Stenting in the oesophagus

MG Cowling

Self-expanding metallic stents have assumed increasing importance in the palliative treatment of malignant dysphagia in recent years. This is most commonly the result of inoperable oesophageal cancer, but may also be the result of extrinsic compression on the oesophagus by other malignant masses. Stents are also occasionally used as a last resort in benign disease.

Self-expanding metallic stents, when employed in the oesophagus, are most commonly used for the relief of inoperable malignant dysphagia. Malignant strictures usually arise from the oesophagus itself, although a proportion are related to extrinsic compression from malignant mediastinal lymph nodes or masses. In benign disease, oesophageal stents are only used as a treatment of last resort, when repeated balloon dilatation has failed, and open surgery is considered to be impossible or to involve too high a risk.

This review sets out to describe the interventional radiological approach to oesophageal stenting, and summarize the results that can be expected. Potential complications of the procedures are described, and possible future developments are discussed.

RADIOLOGICAL MANAGEMENT OF MALIGNANT OESOPHAGEAL STRICTURES

At the time of presentation 50–60% of patients with oesophageal carcinoma will have tumours that are not amenable to curative resection (Rankin and Mason, 1992). Available palliative treatments include surgery, chemotherapy, radiotherapy, rigid plastic tubes, laser therapy and self-expanding metallic oesophageal stents. Experience has grown with oesophageal stents such that they now form an important component in the palliative management of malignant oesophageal obstruction.

A number of stent types are available, the most commonly used being Wallstents (covered or uncovered, Schneider AG, Zurich, Switzerland), Strecker stents (covered, Boston Scientific Corporation, Watertown, MA, USA) and Gianturco stents (covered, William Cook Europe, Bjaeverskov, Denmark).

TECHNIQUE OF INSERTION

After performing a contrast swallow to delineate the site and extent of the stricture (*Figure 1*), the patient is placed on the fluoroscopic table in the left lateral position. Xylocaine spray is applied to the pharynx, and the patient is then sedated with intravenous midazolam or another suitable agent.

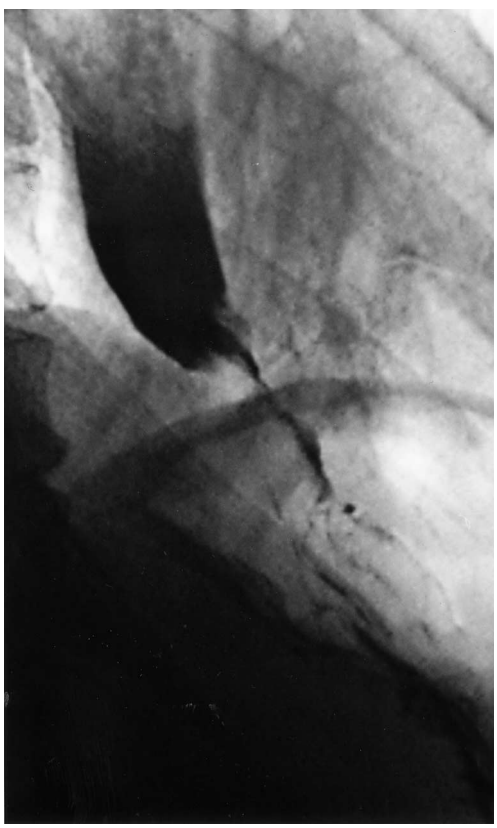

Figure 1. A contrast swallow demonstrating a malignant stricture at the oesophago-gastric junction. Biopsy showed this to be an adenocarcinoma.

Dr MG Cowling is Consultant Radiologist in the Department of Radiology, QEQM Building, St Mary's Hospital, London W2 1NY

A catheter and guidewire are passed down the oesophagus and used to negotiate the stricture. Generally it is straightforward to cross oesophageal strictures, but occasionally it is necessary to use a hydrophilic guidewire; it is extremely uncommon to fail to cross a stricture using catheter and guidewire techniques. They are then advanced into the duodenum, and the guidewire is changed for a stiff exchange (260 cm) guidewire. A 15 mm balloon is advanced over the guidewire and across the stricture. The relatively small diameter is chosen to reduce the risk of oesophageal perforation, and ensure that the lumen is not overdilated, which would otherwise increase the likelihood of stent migration.

