The Journal of Laryngology and Otology
July 1996, Vol. **110**, pp. 683–684

Oesophageal strictures in children: balloon or bougie dilatation?

C. M. ALLSAGER, A. R. BANERJEE, F.R.C.S., A. BOLIA, F.R.C.R.*, A. MOIR, F.R.C.S.

Abstract
The management of oesophageal strictures in neonates and infants is often by bougie dilatation. We report two cases in which balloon dilatation was used successfully and suggest that this may be a preferable technique in this age group.

Key words: Oesophageal stenosis; Balloon dilatation; Oesophageal perforation

Introduction

The early treatment of oesophageal strictures is important in securing a satisfactory long term outcome. Both balloon dilatation and bougie dilatation are practised in adult patients. In the United Kingdom however, there is no overall consensus on the most suitable form of treatment for this condition in neonates and infants.

Reports in the American medical literature have demonstrated the efficiency of balloon dilatation in this age group. We report two cases of successful balloon dilatation of oesophageal strictures in an infant and a neonate.

Case reports

Case 1

A two-year-old male was admitted to Leicester Royal Infirmary with a history of alkali ingestion four days previously. He had initially been admitted to a District General hospital during which he became progressively unwell.

On admission he was pyrexial, dehydrated and was unable to tolerate an oral diet. He was also suspected of having a right middle lobe pneumonia. An aspiration pneumonia was diagnosed and treated. Twenty-four hours after admission an ENT opinion was requested. At this point the patient was managing an oral diet of soft solids. Lip and buccal mucosa burns were noted. One day after the initial assessment the patient was discharged with a barium swallow requested as an out-patient procedure.

Three weeks later the patient re-presented with a progressive history of increasing dysphagia. A barium swallow was performed and revealed a smooth tapered narrowing at the mid-oesophagus, with a degree of mucosal irregularity. Balloon dilatation was performed under general anaesthesia. With fluoroscopy, a hydrophilic guide wire (0.035 cm diameter, 150 cm long, Ferumo, Tokyo, Japan) was manipulated through the stricture. Once the lesion was crossed, a balloon catheter (5F 75 cm long catheter, Optiplast, Mississanga, Ontario, Canada) was fed over the wire and positioned at the site of the lesion under fluoroscopic guidance. The balloon (4 mm diameter and subsequent 8 mm diameter, 4 cm length) was inflated with 50 per cent saline, 50 per cent contrast (Omnipaque 240, Nycomed, Oslo, Norway). The balloon pressure was gradually increased to 10 atmospheres, and held for two minutes. A waist from the lesion was seen which resolved with increasing pressure. The balloon inflation was repeated three times. A successful result was confirmed with contrast swallow post-dilatation. The patient was discharged home managing a normal diet two days post dilatation. Ten days later a repeat barium swallow revealed two strictures, upper and mid-oesophagus approximately 3 cm long. These were dilated again with image intensifier guidance under general anaesthesia using a balloon catheter. There were no post-operative complications.

Case 2

A two-day-old male infant was admitted to Leicester Royal Infirmary Special Care Baby Unit with persistent vomiting. Contrast radiology revealed oesophageal atresia at the level of the first thoracic vertebra. No tracheo-oesophageal fistula was present. The infant underwent a primary repair of the defect.

Two months later, the infant's mother gave a one month progressive history of vomiting after feeding. A barium swallow revealed a narrow upper oesophageal stricture below the original stricture at the site of surgery. No aspiration of contrast medium was seen and a nasogastric tube was unable to be passed. Attempted oesophageal dilatation four days later with an elastic bougie failed. Although the bougie passed the stricture, a nasogastric tube could not be passed. A gastrostomy was therefore performed.

Balloon dilatation of the stricture under fluoroscopy subsequently took place using the method previously described. Good progress was noted post-operatively and a barium swallow, performed five days later, revealed good passage of contrast and a blind posterior sinus below the level of stricture.

