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Endoscopic Removal of a Migrated Coil after Embolization of a Splenic Pseudoaneurysm: A Case Report

Yoo Min Han¹, Jong Yeul Lee², Il Ju Choi², Chan Gyoo Kim², Soo-Jeong Cho², Jun Ho Lee², Hyun Beom Kim³ and Ji Min Choi¹

¹Department of Internal Medicine and Liver Research Institute, Seoul National University College of Medicine, Seoul, ²Center for Gastric Cancer and

³Department of Radiology, National Cancer Center, Goyang, Korea

Splenic artery pseudoaneurysms can be caused by pancreatitis, trauma, or operation. Traditionally, the condition has been managed through surgery; however, nowadays, transcatheter arterial embolization is performed safely and effectively. Nevertheless, several complications of pseudoaneurysm embolization have been reported, including coil migration. Herein, we report a case of migration of the coil into the jejunal lumen after transcatheter arterial embolization of a splenic artery pseudoaneurysm. The migrated coil was successfully removed by performing endoscopic intervention.

Key Words: Splenic artery; False aneurysm; Therapeutic embolization; Migration; Endoscopy

INTRODUCTION

Splanchnic artery aneurysms and pseudoaneurysms can develop secondary to congenital, traumatic, and inflammatory pathologies.¹ The splenic artery is the most common artery affected by pseudoaneurysms.² When a pseudoaneurysm ruptures, hemodynamic instability due to bleeding can occur, which is life-threatening. Transcatheter arterial embolization (TAE) is a safe and effective treatment for pseudoaneurysms.³ However, some complications have been reported, such as bleeding, pseudoaneurysm recurrence, and postembolization syndrome.⁴ Coil migration from a visceral artery pseudoaneurysm is a rare complication of TAE.¹

We describe a case of coil migration into the jejunal lumen after the embolization of a splenic pseudoaneurysm, which was successfully removed by means of an endoscopic intervention.

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Correspondence: Jong Yeul Lee

Center for Gastric Cancer, National Cancer Center, 323 Ilsan-ro, Ilsandong-gu, Goyang 410-769, Korea

Tel: +82-31-920-1613, **Fax:** +82-31-920-2799, **E-mail:** jylee@ncc.re.kr

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CASE REPORT

A 63-year-old man was found to have advanced gastric cancer on a routine cancer screening examination. Preoperative abdominal computed tomography (CT) was performed, and there was no specific finding besides advanced gastric cancer. He underwent total gastrectomy. The tumor was located at the posterior wall of the high body. The gross type of the tumor was Bormann type II. The size of the tumor was 4.5×3.8×0.8 cm, and the depth of invasion was at the subserosal level (pT2b). Sixty-six lymph nodes were dissected, and no metastases were observed (pN0). Lymphatic, venous, and perineural invasions were present.

One month after the surgery, he came to the emergency department with complaints of a febrile sense and abdominal pain. An abdominal CT scan was carried out, and a pseudoaneurysm of the splenic artery and a small amount of hemoperitoneum were detected (Fig. 1A). The total gastrectomy performed 1 month ago was thought to be the cause of the pseudoaneurysm. The size of the pseudoaneurysm was 2.7×1.9×3.6 cm. On the day after admission, a celiac angiography was performed. A large pseudoaneurysm of the splenic artery was observed on angiography (Fig. 1B). Extravasation of the contrast agent was not observed, and there was no evidence of ongoing bleeding or rupture of the pseudoaneurysm. How-

ever, the risk of rupture seemed high, and we decided to perform embolization. The splenic artery was selected by using a microcatheter, and coils (Tornado embolization microcoil; Cook, Bloomington, IN, USA) were inserted to obliterate the pseudoaneurysm. The large size of the pseudoaneurysm and the fast blood flow required the use of 22 coils. After the coils were placed, splenic angiography was done and successful embolization of the pseudoaneurysm was confirmed (Fig. 2). He was discharged without any complication. As a routine surveillance, an abdominal CT scan was taken 5 months after the embolization, and it showed no evidence of cancer recurrence or any complication associated with embolization.

