

# Enteral stent placement for malignant afferent loop obstruction by the through-the-scope technique using a short-type single-balloon enteroscope



## Authors

Takashi Sasaki, Ikuhiro Yamada, Masato Matsuyama, Naoki Sasahira

## Institution

Department of Gastroenterology, Cancer Institute Hospital of Japanese Foundation of Cancer Research, Koto-ku, Japan

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## Bibliography

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## Corresponding author

Takashi Sasaki, MD, PhD, Department of Gastroenterology, Cancer Institute Hospital of Japanese Foundation of Cancer Research, 3-8-31 Ariake, Koto, Tokyo 135-8550, Japan

Fax: +81-3-3520-0141

[sasakit-ky@umin.ac.jp](mailto:sasakit-ky@umin.ac.jp)

## ABSTRACT

**Background and study aims** A short-type single-balloon enteroscope with a 3.2-mm working channel makes it possible to insert an enteral stent by the through-the-scope technique in patients with malignant afferent loop obstruction. Here, we report five cases of malignant afferent loop obstruction treated with endoscopic enteral stenting. We also propose a new classification for three types of malignant afferent loop obstruction. Type 1: The obstruction site is located distal to the papilla or the bilioenteric anastomosis. Type 2: The obstruction site is located at the papilla or the bilioenteric anastomosis. Type 3: The obstruction site is located between the bilioenteric and pancreaticoenteric anastomosis. The patients with type 1 and 3 were simply treated by inserting an enteral stent endoscopically. The patient with type 2 was treated with an endoscopic enteral stent for malignant afferent loop obstruction and with percutaneous transhepatic biliary stenting for malignant biliary obstruction. Although double stenting for type 2 remains a difficult endoscopic procedure, the endoscopic approach has become the standard approach for malignant afferent loop obstruction.

