A newly developed short double-balloon enteroscope with a working channel enlarged to a diameter of 3.2 mm is a novel innovation in stent placement for patients with surgically altered anatomies. Herein, we report three patients in whom this new scope contributed to an efficient technique and ideal treatment. In the first case, the double guidewire technique was efficient and effective for multiple stent placements. In the second case, covered self-expandable metal stent (SEMS) placement, which is the standard treatment for malignant biliary obstruction, could be performed in a technologically sound and safe manner. In the third case, SEMS placement was performed as palliative treatment for malignant afferent-loop obstruction; this procedure could be performed soundly and safely using the through-the-scope technique. The wider working channel of this new scope also facilitates a smoother accessory insertion and high suction performance, which reduces procedure time and stress on endoscopists. Furthermore, this new scope, which has advanced force transmission, adaptive bending, and a smaller turning radius, is expected to be highly successful in both diagnosis and therapy for various digestive diseases in patients with surgically altered anatomies. (Gut Liver 2017;11:306-311)

Key Words: Double-balloon enteroscopy; Cholangiopancreatography, endoscopic retrograde; Stents; Gastric outlet obstruction; Technology

INTRODUCTION

The short double-balloon enteroscope (DBE) is considered a useful device for endoscopic retrograde cholangiopancreatography (ERCP) in patients with surgically altered anatomies.¹ One reason for this is that the short length of the scope allows many conventional ERCP accessories to be used, unlike the long DBE. However, the narrow working channel of the scope, with a 2.8-mm diameter, limits the procedures and treatments that can be performed.

On the other hand, a useful overtube-assisted technique with the long single-balloon enteroscope replaced by a conventional forward-viewing upper endoscope, which enables the use of conventional accessories after reaching the target site, was reported.² However, the scope exchange can be difficult, especially if the overtube collapses due to an acute angulated site,³ and the diameter of the working channel of currently available upper scopes is only 2.8-mm.

A newly developed short DBE (EI-580BT; Fujifilm, Tokyo, Japan), whose working channel is enlarged to 3.2 mm in diameter (Figs 1 and 2), represents a novel innovation for patients with surgically altered anatomies. Herein, we report three patients in whom this new scope contributed to efficient technique
CASE REPORTS

1. Case 1

A 37-year-old woman who had undergone living donor liver transplantation with right lobe graft for congenital biliary atresia was admitted for cholangitis due to benign recurrent biliary obstruction. She had a history of hepaticojejunostomy as a reconstruction method. Therefore, ERCP was attempted for biliary drainage using the newly developed short DBE. Scope insertion to the bilioenteric anastomosis was successfully achieved (Fig. 3A), and cholangiogram showed benign strictures of the bile duct (B6, B7, and B8) and bilioenteric anastomotic stricture (Fig. 3B). We planned to place as many plastic stents as possible in order to achieve sufficient dilation of these strictures. First, 0.035-inch (RevoWave; Piolax, Kanagawa, Japan) and 0.025-inch (Visiglide2; Olympus, Tokyo, Japan) guidewires were...
inserted in B7 and B6, respectively (Fig. 3C). While maintaining a 0.025-inch guidewire in B6, a 7-F plastic stent (Through Pass; Gadelius, Tokyo, Japan) was smoothly advanced using a 0.035-inch guidewire, and was placed into B7 (Fig. 3D). Secondly, the 0.035-inch guidewire was reinserted in B6, and a second 7-F plastic stent (Through Pass; Gadelius) was placed into B6 using the guidewire, still maintaining the 0.025-inch guidewire in place. Similarly, the 0.035-inch guidewire was reinserted in B8, and a third 7-F plastic stent (Through Pass; Gadelius) was placed into B8 (Fig. 3E). Finally, a fourth 7-F plastic stent (Through Pass; Gadelius) was successfully placed into B6 using the 0.025-inch guidewire that was initially inserted (Fig. 3F). No procedure-related adverse events occurred. Three months later, these four plastic stents were exchanged safely and accurately by the same methods due to persistent biliary strictures, which were improved but still present (Table 1).

### 2. Case 2

A 78-year-old man who had received chemotherapy for postoperative recurrence of gastric cancer in the intra-abdominal lymph nodes and lung after distal gastrectomy with Roux-en-Y reconstruction was admitted for jaundice. Computed tomography imaging revealed distal malignant biliary obstruction (MBO) due to enlarged lymph nodes. Therefore, ERCP was attempted for biliary drainage using the newly developed short DBE. After insertion of the scope to the ampulla of Vater (Fig. 4A), biliary cannulation was successfully performed; a cholangiogram showed a 15-mm long distal biliary obstruction (Fig. 4B). Following endoscopic sphincterotomy using a sphincterotome (RotaCut; Medi-Globe GmbH, Achenmühle, Germany), a partially covered self-expandable metal stent (CSEMS) with a delivery system of 8.5-mm diameter and 194-cm working length (Wallflex biliary RX stent; Boston Scientific, Natick, MA, USA; 10 mm x 60 mm) was successfully deployed (Fig. 4C and D). Postprocedure, mild pancreatitis occurred, but improved immediately with conservative therapy. After resolution of jaundice, chemotherapy was resumed, and no recurrent biliary obstruction occurred for 13 months (Table 1).

