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RAPID COMMUNICATION

Treatment of gastric outlet and duodenal obstructions with uncovered expandable metal stents

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Abstract

AIM: To investigate and evaluate the technical feasibility and clinical effectiveness of fluoroscopically guided peroral uncovered expandable metal stent placement to treat gastric outlet and duodenal obstructions.

METHODS: Fifteen consecutive patients underwent peroral placement of Wallstent™ Enteral Endoprosthesis to treat gastric outlet and duodenal obstructions (14 malignant, 1 benign). All procedures were completed under fluoroscopic guidance without endoscopic assistance. Follow-up was completed until the patients died or were lost, and the clinical outcomes were analyzed.

RESULTS: The technique success rate was 100%, and the oral intake was maintained in 12 of 14 patients varying from 7 d to 270 d. Two patients remained unable to resume oral intake, although their stents were proven to be patent with the barium study. One patient with acute necrotizing pancreatitis underwent enteral stenting to treat intestinal obstruction, and nausea and vomiting disappeared. Ten patients died during the follow-up period, and their mean oral intake time was 50 d. No procedure-related complications occurred. Stent migration to the gastric antrum occurred in one patient 1 year after the procedure, a tumor grew at the proximal end of the stent in another patient 38 d post-stent insertion.

CONCLUSION: Fluoroscopically guided peroral metal stent implantation is a safe and effective method to treat malignant gastrointestinal obstructions, and complications can be ignored based on our short-term study. Indications for this procedure should be discreetly considered because a few patients may not benefit from gastrointestinal insertion, but some benign gastrointestinal obstructions can be treated using this procedure.

Key words: Gastric outlet obstruction; Duodenal obstruction; Expandable metal stent

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INTRODUCTION

Gastroduodenal obstruction is usually a preterminal event in patients with advanced malignancies of the stomach, pancreas, and duodenum. Surgery is associated with a high complication rate, and relatively high morbidity and mortality rates, due to poor nutrition and general status or progressing tumor infiltration in these patients[1-8]. Fluoroscopically guided peroral placement of self-expandable metal stents to treat gastric and duodenal obstructions have been demonstrated to be an effective alternative to surgical bypass with lower morbidity and mortality rates, shorter hospitalization, and a lower cost of the overall treatment[1,3,5,6,8-10]. Various stents including vascular stents have been used to treat gastric and duodenal obstructions before the design of special duodenal stents[1]. Here, we report our experience in the treatment of gastric and duodenal obstructions using uncovered Wallstent Enteral Endoprosthesis in recent years. There have been few reports on enteral stenting for benign gastrointestinal obstructions[2,11,12]. Here, we discuss our methods used for intestinal stenting for one patient with acute necrotizing pancreatitis. We also discuss our opinions on the placement technique, indications, complications, and follow-up results.

MATERIALS AND METHODS

Subjects

A total of 15 consecutive patients underwent fluoroscopically guided peroral placement of Wallstent Enteral Endoprosthesis to treat gastroduodenal obstructions from June 2004 to December 2006, in our department. There were 11 men and 4 women with an average age of 62.4 years (age range, 32-87 years). The underlying causes of

Table 1 Patient information

Case	Sex/age (yr)	Underlying disease	Stent size (diameter × length, mm)	Duration of oral intake after stenting	Follow-up time	Outcome
1	F/68	Ampullary cancer	22 × 90	At least 10 d	10 d	
2	M/72	Gastric cancer	22 × 60	15 d	24 d	Dead
3	F/39	Pancreatic cancer	20 × 90	At least 4 mo	4 mo	
4	F/65	Pancreatic cancer	22 × 90	38 d	74 d	Dead
5	M/86	Pancreatic cancer	20 × 90	80 d	85 d	Dead
6	M/87	Pancreatic cancer	20 × 60 22 × 60	At least 20 d	20 d	
7	M/80	Ampullary cancer	20 × 60	9 mo	10 mo	Dead
8	F/72	Colon cancer	22 × 90 22 × 60	22 d	26 d	Dead
9	M/66	Gallbladder cancer	22 × 90	7 d	50 d	Dead
10	M/33	Acute necrotizing pancreatitis	20 × 60 22 × 60 22 × 90		1 y	
11	M/67	Duodenal cancer	20 × 90	60 d	70 d	Dead
12	M/68	Pancreatic cancer	20 × 90	7 d	10 d	Dead
13	M/48	Pancreatic cancer	20 × 90	0 d	6 d	Dead
14	M/32	Colon cancer	20 × 60	At least 7 d	7 d	
15	M/53	Esophageal cancer	20 × 60	0 d	40 d	Dead

