

Percutaneous Transhepatic Biliary Drainage Using a Ligated Catheter for Recurrent Catheter Obstruction: Antireflux Technique

Tsuyoshi Hamada^{*†}, Takeshi Tsujino^{*†}, Hiroyuki Isayama^{*†}, Ryunosuke Hakuta^{*}, Yukiko Ito^{*}, Ryo Nakata^{*}, and Kazuhiko Koike[†]

^{*}Department of Gastroenterology, Japanese Red Cross Medical Center, and [†]Department of Gastroenterology, The University of Tokyo, Graduate School of Medicine, Tokyo, Japan

Percutaneous transhepatic biliary drainage (PTBD) is an established procedure for biliary obstruction. However, duodenobiliary or jejunobiliary reflux of the intestinal contents through a PTBD catheter sometimes causes recurrent catheter obstruction or cholangitis. A 64-year-old female patient with a history of choledochojejunostomy was referred to our department with acute cholangitis due to choledochojejunal anastomotic obstruction. Emergent PTBD was performed, but frequent obstructions of the catheter due to the reflux of intestinal contents complicated the post-PTBD course. We therefore introduced a catheter with an antireflux mechanism to prevent jejunobiliary reflux. A commercially available catheter was modified; side holes were made at 1 cm and 5 to 10 cm (1 cm apart) from the tip of the catheter, and the catheter was ligated with a nylon thread just proximal to the first side hole. Using this novel "antireflux PTBD technique," jejunobiliary reflux was prevented successfully, resulting in a longer patency of the catheter. (**Gut Liver 2013;7:255-257**)

Key Words: Catheters; Cholangitis; Choledochostomy; Drainage

INTRODUCTION

Percutaneous transhepatic biliary drainage (PTBD) is an established nonsurgical procedure for the management of biliary obstruction, especially in patients in whom an endoscopic approach to the biliary system is impossible.^{1,2} Compared with endoscopic biliary drainage, PTBD secures more stable drainage because it allows for serial monitoring of the quality and quantity of bile discharge. Duodenobiliary or jejunobiliary reflux of intestinal contents through a PTBD catheter, however,

sometimes causes recurrent catheter obstruction or cholangitis. We successfully prevented jejunobiliary reflux, only by simply modifying a commercially available catheter. Here, we report a novel technique to prevent jejunobiliary reflux through a PTBD catheter: "antireflux PTBD technique."

CASE REPORT

A 64-year-old female patient was referred to our department with a 1-day history of abdominal pain and fever. She had a history of choledochojejunostomy with Roux-en-Y reconstruction for common bile duct injury during laparoscopic cholecystectomy for cholecystolithiasis 2 years earlier. Laboratory data on admission were as follows: white blood cells, 13,900/mm³ (normal, 3,700 to 8,000/mm³); total bilirubin, 3.6 mg/dL (normal, 0.2 to 1.2 mg/dL); alkaline phosphatase, 868 IU/L (normal, 104 to 338 IU/L); γ -glutamyltranspeptidase, 320 IU/L (normal, 0 to 59 IU/L); and C-reactive protein, 6.12 mg/L (normal, 0.00 to 0.29 mg/dL). A contrast-enhanced computed tomography scan of the abdomen revealed marked dilatation of the bile duct of the left liver without evidence of bile duct stones or tumors. Based on these findings, a diagnosis of acute cholangitis due to biliary obstruction was made.

After obtaining informed consent from the patient and her family members, emergent PTBD was performed under ultrasonographic and fluoroscopic guidance. The bile duct of segment three was punctured. A subsequent cholangiogram demonstrated a choledochojejunal anastomotic obstruction (Fig. 1). A 0.035-inch polymer-coated guidewire (Radifocus; Terumo Co., Tokyo, Japan) was passed successfully through the obstruction. At the end of the procedure, an 8-Fr balloon-tipped internal-external drainage catheter (Create Medic Co., Kanagawa, Japan)

Correspondence to: Takeshi Tsujino

Department of Gastroenterology, The University of Tokyo Graduate School of Medicine, 7-3-1 Hongo Bunkyo-ku, Tokyo 113-8655, Japan
Tel: +81-3-3815-5411, Fax: +81-3-3814-0021, E-mail: tsujinot-int@h.u-tokyo.ac.jp

Received on August 9, 2012. Revised on September 11, 2012. Accepted on September 13, 2012.

