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Review Article

Stenting for malignant gastric outlet obstruction: Current status

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A B S T R A C T

Malignant gastric outlet obstruction is most commonly seen in the patients with cancers of the pancreas, gallbladder, biliary tree, stomach, and duodenum. The placement of self-expanding metal stents under fluoroscopy or endoscopy has proven to be an alternative to surgical treatment and to have the advantages of being less invasive, having a lower complication rate, and allowing a quicker recovery. In this review article, we provide an overview of current fluoroscopic and endoscopic stenting practice for gastric outlet obstruction with regard to stent design and stenting procedure, efficacy, and complications, and compare stenting and surgery.

Keywords: Endoscopic, Fluoroscopic, Gastrojejunostomy, Malignant gastric outlet obstruction, Stent

Introduction

Malignant gastric outlet obstruction (GOO) is most commonly seen in patients with cancers of the pancreas, gallbladder, biliary tree, stomach, and duodenum. It has been reported that GOO occurs in 15–20% of patients with pancreatic cancer.[1,2] Patients with GOO are often unable to take liquids or solid food and can have symptoms of nausea, vomiting, and severe weight loss.

Gastroenterostomy has traditionally been the treatment strategy for this condition. However, it carries a high risk of complications (25–35%) and high perioperative mortality (2%),[3–7] and many patients are excluded from surgery because of poor medical condition.[8] The placement of self-expanding metal stents under fluoroscopy or endoscopy has proven to be an alternative to surgical treatment and to have the advantages of being less invasive, having a lower complication rate, and allowing a quicker recovery.[9–13]

This article presents an overview of current fluoroscopic and endoscopic stenting practice for GOO with regard to stent design and stenting procedure, efficacy, and complications, and compares stenting and surgery.

Stent design

Covered and uncovered

The main principle behind enteral stents is to provide internal splinting of the lumen with enough radial force to push against any disease process obstructing the duodenal tract.[14] Enteral stents can be classified as covered or uncovered, depending on whether they are coated. The most commonly used materials for enteral stents are silicone, polyurethane, and expanded polytetrafluoroethylene.[15] The advantage of covered stents is that they can prevent tumor ingrowth, which can cause restenosis. However, they have an unacceptably higher migration rate when used for malignant GOO (21–26%) compared with bare-metal stents (0–3%).[16–19] Another disadvantage of covered stents is that the delivery system is larger in size and more rigid, making the stents difficult to deliver transorally to distant lesions, such as distal duodenal stenosis, through tortuous anatomy.[16] Moreover, there is an increased incidence of biliary obstruction due to occlusion of the common bile duct by the covered stent.[19,20] In contrast, bare stents have a low risk of migration and are flexible enough for distal delivery, but tumor ingrowth can be a problem and can result in stent occlusion.

Woo et al[13] recommended using uncovered stents for duodenal stenoses caused by pancreaticobiliary malignancies because of a lower complication rate and longer stent patency. However, Bang et al[21] compared covered stents and uncovered stents for malignant GOO in 134 patients and found that there were no significant differences between groups with respect to resumption of food intake and improvement of overall performance score. In a study in which a partially covered dual metal stent was reported to have good outcomes in GOO,[11] a migration rate of 4%, which is much lower than that of covered stents and similar to that of bare stents, was demonstrated. The diameter of the stent delivery system is 3.8 mm, which is much smaller than a conventional covered-stent delivery system (6.0 mm in diameter).

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Materials used in metallic enteral stents

Early metallic enteral stents were made of stainless steel, such as the Enteral Wallstent (Boston Scientific, Marlborough, MA, USA). Although this stent had good radial force, it was prone to straightening, which increases the risk of stent impaction, and could not be followed up using magnetic resonance imaging. With the invention of nitinol wire stents, stainless steel stents gradually lost ground. Nitinol wire is soft and flexible, and stents made of nitinol demonstrate good radial and axial force, the combination of which is felt to be more effective than either radial or axial force alone.[15]

Stent delivery system

Enteral stents can be placed using a through the scope (TTS) delivery system or an over-the-wire (OTW) delivery system. Because a TTS delivery system requires going through the scope channel, its profile should be small. For this reason, the size of TTS delivery systems is usually no more than 10F. There is no such requirement for an OTW system, however, because stent placement using this delivery system can be performed only under fluoroscopic guidance. The disadvantage of OTW systems is that, because the lesion cannot be directly seen under fluoroscopy, traversing the stricture can be time-consuming.

