Case Report

Successful Percutaneous Transhepatic Removal of an Internal Plastic Stent Migrated into the Intrahepatic Bile Duct after Pancreatoduodenectomy

Koki Nakanishi1, Yasuaki Arai1, Miyuki Sone1, Norshazriman Sulaiman1, Minoru Esaki2, Kazuaki Shimada2

Abstract
Two patients suffered from repeated cholangitis. Follow-up computed tomography showed dilatation of the intrahepatic bile ducts due to internal plastic stents that had migrated into the intrahepatic bile ducts after choledochojejunostomy. Endoscopic approaches were initially attempted in both cases; however, they failed because of complete migration of the internal plastic stents into the hepatic ducts. Both patients were successfully treated with percutaneous transhepatic removal of the internal plastic stents and balloon cholangioplasty in a single session, without any complications. After the procedure, the patients remained well, without any evidence of cholangitis or dilatation of bile ducts.

Removal of internal plastic stents is crucial in the management of patients with morbidity caused by residual stents, and this interventional procedure should be recognized as a treatment option in such challenging cases.

Key words: Internal plastic stent, Choledochojejunostomy, Pancreatoduodenectomy, Percutaneous transhepatic stent removal

(Interventional Radiology 2017; 2: 19-24)

INTRODUCTION

Pancreatoduodenectomy (PD) is a standard surgical treatment for pancreatic head malignancy [1, 2]. Leakage of pancreatic and bile juice after PD sometimes leads to serious complications. Placement of an internal plastic stent at the anastomotic site of pancreaticojejunostomy (PJ) and choledochojejunostomy (CJ) is a well-known procedure to prevent these complications. The internal plastic stent is fixed with absorbable sutures, and is typically expelled spontaneously into the jejunum and out of the body within a few months after surgery. On one hand, it was reported that placement of an internal plastic stent reduced the length of hospital stay [3]. On the other hand, there have been some reports of stent-induced complications such as cholangitis, liver abscess, stenosis of the bile duct, and intraductal stones caused by internal plastic stents that remain in the hepatic ducts [4-6]. Early removal of the stent in such situations is critical, and there have been several reports of endoscopic stent removal [5, 6].

Recently, we encountered two patients with cholangitis and stricture at the anastomotic site, caused by internal plastic stents that had migrated into the intrahepatic bile ducts. In both cases, endoscopic approaches failed because of complete migration of the stents into the intrahepatic bile ducts; however, stent removal and balloon cholangioplasty succeeded with percutaneous interventional procedures.

CASE REPORTS

Both patients had provided informed consent before the
procedures. Approval from the review board of our hospital was not required. The need for informed consent from both patients was waived in this retrospective report.

Case 1

An 81-year-old man with pancreatic head cancer underwent pylorus-preserving PD (PPPD). Reconstruction was performed using the modified Child method; three end-to-side anastomoses were fashioned between the jejunum and the tail of the pancreas, proximal common bile duct, and pylorus of the stomach. A 3-mm-diameter, 4-cm-long polyvinyl chloride plastic stent (retrograde transhepatic biliary drainage [RTBD] tube; Sumitomo Bakelite, Tokyo, Japan) was placed as an internal plastic stent and knotted with an absorbable suture (5-0 Monosyn; B. BRAUN, Pieffewiesen, Melsungen, Germany). The patient had a fairly uneventful recovery after the procedure, except for the development of a minor pancreatic fistula and delayed gastric emptying that was successfully treated conservatively. He was discharged 22 days after the surgery. At the follow-up visits at the outpatient clinic, the patient was found to have frequent fever, with no remarkable findings on blood biochemical examination. Postsurgical cholangitis was diagnosed and well controlled with oral antibiotics. Follow-up computed tomography (CT) performed three months after the surgery revealed a remaining plastic stent at the anastomotic site of the choledochojejunostomy (CJ); however, dilatation of the bile duct was not observed. CT performed six months after the surgery showed dilatation of the intrahepatic bile ducts with a stent remaining at the anastomotic site. At one year, the dilatation of the intrahepatic bile ducts worsened (Fig. 1 a-d). A blood chemical test showed serious hepatobiliary disorder (total bilirubin, 4.2 mg/dL; γ-glutamyltransferase, 1394 IU/L; alkaline phosphatase, 1969 IU/L). At this point, we assumed that the remaining stent caused repeated cholangitis and dilatation of the intrahepatic bile ducts. Therefore, removal of the stent was planned. Endoscopic stent removal was initially attempted, but the stent was not visualized at the anastomotic site of the CJ (Fig. 2a, 2b).