A further repeat barium swallow two weeks later again gave good passage of contrast with the posterior pouch still present but emptying easily. The infant continued to improve and one week later the gastrostomy was removed. Examination under anaesthetic with further balloon

From the Departments of Otolaryngology and Radiology*, Leicester Royal Infirmary, Leicester, UK.
Accepted for publication: 18 January 1996.

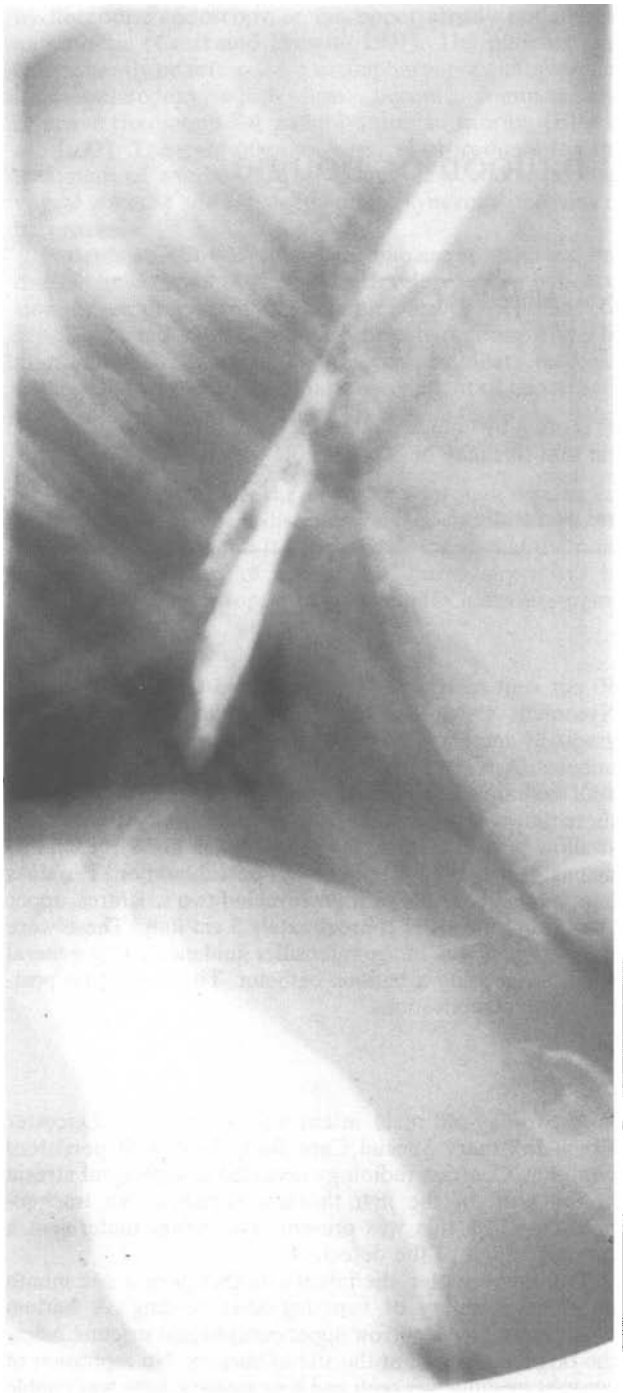

FIG. 1

Posterior sinus produced by bougie dilatation with normal flow of barium through the dilated stricture.

dilatation was subsequently performed at one, three and seven weeks post-gastrostomy removal with good results.

Discussion

The use of balloon dilatation in benign and malignant oesophageal stenosis in adults has been well described (London *et al.*, 1981; Owman and Lunderquist, 1982; Blundell and Burhenne, 1984; Stark *et al.*, 1984). Reports have suggested that balloon dilatation should be considered before other procedures in infants and children (Sato *et al.*, 1988; Myer *et al.*, 1991).