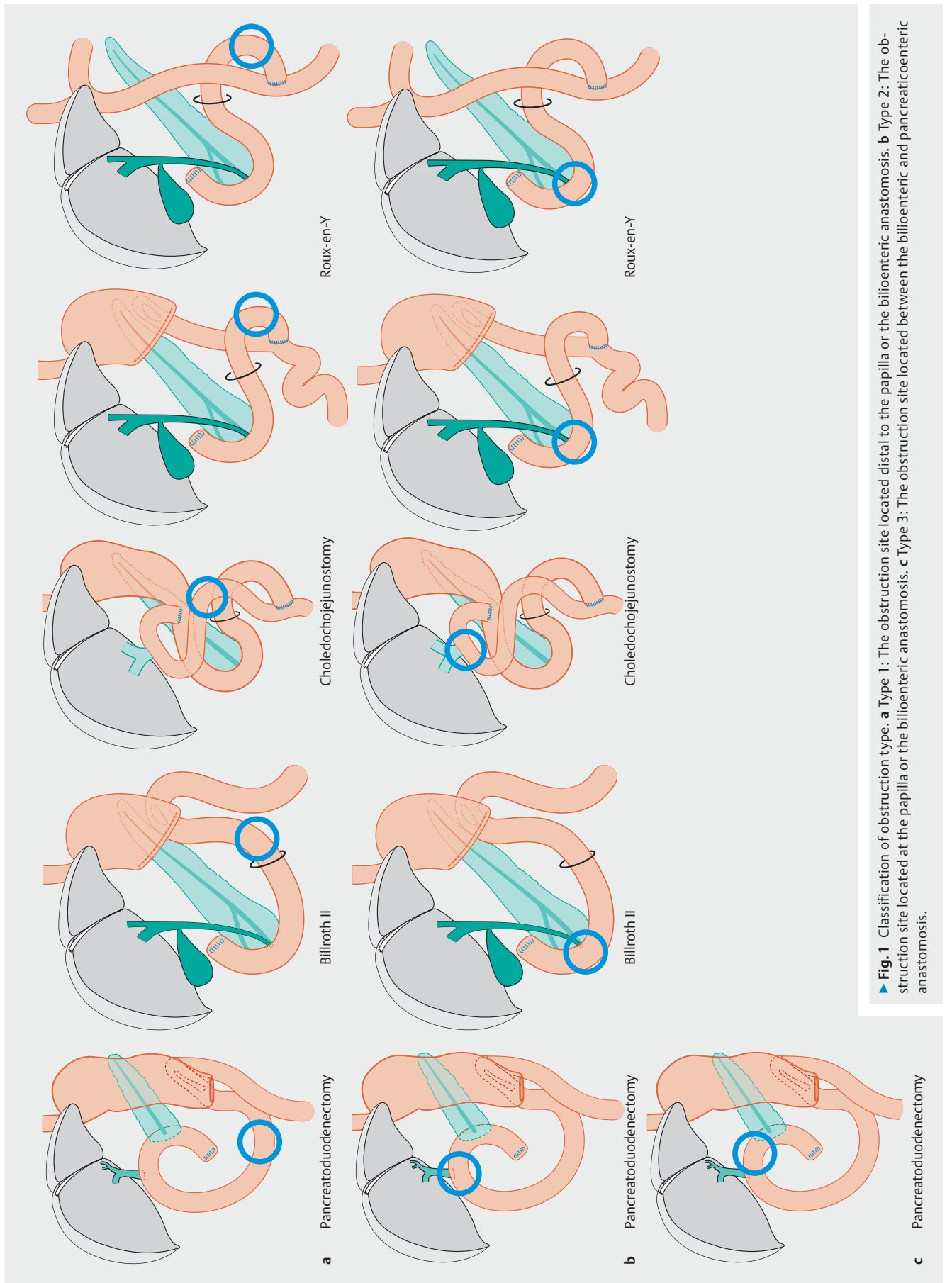
## Introduction

Malignant afferent loop obstruction is caused by tumor recurrence in patients with surgically altered gastrointestinal anatomy. Hepatobiliary and/or pancreatic enzymes are elevated, and malignant afferent loop obstruction sometimes complicates acute cholangitis. Risk of perforation increases due to severe extension of the blind loop. Recently, it has become possible to perform enteral stenting by the through-the-scope technique, using a short-type balloon-assisted enteroscope with a 3.2-mm working channel. Herein, we report five cases of malignant afferent loop obstruction treated endoscopically by enteral stent placement with the through-the-scope technique. We also propose a new classification for three types of malignant afferent loop obstruction (► **Fig. 1**). Type 1: The obstruction site is located distal to the papilla or the bilioenteric anastomosis. Type 2: The obstruction site is located at the papilla or the bilioenteric anastomosis. Type 3: The obstruction site is located

between the bilioenteric and pancreaticoenteric anastomosis. The clinical conditions and the treatment approaches differ according to the obstruction types of malignant afferent loop obstruction.

## Case reports

We experienced five cases of malignant afferent loop obstruction treated with endoscopic enteral stenting. ► **Table 1** shows details of these cases. A short-type single-balloon enteroscope with a 3.2-mm working channel and a 152-cm working length (SIF-H290S; Olympus, Tokyo, Japan) was used to insert a self-expandable metallic stent. Enteral stent (Niti-S colonic stent; TaeWoong Medical, Seoul, South Korea) was deployed under fluoroscopic and endoscopic guidance by the through-the-scope technique. According to the new classification of obstruction types, two patients (Patient 1 ► **Fig. 2**) and Patient 2) were classified as type 1, and one patient (Patient 3