Percutaneous transhepatic stent removal was then planned. As the surface of the left hepatic lobe was close to the small bowel, initially, the access route at the right side was selected. The right intrahepatic bile duct was punctured using a 21-gauge needle. Cholangiography showed dilated bilateral intrahepatic bile ducts, and the remaining plastic stent was situated in the hepatic duct, with the upper tip in the left hepatic duct and the common hepatic duct (Fig. 3a). The left intrahepatic bile duct was then punctured under fluoroscopy using a 21-gauge needle, and a 10-Fr sheath introducer (Medikit, Tokyo, Japan) and 6.5-Fr angle-type catheter (Hanaco disposable percutaneous transhepatic cholangial drainage tube; Hanaco Medical, Saitama, Japan) were inserted.

Figure 1. Follow-up contrast-enhanced computed tomography (CT) findings. (a) CT performed three months after the surgery shows pneumobilia but no dilatation of the intrahepatic bile ducts. (b) CT performed six months after the surgery shows slight dilatation of the intrahepatic bile ducts. (c) CT performed nine months and (d) one year after the surgery shows worsening of the dilatation of the intrahepatic bile ducts.
Figure 2. Double-balloon enteroscopic findings. (a) Endoscopy using a double-balloon technique enabled close access to the anastomotic site of the choledochojunostomy. However, visualization and removal of the stent was not possible with endoscopy. (b) Enteroscopy allowed us to reach the anastomotic site of the choledochojunostomy, but spot radiography showed the tip of the plastic stent in the distal side of the anastomotic site.

Figure 3. Case 1. (a) Percutaneous transhepatic cholangiogram demonstrates the proximal tip of the stent in the left main hepatic duct (arrow) surrounded by debris as filling defects of contrast material. Intraductal stones are also depicted in the right hepatic duct (arrowhead). (b) Spot radiography at the time of percutaneous biliary access shows that the left hepatic bile duct was punctured, and a 10-Fr introducer was advanced close to the stent. (c) Spot radiography demonstrates that the stent was entrapped with a loop snare at its side hole. (d) Spot radiography at the time of balloon cholangioplasty shows that the stricture at the anastomotic site was dilated using a balloon catheter via a right-side biliary access route.
Case 2

A 49-year-old man with pancreatic head cancer underwent PPPD. Reconstruction was performed using the modified Child method. A 3-mm-diameter, 4-cm-long RTBD tube stent was placed and knotted with an absorbable suture. Similar to Case 1, this patient suffered from repeated cholangitis. Follow-up CT showed worsening of the dilatation of the intrahepatic bile duct due to a remaining stent in the right intrahepatic bile duct. Fifteen months after the initial surgery, removal of the stent was planned. Endoscopic stent removal was initially attempted, but the stent existed in the distal side of the anastomotic site.

Percutaneous transhepatic stent removal was then planned. At first, a right-side biliary access route from B8 was obtained and a 6.5-Fr angle-type catheter and 7-Fr sheath introducer (Medikit) were advanced close to the stent. Cholangiography with the catheter showed dilated bilateral intrahepatic bile ducts and the remaining stent in the right main hepatic duct (Fig. 5a). Balloon dilation of the stricture at the anastomotic site and choledocholithotomy were performed using a 10-mm-diameter, 4-cm-long balloon catheter via the B8 route (Fig. 5b). However, the single access route failed to hold the stent under the effect of intraductal stones and debris around the stent. The proximal route of the stent was obtained from B5. The remaining stent strongly adhered to the bile duct wall and was surrounded by debris; therefore, multiple attempts were required from both routes. Subsequently, the stent could be grasped from the first obtained route (B8). We used the B8 route for withdrawal and the B5 route for postprocedural drainage. The stent was removed with a sheath introducer in a manner similar to that used in Case 1 (Fig. 5c).

