Cholangiopancreatography troubleshooting: the usefulness of endoscopic retrieval of migrated biliary and pancreatic stents

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BACKGROUND: **Stent migration in the hepatopancreatic duct might arise as one of the rare complications associated with biliary or pancreatic stenting. Although there are some procedures to retrieve the migrated stent, including surgical, percutaneous, and endoscopic approaches, endoscopy should be attempted first because it is least invasive. This study set out to evaluate the usefulness of endoscopic retrieval of migrated biliary and pancreatic stents.**

METHODS: **Plastic stents that migrated in the bile duct (35 patients) or pancreatic duct (2) were retrieved with endoscopic retrograde cholangiopancreatography. Devices used were snare forceps, a basket catheter, grasping forceps, biopsy forceps, a balloon catheter, and the Soehendra stent retriever.**

RESULTS: **Endoscopic retrieval of migrated stents was performed successfully in 36 (97.0%) of the 37 patients. The devices utilized for successful treatment were basket catheter (13 patients), grasping forceps (10), snare forceps (8), balloon catheter (3), biopsy forceps (1), and the Soehendra stent retriever (1). The unsuccessfully treated patient with chronic pancreatitis underwent surgery since the guide wire did not move forward due to bile duct stenosis, and there was also duodenal stenosis. One patient developed mild pancreatitis after withdrawal of the stent; the pancreatitis was relieved with conservative treatment.**

CONCLUSIONS: **Endoscopic retrieval of migrated biliary and pancreatic stents appears to be useful because of its safety and low invasiveness. However, various forceps should be prepared for the retrieval of a migrated stent.**

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KEY WORDS: **endoscopic biliary drainage; stent migration; endoscopic retrograde cholangiopancreatography; endoscopic retrieval; troubleshooting**

Introduction

Endoscopic stenting with a plastic stent for the treatment of cholangiopancreatic diseases is now widely used because of its low cost and easy convertibility.[1] This stenting has generally been utilized for the treatment of acute cholangitis,[2-4] obstructive jaundice with the biliary drainage procedure,[5, 6] and pancreatic stenosis caused by chronic pancreatitis with drainage of the pancreatic duct.[7] In addition, this technology has been increasingly used for procedures such as the dilatation of benign narrow segments of the bile duct[8, 9] and the prevention of pancreatitis after endoscopic retrograde cholangiopancreatography (ERCP),[10, 11] and more frequent use of this technology is expected. Stent migration in the hepatopancreatic duct might arise as one of the rare complications associated with biliary or pancreatic stenting.[12-14] Stent migration can cause the loss of its drainage function and infection or perforation of these ducts, since it is an intracorporeal foreign body; further, re-stenting is required. Although there are some procedures to retrieve a migrated stent, including surgical, percutaneous, and endoscopic approaches, endoscopy

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should be attempted first because it is least invasive. One of the problems associated with this procedure is to be forced to use currently available devices, since there are no devices exclusive to this approach. Furthermore, in many cases, retrieval is difficult since the two-dimensional radioscopy used for this approach requires a skillful endoscopist and stent migration occurs unexpectedly. Thus, we conducted a retrospective study to assess the effectiveness of endoscopic procedures for the retrieval of a plastic stent migrated in the bile duct or pancreatic duct.

Methods

Enrolled patients were those who had a stent migrated in the bile duct or pancreatic duct and treated in our department between January 1992 and January 2009. ERCP was conducted in 14 010 patients during the period, and stent migration occurred in 37, with a frequency of 0.0026%. In the 37 patients, 31 were male and 6 female and their mean age was 62.4 years (range 38 to 78 years). Nineteen patients had chronic pancreatitis, 11 choledocholithiasis, 2 bile duct cancer, 1 pancreatic cancer, 1 duodenal papilla cancer, 1

