

Fluoroscopy guided stent placement for the treatment of malignant afferent loop obstruction

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Abstract

BACKGROUND & AIM:

To evaluate the efficacy and safety of fluoroscopy guided stent placement for the treatment of malignant afferent loop obstruction (ALO).

METHODS

12 patients with malignant ALO in whom fluoroscopy guided stent placement had been performed were analyzed retrospectively. The operation time, clinical efficacy, complications and postoperative hospitalization were observed. Follow-up was scheduled at 1 and 3 months after the operation, and every 3 months thereafter, or when the patients developed clinical symptoms related to ALO.

RESULTS

Stent placement was performed successfully in 11 patients with an average time of 37.9 ± 12.2 min. For the other one patient, we adopted transnasal drainage tube implantation in afferent loop instead of stent placement. All the patients had an obvious relief of clinical symptoms, and no serious complications occurred. During the follow-up, 1 patient had restenosis 12 months later as the tumor grew across the stent mesh. 7 patients died of tumor progression at 3, 4.5, 5, 7, 8, 11 and 15 months after the operation.

CONCLUSION

Fluoroscopy guided stent placement is an effective and safe method for the treatment of malignant ALO.

Introduction

Afferent loop obstruction (ALO) is a mechanical obstruction of the afferent loop after distal gastrectomy with Billroth II or Roux-en-Y reconstruction, or pancreaticoduodenectomy, which can lead to cholangitis, pancreatitis and intestinal perforation due to continuous elevation of the blind loop's pressure(1).

Traditionally, ALO was managed by surgery with repeat anastomosis or bypass, but it is too invasive for the patients who have tumor recurrence with poor tolerance(2, 3). More recently, endoscopic therapy has been reported for the treatment of malignant ALO in a small number of cases, including stent placement and endoscopic ultrasound-guided entero-enterostomy (EUS-EE)(4, 5). However, stent placement guided by fluoroscopy had not been reported in the literature so far. The purpose of this study was to evaluate the efficacy and safety of fluoroscopy guided stent placement for the treatment of malignant ALO.

Materials And Methods

Patients

From January 2017 to January 2020, we retrospectively analyzed 12 patients with malignant ALO in whom stent placement had been performed. All the patients had undergone distal gastrectomy with Billroth II or Roux-en-Y reconstruction, or pancreaticoduodenectomy. ALO was diagnosed by abdominal computed tomography (CT) (Fig. 1A) and endoscopy, and histopathology confirmed tumor recurrence. The clinical data are summarized in Table 1. All methods were carried out in accordance with relevant guidelines and regulations. The study was approved by the Ethics Committee of The First Affiliated Hospital, and College of Clinical Medicine of Henan University of Science and Technology (Project No. 2019-19), and written informed consent was obtained from all the patients.

Table 1
Clinical data of the 12 patients in this study

Patient No./age (y)/sex	Etiology requiring surgery	Type of previous surgery	Clinical symptoms
1/58/M	Duodenal adenocarcinoma	PD with Child	AP, fever
2/66/M	Cholangiocarcinoma	PD with Child	AP, AD, cachexia
3/49/M	Cholangiocarcinoma	PD with Whipple	AP, jaundice
4/71/F	Cholangiocarcinoma	PD with Child	AP, AD
5/86/M	Cholangiocarcinoma	PD with Child	AP, jaundice
6/42/M	Cholangiocarcinoma	PD with Child	AP
7/54/F	Pancreatic cancer	PD with Whipple	AP, fever, cachexia
8/49/M	Pancreatic cancer	PD with Child	AP, jaundice
9/67/F	Gastric cancer	DG with Billroth II	AP, AD, jaundice
10/37/M	Gastric cancer	DG with Roux-en-Y	AP, vomiting
11/44/F	Gastric cancer	DG with Billroth II	Fever
12/60/F	Gastric cancer	DG with Roux-en-Y	AP, AD

M, male; F, female; PD, pancreaticoduodenectomy; DG, distal gastrectomy; AP, abdominal pain; AD, abdominal distension

Treatment

Uncovered self-expanded metallic stent (Nanjing Micro-Tech Co. Ltd., Nanjing, China) was used in this study. The operation was performed under digital subtraction angiography (Artis Zeego; Siemens,

Munich, Germany) as follows. A transnasal gastric tube was placed in the stomach and contrast agent was injected through the tube to locate the afferent and efferent loop. Negative pressure drainage through the gastric tube was continued during the next procedure. A vertebral artery catheter (Cook Medical, Bloomington, IN, USA) was introduced from the mouth cooperated with a hydrophilic guidewire (Terumo, Tokyo, Japan), passing through the esophagus, stomach, proximal afferent loop and the obstructive segment to the distal afferent loop (Fig. 1B). After being confirmed by radiography, a 90cm 10F vascular sheath (Cook Medical) was introduced from mouth to stomach via a stiff guidewire (Terumo). Through the sheath, the stent delivery system was introduced over the guidewire. The location of the stent was adjust to ensure the margins exceeded the obstructive segment by 2–3 cm.