pISSN 1976-2283 eISSN 2005-1212 <http://dx.doi.org/10.5009/gnl.2013.7.2.255>

© This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

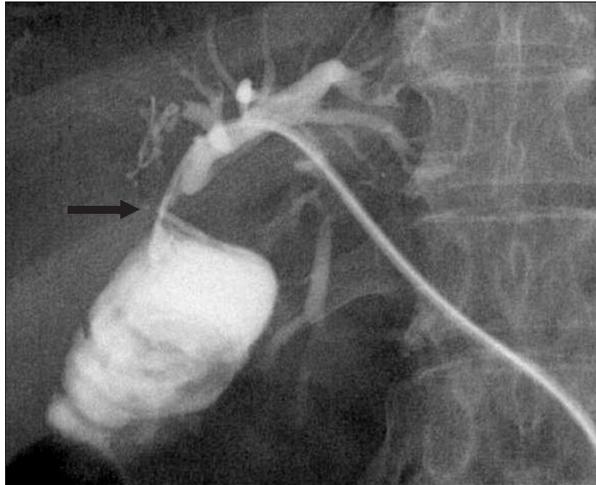


Fig. 1. Percutaneous transhepatic cholangiography revealed a choledochojejunal anastomotic obstruction (arrow) without the revelation of the right intrahepatic bile duct.

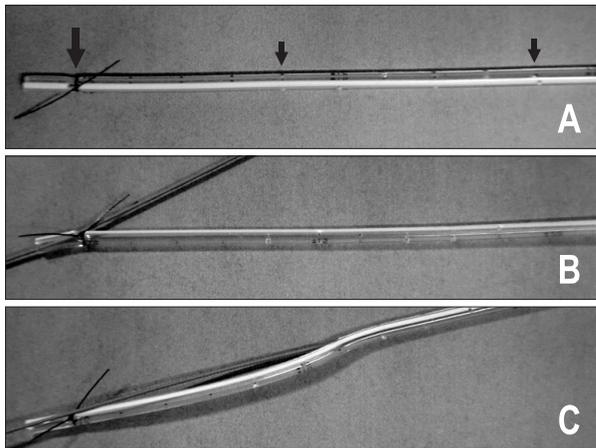


Fig. 2. (A) Image of a drainage catheter with an antireflux mechanism. The site just proximal to the first side hole (1 cm from the tip, long arrow) was ligated with a nylon thread, and proximal side holes were made 5 to 10 cm (1 cm apart) from the tip (between short arrows). (B) At the time of catheter insertion, a guidewire must be passed through the distal end to the first side hole as insertion of a rapid exchange catheter. (C) At the time of catheter removal, a guidewire must be passed through one of the proximal side holes.

was placed across the choledochojejunal anastomosis to dilate the anastomotic stricture. We planned to change the catheter prophylactically until the anastomotic stricture resolved. Bile culture showed *Escherichia coli* and *Enterobacter cloacae*. Brushing cytology of the obstruction identified no malignant cells.

After the initial PTBD, the patient recovered quickly and the acute cholangitis subsided. However, the occlusion of the PTBD catheter due to reflux of intestinal contents occurred repeatedly accompanied by elevated serum liver enzymes, requiring frequent cleaning of the catheter with flushing of natural saline to facilitate bile flow (nine times in 14 days). Larger-caliber (10-,



Fig. 3. Drainage catheter with an antireflux mechanism *in situ*. The first side hole (long arrow) was located in the jejunum, and the proximal side holes were located in the left intrahepatic bile duct (between the short arrows).

12-, and 16-Fr) catheters failed to prevent the reflux of intestinal contents into the catheter.

To circumvent the problem, we introduced a novel method using a modified PTBD catheter with an antireflux mechanism. We used a commercially available 10-Fr internal-external drainage catheter (Create Medic Co.), which originally had side holes 1 to 10 cm (1 cm apart) from the tip. We cut the distal side of this catheter and made side holes at 1 cm and 5 to 10 cm (1 cm apart) from the tip. Furthermore, the tip of the catheter was ligated with a nylon thread just proximal to the side hole (1 cm from the tip) (Fig. 2A) to prevent reflux. Placement of a modified catheter over the prepositioned guidewire was achieved without any technical difficulties (Fig. 3).

Ultrasonography performed 2 days after the procedure demonstrated the disappearance of pneumobilia, indicating successful prevention of the reflux of intestinal contents and air from the jejunum. Neither obstruction nor the discharge of intestinal contents through the catheter was observed until the prophylactic exchange of the catheter, 100 days after the procedure. At the time of removal of a modified catheter, we passed a guidewire through one of the proximal side holes without any technical difficulties.

