Cystic Artery Hemorrhage after Cholecystostomy Catheter Exchange Treated with Transcatheter Embolization

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Abstract

Keywords

- hemorrhage
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- interventional radiology

The pathogenesis of formation of cystic artery pseudoaneurysms is not well understood, but is thought to result from erosion of the cystic artery wall from the adjacent inflammatory process associated with acute or chronic cholecystitis. The presented case discusses an incident of hemorrhage from a cystic artery pseudoaneurysm resulting in a large perihepatic hematoma as well as hemobilia, which developed after a routine cholecystostomy catheter exchange. This was treated with transcatheter embolization using ethylene-vinyl alcohol copolymer.

Pseudoaneurysms of the cystic artery are an uncommon source of clinically significant hemorrhage.^{1–3} The pathogenesis of formation of cystic artery pseudoaneurysms is not well understood, but is thought to result from erosion of the cystic artery wall from the adjacent inflammatory process associated with acute or chronic cholecystitis.^{2,4} The presented case discusses an incident of hemorrhage from a cystic artery pseudoaneurysm resulting in a large perihepatic hematoma as well as hemobilia, which developed after a routine cholecystostomy catheter exchange. This was treated with transcatheter embolization using ethylene-vinyl alcohol copolymer, commonly known as Onyx (Medtronic, Irvine, CA). Institutional review board approval was not required for this report.

Case Report

A 69-year-old male with end-stage renal disease on hemodialysis, coronary artery disease, peripheral vascular disease, and diabetes presented with persistent bloody output from a cholecystostomy catheter 5 days after a routine evaluation and exchange of the catheter (►Fig. 1). He noted that bloody output began immediately following the exchange procedure. The cholecystostomy catheter had been placed 4 months ear-

lier to treat an episode of acute calculous cholecystitis, which had developed in the postoperative period following coronary artery bypass graft surgery. Surgery was initially deferred as the patient was on dual-antiplatelet therapy with aspirin and clopidogrel following bypass surgery. The catheter had been uneventually placed initially, using ultrasound and fluoroscopic guidance via a transperitoneal approach. Antiplatelet therapy was not withheld at the time of cholecystostomy catheter placement or exchange.

The patient was hemodynamically stable, with a hemoglobin of 10.6 g/dL. Non-contrast-enhanced computed tomography (CT) of the abdomen showed a perihepatic hematoma along the inferior margin of the liver adjacent to the gallbladder fossa. Antiplatelet medications were withheld; however, bloody output from the cholecystostomy catheter persisted. Following a decrease in hemoglobin to 9.7 g/dL, a CT angiography of the abdomen was obtained. This showed hyperdense material within the gallbladder lumen, consistent with hemobilia, as well as a 1-cm pseudoaneurysm supplied by a peripheral branch of the cystic artery (►Fig. 2). The perihepatic hematoma had also increased in size (►Fig. 3). The surgical and interventional radiology services were consulted. Because of the patient's comorbid

Fig. 1 Cholangiogram obtained at the time of cholecystostomy catheter exchange shows innumerable filling defects within the gallbladder lumen due to gallstones. The cystic and common bile ducts are patent with unimpeded passage of contrast into the duodenum. The cholecystostomy catheter is appropriately positioned within the gallbladder.

conditions including coronary artery disease and recent treatment with antiplatelet therapy, a multidisciplinary decision was made to treat the cystic artery pseudoaneurysm with transcatheter embolization. Elective cholecystectomy would be planned once the patient completed 6 months of antiplatelet therapy and was medically cleared for the surgical procedure.

Fig. 2 Axial CT image of the upper abdomen shows an area of focal contrast accumulation in the gallbladder (arrowhead) compatible with a pseudoaneurysm supplied by a peripheral branch of the cystic artery. The cholecystostomy drainage catheter is identified within the gallbladder lumen (arrows). Hyperenhancement of the liver parenchyma adjacent to the gallbladder likely reflects hyperemia.

Fig. 3 Coronal CT image of the abdomen shows a large perihepatic hematoma (asterisk) extending from the inferior margin of the liver and gallbladder into the lower abdomen.