obstructions were pancreatic carcinoma (n = 6), ampullary carcinoma (n = 2), colon carcinoma (n = 2), gastric cancer (n = 1), duodenal cancer (n = 1), gallbladder cancer (n = 1), esophageal carcinoma (n = 1), and acute necrotizing pancreatitis (n = 1) (Table 1). The diagnosis was established by means of CT (n = 7), endoscopy (n = 2) or after surgery (n = 6). Gastrointestinal obstructions were confirmed by a barium study (n = 11), endoscopy (n = 2), and CT (n = 2). The sites of obstructions were the gastric antrum (n = 1), pylorus (n = 1), gastrointestinal anastomotic stoma (n = 1), duodenum (n = 12, including duodenal metastasis from colon carcinoma in two patients). Fourteen patients with malignant obstructions were considered inoperative because of the risk of recurrence after surgery, extensive tumor growth, metastatic cancer or the presence of peritoneal seeding or distant metastasis. They all presented with severe nausea and recurrent vomiting. The patient with acute necrotizing pancreatitis developed severe intestinal obstruction following surgery. Although jejunostomy had been performed, nausea and vomiting persisted in this patient, and duodenal obstruction was finally detected. There was no amelioration in conditions after 4 months, so we decided to insert a metal stent in order to relieve the obstructive syndrome.

Methods

The Wallstent Enteral Endoprosthesis (Boston Scientific Medi-Tech, USA) was used in all patients. The sizes of the stents were as follows: 20 mm (diameter) × 60 mm (length), 22 mm × 60 mm, 20 mm × 90 mm, and 22 mm × 90 mm. Informed consent was obtained from all patients before all procedures. Stent placement procedures were performed according to a standard technique as described in the literature[1,13,14]. More than 2 d before the stent placement, a barium study was performed to evaluate the site, length, and severity of the obstruction. A nasogastric tube was placed overnight to empty the stomach, and was removed just before the stent insertion. All procedures were performed using a digital angiographic unit with the patient in the supine position. Pharyngeal anesthesia was usually performed using lidocaine aerosol spray (n = 13), but basal anesthesia (n = 1) or intravenous general anesthesia (n = 1) was also offered depending on the patients' or their relatives' demands. A catheter and guiding wire were inserted perorally into the esophagus under fluoroscopic guidance, and were advanced into the stomach. A small amount of contrast medium was injected through the catheter to identify the gastric outlet or the site of obstruction. The guiding wire and catheter were carefully manipulated to cross the obstruction using a standard catheter technique. After the catheter and guiding wire were located distal to the obstruction and the length of the obstruction was measured, the wire was exchanged for a 260-cm super-stiff guide wire to provide better support for the stent insertion. The Wallstent Enteral Endoprosthesis was then performed under fluoroscopic monitoring to ensure the perfect position of the stent. A stent 4 cm longer than the obstruction length was routinely chosen to completely overlap the affected region. Balloon dilation was performed when the stent assembly could not pass the stenosis. We also performed balloon dilation after stent deployment in 2 of our patients, which was a different procedure from the literature[1].

The patients were monitored hourly for at least 8 hours after the procedure. If they did not complain of abdominal pain and the hemoglobin level was normal, they were allowed to resume oral intake of liquids. Their diet progressed to soft or solid foods when they could tolerate liquids well. A barium study or endoscopy was performed to verify the position and patency of the stent in cases of bad tolerance of foods or recurrence of nausea and vomiting.