Table. Patients list

Case	Age	Sex	Disease, infection	Migration	Stricture	Stent type	Devices
1	56	F	choledocholithiasis	BD	no	7Fr. straight	basket
2	49	M	chronic pancreatitis, AC	BD	Bi	7Fr. Straight	basket
3	78	F	papilla of Vater cancer	BD	Bi	10Fr. straight	grasping forceps
4	48	M	chronic pancreatitis	PD	pancreatic head	10Fr. straight	grasping forceps
5	51	M	chronic pancreatitis	BD	Bi	7Fr. straight	operation
6	70	M	bile duct cancer AC	BD	no	7Fr. straight	grasping forceps
7	77	M	chronic pancreatitis, AC	BD	Bi	10Fr. straight	grasping forceps
8	54	F	hepatolithiasis AC	BD	no	8.5Fr. straight	grasping forceps
9	62	M	chronic pancreatitis	BD	Bi	10Fr. straight	Soehendra stent retriever
10	55	M	chronic pancreatitis, AC	BD	Bi	7Fr. straight	basket
11	71	F	choledocholithiasis, AC	BD	no	10Fr. straight	grasping forceps
12	45	M	chronic pancreatitis	BD	Bi	7Fr. straight	snare forceps
13	63	M	chronic pancreatitis, AC	BD	Bi	8.5Fr. straight	grasping forceps
14	45	M	chronic pancreatitis	BD	Bi	10Fr. straight	grasping forceps
15	64	M	chronic pancreatitis, AC	BD	Bi	8.5Fr. straight	snare forceps
16	72	M	bile duct cancer AC	BD	Bi	8.5Fr. straight	balloon
17	53	M	chronic pancreatitis, AC	BD	Bi	8.5Fr. straight	snare forceps
18	53	M	chronic pancreatitis, AC	BD	Bi	8.5Fr. straight	basket
19	77	M	sphincter of Oddi dysfunction	BD	no	8.5Fr. straight	basket
20	75	M	choledocholithiasis, AC	BD	no	7Fr. straight	basket
21	59	M	choledocholithiasis, AC	BD	no	7Fr. straight	basket
22	72	M	choledocholithiasis, AC	BD	no	7Fr. straight	basket
23	72	M	choledocholithiasis, AC	BD	no	7Fr. straight	basket
24	55	M	choledocholithiasis, AC	BD	no	7Fr. straight	basket
25	67	M	pancreatic cancer, AC	BD	Bi	7Fr. straight	grasping forceps
26	64	F	choledocholithiasis, AC	BD	no	7Fr. straight	basket
27	65	M	choledocholithiasis, AC	BD	no	7Fr. straight	basket
28	67	F	choledocholithiasis	PD	no	8.5Fr. straight	snare forceps
29	78	M	chronic pancreatitis, AC	BD	Bi	8.5Fr. straight	snare forceps
30	78	M	chronic pancreatitis, AC	BD	Bi	8.5Fr. straight	snare forceps
31	58	M	chronic pancreatitis	BD	Bi	8.5Fr. straight	snare forceps
32	54	M	chronic pancreatitis, AC	BD	Bi	8.5Fr. straight	balloon
33	38	M	chronic pancreatitis	BD	Bi	7Fr. straight	balloon
34	74	M	chronic pancreatitis, AC	BD	Bi	8.5Fr. straight	grasping forceps
35	78	M	benign bile duct stricture	BD	Bs	8.5Fr. straight	basket
36	49	M	chronic pancreatitis, AC	BD	Bi	8.5Fr. straight	biopsy forceps
37	63	M	choledocholithiasis, AC	BD	no	8.5Fr. straight	snare forceps

M: male; F: female, AC: acute cholangitis; Bs: superior extrahepatic bile duct; Bi: inferior extrahepatic bile duct.

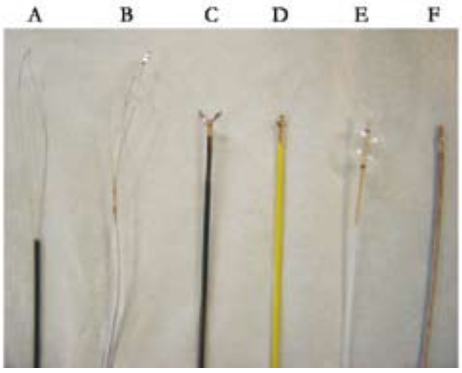

Fig. 1. Devices used for the endoscopic retrieval of migrated stents. **A:** snare forceps; **B:** basket catheter; **C:** grasping forceps; **D:** biopsy forceps; **E:** balloon catheter; **F:** Soehendra stent retriever.

sphincter of Oddi dysfunction, 1 hepatolithiasis, and 1 benign bile duct stricture. Biliary stent migration occurred in 35 patients and pancreatic stent migration in 2. ERCP was performed in all patients to remove the migrated stent. Duodenoscopes used were TJF-M20, JF200, JF240, and JF260V (Olympus), and devices utilized were snare forceps (SD-5U-1, Olympus), basket catheter (FG-22Q, FG-401Q, FG-V416Q, Olympus), grasping forceps (FG-44NR-1, Olympus), biopsy forceps (Radial Jaw®3, Boston Scientific Corp.), balloon catheter (Quantum TTC, Wilson Cook, B-V231P-B, Olympus), and the Soehendra stent retriever (Wilson Cook) (Fig. 1). Physicians selected one of these devices before the operation. The risk associated with ERCP was assessed according to Cotton's criteria.[15]