Nine months after the embolization of the pseudoaneurysm, the patient presented to the emergency department with epigastric pain. On upper gastrointestinal endoscopy, several strands of wire were noted at the inferolateral side of

the esophagojejunal anastomosis (Fig. 3). A simple abdominal radiograph showed that the wires protruding through the jejunal wall were part of a coil used for pseudoaneurysm embolization (Fig. 4). We tried to cut the wires by using endoscissors (FS-5L-1; Olympus, Tokyo, Japan); however, it was difficult because the wires were thick and stiff. Thus, we tried to use hot biopsy forceps (Radial Jaw 3; Boston Scientific, Natick, MA, USA) for cutting the wires, which proved to be easy and effective. The hot biopsy forceps were used with an electrosurgical generator (VIO-300D; ERBE Elektromedizin, Tübingen, Germany) in the Endocut Q mode (effect 2, cut duration 2, and cut interval 2) (Fig. 5). It took about 1 to 2 seconds to cut each wire, and five wires were cut in total. Residual thin strands of wires were removed with endoscissors. There was no immediate complication during and after the procedure.

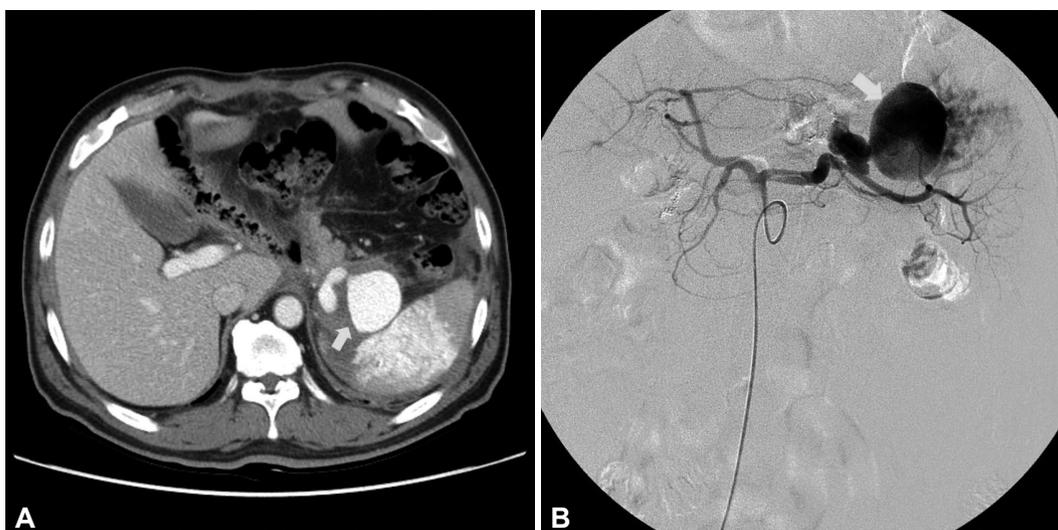


Fig. 1. (A) Computed tomography showed a pseudoaneurysm of the splenic artery (arrow) and a splenic infarct. (B) Celiac angiography revealed a pseudoaneurysm of the splenic artery (arrow).

