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Main Article

Radiological balloon dilatation of post-treatment benign pharyngeal strictures

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Abstract

Aims: To assess the technical success, clinical outcomes and complications of radiologically guided balloon dilatation of benign strictures developing after treatment for head and neck cancer.

Materials and methods: Forty-six balloon dilatations were performed in 20 patients. All dilatations were performed over a guidewire.

Results: Technical success was 100 per cent. Fifteen of the 20 patients demonstrated clinical improvement in dysphagia scores. Improvement in dysphagia was temporary in all patients (median 102 days), with multiple dilatations usually required (total dilatations ranged from one to seven). Immediate complications were encountered in six of the 46 (13 per cent) dilatations and were all minor. Late complications occurred after two procedures (4 per cent): localised perforation (later complicated by secondary infection) and recurrence of a previous, small, pharyngo-cutaneous fistula.

Conclusion: Radiologically guided balloon dilatation is straightforward to perform and is well tolerated, but there is a small risk of perforation. Relief of symptoms is likely to be temporary, requiring multiple subsequent dilatations. A minority of patients will obtain no symptomatic relief.

Key words: Balloon Dilatation; Pharynx

Introduction

Fibrotic pharyngeal strictures are commonly encountered in head and neck cancer patients following treatment, e.g. after laryngectomy or pharyngolaryngectomy, radiotherapy, or chemoradiotherapy.[1,2] Strictures are seen particularly following chemoradiation (which is increasingly used to treat head and neck cancer), with up to 45 per cent of patients experiencing severe dysphagia.[1,3]

Treatment of such strictures has traditionally been by bougie dilatation, which applies a longitudinal shear force in addition to the intended radial force. Balloon dilatation, typically with an angioplasty balloon, has the advantage of applying radial force but with significantly less longitudinal shear force (four to seven times less).[4] There is little published data on the safety and efficacy of radiologically guided balloon dilatation of pharyngeal strictures.[5]

The aim of this study was to review the outcomes of balloon dilatation of benign, post-treatment pharyngeal and neo-pharyngeal strictures, performed in a tertiary referral cancer centre. Technical success, improvement in dysphagia scores and complications were reviewed.

Materials and methods

Patients

A retrospective review was conducted of all 46 dilatations (in 20 patients) which had been performed at the time of writing. All patients had undergone radiologically guided balloon dilatation of pharyngeal strictures at a tertiary referral cancer centre the Christie Hospital NHS Trust. All patients had biopsy-proven, benign, post-therapeutic, fibrotic strictures which had developed following external beam radiotherapy. Eighteen patients had received previous surgical treatment. Nineteen patients had suffered previous squamous cell carcinoma of the mouth, pharynx or tongue, and one patient had suffered previous papillary carcinoma of the thyroid. Eleven of the 20 patients had previously undergone rigid bougie dilatation under general anaesthesia.

Technique

At the beginning of the procedure, Xylocaine spray (Astra Zeneca, Luton, UK) was applied to the pharynx. Intravenous midazolam (Roche, Welwyn Garden City, UK) and fentanyl (Janssen-Cilag, High Wycombe, UK) were administered, initially by clinical assessment, but subsequently under bispectral index electroencephalogram monitoring as per a previously published protocol.[6] A 5 Fr, steerable biliary manipulation catheter was advanced over a stiff hydrophilic guidewire (Terumo, Hasroode, Belgium). Water-soluble, non-ionic, radiopaque contrast (Omnipaque 350, GE Healthcare, Oslo, Norway) was injected through the catheter to delineate the stricture, which