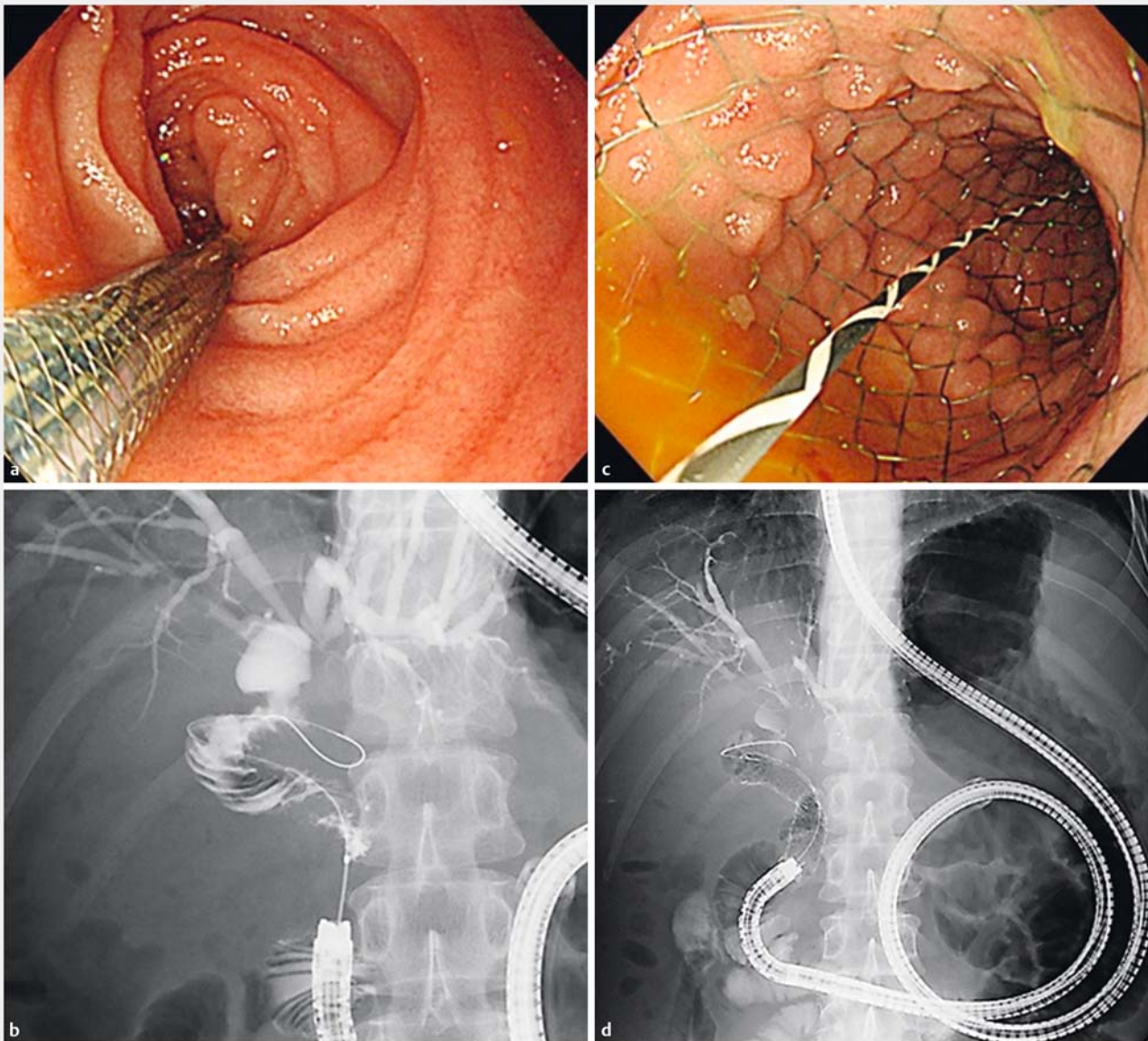


► **Fig. 1** Classification of obstruction type. **a** Type 1: The obstruction site located distal to the papilla or the bilioenteric anastomosis. **b** Type 2: The obstruction site located at the papilla or the bilioenteric anastomosis. **c** Type 3: The obstruction site located between the bilioenteric and pancreaticoenteric anastomosis.

► **Table 1** Summary of cases.

