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Case Report

Percutaneous transhepatic cholangioscopy-guided lithotripsy and retrieval of vascular coils eroded into the biliary tree ☆,☆☆

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ABSTRACT

Endovascular coil erosion into the biliary system after hepatic artery embolization is a rare complication which may result in inflammation, strictures, choledocholithiasis, biliary colic, and cholangitis. Removal of coils may result in cessation of these symptoms, but is challenging in patients who cannot undergo removal via standard endoscopic approaches. This case report describes the retrieval of coils placed across a hepatic artery pseudoaneurysm, which over several years eroded into the biliary tree, resulting in calculi formation and postprandial pain. Using combined fluoroscopy and cholangioscopy via percutaneous transhepatic accesses, the calculi were fragmented and the coils were retrieved, resulting in cessation of symptoms.

Introduction

Intra-biliary foreign bodies can be a nidus for stone formation and obstruction. Case reports have described the erosion of cholecystectomy clips and vascular coils into the biliary system, necessitating open surgical intervention or retrieval via endoscopic retrograde cholangiopancreatography (ERCP) [1–5]. These retrieval methods are not practical in patients with Roux-en-Y gastric bypass, complex anatomy, or other issues precluding retrograde approaches to the biliary tree. In these scenarios, direct percutaneous transhepatic biliary access can

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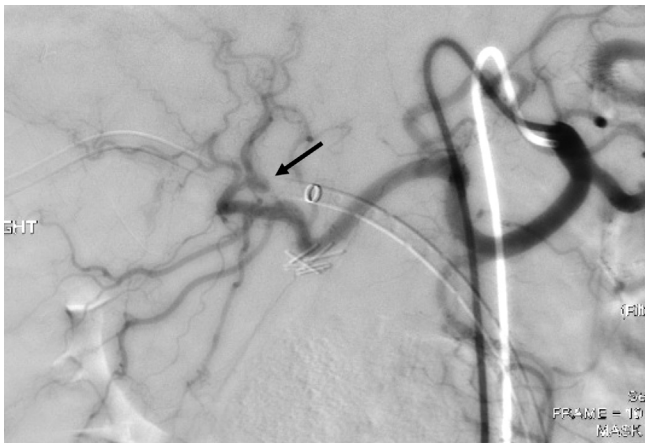

Fig. 1 – Right anterior oblique projection, digital subtraction celiac axis angiography reveals a right hepatic artery pseudoaneurysm (black arrow) overlying the percutaneous biliary drain.

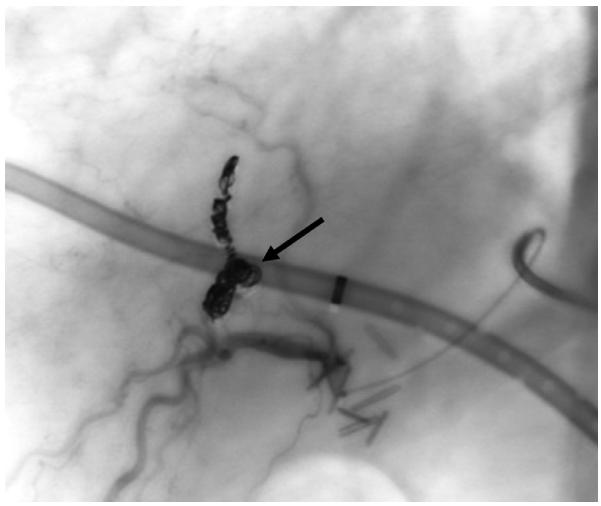

Fig. 2 – Right anterior oblique projection, and right hepatic arteriography after coil embolization across the pseudoaneurysm seen in Fig. 1. The coil pack extends across and bulges into (black arrow) the pseudoaneurysm.

provide access for cholangioscopy to address the foreign bodies [6].

Transhepatic cholangioscopy with the SpyGlass Discover Direct Visualization System (Boston Scientific, Marlborough, MA) has become increasingly utilized for advanced biliary interventions. This system combines a low-profile, steerable camera and dedicated intervention channel for real-time, intra-luminal visualization and intervention including irrigation, biopsy, lithotripsy, and foreign object retrieval [6]. This case describes the use of percutaneous transhepatic cholangioscopy combined with fluoroscopy for lithotripsy of cholangiolithiasis and precise retrieval of eroded vascular coils.

