Metal stents in the oesophagus

Management of carcinoma of the oesophagus and oesophagogastric junction is a major challenge and the prognosis remains poor for most patients. Only a third of these patients are suitable for resection.\(^1\) Effective palliation of dysphagia is the goal in most and a variety of methods have been developed.\(^2\) Insertion of semirigid oesophageal endoprostheses and endoscopic thermal laser photodestruction is most commonly used. The major advantage of semirigid oesophageal endoprostheses is that insertion is a one step procedure with rapid, reliable relief of dysphagia. The quality of swallowing achieved, however, is often poor. Few patients are able to manage a normal diet.\(^3\) In addition, complications, including bolus obstruction, tumour overgrowth, and tube migration, are relatively common and the mortality from insertion is greater than 10% in some series.\(^4\) Laser therapy has the advantages of potentially restoring swallowing to near normal and a low complication rate. These advantages must be balanced against the need for repeated admissions with a rather slower and less reliable relief of dysphagia. Injection of agents to induce tumour necrosis, such as alcohol, is a potentially cheap method of palliation but is only applicable to exophytic tumours and has not yet been evaluated in controlled trials.

Self expanding metal endoprostheses (stents) may overcome some of the problems associated with semirigid oesophageal endoprostheses and laser therapy. Implantation is less traumatic and better tolerated than the insertion of semirigid tubes because the diameter of the delivery catheters is only 8–12 mm, which reduces the need for oesophageal dilatation essential for the placement of semirigid endoprostheses. The larger lumen achieved, from 16–20 mm, and flexibility of the stent should improve the quality of swallowing still further. They can be inserted as a one step outpatient procedure. Two major problems have been identified – tumour ingrowth and stent migration – but recent design modifications have addressed these problems.

The only major controlled trial published to date compared the insertion of an uncoated, metal stent and a semirigid endoprostheses in 42 patients with malignant dysphagia.\(^5\) There was a significantly higher rate of complications with the plastic prostheses, including three deaths, and the duration of hospital stay was longer. Recurrent dysphagia was equally common (25%) and usually a result of tumour ingrowth in the group treated with metal stents and of tube migration in the semirigid endoprosthesis group. Despite their considerably higher cost, the metal stents proved cost effective because of the decreased complication rate and shorter hospital stay. The major advantage of the metal stents was the low complication rate at insertion, which is supported by earlier uncontrolled studies.\(^6\)\(^7\) In this trial, however, the semirigid prostheses were placed during general anaesthesia and after a single stage oesophageal dilatation to 20 mm. However, since neither general anaesthesia nor wide dilatation is necessary or common practice in most UK gastroenterology units, the results of this trial should be interpreted with caution.

Further comparative trials are being conducted but it seems unlikely that the different oesophageal metal stents can all be tested in controlled trials against each other and against other palliative treatments. The techniques of insertion are relatively simple to learn for practitioners experienced in therapeutic oesophageal procedures and despite the expense, the use of oesophageal metal stents is likely to increase.

What are the potential applications, advantages, and disadvantages of the various models available? The Ultraflex stent (Boston Scientific, USA) consists of a knitted nitonol wire tube. Nitonol, an alloy of nickel and titanium, gives the stent rubber-like elastic properties. The compressed stent is released when the gelatin coating dissolves after contact with oesophageal secretions. The rate of expansion after release may be increased by balloon dilatation after placing the stent; the expanded stent diameter is 18 mm. The advantages of this device are a thin, atraumatic delivery system; a soft, pliable stent with good functional properties; a wide lumen and high resistance to compression. The release system is time consuming and precise placement of the stent may be difficult because it shortens as it widens and this may not occur symmetrically. The high resistance to compression can paradoxically be a problem because when it is overcome, the stent, instead of compressing uniformly, may buckle. The endoscopist then has a metal mesh 'bezoar' obstructing the oesophagus rather than a stricture and an effective salvage procedure is difficult. Finally, this is an uncovered stent and is therefore susceptible to tumour ingrowth. An uncontrolled trial using this stent has suggested good early functional results with a 17% reobstruction rate which is lower than rates published for other varieties of metal stent.\(^7\)
The Wallstent (Schneider Europe, Switzerland) is made from stainless steel formed into a tubular mesh and can expand to 20 mm. This stent was initially produced in an uncovered form but now is available with the central segment covered with polyurethane. We think this is the easiest stent to insert, and repositioning is possible during the procedure providing the stent has not been fully deployed.

High oesophageal strictures are difficult to palliate by any method, but while the manufacturers of all these stents caution against their use in strictures close to the cricopharyngeus, we have used the Wallstent successfully in this situation, where precise positioning is essential and the use of a conventional semirigid endoprosthesis would have been impossible. Coating of the stent seems to reduce the rate of tumour ingrowth and can overcome the problems of oesophagotracheal fistulae but makes stent migration more likely. The coating does not run the full length of the stent, however, which has led to leakage and ineffective sealing of fistulae.

The Gianturco-Rösch stent (Cook, USA), a modified version of an earlier device, consists of a wide ‘Z’-mesh of stainless steel covered over its entire length by a polyethylene film, with barbs in the centre segment to prevent migration. The stent does not shorten on release, expands to 18 mm, and is available in various lengths. The release mechanism is more complex than that of the Wallstent but a degree of repositioning is possible allowing precise placement. The covering should prevent tumour ingrowth in most cases and allow treatment of high oesophagorespiratory fistulae.

The EsopaCoil (InStent, USA) is a tightly wound, coiled spring that shortens and widens on release. This stent is robust and tumour compression is unlikely. Ingrowth may occur, however, between the coils since there is no covering. Precise placement is difficult because of shortening on release and there is no possibility of repositioning once deployment of the device has started. Significant chest pain occurs up to 24 hours after insertion because of slow dilatation of the malignant stricture by the stent.

All the metal stents described function well, insertion is relatively easy, and the initial complication rate is low. Are there clinical situations in which a particular stent is more appropriate than another? Malignant external compression of the oesophagus, where there is little chance of tumour ingrowth can probably best be managed by an Ultraflex or Instent prosthesis which are relatively resistant to compression. High strictures, with only short segments of uninvolved oesophagus distal to the upper sphincter require precise placement of a stent and the Wallstent or Gianturco devices are appropriate. Oesophagorespiratory fistulae require a covered stent and if the fistula is in the proximal oesophagus, a fully covered Gianturco device is probably best.

What are the characteristics of the ideal stent? The stent should beatraumatically introduced using a narrow delivery system, be easily deployed without shortening, and yet have a capacity for repositioning during deployment. The material would be highly resistant to compression, coated to prevent tumour ingrowth, and barbed to reduce migration. The stent would deploy in craniocaudal direction to allow precise placement for high oesophageal lesions and should be much cheaper than currently available models.

Cotton, in an editorial on the use of expanding metal stents in both the biliary tree and the oesophagus, questioned whether the ‘expans’ was worth the expense.8 The current cost of these devices is approximately £600–800 which is about 10 times the cost of conventional semirigid endoprostheses. Multicentre, controlled trials are examining the potential role for metal oesophageal stents but not all the devices are likely to be compared in this way and further technical developments will undoubtedly occur. In patients with such a short life expectancy and distressing symptoms, a little bit of extra relief can mean a great deal. In certain situations, we therefore think the ‘expans’ justifies the expense.

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