Postoperative Observation and Follow-up Study

The operation time, clinical efficacy, complications and postoperative hospitalization were observed. The clinical efficacy was defined as follows: good, complete disappearance of symptoms without any complications related to the operation; fair, well tolerated symptoms and/or mild complications that not require management; poor, little or no improvement of symptoms, and/or serious complications, such as hemorrhage, perforation and stent migration(6). Follow-up was scheduled at 1 and 3 months after the operation, and every 3 months thereafter, or when the patients developed clinical symptoms related to ALO.

Results

Stent placement was successfully performed at the first attempt in 11 patients with an average operation time of 37.9 ± 12.2 min (Fig. 1C), and the efficacy can be defined as good. However, in 1 patient, we selected transnasal drainage tube indwelling in afferent loop instead of stent placement, as the proximal end of the obstructive segment was adjacent to the anastomotic stoma. The patient also had an obvious relief of clinical symptoms. The detailed information of stent model, operation time, postoperative hospital stay can be seen in Table 2.

Table 2
Results of treatment and follow-up

Patient no.	Stent model	Operation time (min)	Complication	Clinical efficacy	Postoperative hospital stay (d)	Follow-up time (mo) and patient outcome
1	22 mm·10 cm	45	None	Good	6	20, live
2	22 mm·10 cm	32	None	Good	9	15, dead
3	20 mm·10 cm	29	None	Good	4	12, live
4	22 mm·8 cm	30	None	Good	7	8, dead
5	22 mm·10 cm	38	None	Good	6	13, live
6	22 mm·10 cm	52	Restenosis	Good	5	5, dead
7	20 mm·8 cm	25	None	Good	12	4.5, dead
8	22 mm·6 cm	30	None	Good	7	7, dead
9	22 mm·8 cm	38	None	Good	7	17, live
10	None	40	None	Good	5	11, dead
11	22 mm·10 cm	30	None	Good	8	19, live
12	22 mm·10 cm	41	None	Good	6	3, dead

The follow-up ranged from 3 to 20 months (Fig. 1D). During that period, 7 patients died of tumor progression at 3, 4.5, 5, 7, 8, 11 and 15 months after the operation, but none of them had any symptoms related to ALO. 1 patient had restenosis 12 months later as the tumor grew across the stent mesh, and stent placement was performed again using the stent-in-stent technique (Table 2).

Discussion

ALO is a rare complication following distal gastrectomy with Billroth II or Roux-en-Y reconstruction, or pancreaticoduodenectomy, with an estimated incidence of 0.3–13%(1). ALO can lead to cholangitis, pancreatitis and intestinal perforation due to continuous elevation of the blind loop's pressure. Traditionally, ALO was managed by surgery with repeat anastomosis or bypass, but it is too invasive for the patients who have tumor recurrence with poor tolerance(2, 3). More recently, endoscopic therapy including EUS-EE and stent placement has been reported for malignant ALO in a small number of cases(4, 5). Brewer *et al.*(5) reported 18 patients treated by EUS-EE with a success rate of 100% and 17 patients treated by stent placement with a success rate of 88.2%. All the patients who had a successful operation had an obvious relief of clinical symptoms without any serious complications, which showed that both EUS-EE and stent placement were effective and safe. The difference in the present study was that stent placement was guided by fluoroscopy instead of endoscopy, which had not been reported previously.

In the present study, the technical success rate of stent placement was 91.7% and the clinical efficacy can be defined as good. The long-term stent function was good except stent restenosis in 1 patient. The data were similar to those of endoscopic therapy reported previously(5). However, we encountered 1 patient who was not suitable for stent placement as the proximal end of the obstructive segment was adjacent to the anastomotic stoma. Our experience suggested that the distance between the anastomotic stoma and the proximal end of the obstruction should be at least 2 cm; otherwise the stent may affect the gastric contents entering the efferent loops.

Compared with endoscopic treatment, fluoroscopy guided stent placement seems to be safer and less invasive, and even the patients with cachexia can also be well tolerated. Combined with preoperative CT, fluoroscopy can provide a great spatial resolution than endoscopy, which helped to locate the afferent loop quickly and accurately. In fact, the operation in all the patients were finished in an hour. However, the difficulty that fluoroscopy guided needs to overcome is the insufficient support force of the guidewire when the stent delivery system is introduced, especially when the guidewire forms loops in the stomach. Here, we adopted two techniques to improve the successful rate of the operation. Firstly, continuous negative pressure drainage through a transnasal gastric tube kept the gastric cavity from becoming too large, which can prevent the guidewire forming loops. Meanwhile, it reduced gastric-acid-induced damage to the guidewire. Secondly, the use of a long sheath provided a powerful support force, which ensured the delivery system reached the stomach and passed through the obstructive segment smoothly.

However, there were limitations to this study. Firstly, the study was retrospective, with a limited number of cases; therefore, the data may have been affected by various potential biases. Secondly, it was not always easy for the guidewire to pass through the obstructive segment to the distal intestine as the regional anatomy was complex after surgery, which required a good understanding of the type of surgery and preoperative imaging; thus, the treatment was restricted to university hospitals.