Case presentation

A 76-year-old female with obesity and remote Roux-en-Y gastric bypass who developed post-prandial abdominal pain was found to have a common bile duct (CBD) stricture and choledocholithiasis. Roux-en-Y bypass anatomy precluded conventional ERCP, so the patient was referred to interventional radiology for a percutaneous approach. A 12 French right percutaneous internal-external biliary drain (PBD) (Cook Medical Inc., Bloomington, IN) was placed to decompress the biliary tree, facilitate 5 Fr Fogarty (Edwards Lifesciences, Irvine, CA) balloon sweeps, and CBD cholangioplasty with 8, 10, and 12 mm high-pressure Conquest balloons (Bard Peripheral Vascular, Tempe, AZ). During a subsequent treatment session, the PBD tract was further dilated, resulting in hemobilia secondary to a right hepatic artery anterior division branch pseudoaneurysm (Fig. 1). Hepatic angiography was performed, where the pseudoaneurysm was crossed and embolized with Tornado microcoils (Cook Medical Inc., Bloomington, IN) of various sizes (Fig. 2). During a subsequent procedure, repeat transhepatic cholangioplasty and Fogarty balloon (Edwards Lifesciences, Irvine, CA) sweeps of the CBD removed the biliary calculi and resolved the obstruction. The PBD was ultimately removed

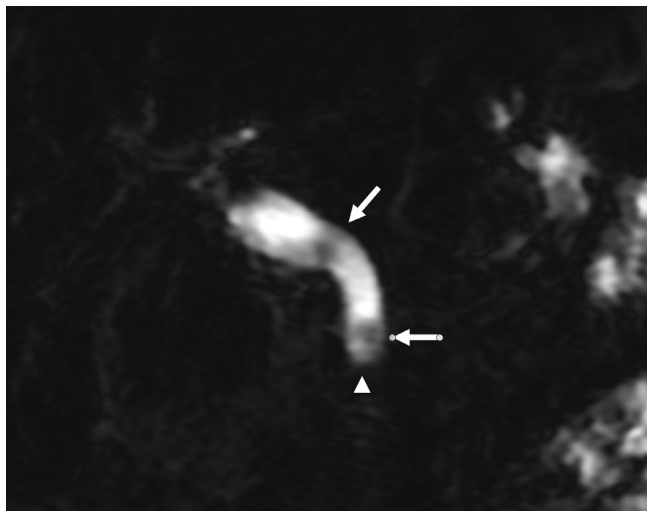

Fig. 3 – Magnetic resonance cholangiopancreatography coronal heavily T2 weighted sequence demonstrates a dilated common bile duct with cholangiolithiasis (white arrows).

Approximately 10 years later, the patient presented with post-prandial abdominal pain, nausea, and generalized pruritis. Magnetic resonance imaging demonstrated the development of CBD stones and biliary ductal dilatation (Fig. 3). Percutaneous transhepatic cholangiography demonstrated a high-grade distal CBD stricture as well as biliary stones, some of which were adherent to vascular coils which had eroded into the biliary system, (Fig. 4). A 12 French PBD was placed and subsequent cholelithiotrispy was planned.

During the second procedure, the PBD was exchanged for a 14 French by 25 cm sheath and cholangioscopy revealed multiple calculi and portions of the eroded vascular coil. The Au-

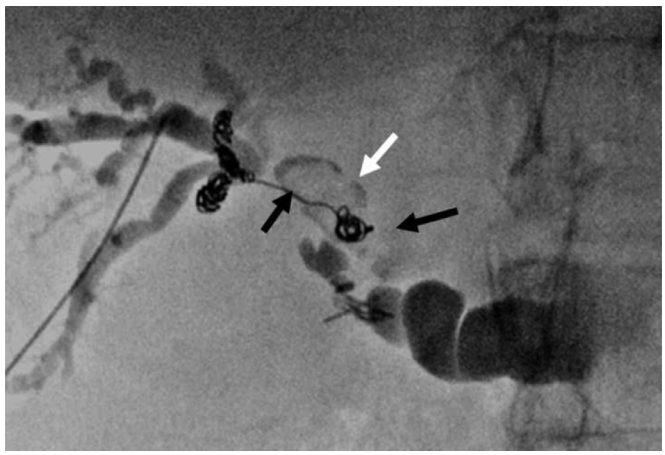

Fig. 4 – Percutaneous cholangiography reveals a high-grade stricture at the point of coil pack erosion into the biliary tree (black arrows). A prominent filling defect (white arrow) representing calculi and debris, is adjacent to the eroded coil pack.