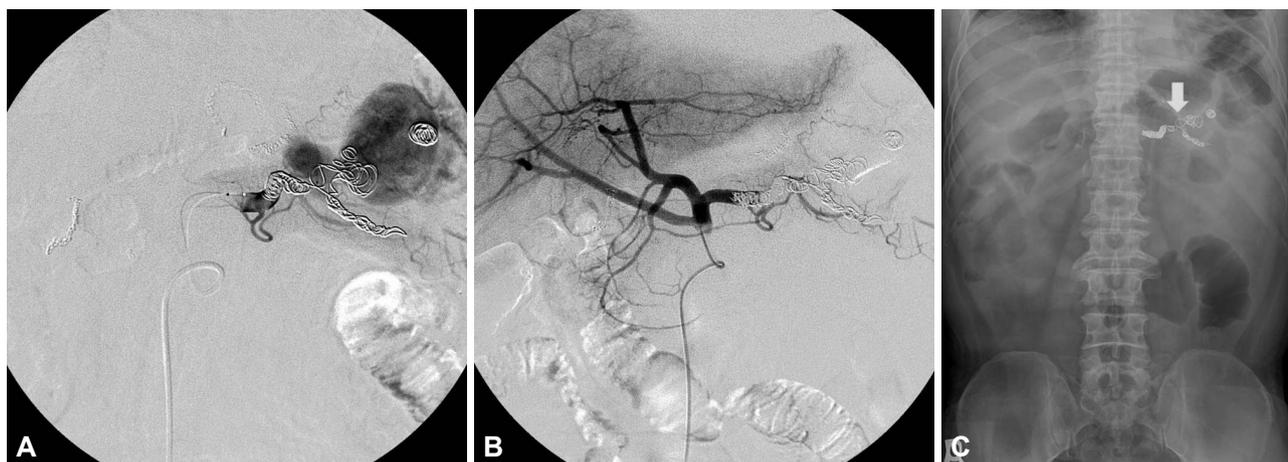


Fig. 2. (A) Embolization of the pseudoaneurysm was done by using coils. (B) Angiography after coil embolization revealed total occlusion of the pseudoaneurysm. (C) Simple abdominal radiograph taken just after embolization showed the multiple coils (arrow) placed within the pseudoaneurysm and splenic artery.

The patient was discharged from the hospital without epigastric pain and remained asymptomatic. He was followed up with upper gastrointestinal endoscopy 3 months after the endoscopic coil removal, and annually thereafter. Abdominal CT scans were performed every 6 months. There had been no symptom or complication related to the coil during the 2-year follow-up period.

DISCUSSION

Splanchnic artery aneurysms and pseudoaneurysms are uncommon; however, incidental detection of such cases has

been increasing in recent decades.⁵ It is important to recognize splanchnic artery aneurysms and pseudoaneurysms because their risk of rupture is up to 25%, and if ruptured, the mortality rate is between 25% and 75%.⁶ The artery most commonly affected by pseudoaneurysms is the splenic ar-

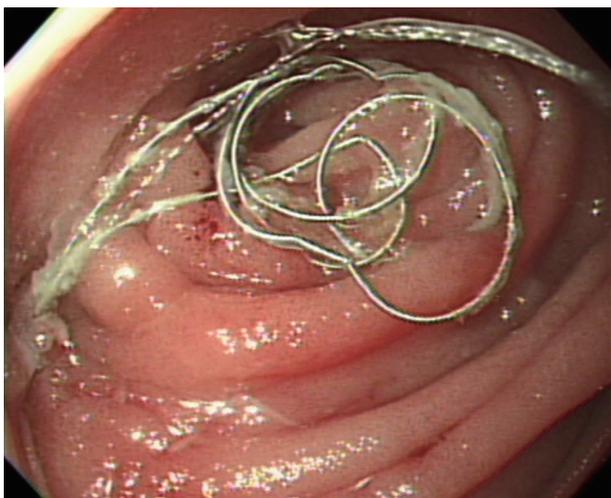


Fig. 3. Endoscopy showed several strands of wire protruding through the jejunal lumen below the esophagojejunal anastomosis.

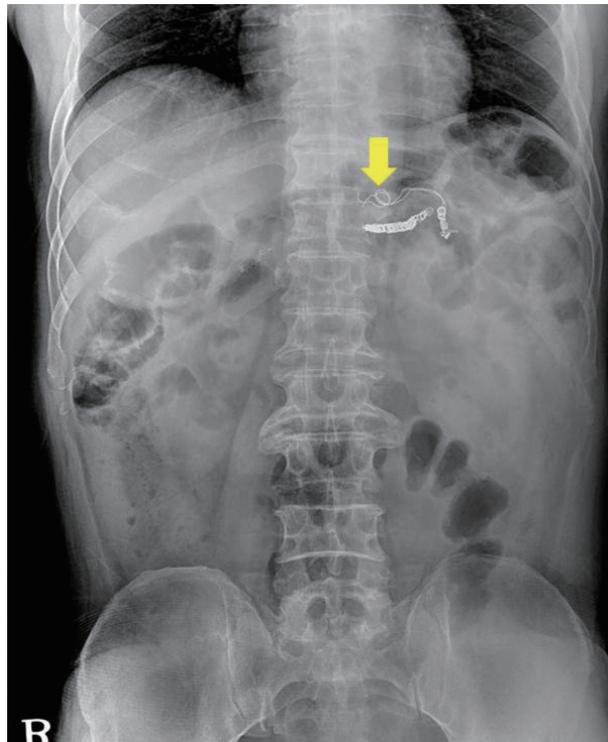


Fig. 4. A migrated coil (arrow) was seen on simple abdominal radiograph.