Stents designed for distal duodenal obstruction

The distal duodenum has three segments: the second half of the horizontal segment, the ascending segment, and the duodenojejunal flexure. A distended stomach and a long distance to a distal duodenal stenosis can make delivery of a traditional enteral stent difficult.[11,22] The ideal stent for this region should have enough radial force to overcome a tortuous stricture and enough flexibility to pass through tortuous areas without kinking. The stent delivery system should be long enough to reach the target but small enough to allow smooth delivery of the stent.

A newly designed stent and delivery system designed for distal duodenal stenosis was recently introduced and has shown a good technical success in a preliminary case study.[23] The stent wires are braided in a nested configuration, which provides better radial force than the traditional helical form. The closed-loop design at both ends of the stent minimizes the possibility of injury to adjacent tissues, and its dumbbell shape reduces the risk of migration. The delivery system has a small diameter (10F) and a long length (2300 mm). The inner layer of the sheath is strengthened by a metallic mesh layer, which can prevent the system from kinking when winding toward a distal lesion.

Stenting procedure

Fluoroscopic technique

An aerosol spray for topical anesthesia of the pharynx is routinely administered before the procedure. A 0.89-mm exchange guidewire is advanced through the mouth and across the stricture to the distal portion of the duodenum or jejunum. A coil catheter (consisting of a distal uncovered and middle covered coil part, and a proximal homeostasis valve part with side holes) or a 5F multipurpose catheter is inserted over the guidewire to the distal part of the stricture to measure its length. The catheter is then exchanged for the stent delivery system, and the stent is delivered under fluoroscopic guidance. The stent should be 3–4 cm longer than the stricture to ensure that the stent covers the entire lesion. For duodenal stenting, prestent balloon dilation is discouraged because it increases the risk of bowel perforation and stent displacement or migration.[18] The exception to this is when a very tight lesion prevents the stent delivery system from advancing, in which case predilatation with a 10-mm balloon should be performed.[14] The stent is usually fully expanded 1–2 days after placement, so postplacement dilatation is not normally performed.

In distal duodenal stenosis, stomach distension makes it very difficult to advance the stent delivery system to the target lesion because of loops that can be created by the guidewire and delivery system in a distended stomach. To reduce the possibility of looping, it is recommended that the stomach be decompressed with a nasogastric tube at least 24 h before the procedure.[24] A guiding sheath that assists stent placement in patients with malignant GOO has been described by Park et al.[25] The sheath can help overcome the problem of guidewire looping, and the overall technical success rate was 98%. The authors also found that patients with pancreatic cancer and duodenal stenosis were significantly more likely to require the use of guiding sheaths. Moreover, for distal duodenal stenosis, a long, super-stiff guidewire may be required to provide enough support during negotiation of the stenosis and stent delivery.

Endoscopic technique

Conscious sedation is performed before the start of the procedure. Because of the size of the TTS delivery system, an operative endoscope is required. The endoscope is first advanced through the stricture, and a guidewire is then inserted through the working channel of the endoscope. The tip of the guidewire should be at least 20 cm distal to the stricture, and the stent length is the same as in fluoroscopic stent placement. The stent delivery system is then advanced over the guidewire to the lesion and deployed. Stent position and patency are confirmed endoscopically and fluoroscopically. As with the guiding sheath used in fluoroscopic technique, the endoscope can prevent looping of the guidewire in the stomach.

For extremely difficult cases in which both transoral fluoroscopic and endoscopic techniques have failed, enteral stenting via the percutaneous transgastric route is an option.[26] For example, strictures in the distal portion of the duodenum or proximal jejunum can be managed more easily using this approach. It should be mentioned that after successful stenting using this technique, a gastrostomy tube should be placed and maintained for 10–15 days to allow tract maturation and avoid leakage of gastric contents.[16]

Evaluation of efficacy

Technical success is defined as adequate positioning and deployment of a stent across the stricture. The GOO Scoring System (GOOSS) is used to evaluate the severity of GOO before and after stent placement (0 = unable to eat anything; 1 = able to swallow liquid only; 2 = able to eat soft solids; 3 = able to eat low-residue or full diet).[1] Clinical success is defined as resolution of symptoms and/or improvement of food intake as quantified by GOOSS.[27] Reported technical success rates are over 90%. The most common reasons for failure are inability of the guidewire to traverse the stricture, inability of the stent delivery system to reach the lesion, failure of stent deployment, and early migration of the stent during the procedure.[27,28] Clinical success rates are not as high as those for technical success. Depending on the definition of clinical success, the reported rates range from 79% to 94%.[11,29–31]

In a systematic review conducted in 2004 that included 606 patients with gastroduodenal malignancies, rates of technical success and clinical success (defined as relief of symptoms) for stent placement were 97% and 87%, respectively.[32] Jeurnink et al[27]