In conclusion, fluoroscopy guided stent placement for the treatment of malignant ALO is an effective and safe method. It provides a great option, in addition to surgery and endoscopic treatment, especially for patients who have poor tolerance to the traditional surgery.

Declarations

Ethics approval and consent to participate

The study was approved by the Ethics Committee of The First Affiliated Hospital, and College of Clinical Medicine of Henan University of Science and Technology (Project No. 2019-19), and written informed consent was obtained from all the patients.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

Chaoyang Wang is the guarantor of the study and wrote the main manuscript text, Xiaoyi Duan collected the data, Lequn Wei and Tong Wang prepared the figures, Huanzhang Niu helped design the study. All authors reviewed the manuscript.

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Figures

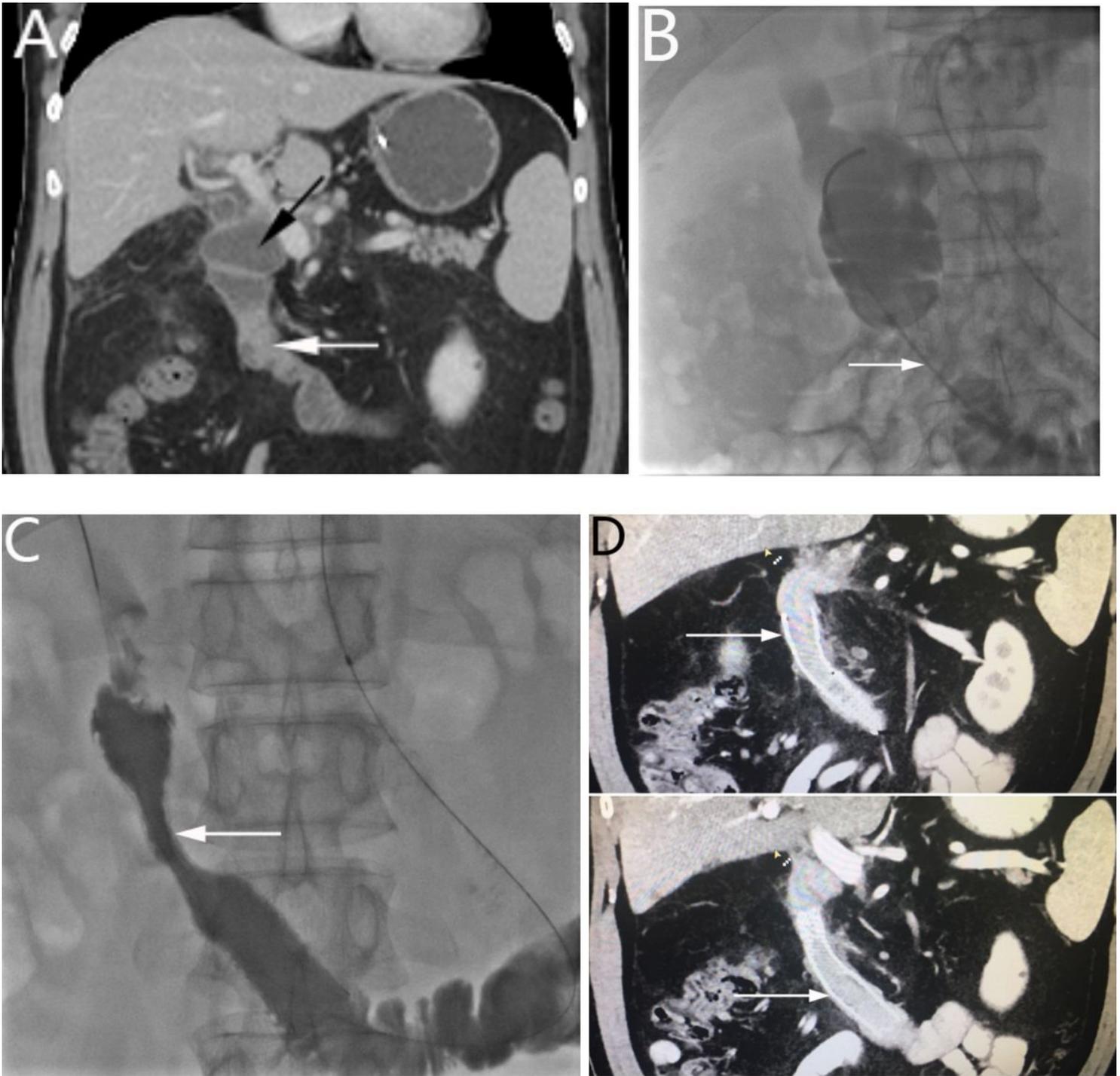


Figure 1

A 58-year-old man had abdominal pain and fever 27 months after pancreaticoduodenectomy as a result of duodenal adenocarcinoma. A: CT showed soft tissue mass in afferent loop (white arrow) and distended intestine (black arrow). B: radiology showed obstruction of the afferent loop (white arrow). C: after stent placement, radiology showed the afferent loop was fluent. D: 20 months later, CT showed that the stent had complete expansion without migration.