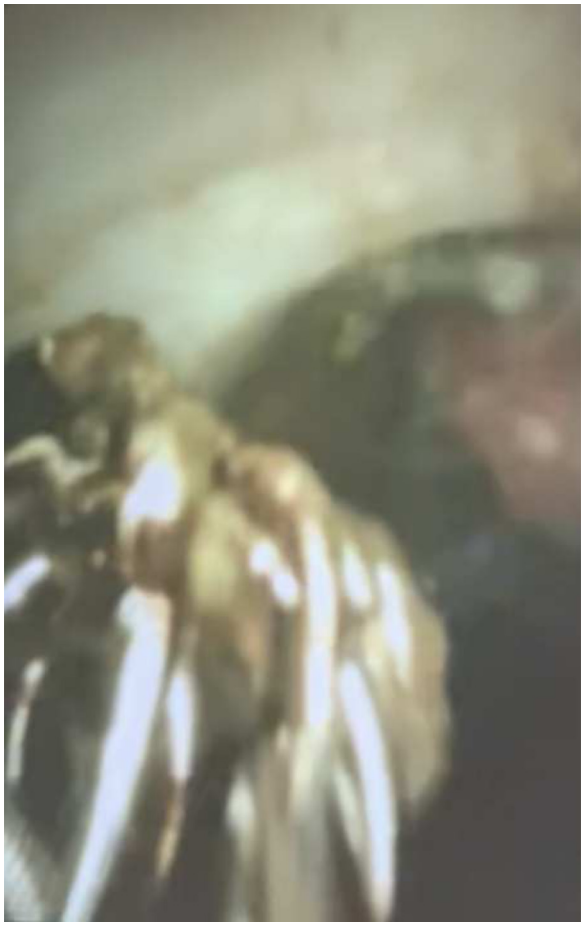

Fig. 5 – Direct cholangioscopic visualization of the eroded coil pack with adherent calculi and debris.

tolith Touch System for Electrohydraulic Lithotripsy (Boston Scientific, Marlborough, MA) was used for lithotripsy under direct visualization (Fig. 5). The stone fragments were further pushed into the bowel using Fogarty balloon sweeps. It was

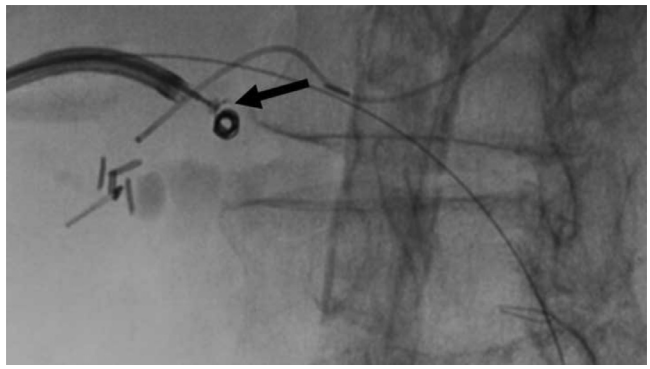

Fig. 6 – Fluoroscopic image of endo-biliary forceps (black arrow) directly engaging the central aspect of the coil mass.

apparent that the eroded vascular coils served as the nidus for the stones and remained anchored to outside of the biliary tree. Since the communication between the eroded coils and vascular system was not clearly understood, a 12 French PBD was replaced and the procedure was concluded.

A decision was made to remove the eroded coils using combined cholangioscopy and fluoroscopy after a thorough discussion of risks and benefits with the patient. First, arterial access was obtained to evaluate the hepatic vasculature and ensure that any potential injury which developed during retrieval could be treated immediately. Initial hepatic angiogram did not demonstrate any residual hepatic artery pseudoaneurysm. The PBD was exchanged for a 14 French sheath and Spyglass cholangioscopy revealed 2 dominant eroded coil packs within the right hepatic duct (RHD). Endo-biliary forceps (Boston Scientific, Marlborough, MA) were used to grasp and retrieve the coil masses through the sheath. The coil masses were engaged from the central aspect (Fig. 6) rather than the periphery to minimize further unraveling in the biliary system (Fig. 7). After retrieval of the larger coil packs, a residual subtle elongated coil fiber was visualized extending from the RHD to the CBD on fluoroscopy. This was clearly identified on

Fig. 7 – Gross inspection demonstrates successful retrieval of the coil masses in large intact fragments using a forceps biopsy.