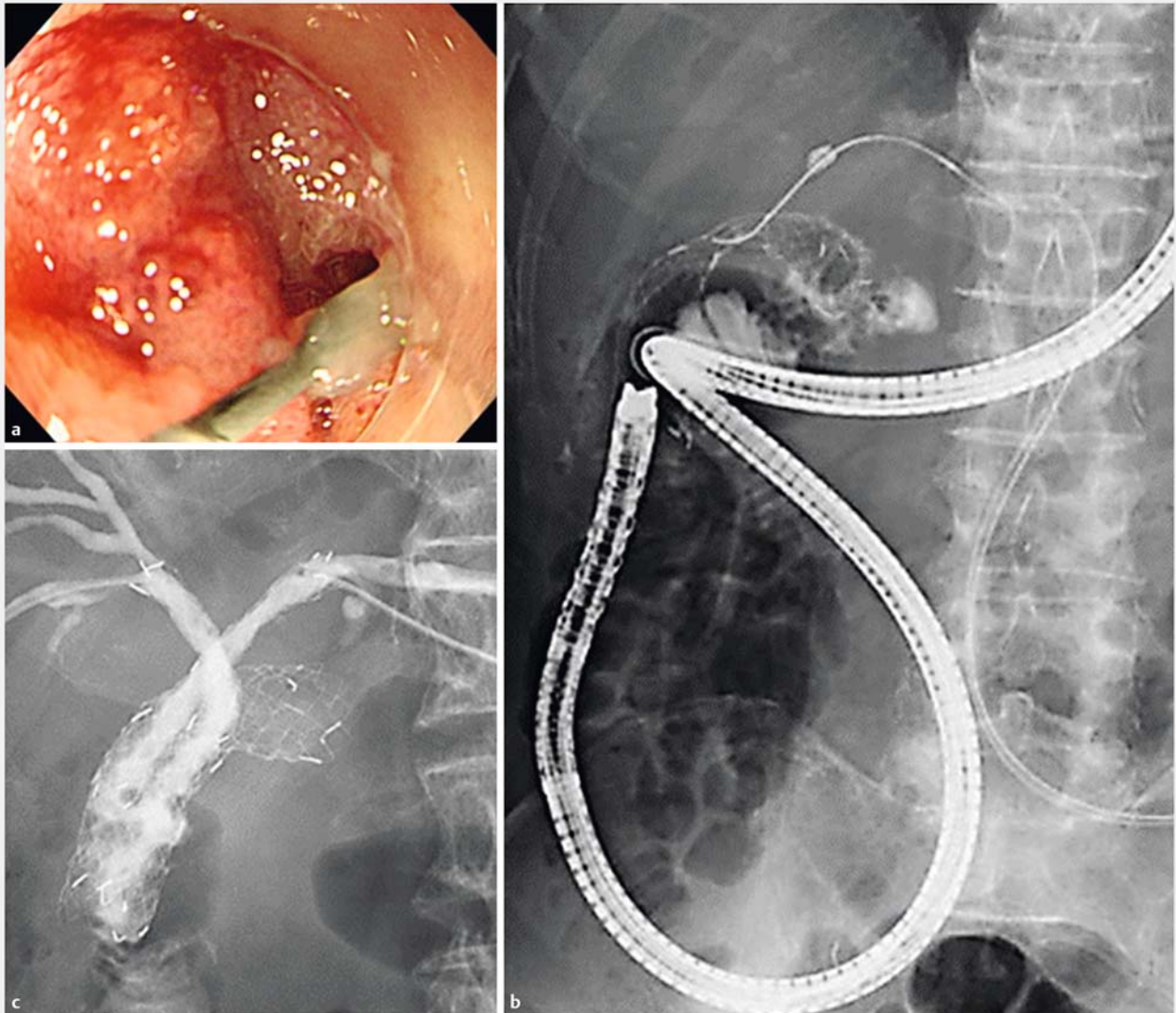
Case	Age	Gender	Primary cancer	Operative methods	Obstruction type	Cause of obstruction	Stent diameter	Stent length
1	37	M	Cholangiocarcinoma	PpPD	Type 1	Local recurrence	18 mm	10 cm
2	73	M	Pancreatic cancer	SSPPD	Type 1	Peritoneal dissemination	18 mm	8 cm
3	84	M	Cholangiocarcinoma	Choledochojejunostomy	Type 2	Local recurrence	18 mm	10 cm
4	53	M	Pancreatic cancer	SSPPD	Type 3	Local recurrence	18 mm	12 cm
5	55	M	Pancreatic cancer	SSPPD	Type 3	Local recurrence	18 mm	12 cm

PpPD, pylorus-preserving pancreatoduodenectomy; SSPPD, subtotal stomach-preserving pancreatoduodenectomy.



► **Fig. 2** Enteral stent placement for malignant afferent loop obstruction (Type 1). **a** The delivery system was advanced over the guidewire. **b** Contrast media clarified the stenosis of malignant afferent loop obstruction. **c** Endoscopic view of enteral stent placement. **d** Fluoroscopic view of enteral stent placement.