Follow-up was continued by phone calls after patient discharge, and a further barium study or endoscopy was suggested only when symptoms recurred.

RESULTS

Peroral stent deployment was successfully completed under fluoroscopic guidance in our 15 patients, indicating

a technique success rate of 100%. No procedure-related complication occurred. Two stents were needed in 2 patients, and three stents were needed in one due to the lengths of the obstructions. Therefore, a total of 19 stents were used in our 15 patients. The follow-up period was 6 d to 365 d (mean = 80.5 d). Stent migration to the gastric antrum occurred in one patient 1 year after the procedure, and tumor ingrowth at the proximal end of the stent was detected in another patient 38 d after stent insertion. Oral intake was maintained in 12 of 14 patients (85.7%) varying from 7 d to 270 d. Two patients were still unable to resume oral intake, although their stents were proven to be patent with the barium study. The patient with acute necrotizing pancreatitis (benign gastrointestinal obstruction) underwent enteral stenting in order to treat the intestinal obstruction, and nausea and vomiting disappeared after the procedure. Ten patients died during the follow-up period, and their mean oral intake time was 50 d (0 d to 270 d). The time between their death and the stent insertion varied from 6 d to 300 d (mean = 68.5 d).

Percutaneous transhepatic biliary drainage (PTBD) and/or bile duct stent embedding were performed before enteral stenting in 13 patients, 4 of whom further underwent biliary interventional procedures as jaundice recurred after the procedure. The times between the relapse of jaundice and the enteral stent procedure were 7 d, 14 d, 15 d, and 130 d for these 4 patients, respectively. No evidence showed that jaundice recurred because of enteral stenting.

Three of the 14 patients (malignant gastrointestinal obstructions) underwent transcatheter arterial chemotherapy (TAC), and their nutritional status improved after the procedure. Their survival time seemed to be longer than that of the others. However, we did not analyze the influence of TAC considering the small number of patients.

DISCUSSION

A malignant gastrointestinal obstruction is usually a preterminal event in patients with pancreatobiliary, stomach or duodenum malignancies. Such patients often cannot undergo curative resections because of the inoperability or unresectability of their tumors. Palliative surgery is associated with a high complication rate, and relatively high morbidity and mortality rates, due to poor nutritional and general status or progressing tumor infiltration in such patients[1-8]. Fluoroscopically guided peroral placement of self-expandable metal stents to treat gastric and duodenal obstructions have been demonstrated to be an effective alternative to surgical bypass with lower morbidity and mortality rates, shorter hospitalization, and a lower cost of the overall treatment[1,3,5,6,8-10]. Various stents including vascular stents have been used for the treatment of gastric and duodenal obstructions before the availability of specially designed duodenal stents[13]. However, only expandable metal stents have been approved by the Food and Drug Administration for the treatment of gastrointestinal obstructions due to cancer risks[5,15]. We chose the Wallstent Enteral Endoprosthesis (Boston Scientific Medi-Tech, USA) because of its flexibility and safety. Covered stents have been used to prevent tumor ingrowth or overgrowth[4,6,10,12,16-19]. Because we thought the expected survival time of these patients was limited, and tumor ingrowth or overgrowth did not need to be considered[19], we chose to use uncovered metal stents to obviate migration. In fact, only one case of tumor ingrowth was identified in our 15 patients 38 d after stent insertion, with an ingrowth rate of 6.67%. Additionally, the implantation of peroral uncovered stents is technically easier than covered stents[1,6,8,16-18].