DISCUSSION

Although PTBD is an established procedure for biliary obstruction, clogging of a PTBD catheter by biliary sludge is inevitable. Catheter obstruction predisposes patients to acute cholangitis and obstructive jaundice. It is believed that bacterial colonization in the biliary system (bactibilia), which is usually seen after PTBD catheter placement, plays a major role in sludge formation, eventually leading to catheter obstruction.³⁻⁵ Loss of

papillary sphincter function after choledochojejunostomy, the location of the catheter tip in the intestine, and duodenal tumor invasion⁶ provoke the reflux of duodenal and jejunal contents into the biliary system as well as into the catheter, increasing the risk of catheter obstruction and cholangitis. In some cases, however, the catheter tip should be placed in the intestine in order to stabilize the catheter position or to dilate an anastomotic stricture. Frequent catheter irrigation with normal saline, larger diameter catheter placement, and periodical catheter exchanges have been attempted to prevent PTBD catheter obstruction.

Our patient developed recurrent catheter obstruction in a short period of time despite the aforementioned attempts to decrease this complication. We considered that in this patient, free reflux of intestinal contents into the catheter may have caused the unfavorable outcome. To prevent jejunobiliary reflux, we modified a conventional PTBD catheter. This novel PTBD technique ("antireflux PTBD") successfully prevented jejunobiliary reflux of intestinal contents in our patient based on the evidence of clearer bile discharge through the catheter and the disappearance of pneumobilia. In addition, this technique resulted in a longer patency of the catheter.

The advantage of this technique is its simplicity; a commercially available PTBD catheter is easily modified using a nylon thread. This technique, therefore, is applicable to clinical practice in many centers without technical difficulties or additional cost. We consider that patients with increased intraluminal pressure (e.g., afferent loop obstruction) are especially suitable candidates for antireflux PTBD because the enhanced jejunobiliary reflux is likely to provoke severe, life-threatening bacterial cholangitis.^{7,8}

Because a modified catheter is inserted in a fashion similar to that of a rapid exchange catheter, more technical difficulties may be encountered compared with the usual catheter exchange with a guidewire through the entire length of the catheter (Fig. 2B). In addition, a guidewire must be passed through one of the proximal side holes of a modified catheter at the time of catheter exchange (Fig. 2C). Based on our limited experience in this case, however, these potential disadvantages were overcome without any technical difficulties.

In conclusion, the antireflux PTBD technique is an effective procedure in select patients with recurrent PTBD catheter obstruction due to reflux of intestinal contents.

CONFLICTS OF INTEREST

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

REFERENCES

1. Takada T, Hanyu F, Kobayashi S, Uchida Y. Percutaneous transhepatic cholangial drainage: direct approach under fluoroscopic control. *J Surg Oncol* 1976;8:83-97.
2. Nagino M, Hayakawa N, Nimura Y, Dohke M, Kitagawa S. Percutaneous transhepatic biliary drainage in patients with malignant biliary obstruction of the hepatic confluence. *Hepatogastroenterology* 1992;39:296-300.
3. McPherson GA, Benjamin IS, Habib NA, Bowley NB, Blumgart LH. Percutaneous transhepatic drainage in obstructive jaundice: advantages and problems. *Br J Surg* 1982;69:261-264.
4. Blenkharn JI, McPherson GA, Blumgart LH. Septic complications of percutaneous transhepatic biliary drainage. Evaluation of a new closed drainage system. *Am J Surg* 1984;147:318-321.
5. Joseph PK, Bizer LS, Sprayregen SS, Gliedman ML. Percutaneous transhepatic biliary drainage. Results and complications in 81 patients. *JAMA* 1986;255:2763-2767.
6. Audisio RA, Bozzetti F, Severini A, et al. The occurrence of cholangitis after percutaneous biliary drainage: evaluation of some risk factors. *Surgery* 1988;103:507-512.
7. Morita S, Takemura T, Matsumoto S, Odani R. Septic shock after percutaneous transhepatic drainage of obstructed afferent loop: case report. *Cardiovasc Intervent Radiol* 1989;12:66-68.
8. Moriura S, Ikeda S, Kimura A, Iwatsuka Y, Ikezawa T, Naiki K. Jaundice due to afferent loop obstruction following hepatectomy for a hilar cholangiocarcinoma. *Abdom Imaging* 1996;21:226-227.