After balloon dilatation the stent is introduced over the guidewire on its delivery system. Using fluoroscopic guidance it is positioned such that approximately 60% of the stent will lie above the mid-point of the stricture, with the intention of minimizing migration. The stent is then deployed under fluoroscopic control. In the case of the Wallstent, it is possible to recover it and reposition should that prove necessary, as long as no more than half of the stent has been released.

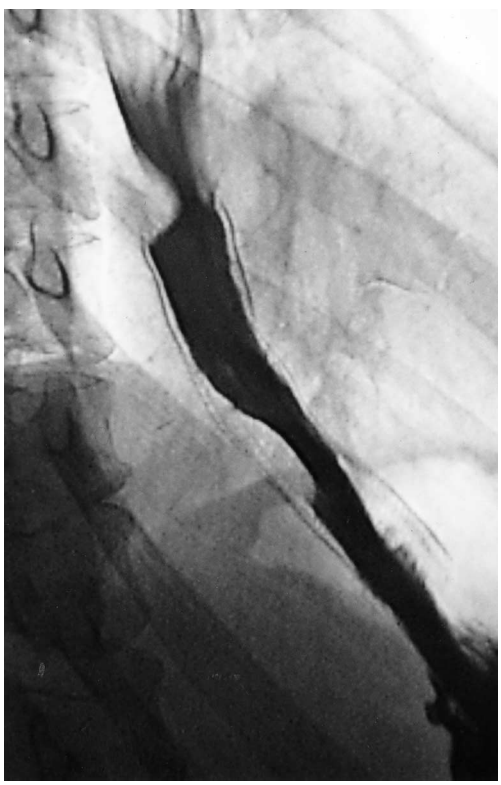

Figure 2. Patient from Figure 1. *The day after stent insertion, the device can be seen to be fully expanded and contrast is flowing freely into the stomach.*

After stent deployment, contrast is injected down the catheter and through the stent to ensure that it is patent and there has been no complication of the procedure. After the patient has recovered from the sedation they are allowed initially to take sips of fluid, and over the next few hours to take increasing volumes.

The next day the patient returns to the radiology department for a contrast swallow to ensure that the stent remains patent has not migrated or developed any other complication (*Figure 2*). If required any other necessary intervention can be undertaken at this stage. Patients in whom the stent crosses the gastro-oesophageal junction will experience uncontrolled gastro-oesophageal reflux. Therefore these individuals are prescribed omeprazole routinely.

RESULTS

The degree of dysphagia can be evaluated using the dysphagia score (*Table 1*). Improvement in the dysphagia score is observed in 83–100% of patients when they are evaluated 24 hours after the procedure (Cowling et al, 1998; Cwikiel et al, 1993; Song et al, 1994).

The different stent designs are associated with different complications. For example, the original Strecker stent, with its weaker radial force, often required balloon dilatation after deployment. Furthermore, in patients with oesophageal obstruction resulting from extrinsic compression, the use of Strecker stents has been associated with recurrent dysphagia as a result of stent collapse (Cowling et al, 1998). In these cases the use of the stronger Wallstent is therefore recommended.

Uncovered stents are prone to tumour ingrowth (20–30%), which is only rarely observed with covered stents. Covered Wallstents, on the other hand, are prone to migration, especially when placed across the gastro-oesophageal junction. The cause for this must be the reduction in the friction between the oesophageal wall and the stent brought about by

TABLE 1.
The dysphagia score

Dysphagia score	Degree of dysphagia
0	No dysphagia
1	Able to swallow semi-solid food only
2	Able to swallow liquids only
3	Difficulty in swallowing liquids and saliva
4	Complete dysphagia

the polyurethane covering. When placed completely within the oesophagus the stent relies on the uncovered portion at either end to provide stability. Placement of the stent across the gastro-oesophageal junction compromises this mechanism. Other complications include upper gastrointestinal haemorrhage, pain, aspiration pneumonia and fistula formation.

In the longer term recurrent dysphagia may be encountered because of tumour ingrowth, tumour overgrowth or food bolus impaction. Tumour ingrowth effectively only occurs in uncovered stents (20–30%), but overgrowth may be encountered in any stent type (15–30%). This is managed either by endoscopic laser therapy or insertion of a further stent. Food bolus impaction happens rarely, but is amenable to endoscopic treatment. This latter complication is avoided by advising patients to cut their food into small pieces, to chew it thoroughly and to have carbonated beverages after each meal in order to clear the stent of any food debris.