Results

The endoscopic removal procedure was successfully performed in 36 (97.0%) of the 37 patients (Table). Acute cholangitis occurred in 25 (71.4%) of the 35 patients with a stent migrating into the bile duct. The devices utilized for successful treatment of the 36 patients were basket catheter (13 patients), grasping forceps (10), snare forceps (8), balloon catheter (3), biopsy forceps (1), and the Soehendra stent retriever (1). The unsuccessfully treated patient had chronic pancreatitis. Although ERCP was performed in this patient, the guide wire did not move forward due to severe stenosis in the inferior bile duct, and the endoscope did not pass through the duodenum, also due to severe stenosis in the descending part of the duodenum. Since an endoscopic approach was likely to be difficult, informed consent was obtained from the patient to surgically retrieve the migrated stent along with pancreatoduodenectomy. One patient developed mild pancreatitis after withdrawal of the stent, and this was relieved with conservative treatment.

Discussion

The incidence of biliary and pancreatic stent migration is reported to be 1.7% to 10%.[12-14] Johanson et al[12] reported that stent migration occurs in patients with cholangiocarcinoma or in those treated with short stents or stents with large diameters. In addition, placement of multiple stents and broken stents may cause stent migration. Endoscopic retrieval rates of migrated biliary and pancreatic stents are 80 to 90%.[14, 16, 17] A standard procedure for endoscopic retrieval of migrated stents has not been established, thus this procedure has been performed depending on the ingenuity or skills of individual operators. If the endoscopic retrieval procedure is unsuccessful, surgery is required[18, 19] or a second stent should be placed while leaving the first stent. Tarnasky et al[14] claimed that the difficulty of endoscopic retrieval was due to stent migration upstream of a stenotic region, inconsistency between the biliary stent and its axis in patients with no

Fig. 2. A 56-year-old female with a biliary stone. **A:** Presence of a migrated biliary stent; **B:** ERCP demonstrated an 8-mm stone in the inferior bile duct. The stone was retrieved after hooking a basket catheter on the side flap of the stent; **C:** Radiogram of the bile duct after retrieval of the stent.

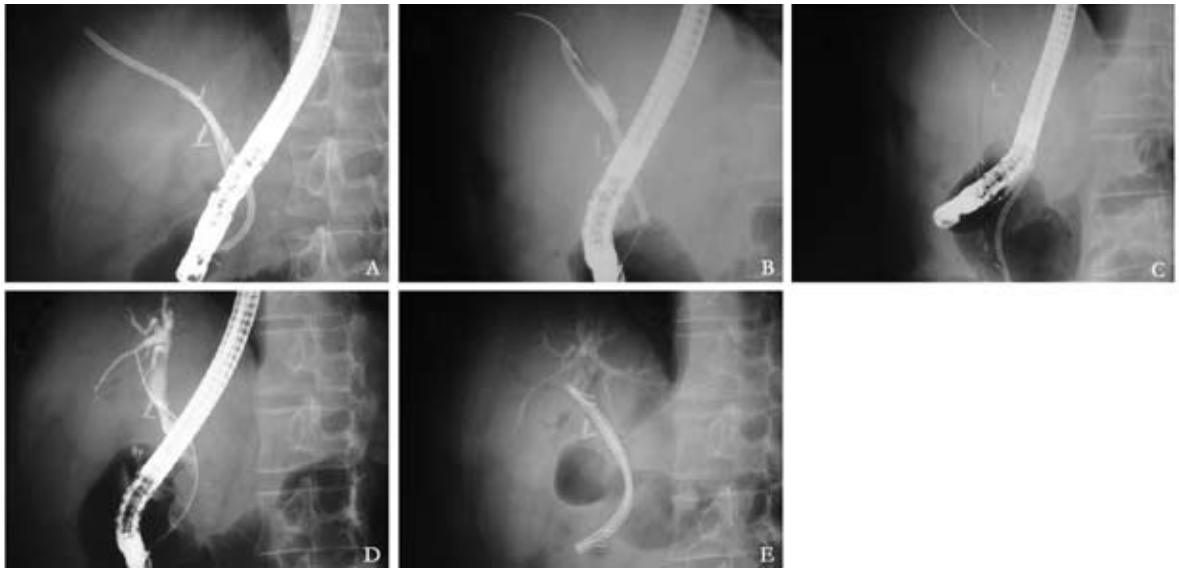

Fig. 3. A 54-year-old male with chronic pancreatitis. **A:** This patient had 2 stents placed for dilatation of the inferior bile duct because of stenosis due to chronic pancreatitis. One of these stents migrated to the bile duct; **B:** The stent that had not migrated was removed, after which a guide wire was inserted and the balloon was inflated near the stent; **C:** The balloon was pulled toward the papilla while it was still inflated; **D:** After the stent was removed, the guide wire was inserted again; **E:** Two stents were inserted into the bile duct, when treatment was completed.