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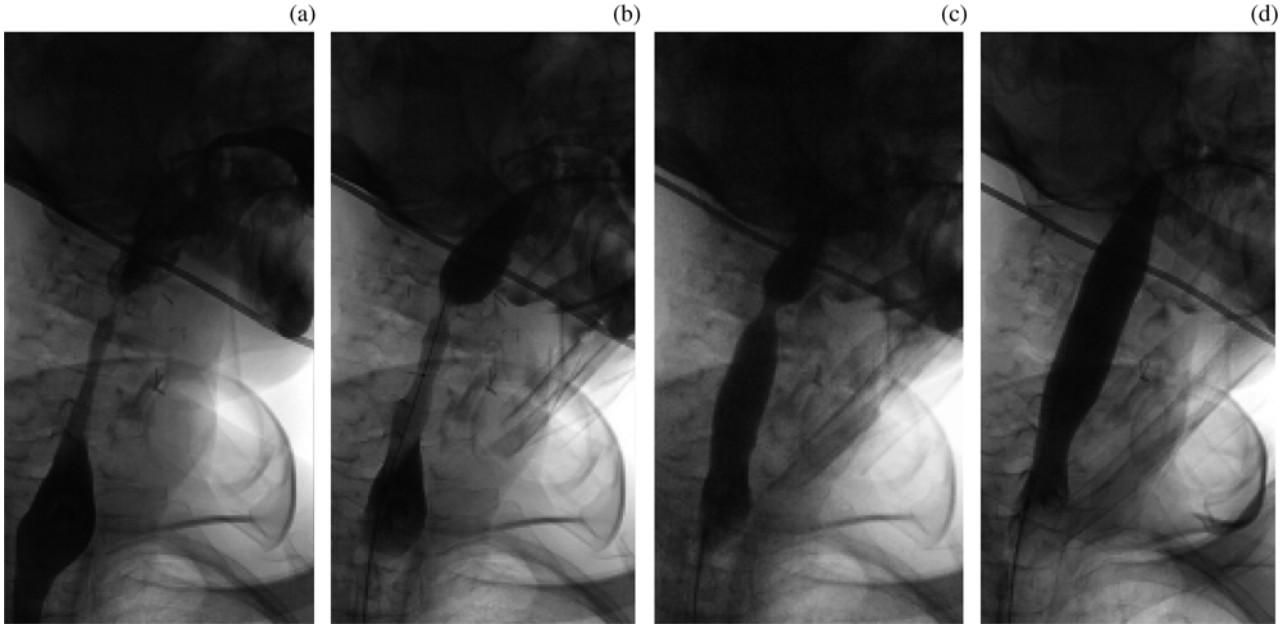

FIG. 1

Contrast swallow study demonstrating (a) a long stenosis which is more focally strictured superiorly. Parts (b), (c) and (d) demonstrate placement of a balloon over a wire and progressive dilatation. Note the 'waisting' of the balloon at the site of the more superior focal stricture.

was marked with a metal paper clip on the skin, unless internal surgical clips or sufficient anatomical landmarks were present. After reinsertion of the stiff guidewire, the catheter was removed and an 18 mm wide, 4 cm long Atlas angioplasty balloon (Boston Scientific, St Albans, UK) was passed and subsequently inflated with a manometer inflator (Figure 1). All procedures were performed by the same operator.

We recorded the number of inflations, maximum pressure and maximal balloon diameter at the level of the stricture, complications, and subsequent clinical improvement. Dysphagia was scored according to the method described by Mellow and Pinkas.[7]

Results and analysis

Clinical improvement in dysphagia was seen in 15 of the 20 (75 per cent) patients. Relief of symptoms was measured from the date of the procedure to the date of relapse back to the pre-dilatation dysphagic state. For those patients showing improvement, the median relief of symptoms was 102 days (range 3 to 600 days). One patient had no relapse of symptoms when reviewed 20 months after the last dilatational treatment, although they had received five dilatations in total. The number of procedures undergone by each patient at our institution ranged from one to seven (mean 2.3). The median pre-dilatation dysphagia score was three (range two to four), improving to a median post-dilatation score of two (range one to four). The technical success of the procedure was 100 per cent (defined as achieving balloon dilatation across the stricture). Follow up ranged from six to 54 months (Table I).

Complications were encountered in eight of the 46 (17 per cent) dilatations (Table II). Early complications were encountered following six of the 46 (13 per cent) dilatations, all in different patients.

TABLE I

PROCEDURAL TECHNIQUE

Parameter	Inflations per procedure (*n*)	Max pressure (atm)	Inflated balloon diameter (mm)
Max	5	10	18
Min	1	1	9
Mean	2.7	5.5	17.2
Median	3	6	18

Max = maximum; min = minimum

These were all minor and self-limiting: pain (two patients), bitten lip (one) and bleeding at the dilatation site (three).

Late complications were seen in two of the 46 (4.3 per cent) dilatations. One patient developed local infection of the neo-pharynx, requiring readmission for intravenous antibiotics. A contrast swallow investigation at this time demonstrated a small, localised perforation (Figure 2). The patient did not develop any improvement in dysphagia on this occasion, but subsequently underwent a further dilatation three months later at another institution, with clinical improvement and no complications. In another patient, a previous pharyngocutatneous fistula was re-opened; this subsequently healed over six months. No life-threatening perforations were encountered.

No patients developed recurrence of malignancy during follow up.

