Vascular Complications Associated with Percutaneous Biliary Drainage: A Report of Three Cases

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ABSTRACT

Percutaneous biliary drainage is a common interventional radiology procedure. It is usually performed in the setting of biliary obstruction, benign or malignant, after endoscopic approach failed or is technically not possible. Percutaneous biliary drainage has a relatively low complication rate, and most complications that occur are usually self-limited. Major complications, however, can occur. In this article, we report three major hemorrhagic complications and their management. They include hemorrhage secondary to fistula formation and pseudoaneurysm formation occurring several days to weeks subsequent to the initial drain placement.

KEYWORDS: Pseudoaneurysm, percutaneous biliary drainage, fistula, complication

Objectives: Upon completion of this article, the reader should understand the indications, common complications, and various solutions for treating complications created by percutaneous biliary drain placement.

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Percutaneous biliary drains are placed in thousands of patients each year for a variety of conditions, with the primary aim of decompressing the biliary system. The indications for drain placement include extrahepatic obstruction with jaundice, cholangitis with sepsis, preoperative decompression, and biliary strictures. The most common etiologies of biliary obstruction are pancreatic carcinoma and periductal metastases.¹⁻⁶ Percutaneous biliary drainages have an important palliative role in individuals affected by pancreatic and hepatocellular tumors and cholangiocarcinomas, and they are a safe and effective procedure with technical success rates ranging between 93.5% and 95%.^{1,3-6} However,

although this procedure has become routine over the past 40 years, serious complications can still occur.

The literature suggests that the most common complications associated with percutaneous biliary drain placement are hemobilia, fever, and catheter dislodgement.³ More serious complications include significant hemorrhage, sepsis, local infection, and death. Various studies place the risk of death at between 2.5% and 4.8%, with newer studies finding death to be a rarer occurrence.^{2,5-7} We have encountered in our practice three percutaneous biliary drainage cases that encompass several of the potential vascular complications. In each case, the complication arose some days after the initial

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procedure and was heralded by hemobilia and worsening of the patient's clinical condition. We report our experience in the discovery and management of these complications.

CASE 1

A 69-year-old man with colon cancer metastatic to the liver, status post resection, radiation, and chemotherapy, was transferred to our institution for drainage of a suspected liver abscess. The patient initially presented to the community hospital with fever, tachycardia, and hypotension. A computed tomography (CT) scan was obtained that demonstrated a liver abscess as well as dilated intrahepatic bile ducts. Interventional radiology was consulted for placement of a percutaneous biliary drain and for aspiration of the abscess. The respective drains were placed successfully, and the patient returned to the floor. However, the patient did not improve, and he was noted to have gross hemobilia.

The patient was brought back to the angiography suite for a biliary drain evaluation. Upon injection of the biliary drain, a biliary duct to portal vein fistula was uncovered (Fig. 1). A second biliary drain was placed by direct puncture of a more peripheral bile duct, and the first drain was removed. Although he remained hemodynamically stable and hemobilia resolved, the patient's clinical course continued to worsen due to disseminated malignancy. Two weeks after the procedure, the patient was discharged to hospice.

Figure 1 Injection of the biliary drain demonstrates an iatrogenic portal vein to biliary duct fistula.

CASE 2

A 43-year-old woman with hepatitis C has undergone two liver transplantations, the most recent 6 weeks prior to admission. She was referred after dilation of her biliary ducts was demonstrated on a post-transplant follow-up CT scan. A percutaneous biliary drain was placed successfully. The next day the patient was noted to have gross hemobilia, and a hepatic arteriogram was performed. The arteriogram revealed a pseudoaneurysm that was successfully treated with multiple coils. The hemobilia resolved temporarily, but later that evening, the patient was again noted to have hemobilia. The biliary drain was removed over a wire, and the tract was injected with contrast, demonstrating an intrahepatic portal vein to hepatic vein fistula (Fig. 2). The drain was then replaced over the wire to provide hemostasis, and a new site was chosen for insertion of a percutaneous biliary drain. Once the new drain was placed, the initial drain was removed. The patient's clinical course remained stable thereafter and without further episodes of hemobilia.