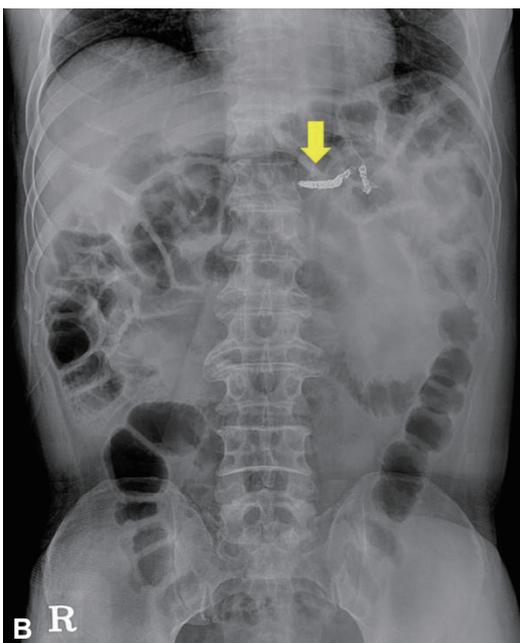
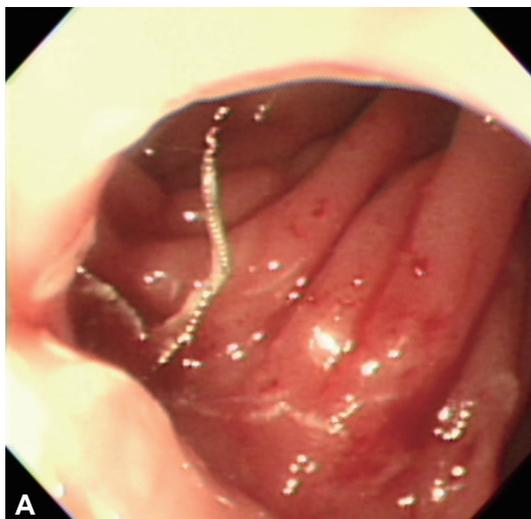


Fig. 5. (A) The wires were nearly removed by using hot biopsy forceps with an electrosurgical generator. (B) Simple abdominal radiograph showed the removed wires (arrow) protruding through the jejunal wall.

Table 1. Clinical Findings of Reported Coil Migration from Visceral Arteries

Author	Age/sex	Underlying disease	Affecting vessel	Site of coil migration	Symptoms	Treatment
Present study	63/M	Advanced gastric cancer	Splenic artery	Jejunum	Epigastric soreness	Endoscopic removal
Skipworth et al. ¹	55/M	Chronic pancreatitis	Gastroduodenal artery	Gastric pylorus	Epigastric and RUQ tenderness	Nasojejunal feeding and future surgery
Takahashi et al. ¹⁰	59/M	Chronic pancreatitis	Splenic artery	Gastric body	None	Open surgery
Shah et al. ¹¹	65/F	Chronic pancreatitis	Splenic artery	Rectum	None	Spontaneous passage of coil
Turaga et al. ¹²	65/M	Cholecystectomy	Hepatic artery	CBD	Cholangitis	Open CBD exploration
Dinter et al. ¹³	82/F	Gastric ulcer bleeding	Celiac artery	Gastric cardia	Hematemesis	None (death)
Ozkan et al. ¹⁴	58/M	Chronic pancreatitis	Hepatic artery	CBD	Abdominal pain	Open CBD exploration
Reed et al. ¹⁵	50/F	Percutaneous nephrolithotomy	Renal artery	Left UV junction	Hematuria and vomiting	Spontaneous passage of coil
Van Steenberg et al. ¹⁶	72/M	Liver transplantation	Hepatic artery	CBD	Biliary colic	Percutaneous cholangioscopic extraction
Kao et al. ¹⁷	65/F	Cholecystectomy	Hepatic artery	CBD	Laboratory abnormality	Endoscopic cholangioscopic extraction
AlGhamdi et al. ¹⁸	55/F	Liver transplantation	Hepatic artery	CBD	None	Endoscopic cholangioscopic extraction

M, male; RUQ, right upper quadrant; F, female; CBD, common bile duct; UV, ureterovesical.

tery.² Causes of splenic artery pseudoaneurysms are chronic pancreatitis (46%), trauma (29%), acute pancreatitis (6%), postoperative complication (3%), and peptic ulcer disease (2%).² In our case, a total gastrectomy performed 1 month before presentation might have been the cause of the pseudoaneurysm.