Discussion

Balloon dilatation is easy to perform, is well tolerated and leads to improvement in swallowing in the majority of patients with benign fibrotic strictures, following treatment for head and neck cancer. However, functional improvement in swallowing is

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TABLE II

COMPLICATIONS

Complication	History	Description	Outcome	Dysphagia
Pain	SCC larynx Previous surgery & RT	Opiate analgesia required post-procedure	Self-limiting	No improvement
Pain	Oral SCC Previous surgery & RT	Opiate analgesia required post-procedure	Self-limiting	175 days' improvement
Bleeding	SCC larynx Previous surgery & RT	Minor bleed	Self-limiting No transfusion	30 days' improvement
Bleeding	SCC hypopharynx Previous surgery & RT	Minor bleed	Self-limiting No transfusion	No improvement
Bleeding	SCC larynx Previous surgery & RT	Minor bleed	Self-limiting No transfusion	152 days' improvement
Bitten lip	SCC hypopharynx Previous surgery & RT	Mouth guard came loose	Self-limiting	No improvement
Local infection & small perforation	SCC larynx Previous surgery & RT	Small localised perforation Readmitted with local infection	Responded to IV antibiotics	No improvement Further balloon dilatation 3 mths later with improvement
Recurrent pharyngo-cutaneous fistula	SCC larynx Previous surgery & RT	Previous perforation following rigid dilatation Patient continued with gastrostomy feeding	Fistula healed over 6 mths	No improvement

SCC = squamous cell carcinoma; RT = radiotherapy; IV = intravenous; mths = months

likely to be incomplete. This relief is usually temporary, lasting months, and multiple subsequent dilatations are likely to be required. These findings are in keeping with previous descriptions of rigid dilatation of such strictures.[8] Minor complications are relatively common and include bleeding and pain. Although not encountered in this series, life-threatening perforations are a theoretical possibility. We encountered a single case of significant local infection requiring readmission for intravenous antibiotics, following a small, localised perforation.

Only one series of patients undergoing radiological balloon dilatation of pharyngeal strictures has previously been published, by Rowe-Jones *et al.*[5] These authors described complete eradication of symptoms after just one balloon dilatation in three of 13 subjects. In our series, no patients achieved eradication of dysphagia following a single dilatation. In Rowe-Jones and colleagues' series, only one patient achieved no relief of symptoms, compared with five of 20 subjects in our series. Rowe-Jones and colleagues' cases included both benign (10/13) and malignant strictures (three of 13), with three of 13 benign strictures not being related to the treatment of malignant disease. Our series included only biopsy-proven, benign strictures encountered following treatment of malignant disease. In our series, patients who required multiple dilatations obtained similar periods of symptom relief after each dilatation.

A recent paper by Ahlawat and Al-Kawas reviewed experiences following endoscopic dilatation of upper oesophageal strictures developing after treatment for head and neck surgery.[9] The management of 24 patients was reviewed. Dilatation was predominantly performed with Savary–Gilliard polyvinyl dilators (Wilson-Cook Medical, Winston-Salem, North Carolina, USA). Further dilatation was performed with balloon dilatation in nine patients. However, technical success was encountered in just 80 per cent (versus 100 per cent in the current series), although Ahlawat and Al-Kawas defined technical success more strictly, as achieving a post-treatment luminal diameter of 42 F. In Ahlawat and Al-Kawas's study, dysphagia relief was encountered in 84 per cent (versus 75 per cent in the current series) and repeat dilatation was required in 58 per cent (versus 100 per cent), although the follow-up period ranged from one to 96 months (versus six to 54 months). Patients also frequently required multiple dilatations. In Ahlawat and Al-Kawas's series, no complications or deaths were encountered.

Whether balloon dilatation is safer than bougie dilatation is unclear, but there are theoretical advantages. These relate to the avoidance of longitudinal shear force and the assumed lower risk of mucosal damage and perforation.[4] However, previous comparison of rigid and balloon dilatation of oesophageal strictures has found no significant difference in clinical outcomes and complications.[10–12] A large review of bougie dilatation of pharyngeal and oesophageal strictures reported similar findings: low complication rates, and the fact that post-radiotherapy and post-surgery strictures were particularly refractory to treatment and required repeated dilatations.[8]

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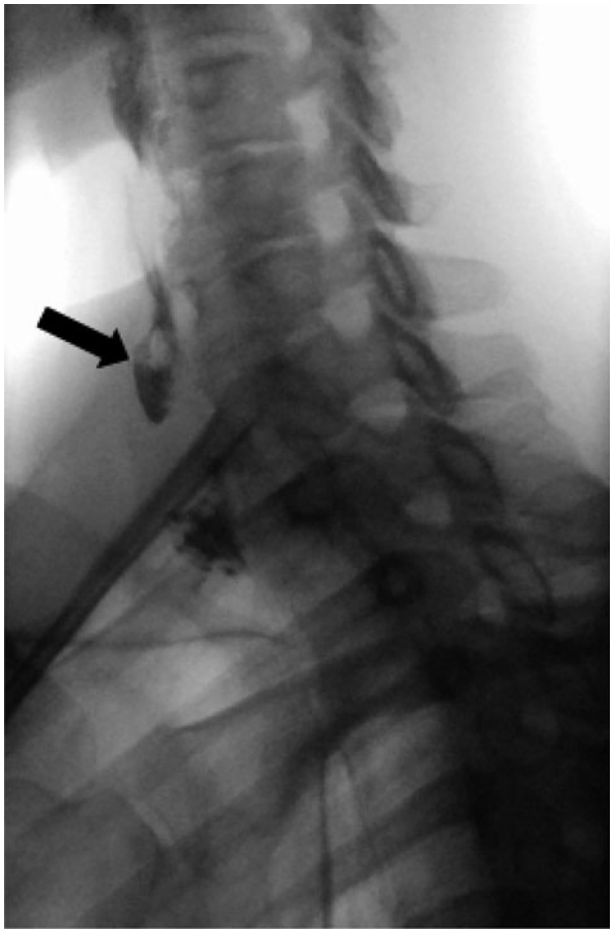