According to the literature, fluoroscopic stent placement for duodenal obstructions is a technically more difficult procedure than for gastric outlet obstructions, not only because of a loop formation of the stent delivery system in the distended stomach, but also because of the curved configuration of the duodenal C loop[1,16,17,20]. Endoscopic assistance and gastrostomy have been used after guide wire navigation to advance past the duodenal obstructions[1,3,16]. In our series, the site of obstruction was located in the duodenum in 12 patients, but no endoscopic assistance or gastrostomy was required in any of them because of the flexibility of the endoprosthetic system and the patience of the interventional radiologists. PTBD before enteral stenting is considered to be necessary by some authors, but there are different opinions[1,18]. Thirteen patients in our series developed jaundice and underwent PTBD or biliary stenting before gastrointestinal obstructions occurred, and enteral stenting was scheduled. Three of them underwent a second biliary intervention after the enteral stenting, but there was no evidence showing that enteral stenting caused recurrence of jaundice.

TAC was performed in three patients who showed a relatively longer survival time than those who could not tolerate TAC. Considering the small number of patients, we did not analyze the influence of TAC on survival time. Further studies are required to elucidate this relationship.

Nausea and vomiting disappeared or mitigated, and oral intake was maintained in 12 of 14 (85.7%) patients with malignant gastrointestinal obstructions ranging from 7 d to 270 d (mean = 54.7 d). Two patients were still unable to resume oral intake while nausea and vomiting continued after the procedure, although their stents were proven to be patent according to the barium study. A clinical success rate of 85.7% is acceptable because many factors may contribute to the symptoms in malignant gastrointestinal obstructions[21]. Further studies on the indications of enteral stenting for malignant gastric and duodenal obstructions are warranted.

The patient with acute necrotizing pancreatitis (benign gastrointestinal obstruction) underwent enteral stenting to treat the intestinal obstruction, and nausea and vomiting disappeared after the procedure. His symptoms of nausea and vomiting continued for over 4 mo even after jejunostomy had been performed. Therefore, we decided to perform enteral stenting after discussion with his surgeons. The convention has been that stent placement is rarely indicated for benign gastrointestinal strictures[12,14], and further studies are needed to elucidate such issues. No procedure-related complication occurred, and only two complications were observed during the follow-up period. Stent migration to the gastric antrum happened in one

patient 1 year after the procedure, and a gastric ulcer with hemorrhage was found around the proximal end of the stent by endoscopy. The patient refused further treatment, and left. Tumor ingrowth at the proximal end of the stent was detected by the barium study in another patient 38 d after stent insertion. Due to progressing tumor infiltration and a hepatic abscess leading to deterioration, a second stent implantation could not be performed, and the patient died 36 d later.

In conclusion, fluoroscopic peroral placement of self-expandable metal stents is a safe and effective treatment for malignant gastric outlet and duodenal obstructions. The technique success rate is high, and complications can be ignored due to the short survival time of the patients in our study. However, indications should be carefully considered before the procedure because a minority of patients may not benefit from gastrointestinal insertion, while some benign gastrointestinal obstructions can also be treated with this procedure.

COMMENTS

Background

Gastroduodenal obstruction is usually a preterminal event in patients with advanced malignant diseases. It can lead to severe malnutrition and even death in the patients. Many studies have reported that enteral stents can be used to achieve gastroduodenal patency, and the effects have been satisfactory.

Research frontiers

Stents have been widely used in interventional procedures. A research hotspot has been to modify the craft of stents to obtain more flexible and durable materials. Various covered stents have been studied to improve effectiveness and reduce adverse reactions.

Innovations and breakthroughs

In previous applications of stents to treat gastroduodenal obstructions, it was found that tumor ingrowth or overgrowth could cause restenosis in uncovered stents, while migration might happen in covered stents. Endoscopic assistance or gastrostomy has been used after guide wire navigation to advance past the duodenal obstructions. Here, we proved that fluoroscopic peroral placement of uncovered metal stents can be safe and effective for most cases.

Applications

The study results suggest that fluoroscopic peroral placement of uncovered metal stents is safe and effective to treat gastroduodenal obstructions. However, indications should be discreetly considered before the procedure.

Peer review

This is a clinical study in which authors investigate and evaluate the technique feasibility and clinical effectiveness of fluoroscopically guided peroral uncovered expandable metal stent placement to treat gastric outlet and duodenal obstructions.

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