Cholangiography performed five days later showed improvement of the stricture and no residual debris (Fig. 5d). Thus, the external biliary drainage catheter from the B5 route was removed. The patient was discharged 14 days after stent removal and has remained well with no evidence of cholangitis and dilatation of bile ducts for nearly 9 months after the procedure.

DISCUSSION

An internal plastic stent is sometimes placed at the anastomotic site after PD to decrease the length of hospital stay and increase the comfort of the patient [3]. However, Ogino et al. reported that movement of the internal plastic stent after CJ could lead to late complications. They reported one

Figure 4. (a) Photograph shows the removed stent (arrowhead), which was grasped with a loop snare in a 6.5-Fr angle-type catheter (arrow). (b) Spot radiography demonstrates improvement with flow of contrast from the intrahepatic bile duct to the jejunum, without residual filling defects in the bile duct.
case in which biliary obstruction was caused by intraductal stones around an internal plastic stent. The median interval for stent expulsion via defecation was reported to be 7 months; however, they reported that remaining plastic stents were observed in 31% of patients at 18 months after surgery [5]. Naitoh et al. reported that remaining plastic stents after CJ were observed in 16 of 23 patients at 6 months, 4 patients at 12 months, and 3 patients at 18 months after surgery [7]. The main purpose of our interventional procedure is the removal of the remaining plastic stent. In cases of obstructive jaundice or cholangitis caused by a remaining plastic stent, there is no argument that stent removal is crucial. Endoscopic and percutaneous transhepatic cholangioscopic approaches have been reported for the removal of plastic stents [5, 6]. Each approach has some advantages and disadvantages. The endoscopic approach is more common; however, approaching the CJ anastomotic site is sometimes not easy, and stent removal is difficult when the stent has migrated into the intrahepatic bile duct. The percutaneous transhepatic cholangioscopic approach requires creating a 12- to 16-Fr access route to enable insertion of the scope, which requires approximately 2 weeks by staged dilatation [8]. Our procedure without cholangioscopy is feasible for approaching a stent that has migrated into the intrahepatic bile duct. Further, it requires a much smaller route than that used in the cholangioscopic approach, and stent removal and balloon cholangioplasty can be completed in one session.

This report had several limitations. Direct comparison with other advanced techniques and devices was not performed because this report aimed to describe a single institutional experience. In both cases, we required two access routes. We immediately removed the 10-Fr and 7-Fr sheaths without tract embolization, when the stent was removed. An external drainage tube was placed in the junction of the right and left hepatic ducts. We believe that the bile duct on the removal side should be drained completely.

In conclusion, percutaneous transhepatic removal of a mi-

---

**Figure 5.** Case 2. (a) Percutaneous transhepatic cholangiogram demonstrates the stent in the right main hepatic duct to B8 (arrow) surrounded by debris as filling defects of contrast material. (b) Spot radiography at the time of balloon cholangioplasty shows a stricture at the anastomotic site that was dilated using a balloon catheter via the B8 route. The debris was simultaneously pushed out of the bile duct as much as possible, using this balloon catheter. (c) Spot radiography demonstrates that the stent was grasped with a loop snare on the right biliary duct (B8). A 7-Fr sheath introducer and guidewire in the right biliary duct (B5) to the left biliary duct (B3) are also shown. (d) Spot radiography demonstrates improvement of the stricture and no residual debris.
grated stent into the intrahepatic bile duct and balloon cho-
langioplasty were successful in two cases, without any com-
plications. This procedure should be recognized as a treat-
ment option in the management of such challenging cases.

Conflict of interest: The authors declare that they have no con-
flicts of interest.

References

gration of internal pancreaticojejunostomy stents into the bile ducts in patients undergoing pancreatoduodenectomy. J Gastro-
createicojejunostomy following pancreatoduodenectomy. J Hepato-
7. Naitoh H, Sasaki M, Kobayashi T, Hashizume J, Nakagawa N, Tatsumoto N. A case of small intestinal perforation caused by a lost tube for biliary anastomosis: five years after pylorus preserv-
8. Kita, H. Percutaneous transhepatic cholangioscopy. In: UpToDate, Post TW (Ed), UpToDate, Waltham, MA. (Accessed on October 29, 2016.)