Balloon dilatation produces a direct radial force to the stricture site and can be closely controlled under image intensification. Bougie dilatation converts longitudinal shear forces into a radial force dependent on the bougies friction co-efficient and degree of taper. It has been reported that balloon dilatation produces four to seven times less longitudinal shear force for a given radial force (McClean and LeVeen, 1989). This reduces the risk of significant oesophageal trauma. An oesophageal perforation rate of approximately eight per cent for bougienage and up to 2.8 per cent for balloon dilatation (Kim *et al.*, 1993) has been reported. This value for balloon dilatation was reported during serial dilatations of oesophageal strictures in children. A regime of repeat balloon dilatation of strictures at progressively longer intervals has been shown to produce resolution of symptoms with a reduced risk of oesophageal perforation (Goldthorn *et al.*, 1984).

Transendoscopic balloon dilatation of oesophageal stricture has been proposed as a means to visualising the procedure whilst removing the problem of X-ray exposure (Cox *et al.*, 1988). This has not yet been assessed fully and it would appear that despite the problems of X-ray exposure, image intensifier monitoring of balloon dilatation is advisable.

In conclusion, balloon dilatation of oesophageal strictures in neonates and infants under image intensifier control is associated with low morbidity and a high rate of symptom resolution. It compares favourably with the technique of bougie dilatation which is a procedure performed blind, and which produces much greater longitudinal shear forces resulting in a greater risk of oesophageal trauma and perforation.

References

Blundell, G. E., Burhenne, H. J. (1984) Balloon catheter dilatation of malignant oesophageal stricture. *Journal of the Canadian Association of Radiology* **35:** 180–182.

Cox, J. G. C., Winter, R. K., Maslin, S. C., Jones, R., Buckton, G. K., Hoare, R. C., Sutton, D. R., Benett, J. R. (1988) Balloon or bougie for dilatation of benign oesophageal stricture? An interim report of a randomised controlled trial. *Gut* **29:** 1741–1747.

Goldthorn, J. F., Ball, W. S., Wilkinson, L. G., Seigel, R. S., Kosloske, A. M. (1984) Oesophageal strictures in children: treatment by serial balloon catheter dilatation. *Radiology* **153:** 655–658.

Kim, I., Yeon, K. M., Kim, W. S., Park, K. W., Kim, J. H., Han, M. C. (1993) Perforation complicating balloon dilatation of oesophageal strictures in infants and children. *Radiology* **189:** 741–744.

London, R. L., Trotman, B. W., DiMarino, A. J. Jr., Juan, A.O., Frieman, D. B., Ring, E. J., Rosato, E. F. (1981) Dilatation of severe oesophageal strictures by an inflatable balloon catheter. *Gastroenterology* **80:** 173–175.

McClean, G. K., LeVeen, R. F. (1989) Shear stress in the performance of oesophageal dilatation: comparison of balloon dilatation and bougienage. *Radiology* **172:** 983–986.

Myer, C. M., Ball, W. S., Bisset, G. S. (1991) Balloon dilatation of oesophageal stricture in children. *Archives of Otolaryngology, Head and Neck Surgery* **117:** 529–532.

Owman, T., Lunderquist, A. (1982) Balloon catheter dilatation of oesophageal stricture. *Gastrointestinal Radiology* **7:** 301–305.

Sato, Y., Frey, E. E., Smith, W. L., Pringle, K. C., Soper, R. T., Franken, E. A. Jr. (1988) Balloon dilatation of oesophageal stenosis in children. *American Journal of Radiology* **150:** 639–642.

Stark, E., Paolucci, V., Herzer, M., Crummy, A. B. (1984) Oesophageal stenosis: treatment with balloon catheters. *Radiology* **153:** 637–640.

Address for correspondence:
Mr A. R. Banerjee, F.R.C.S.,
Department of Otolaryngology,
Leicester Royal Infirmary,
Leicester LE1 5WW.
Fax: (0116) 2586082