### 3. Case 3

A 59-year-old woman who had undergone total gastrectomy with Roux-en-Y due to gastric cancer was admitted for abdominal pain due to cancer recurrence. Computed tomography imaging revealed malignant afferent-loop obstruction, involving the third portion of the duodenum. Therefore, duodenal stent placement was attempted as palliative therapy using the newly developed short DBE. After reaching the lesion (Fig. 5A), small-bowel enema showed stenosis of approximately 40-mm in length (Fig. 5B). Then, an uncovered self-expandable metal stent (USEMS) (Niti-S D pyloric/duodenal uncovered stent; Taewoong Medical, Gimpo, Korea; 18-mm in diameter, 6-cm in length) with a delivery system of 9-F diameter and 220-cm working length was
smoothly advanced via the through-the-scope technique, and placed correctly and safely under endoscopic view and fluoroscopic guidance using the new scope (Fig. 5C-E). Postprocedure, mild pancreatitis occurred, but improved immediately with conservative therapy. Thereafter, her symptom also improved (Table 1).

**DISCUSSION**

This newly developed short DBE with an enlarged working channel represents technological innovation in endoscopic stent placement for patients with surgically altered anatomies; the double guidewire technique was efficient and effective for
multiple stent placement. CSEMS placement, which represents standard treatment for MBO, and USEMS placement, as palliative treatment for malignant afferent-loop obstruction, were both performed in a technologically sound and safe manner.

First, we demonstrated multiple 7-F plastic stent placements with the double guidewire technique using standard guidewires, such as 0.035-inch and 0.025-inch guidewires, employing the newly developed short DBE. The conventional short DBE with a small, 2.8-mm working channel does not allow placement of a 7-F stent while also maintaining a second standard guidewire in place. Therefore, we would need to perform biliary stenting one by one: a repeated process consisting of targeting the bile duct using a standard guidewire and placing a plastic stent within the duct. However, this impractical procedure carries a potential risk with the increasing number of stents placed: a greater number of stents would make it more difficult to identify and target the bile duct using the guidewire. Previously, we reported that a 0.018-inch guidewire was useful in the double guidewire technique as a landmark guidewire when performing partial stent-in-stent placement of metallic stents using conventional short DBE. However, a 0.018-inch guidewire is inadequate for biliary stenting, because of its reduced stiffness. The ability to maintain a 0.025-inch guidewire is more useful and reasonable for definitive and efficient biliary stent placement.

In the second case, we describe a patient with postoperative distal MBO due to lymph node metastases, in whom the newly developed short DBE contributed to transpapillary CSEMS placement, by through-the-scope methods. CSEMS is useful for the treatment of distal MBO, because of its long-term patency compared with USEMS. However, although successful scope insertion and cholangiogram were achieved using a conventional short DBE, a CSEMS that can be placed using the short DBE with a small working channel was unavailable; therefore, an USEMS or plastic stent must be selected for distal MBO. The availability of not only USEMS but also CSEMS is critically important from a clinical perspective, because it allows postoperative patients with distal MBO to receive the standard treatment, similar to that used in patients with normal anatomies.

Thirdly, we report a postoperative patient with malignant afferent-loop obstruction, in whom the new scope contributed to the placement of the USEMS, designed as a duodenal stent, by through-the-scope methods. Conventional DBE could never allow gastrointestinal metal stent placement for malignant gastrointestinal obstruction such as an afferent-loop obstruction, because of the narrow working channel of the scope. Therefore, one common practice is to insert the conventional DBE to the stricture and subsequently remove it, leaving the overtube; the self-expandable metal stent is then placed through the overtube under fluoroscopic guidance. This technique is useful, but stent placement using the new scope, and the through-the-scope method, as in our case, is more ideal for achieving correct and safe stent placement.

The wider working channel of this new scope also facilitates smoother accessory insertion and high suction performance, which can reduce procedure time and stress on endoscopists. In addition, this new scope allows for improved and easier scope insertion, by producing gradual stiffness with advanced force transmission for better stability and adaptive bending. Additionally, the smaller turning radius allows for improved viewing of the target site and a better environment for treatment. This scope is expected to be useful in improving the ability to obtain successful diagnosis and therapy for various digestive diseases in patients with surgically altered anatomies.

This newly developed short DBE brings about technological innovation in stent placement, and therefore standard, efficient, and safe treatment can be performed even in patients with surgically altered anatomies.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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