FIG. 2

Contrast swallow study demonstrating a small, localised perforation following balloon dilatation. The patient was subsequently readmitted for a local infection that required intravenous antibiotics.

There have been attempts to use self-expanding metal stents to treat benign neo-pharyngeal strictures which were refractory to dilatation. However, one series reported disappointing results, with two of four stents needing to be removed due to intractable pain.[13]

- **Head and neck cancers are frequently complicated by benign, post-treatment strictures following surgery, radiotherapy or chemotherapy. These respond to dilatation, although the response is commonly temporary**
- **Traditionally, such strictures have been treated by bougie dilatation**
- **Balloon dilatation has a high degree of technical success, and serious complications are uncommon**

Fluoroscopic guidance offers the advantage of best identifying both the position of the balloon relative to the stricture, and the balloon's degree of inflation. Endoscopic balloon dilatation can be combined with fluoroscopy, but balloon positioning via endoscopy is potentially less stable than positioning via catheter and guidewire.

We found that all patients who responded to balloon dilatation needed further dilatations. Thus, prompt referral for further dilatations is advised when symptoms recur.

Balloon dilatation should be considered as the first line treatment of benign, post-treatment pharyngeal strictures. The perforation rate is low, and the procedure avoids the need for general anaesthesia, with its inherent risks in a population with significant co-morbidity.

References

1 de Casso C, Slevin NJ, Homer JJ. The impact of radiotherapy on swallowing and speech in patients who undergo total laryngectomy. *Otolaryngol Head Neck Surg* 2008;**139**:792–7
2 Starmer HM, Tippett DC, Webster KT. Effects of laryngeal cancer on voice and swallowing. *Otolaryngol Clin North Am* 2008;**41**:793–818, vii
3 Nguyen NP, Moltz CC, Frank C, Vos P, Smith HJ, Karlsson U *et al*. Dysphagia following chemoradiation for locally advanced head and neck cancer. *Ann Oncol* 2004;**15**:383–8
4 McLean GK, LeVeen RF. Shear stress in the performance of esophageal dilation: comparison of balloon dilation and bougienage. *Radiology* 1989;**172**:983–6
5 Rowe-Jones JM, George CD, Moore-Gillon V, Grundy A. Balloon dilatation of the pharynx. *Clin Otolaryngol Allied Sci* 1993;**18**:102–7
6 Bell JK, Laasch HU, Wilbraham L, England RE, Morris JA, Martin DF. Bispectral index monitoring for conscious sedation in intervention: better, safer, faster. *Clin Radiol* 2004;**59**:1106–13
7 Mellow MH, Pinkas H. Endoscopic laser therapy for malignancies affecting the esophagus and gastroesophageal junction. Analysis of technical and functional efficacy. *Arch Intern Med* 1985;**145**:1443–6
8 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
9 Ahlawat SK, Al-Kawas FH. Endoscopic management of upper esophageal strictures after treatment of head and neck malignancy. *Gastrointest Endoscopy* 2008;**68**:19–24
10 Cox JG, Winter RK, Maslin SC, Dakkak M, Jones R, Buckton GK *et al*. Balloon or bougie for dilatation of benign esophageal stricture? *Dig Dis Sci* 1994;**39**:776–81
11 Scolapio JS, Pasha TM, Gostout CJ, Mahoney DW, Zinsmeister AR, Ott BJ *et al*. A randomized prospective study comparing rigid to balloon dilators for benign esophageal strictures and rings. *Gastrointest Endosc* 1999;**50**:13–17
12 Shemesh E, Czerniak A. Comparison between Savary-Gilliard and balloon dilatation of benign esophageal strictures. *World J Surg* 1990;**14**:518–21, 21–2
13 Thornton MA, Conlon BJ, Timon C. How we did it: neopharyngeal stricture management with the nitinol stent in the laryngectomized patient: our disappointing results. *Clin Otolaryngol* 2005;**30**:369–71

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