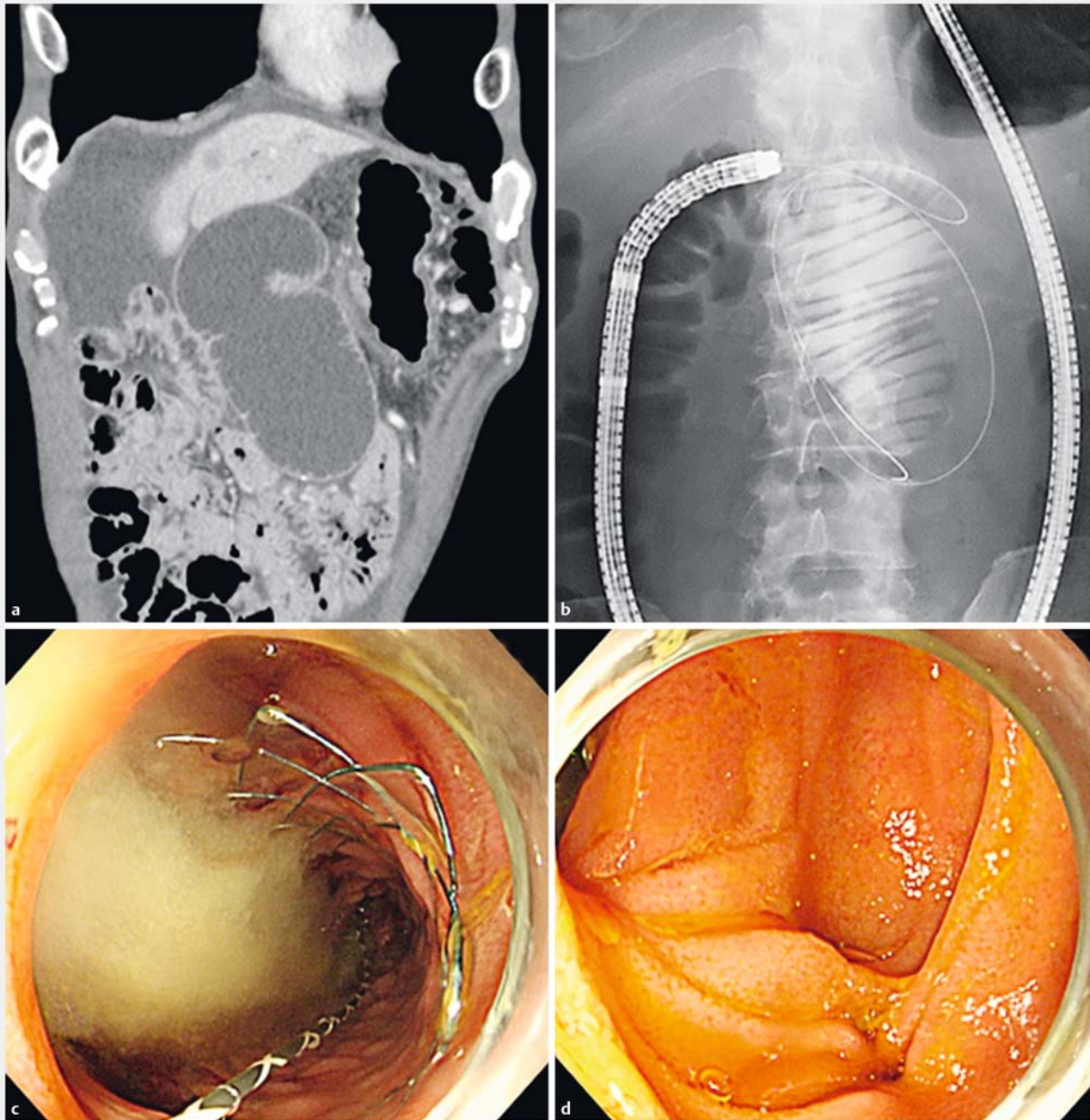
► **Fig. 3** Enteral stent placement for malignant afferent loop obstruction (Type 2). **a** Endoscopic view of the obstruction site. It is difficult to identify the bilioenteric anastomosis. **b** Fluoroscopic view of enteral stent placement. **c** Percutaneous transhepatic biliary stenting.

[► **Fig. 3**]) was type 2, and two patients (Patient 4 [► **Fig. 4**] and Patient 5) were type 3. Patient 1's case was complicated by jaundice. Patients 2 and 3 were admitted because of acute cholangitis. In Patients 4 and 5, symptoms were abdominal distention due to the extended blind loop. Patients with types 1 and 3 were simply treated by inserting an enteral stent endoscopically. The patient with type 2 was treated with an endoscopic enteral stent for malignant afferent loop obstruction and with percutaneous transhepatic biliary stenting for malignant biliary obstruction because it was difficult to identify the bilioenteric anastomosis endoscopically. Two uncovered metallic stents (Large cell D type 8 mm × 6 cm, 8 mm × 8 cm; TaeWoong Medical, Seoul, South Korea) were inserted bilaterally via percutaneous transhepatic biliary drainage (PTBD) routes.

## Discussion

Malignant afferent loop obstruction is conventionally managed by surgical bypass or PTBD [1]. Surgical bypass is a reliable method but is too invasive for patients with recurrent cancer. Decompression via PTBD is less invasive; however, it is difficult to perform PTBD when the bile duct is not dilated enough. Even in cases of dilated bile duct, there is a risk of bile leak via the puncture route because the pressure of blind loop and bile duct are extremely elevated. When it is impossible to insert an enteral stent for malignant afferent loop obstruction via PTBD, a sustainable external drainage worsens quality of life.

