although the average age of present study patients with peptic strictures was 51.25 years, which is slightly lower than the average age of this disorder in the mentioned studies.

Mild forms of GERD tend to be more common in women than men, while severe GERD characterized by erosive esophagitis, oesophageal ulcer, stricture or Barrett's metaplasia are far more common in men than women. (24). Six of eight patients with strictures due to GERD in our series were male.

Schatzki rings are relatively common condition in adults which are usually mucosal and submucosal but rarely may be muscular and most of the cases are usually asymptomatic but sometimes they may be responsible for dysphagia and intermediate food impaction. Patients with rings are least likely to recur and were associated with higher successful rate (8).

In the present study, two patients aged 70 and 45 years with Schazki's rings are required balloon dilation technique less frequently than other conditions.

We excluded patients with pill induced dysphagia and the explanation was based on the fact that most cases of drug-induced dysphagia are usually reversible either spontaneously following discontinuation of the offending drugs or using medical therapy. This is also applicable to some other causes like acute infectious conditions e. g.

candidiasis, viral and bacterial infections, eosinophilic esophagitis, corrosive agents including strong acids and alkali; although the latter agents sometimes may heal with fibrous tissue formation causing chronic complex strictures that may need surgical treatment or stenting.

Through the scope (TTS) balloon dilation is not the method of choice for achalasia which was not included in the present series for varieties of reasons including the requirement for larger size, wire-guided radial expansion balloon dilators that are more specific for achalasia, higher perforation rate as dilations beyond 30-40 mm is required(25), significant recurrence rate and sometimes needing for immediate surgical intervention at emergency situation; such emergency facilities may be available in some gastrointestinal centers in Iraq but unfortunately none are available in the present study setting. In addition the introduction of many modern surgical and endoscopic procedures other than balloon dilation for treating achalasia with good results that may make them the better choice in such condition (26, 27).

Cases of malignant strictures which are commonly encountered following the intrinsic oesophageal tumors and rarely the extrinsic tumor compression on the oesophagus were referred for other options of therapy as balloon dilations are hardly successful in such conditions.

Worldwide, the most frequently used method to treat dysphagia caused by oesophageal or gastric cardia cancer is stent placement. Brachytherapy with or without external beam radiation therapy, in addition, the use of chemotherapy (28)

No one of the present study series necessitated surgical interference; all of them had been successfully responded to repeated balloon dilation. This may be clarified by the fact that strictures in 15 patients were described as "simple" in contrast to only one patient with post-anastomotic "complex" stricture.

In general certain drug readjustment policy is needed for those who were already on some medications like anti-coagulant therapy and also antibiotic prophylaxis for some condition like endocarditis prophylaxis in link with the procedure are needed (29). Fortunately such problems were not faced in the present study, as none of the cases were in need for such medications.

Causes of oesophageal strictures other than those mentioned above are either not encountered or not included in the present series for reasons explained previously. We concluded that the pneumatic balloon dilation is an effective, easy to perform and less likely to be associated with major complications. It would be of interest to investigate this fact in future on a larger sample and compare the results with that of bougies technique.

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**الخلاصة:** المرضى المصابون بتضيقات المريء عادة يعانون صعوبة في بلع المواد الصلبة إضافة الى بعض الاعراض المرافقة الاخرى. هناك مسببات كثيرة تؤدي الى حدوث التضيقات منها خلقية ومنها مكتسبة نتيجة لامراض او تناول مواد قلووية، ادوية وغيرها. ان تنظير أعلى الجهاز الهضمي يعتبر من الطرق المفضلة للتشخيص واستخدام الموسعات ولكن لا يزال للفحص الشعاعي دوراً مهماً في التشخيص. ان استخدام الموسعات البالونية من خلال "المنظار المعدي" أصبحت من الطرق الشائعة والمفضلة لمعالجة هذه التضيقات في الوقت الحاضر.

**الهدف:** هو معرفة مدى فعالية الموسعات البالونية في معالجة تضيقات المريء.

**المرضى والطرق:** أجري ما يقارب اثنان وتسعون توسعاً لـ ستة عشر مريضاً اُحيلوا الى وحدة التنظير الداخلي في مستشفى ابن سينا التعليمي في الموصل خلال فترة من كانون ثاني 2011 الى تشرين ثاني 2013. تم توسيع التضيقات باستخدام موسعات البالون باقطار مختلفة عن طريق التاظر بعد الزرق الوريدي للمهدئات واستخدام الزابلوكين الموضعي للفم والبلعوم.

**النتائج:** كانت الاسباب كالآتي: الراجعة المعدية – المريئية، تشوهات خلقية، حلقات شانكيز، مرض الفقاعات، التضيقات الناتجة بعد العمليات الجراحية في المريء والتضيقات الغير معروفة الاسباب في 8، 3، 2، 1، و 1 مريض على التوالي. وزعت التضيقات على الاماكن التالية في المريء: اثنان في الثلث العلوي، اثنان في الثلث الوسطي و اثنا عشر في الثلث السفلي.

استثناءاً لبعض المضاعفات الطفيفة، لم تحصل عقابيل مهمة ما بعد اجراء التوسيع. تم تصريف المرضى الى بيوتهم خلال فترة زمنية لا تتجاوز ساعة واحدة بعد اجراء عملية التوسع المطلوب والتي كانت بحدود 15 – 20 ملم. جميع المرضى احتاجوا الى جلسات توسيع متعددة ولفترات زمنية متفاوتة.

**الاستنتاج:** استنتج من دراسة هذه العينة الصغيرة من المرضى اعلاه بان استخدام موسعات البالون لمعالجة التضيقات الحميدة (الغير السرطانية) فعالة، سهلة الاستخدام وتمتاز بقلة المضاعفات.



Table 1: Causes of esophageal strictures in a study sample.

Causes	No.	%	Gender		Mean age (yr)
			M	F	
Gastro-esophageal reflux disease (GERD)	8	50.0%	6	2	51.3±9.5
Congenital	3	18.8%	3	0	4±1
Schatzki's ring	2	12.5%	1	1	57.5±17.7
Pemphigus oesophageal bullae	1	6.2%	0	1	48
Post-surgical (anastomotic)	1	6.2%	1	0	17
Unknown	1	6.2%	0	1	10

Table 2: The distribution of strictures (site) in oesophagus

SITE	PATIENTS	
	No	%
Lower 1/3	12	75%
Middle 1/3	2	12.5%
Upper 1/3	2	12.5%
Total	16	100%

Table 3: The procedure minor complications in the study series

Causes	Complications	No.	%	Age	Gender
Anastomotic	Mild oesophageal bleeding	1	6.2%	17	M
Congenital	Odynophagia	1	6.2%	10	F
GERD	Post-sedation confusion	1	6.2%	57	M
Total (No. %)		3	18.6%		