Celiac and selective hepatic digital subtraction angiography showed a pseudoaneurysm arising from an inferior, peripheral branch of the cystic artery (►Fig. 4). The branch of the cystic artery supplying the pseudoaneurysm was selected using a 2.4-Fr microcatheter (Terumo, Tokyo, Japan), and embolization of this branch was achieved using a total of 0.1 mL of Onyx 18 (Medtronic; ►Fig. 5). By the following day, cholecystostomy catheter output was no longer blood-tinged and dual-antiplatelet therapy was resumed. A pigtail drainage catheter was placed in the perihepatic hematoma, due to concern for superinfection; however, microbiologic culture of the aspirated fluid was negative. The drainage catheter remained in place until the time of elective cholecystectomy. Repeat contrast-enhanced CT of the abdomen performed 2 weeks following the embolization

Fig. 4 Digital subtraction angiogram obtained during injection of a cystic artery branch shows a pseudoaneurysm (arrowhead) arising from a peripheral branch in the inferior aspect of the gallbladder. The cholecystostomy catheter is appropriately positioned within the gallbladder (arrow).

Fig. 5 Fluoroscopic image obtained following Onyx embolization of the cystic artery branch supplying the pseudoaneurysm. The Onyx cast is noted (arrow).

procedure demonstrated hyperdense Onyx embolic material within the inferior cystic artery branch without opacification of the previously visualized pseudoaneurysm.

The patient underwent surgical resection of the gallbladder 2 months later, once the patient was cleared to withhold antiplatelet medications. A subtotal cholecystectomy was performed as the cystic duct could not be discerned from the common bile duct intraoperatively. Unfortunately, the patient died suddenly following cardiac arrest 3 days after partial cholecystectomy was performed.

Discussion

Pseudoaneurysms of the cystic artery are an uncommonly reported entity.^{2,3,5} Although the pathogenesis of formation of cystic artery aneurysm is not well understood, it is postulated that the inflammatory process associated with cholecystitis results in erosion of the cystic artery wall.^{2,4} Despite the high incidence of acute and chronic cholecystitis, cystic artery pseudoaneurysms are rarely observed, as the same inflammatory process may also promote vessel thrombosis.^{2,3} In the presented case, dual-antiplatelet therapy may have prevented vessel thrombosis allowing for the formation of a pseudoaneurysm and clinically significant hemorrhage.

In the presented case, onset of hemobilia and hemorrhagic output from the cholecystostomy catheter occurred following routine exchange of the cholecystostomy catheter. Although the cystic artery pseudoaneurysm likely developed in the presence of chronic cholecystitis, active bleeding from the pseudoaneurysm occurred only after wire and catheter manipulation during

the cholecystostomy catheter exchange. While cholecystectomy and surgical ligation remain the definitive treatments for cystic artery pseudoaneurysm, transcatheter embolization is an effective, minimally invasive treatment alternative for those patients with contraindications to surgery.¹ The Onyx liquid embolic system was effective at stopping further bleeding in the presented case. Successful embolization of cystic artery pseudoaneurysms has been described using various embolic materials, including coils, n-butyl cyanoacrylate, absorbable gelatin powder, and thrombin.⁵ Despite optimization from a surgical and anesthesia standpoint for elective cholecystectomy 2 months after transcatheter embolization, this patient's post-operative course was unexpectedly complicated by cardiac arrest and death. This reinforces the surgical morbidity observed in patients deemed a high surgical risk secondary to cardiovascular disease.

Chronic inflammatory processes such as cholecystitis can be complicated by vascular abnormalities such as pseudoaneurysms. Although routine drainage catheter exchange is generally considered safe, simple wire and catheter manipulations can lead to clinically significant hemorrhage in the presence of vascular abnormalities. Care should be taken during seemingly mundane drainage catheter maintenance procedures, especially for patients with multiple medical morbidities, as even mature drain tracks can be subject to minimal trauma and major bleeding. Transcatheter embolization of cystic artery pseudoaneurysms is an effective alternative therapy for patients with contraindications to surgical management.

Financial Disclosure
None.

Conflict of Interest
None.

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