Enteral stenting via PTBD has been reported previously [2]. Endoscopic enteral stenting has also been reported using a conventional endoscope in cases of Billroth II reconstruction and pancreaticoduodenectomy [3]. However, it remains difficult



► **Fig. 4** Enteral stent placement for malignant afferent loop obstruction (Type 3). **a** Computed tomography showed dilated blind loop caused by local recurrence at the pancreaticoenteric anastomosis. **b** The guidewire was passed through the obstruction to the blind loop. **c** Endoscopic view of enteral stent placement. **d** The enteral stent does not cover the bilioenteric anastomosis.

to manage other surgical reconstructions such as Roux-en-Y reconstruction or choledochojejunostomy using a conventional endoscope. Balloon-assisted enteroscopy makes it possible to manage difficult types of surgically altered anatomy cases of malignant afferent loop obstruction. Standard types of balloon-assisted enteroscopy only have a small working channel; therefore, it is not possible to deploy the enteral stent by the through-the-scope technique. The enteral stent is delivered fluoroscopically via the overtube after removing the entero-

scope [4]. In 2016, two types of short-type balloon-assisted enteroscopes (double-balloon enteroscope and single-balloon enteroscope) with a 3.2-mm working channel became available in Japan. It became possible to deploy an enteral stent by the through-the-scope technique, and only a few cases have been reported to date [5–7].

There are several operative methods for surgically altered gastrointestinal anatomy. Major operative methods were pancreaticoduodenectomy (modified Child surgery), Billroth II re-



construction, choledochojejunostomy, and Roux-en-Y reconstruction. Clinical conditions were strongly affected by the operative methods and the obstruction sites of afferent loop. Here, we propose a classification system for types of malignant afferent loop obstruction according to the relationship between the obstruction site and the papilla or the bilioenteric and pancreaticoenteric anastomosis (► **Fig. 1**). Type 1: The obstruction site is located distal to the papilla or the bilioenteric anastomosis (► **Fig. 1a**). In this type, bile and/or pancreatic juice pools in the blind loop, and the hepatobiliary and/or pancreatic enzymes increase due to elevation of blind loop pressure. This obstruction sometimes complicates cholangitis. Type 2: The obstruction site is located at the papilla or the bilioenteric anastomosis (► **Fig. 1b**). In this type, malignant afferent loop obstruction and malignant biliary obstruction occur simultaneously and frequently complicate acute cholangitis. Type 3: The obstruction site is located between the bilioenteric and pancreaticoenteric anastomosis (► **Fig. 1c**). In this type, pancreatic juice pools in the blind loop. Symptoms of abdominal distention usually occur when the blind loop is severely extended, which has risk of perforation. The strategy for managing a malignant afferent loop obstruction differs according to this classification system. In type 1, decompression of malignant afferent loop obstruction and concomitant cholestasis may be achieved by simply inserting an enteral stent at the obstruction site. In type 2, double stenting is required to achieve both decompression of blind loop and biliary drainage in this situation. Because the bilioenteric anastomosis is inside the site of tumor recurrence, it is difficult to detect the anastomosis and cannulate the bile duct endoscopically. A combination of PTBD or endoscopic ultrasound (EUS)-guided biliary drainage is sometimes needed. In type 3, decompression of malignant afferent loop obstruction can be achieved by inserting an enteral stent at the obstruction site, but it requires more attention to perforation because of the short segmented blind loop. Moreover, an enteral stent needs to be deployed at the obstruction so as not to cover the bilioenteric anastomosis. In our series, Patients 1 and 2 were classified as type 1, Patient 3 was type 2, and Patients 4 and 5 were type 3. Most of the previous reports about enteral stenting for malignant afferent obstruction were classified as type 1.

Recently, EUS intervention was also reported as treatment for malignant afferent loop obstruction, especially when balloon-assisted enteroscopy could not reach the obstruction site. There were two approaches to EUS intervention. One approach was decompression via the bile duct using EUS-guided hepaticogastrostomy [8]. This approach has a risk of bile leak like PTBD. The other approach was making the gastrojejunal anastomosis using a lumen-apposing metal stent [9,10]. Inserting a lumen-apposing metal stent by a one-step method is a simple and effective strategy if the blind loop is located near the stomach.

## Conclusion

We reported on five cases of enteral stent placement for malignant afferent loop obstruction by the through-the-scope technique using a short-type single-balloon enteroscope. We also proposed a classification of obstruction types. The endoscopic approach has become the standard approach for malignant afferent loop obstruction.

## Competing interests

None

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