Comparison with other techniques

Conventional palliative therapy for advanced oesophageal carcinoma includes surgery, radiotherapy and chemotherapy. Palliative surgical resection is highly invasive and is associated with a high operative mortality and morbidity (Earlam and Chunha-Melo, 1980a). External beam radiotherapy improves dysphagia in around 50% of patients, but at the expense of fibrotic stricture formation in approximately 30% (Earlam and Chunha-Melo, 1980b). Combined chemotherapy and radiotherapy also produce improved results, but at the expense of greater morbidity (Herskovic et al, 1992).

Rigid plastic tubes, usually inserted under general anaesthesia, have declined in popularity in many centres. The overall complication rate has been reported to be as high as 36%, with a mortality of 2–16%. The reported complications include a perforation rate of 4.2–10.5%, haemorrhage in 1.5–5%, tumour overgrowth in 8.5%, tube migration in 22% and pressure necrosis of the oesophageal wall in 4% (Fuegger et al, 1990). The small luminal diameter leads to problems with food impaction in around 6.5%. The use of a general anaesthesia and the requirement for admission to hospital for a few days also makes this treatment expensive.

A randomized controlled trial has been carried out comparing metallic stents with plastic tubes (Knyrim et al, 1993). The authors concluded that there were statistically significantly fewer complications with metallic stents. The metallic stents were prototype devices with a luminal diameter of 16 mm (i.e. the same as the plastic tubes). The palliation of dysphagia was thus similar in both groups. The larger stents now used would be expected to provide better palliation.

A more recent cost benefit comparison of Atkinson tubes against self-expanding metallic stents has been published (Birch et al, 1998). In this retrospective review of 50 patients they showed that the median total cost for insertion of a self-expanding metallic stent was £1745 compared to £2349 for the Atkinson tube. Interestingly, this group insert metallic stents under general anaesthetic, contrary to the technique described above. Therefore, in the hands of most operators not employing a general anaesthetic, one would expect insertion of metallic stents to have an even lower cost.

Laser therapy has been shown in a number of studies to provide excellent palliation in malignant oesophageal obstruction (Mason et al, 1991). Over 80% of patients can be maintained on a solid or semi-solid diet. The main drawback of laser therapy is the requirement for multiple treatments, which need to be repeated on a 4–8-weekly basis. In a series of 189 patients with inoperable oesophageal carcinoma, a mean of 3.3 procedures per patient were required (Mason et al, 1991). The complication rate is low (5–9%), and is mainly related to oesophageal perforation during pretreatment dilatation. The other main complication is haemorrhage, which can often be controlled by local laser photocoagulation.

Both laser therapy and self-expanding metallic stents are used in many centres for the palliation of malignant dysphagia. There is a published triple randomized study comparing Wallstents, uncovered Strecker stents and laser therapy. The results demonstrated statistically significantly better palliation with metallic stents than with laser therapy (Adam et al, 1997). However, there are certain morphological types of tumour in which oesophageal stents are best avoided. In situations where the tumour is very exophytic, or where the oesophagus is very dilated above the stricture, the free end of the stent will not lie closely apposed to the oesophageal wall, and food or fluid will tend to pool between the stent and the mucosa. In this situation, palliation will be suboptimal, and there is a risk of aspiration. Therefore, to a degree, oesophageal stents and laser therapy are complementary treatments, and each case should be treated on its own merits.

OESOPHAGEAL STENTS IN BENIGN OESOPHAGEAL STRICTURES

Considerable experience now exists in the use of oesophageal stents in the palliation of malignant oesophageal obstruction. However, in this group long-term problems are unlikely because of the relatively short survival. When stents are employed in patients with benign strictures, recurrent dysphagia as a result of epithelial hyperplasia occurs commonly (Tan et al, 1997). Although this complication can be managed using laser therapy or balloon dilatation, it is best to reserve stents for benign strictures that do not respond to repeated balloon dilatation.

FUTURE DEVELOPMENTS

Some preliminary work has suggested that conical stents with the polyurethane covering placed on the inside of the mesh may allow use of a covered stent at the gastro-oesophageal junction (Adam et al, 1998). Thus the problem of stent migration at this site may be essentially eliminated without the penalty of tumour ingrowth at a later date.