biliary dilatation, and displacement of the bile duct wall by the lower end of the migrated stent. But Chaurasia et al[16] stated that such difficulty resulted from stent migration in the deep region of the biliary branch, a lifting stent in the extremely dilatated bile duct, and a stent with the lower end digging into the bile duct wall. This was seen in patients with severe biliary stenosis below the stent or the stent lower end along biliary stenosis. The key to endoscopic stent retrieval is to confirm the location of biliary stenosis and the lower end of the stent, and to choose a device appropriate for biliary dilatation at the region downstream from the stent. The following are methods for stent retrieval using individual devices: 1) The lower end of a stent is grasped directly with a snare or a basket catheter (Fig. 2 A, B, C), and the stent is grasped while pulling out the device upstream of the stent if there is no biliary dilatation in the region of the lower end of the stent. A basket catheter is used with a ropeway system after placing a guide wire if it is difficult to place the device above the stent because of the location of the biliary stenosis. 2) Grasping forceps and biopsy forceps are used to directly grasp the lower end, the side, or the flap of the stent;[16, 20, 21] in this method, the cup often does not open sufficiently or the stent is difficult to grasp since it is slippery. It is useful because it does not require grasping of the stent, it is a method in which the biopsy forceps is inserted directly into the stent lumen and the cup is opened above the stent, which is pulled out toward the duodenum.[22] In this method, care must be taken not to push the stent upstream while passing the device through the stent lumen. 3) A balloon catheter is used (Fig. 3 A-E), pulling the stent toward the duodenum after inflating the balloon. Besides the stent is useful if the bile duct at the lower end of the stent is dilated.[19] It is pulled out after inflating the balloon above the stent if the bile duct is not dilated, or the lower end of the stent is at the region of biliary stenosis.[19] It is difficult to perform this approach if the upper end of the stent has migrated into a far proximal site of the biliary branch or the balloon catheter cannot pass through the biliary stenosis. In such cases, inflating the balloon in the stent lumen under guide wire guidance is an appropriate choice.[16] 4) In case of the Soehendra stent retriever, the retriever is placed forcibly in the lower end of the stent under guide wire guidance placed in advance in the stent lumen and then the stent is retrieved.[20, 23] When we used this procedure to retrieve a migrated stent, another method can be used with a papillotome under guide wire guidance.[14] Endoscopic retrieval of a stent migrating upstream of the biliary stenosis or digging into the biliary duct wall is known to be troublesome. We treated a patient surgically. We consider that combined endoscopic approach and percutaneous approach may be necessary in some cases,[24, 25] or the second stent

should be placed without retrieval of the migrated stent. The patient we treated but failed to retrieve the migrated stent had chronic pancreatitis and biliary and duodenal stenoses. Since endoscopic procedures were difficult to continue, the migrated stent was surgically removed and pancreatoduodenectomy was performed. We found an associated symptom in 1 patient with mild pancreatitis after removal of the migrated stent. Since stent migration may develop infection and perforation because of loss of drainage function, its removal is critical. In this study, acute cholangitis developed in 25/35 patients (71.4%) due to stent migration into the bile duct, which resulted in the loss of drainage function. Since the lumen of the pancreatic duct is narrow, the pancreatic duct should be prevented from any damage in removing the stent. In prevention of stent migration, we recommend the use of a double pigtail stent for the bile duct, and a S-type stent[22] for the pancreatic duct. During the ERCP procedure, precautions are taken not to miss the point for releasing the stent or appropriately mark the stent. Although the incidence of stent migration is low, it may be important to simulate the proper treatment of stent migration. We anticipate the development of a stent that is unlikely to migrate and of devices specific for the retrieval of migrated stents.

In conclusion, endoscopic retrieval of migrated biliary and pancreatic stents appears to be useful because of its safety and reduced invasiveness. However, various forceps should be prepared for the retrieval of a migrated stent.

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To choose time is to save time.

—Francis Bacon