CASE 3

A 60-year-old man with a large hepatocellular tumor presented to the hospital with biliary obstruction, and a

Figure 2 Contrast injection through a hemostatic sheath placed over a wire shows an unusual case of portal vein to hepatic vein fistula. Note that several embolization coils are also present from arterial embolization earlier that day. All injuries lie in the course of the biliary drain.

percutaneous biliary drainage catheter was inserted. One week later the catheter was replaced over a wire due to drain occlusion. Subsequently, the patient began to have hemobilia. An upper endoscopy was performed by the gastroenterology service, and active bleeding from the ampulla was observed. Interventional radiology was consulted for a hepatic arteriogram with possible embolization of the bleeding source. The hepatic arteriogram demonstrated a vascular mass with moderate arterial-portal shunting in the patient's tumor. No definitive bleeding site was identified. It was elected to empirically embolize the patient's tumor in an attempt to control the bleeding.

Because no definitive source of hemorrhage was seen on initial arteriography, the biliary drain was removed over the wire to exclude iatrogenic causes during biliary drain placement as a possible source of bleeding. Upon removal, prominent bleeding was noted from the drain entry site. The drain was then reinserted over the wire to tamponade the hemorrhage. Hepatic arteriogram was then repeated, and a hepatic artery pseudoaneurysm was discovered projecting over the course of the drainage catheter (Fig. 3A). Contrast injection of the right hepatic artery resulted in opacifi-

cation of both the pseudoaneurysm and the bile ducts (Fig. 3B), confirming that the pseudoaneurysm was the source of the hemobilia. The pseudoaneurysm, as well as the vessel proximal and distal to the pseudoaneurysm, was then embolized with gel foam and multiple coils. An arteriogram demonstrated occlusion of the vessel with the pseudoaneurysm (Fig. 3C). The patient's hemobilia resolved, and his liver function tests improved.

DISCUSSION

Iatrogenic injuries secondary to percutaneous biliary drain placement are rare.⁸⁻¹⁵ However, vascular injury can occur after placement of a biliary drain. Patients often present with persistent hemobilia. In the three reported cases, the time between initial drain placement and drain evaluation due to hemobilia ranged between 1 and 7 days.

The literature reports that the major complications of percutaneous biliary drainage are sepsis, hemorrhage, and localized infection or abscess formation. Mortality as a result of this procedure is more often due to hemorrhage than sepsis.²⁻⁴ A conservative approach is usually taken when hemobilia first occurs after

Figure 3 (A) Right hepatic arteriogram shows a small aneurysm originating from the branch vessel. Vascular tumor blush in this patient with hepatocellular carcinoma is also present. (B) Right hepatic arteriogram demonstrates filling of the pseudoaneurysm and abnormal filling of the central bile ducts. (C) Hepatic arteriogram after the deposition of several coils shows absence of pseudoaneurysm opacification.

this procedure.^{1,2,5} The typical experience is that of transient hemobilia with spontaneous resolution. Alternatively, the biliary drain can be replaced or upsized to tamponade the bleeding. When the bleeding cannot be stopped by these measures, a more aggressive approach is indicated.^{10-12,14-16}

Hemobilia may be due to arterial or venous bleeding. In each case, the interventional radiologist can embolize the offending vessel, be it portal vein or hepatic artery. These techniques have been well described in the literature, although other alternatives such as balloon tamponade or stent placement^{8,9,12,13,15,16} have also been described. Selective placement of metallic coils into a bleeding vessel, occasionally supplemented with gel foam, offers a very precise intervention for controlling hemobilia. However, the interventional radiologist should proceed with caution because overly aggressive arterial embolization can lead to vascular compromise, especially in the setting of portal vein occlusion.

Patients who undergo percutaneous biliary drainage typically are ill and may have significant liver pathology. As such, a certain number of complications can be expected. The Society of Interventional Radiology addressed this issue in 1997, suggesting complication thresholds of 5% for sepsis, hemorrhage, and localized infection, and a threshold of 3% for mortality. The interventional radiologist is usually called on when endoscopic methods of biliary decompression have failed or are not possible, thus faced with the task of providing biliary drainage in face of more complex clinical circumstances. Literature suggests that major complications occur in roughly 5% of percutaneous biliary drain placements, with a suggested threshold for the individual practitioner of 10%.^{1,3-6} Our three cases demonstrate some of the hemorrhagic complications that can occur and can be treated by an interventional approach.

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