Pseudoaneurysms can be treated with surgery or endovascular intervention.⁷ Traditionally, pseudoaneurysms were managed surgically by means of ligation of the artery or aneurysm, or excision of the lesion. In recent decades, endovascular techniques such as TAE and covered stent placement were introduced.⁸ Angiography is a useful tool because it could achieve diagnosis and concurrent treatment. Splenic artery embolization is a minimally invasive procedure that involves the use of metallic coils, hydrogel particles, gel foam, acrylic glue, or a combination of these materials.⁹ The success rate of embolization in the treatment of splenic artery aneurysms and pseudoaneurysms is approximately 90%.^{4,7,8} Several complications have been reported, including bleeding, pseudoaneurysm recurrence, postembolization syndrome, and infarction.⁴ Coil migration is also reported after embolization of visceral arteries.¹

Coil migration is one of the rare complications of endovascular management of a pseudoaneurysm. According to a cumulative review of the literature, there are only 10 reports documenting the migration of endovascular coils from visceral arteries (Table 1).^{1,10-18} In two cases, the coils migrated from the splenic artery, as in our case, one into the stomach¹⁰ and the other into the rectum.¹¹ In the former case, the splenic pseudoaneurysm resulting from chronic pancreatitis bled into pseudocyst, and steel-wire coils were placed inside the aneurysm cavity. Several weeks later, some of the coils dislodged through a gastropseudocystic fistula, and open surgery was performed to remove the coils, pseudocyst, and fistula. In the latter case, the patient underwent embolization of a splenic artery pseudoaneurysm caused by chronic pancreatitis. After 3 weeks of intervention, two coils were passed through the rectum. No fistula was found on imaging studies, and it was postulated that the coils passed through a preexisting enteric fistula. As the migrating coils had already passed, no further management was performed.

There are few reports about the risk factors associated with coil migration. Techniques associated with embolization and the presence of collaterals are assumed to influence the migration of coils.¹ To reduce the chance of coil migration, occluding the normal portion of the splenic artery, both distal and proximal to the pseudoaneurysm, is preferred over filling the inside of a pseudoaneurysm.¹⁰ By occluding both sides of the artery, backflow from collateral circulation could be prevented.¹ In our case, the radiologists tried to occlude both the

afferent and efferent arteries; however, the blood flow was so fast that some of the coils migrated into the pseudoaneurysm. This may be the reason why the coil migration occurred.

No treatment strategy has been established for migrated coils. According to previous case reports, some coils were removed surgically or were spontaneously passed. Others, in the case of coils migrating into the common bile duct, were eliminated by using percutaneous or endoscopic cholangiography. What is special in our case is that the migrated coil was successfully removed by endoscopic intervention. To our knowledge, endoscopic removal of a migrated coil from the bowel lumen has not been described before. First, we tried to cut the wires with endoscissors, but it was unsuccessful. Before this case, we already had experience in the endoscopic removal of complicated suture materials at the anastomosis site by using hot biopsy forceps. Therefore, we used hot biopsy forceps for cutting the wires. The wires were cut easily without complication. Endoscopic removal seems to have many advantages over surgical treatment: it is less invasive and more cost-effective because not only is the procedure itself possibly less expensive but also the length of hospital stay might be shorter than with operation. The procedure might also be less painful for the patient than surgery. However, careful evaluation should be performed for the presence of conditions requiring surgery such as a fistula, perforation, and pseudocyst before choosing the treatment modality. Our patient had no relevant condition requiring surgery and was successfully treated with endoscopic intervention. He was followed up for 15 months after coil removal without complication.

In summary, we report a case of coil migration into the jejunal lumen after TAE of a splenic artery pseudoaneurysm. This case shows the feasibility of successful coil removal by means of endoscopic intervention.

Conflicts of Interest

The authors have no financial conflicts of interest.

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