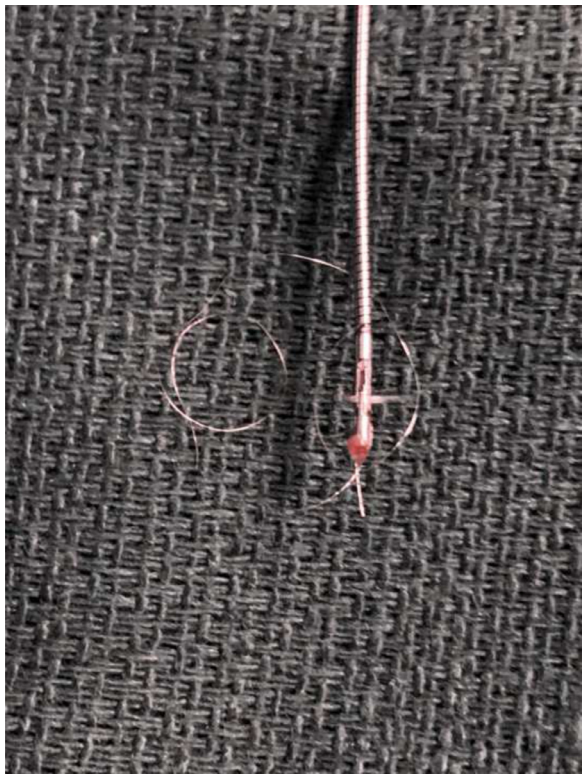

Fig. 8 – An additional thin strand of coil material, separate from the dominant coil masses, was easily visible on cholangioscopy, which primarily guided the retrieval.

cholangioscopy and removed (Fig. 8). Completion celiac artery angiography after coil retrieval demonstrated no arterial injury. There was no portal venous injury on delayed injection of the celiac artery. The 12 French PBD was left in place. The patient had a resolution of symptoms and tolerated capping of the PBD, so it was ultimately removed. There was no recurrence of symptoms on follow-up.

Discussion

This case demonstrates successful lithotripsy and retrieval of eroded intra-ductal coils using combined fluoroscopy and cholangioscopy through a percutaneous transhepatic approach.

Coil packs were precisely removed under direct visualization using a forceps biopsy device advanced through the SpyGlass endoscopy system. This case illustrates advanced techniques for percutaneous removal of foreign bodies within the biliary tree and other small spaces.

Non-target embolization and migration of endovascular coils into adjacent structures have been described throughout the body [7–9]. Eroded coils in the biliary tree can serve as a nidus for stone formation, which may result in inflammation, strictures, biliary colic, obstruction, and cholangitis [3]. Retrieval of such coils has only been described in small series, and there is limited data describing long-term outcomes or potential complications [1–5]. Given the rarity of this complication, management is best tailored to the patient's symptoms and clinical situation.

The SpyGlass system has expanded the interventional radiologist's toolkit. Compared to older fiber optic endoscopy devices, this digital video single-operator system enables greater resolution, field of view, and mobility [6]. The Spyglass also has built in channels which enable irrigation and simultaneous interventions such as biopsy, lithotripsy, and foreign body retrieval [10]. Compared to other percutaneous choledochoscopes, the low profile of this system (under 11 French) minimizes potential complications related to percutaneous tract dilation.

Transhepatic cholangioscopy was performed in lieu of conventional endoscopy because the patient's post-surgical anatomy precluded peroral endoscopic interventions. While retrieval of biliary foreign bodies via transhepatic access using only fluoroscopy has been previously described, the addition of Spyglass cholangioscopy adds unique advantages. Direct visualization of the bile ducts enables a better spatial understanding of the foreign body relative to the bile ducts, potentially making the procedure faster and safer. In this case, it was critical to fragment the calculi to reveal the underlying coil pack, which would not be as feasible with fluoroscopy alone. Retrieval of the coil pack with fluoroscopy only would also be less precise, which could have resulted in inadvertent unraveling of the coil mass or further damage to adjacent structures.

Guidance with cholangioscopy made it easier to grasp the coil masses along the central portion, allowing them to be efficiently retrieved en bloc through a sheath. Direct visualization with cholangioscopy was also beneficial in visualizing small objects not well delineated on fluoroscopy. Towards the end of this procedure a thin strand of elongated coil was barely perceptible on fluoroscopy, but was easily identified and retrieved using the cholangioscope.

Disadvantages of cholangioscopy include the need for specialized equipment, potentially increased costs, and the need for operator experience. Although it is relatively low profile, use of the Spyglass system may still require tract dilation when smaller drainage catheters are used to maintain percutaneous access. For carefully selected patients with biliary foreign bodies, cholangioscopy may enable profound clinical benefits and decreased procedural risks.

Patient consent

IRB approval was granted for this publication. Written informed consent was obtained from the patient.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.radcr.2022.10.103.

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