In the future removable stents may become available. This would potentially allow benign strictures to be stented for period of a few weeks, followed by removal of the device. A prolonged period of dilatation in this way would offer hope of greater success in the treatment of benign strictures, but hopefully without the penalty of epithelial hyperplasia.

CONCLUSIONS

Oesophageal stents provide excellent palliation for patients with irresectable oesophageal carcinoma. We have adopted a policy of using covered Wallstents in the upper two-thirds of the oesophagus, where prevention of tumour ingrowth can be maximized without the penalty of stent migration. At the gastro-oesophageal junction we employ uncovered stents, which reduces the migration rate, but at the expense of a higher incidence of tumour ingrowth.

In the near future, conical stents with the plastic covering placed inside the metallic mesh will allow it to come directly into contact with the oesophageal mucosa; this offers the hope of having a covered stent suitable for use at the oesophago-gastric junction. **HM**

Adam A, Ellul J, Watkinson AF, Tan BS, Morgan RA, Saunders MP, Mason RC (1997) Palliation of inoperable esophageal carcinoma: a prospective randomized trial of laser therapy and stent placement. *Radiology* **202:** 344–8

Adam A, Morgan R, Ellul J, Mason RC (1998) A new design of the esophageal Wallstent endoprosthesis resistant to distal migration. *Am J Roentgenol* **170:** 1477–81

Birch JF, White SA, Berry DP, Veitch PS (1998) A cost-benefit comparison of self-expanding metal stents and Atkinson tubes for the palliation of obstructing esophageal tumours. *Dis Esophagus* **11:** 172–6

Cowling MG, Hale H, Grundy A (1998) The use of self expanding metal stents in the management of oesophageal strictures. *Br J Surg* **85:** 264–6

Cwikiel W, Stridbeck H, Tranberg KG, von Holstein CS, Hambraeus G, Lillo-Gil R, Willen R (1993) Malignant esophageal strictures: treatment with a self expanding nitinol stent. *Radiology* **187:** 661–5

Earlam R, Chunha-Melo JR (1980a) Oesophageal squamous cell carcinoma: 1. A critical review of surgery. *Br J Surg* **67:** 381–90

Earlam R, Chunha-Melo JR (1980b) Oesophageal squamous cell carcinoma: II. A critical review of radiotherapy. *Br J Surg* **67:** 457–61

Fuegger R, Niederle B, Jantsch H et al (1990) Endoscopic tube implantation for the palliation of malignant esophageal stenosis. *Endoscopy* **22:** 101–4

Herskovic A, Martz K, Al-Sarraf M et al (1992) Combined chemotherapy and radiotherapy compared to radiotherapy alone in patients with cancer of the oesophagus. *N Engl J Med* **326:** 1593–8

Knyrim K, Wagner HJ, Bethge N et al (1993) A controlled trial of an expansile metal stent for palliation of esophageal obstruction due to inoperable cancer. *N Engl J Med* **329:** 1302–7

Mason RC, Bright N, McColl I (1991) Palliation of malignant dysphagia with laser therapy: predictability of results. *Br J Surg* **78:** 1346–7

Rankin S, Mason R (1992) Staging of oesophageal carcinoma. *Clin Radiol* **46:** 373–7

Song HY, Do YS, Han YM et al (1994) Covered, expandable esophageal metallic stent tubes: experiences in 119 patients. *Radiology* **193:** 689–95

Tan BS, Kennedey C, Morgan R, Owen W, Adam A (1997) Uncovered metallic endoprostheses for recurrent benign esophageal strictures: preliminary experience. *Am J Roentgenol* **169:** 1281–4

KEY POINTS

- Inoperable malignant oesophageal strictures are successfully palliated using self-expanding metallic stents.
- The evidence so far accumulated suggests that stents provide better palliation with fewer complications than other therapies. They are also less expensive.
- Some tumours are not amenable to palliation with stents, and in this situation laser therapy is effective.
- Patients with stents placed across the oesophago-gastric junction require omeprazole therapy to prevent uncontrolled reflux.
- The main problem with stents is recurrent dysphagia caused by tumour ingrowth or overgrowth. These can be managed either with laser therapy or insertion of a further stent.
- Stents are a treatment of 'last resort' in benign strictures.