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CASE REPORT | ENDOSCOPY

Management of Hemodynamic Collapse After Liver Transplantation From Native Bile Duct Stump Hemorrhage with Gelfoam

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ABSTRACT

Spontaneous hemobilia is a rare complication after liver transplantation and is largely secondary to the formation of an arteriobiliary fistula, which is generally treated by vascular interventional radiology embolization. We present a case of hemorrhagic shock secondary to arterial hemorrhage at an oversewn bile duct stump after liver transplantation, which failed vascular interventional radiology embolization, and was subsequently controlled using an endoscopic application of a gelatin sponge slurry (Gelfoam). We present this unique approach and review the history of this surgical and interventional hemostasis tool that has not been previously described for endoscopic use.

INTRODUCTION

Biliary complications are a major source of morbidity after liver transplantation affecting 5%–25% of transplant recipients.[1] The most common complications include anastomotic leak, biliary strictures, nonanastomotic strictures, and biliary obstruction, and these may present in varying postoperative intervals.[2] Spontaneous hemobilia after liver transplantation is rare, with a reported frequency around 1.2% in the literature, and is largely secondary to the postoperative formation of arteriobiliary fistulae.[3] We present a case of hemorrhagic shock secondary to hemorrhage of an artery supplying the oversewn bile duct stump after transplantation with failed initial vascular interventional radiology (VIR) embolization. This rare complication was treated using a unique approach and treatment during a combined endoscopic and VIR procedure with successful endoscopic application of a gelatin sponge slurry (Gelfoam; Pfizer, New York, NY) to fill the biliary stump and ultimately achieve hemostasis, thus preventing early reoperation post-transplantation.

CASE REPORT

A 54-year-old man underwent deceased donor liver transplant with aortic jump graft and Roux-en-Y hepaticojejunostomy for de novo hilar cholangiocarcinoma after neoadjuvant chemoradiation and brachytherapy. His postoperative course was complicated by liver abscess with peritoneal contamination, which responded to antibiotic therapy. Twelve days after transplantation, he was readmitted to the hospital with syncope and frank blood with clots in the drain pouch around the percutaneous surgical biliary drain. On admission to the intensive care unit, he was hypotensive with a blood pressure of 77/47 mm Hg, hemoglobin of 7.5 g/dL from previous postoperative baseline of 12.4 g/dL, platelet count of 456×10^9/L, which declined to 154×10^9/L postresuscitation, and an international normalized ratio of 1.3. Computed tomography scan performed shortly before admission showed a widely patent portal vein anastomosis, but the patient was too unstable to undergo repeat imaging with a computed tomography angiogram. Resuscitative efforts with vasopressors, massive blood transfusion, and intubation for his presumed hemorrhagic shock were promptly initiated.

Urgent VIR angiography of the aortic jump graft and superior mesenteric artery (SMA) did not demonstrate pseudoaneurysm or extravasation, and the celiac trunk could not be accessed because of postradiation stenotic changes. To assist in localizing the source of hemorrhage, an upper endoscopy was performed in the VIR suite, where hemorrhage from the major papilla was seen which, given the patient's recent transplant, was known to be an oversewn (blind) native distal bile duct (Figure 1). Both VIR and side-viewing (duodenoscope) endoscopic evaluation revealed active bleeding from a small vessel within the oversewn bile duct stump

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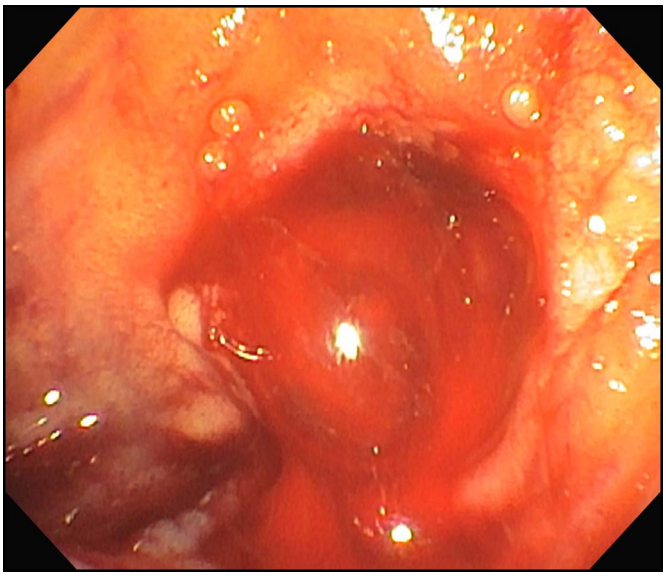

Figure 1. Duodenoscopic examination showing hemobilia.

which was draining via the major papilla and the peritoneal/retroperitoneal space (Figure 2). VIR selectively studied the SMA, and despite a lack of extravasation seen on the arteriogram, the artery ended bluntly near the suspected source area of bleeding. Given this finding, the branch was embolized with multiple vascular embolization coils and gelatin sponge slurry; however, bleeding remained persistent with repeat arteriogram showing anterograde flow through the coils. Intravascular gelatin sponge slurry injection was repeated; however, SMA arteriogram demonstrated persistent bleeding from a branch of the pancreaticoduodenal artery with brisk anterograde flow (Figure 3).

Given the failure to achieve hemostasis through vascular intervention, we proceeded with endoscopic retrograde cannulation of the patient's major ampulla and distal bile duct with a standard

Figure 2. Endoscopic contrast injected into the blind bile duct stump.

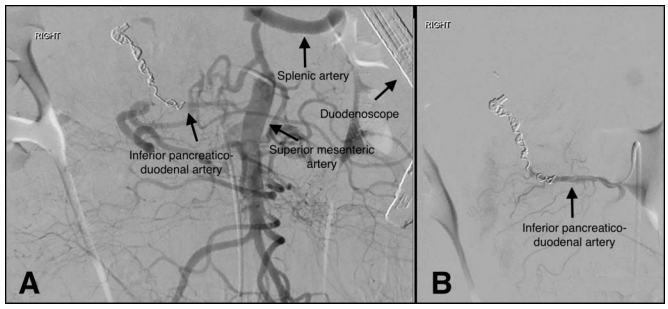

Figure 3. Arteriogram showing (A) mesenteric vasculature and (B) persistent bleeding from a branch of the pancreaticoduodenal artery.

biliary extraction balloon catheter over an angled 0.035-inch guidewire, and contrast was injected through the catheter to confirm placement within and depth of the bile duct stump. Gelatin sponge slurry mixed with epinephrine and contrast suspension was then prepared (Figure 4). A single gelatin sponge was cut into smaller 0.5-cm squares and placed inside a 10-mL syringe, which was partially filled to 5 mL with sterile saline. Another 10-mL syringe of epinephrine diluted to 1:10,000 with contrast media was prepared to total 5 mL. The 2 syringes were connected using a 3-way stopcock and injected back and forth to suspend the Gelfoam. The small 8.5-mm extraction balloon was inflated on the occlusion balloon catheter just within the blind biliary orifice to occlude transpapillary drainage from the bile duct stump, and the guidewire was removed from the catheter. The bile duct stump was then slowly filled with the 10-mL Gelfoam, epinephrine, and contrast mixture, under fluoroscopic guidance, through the wire port of the extraction balloon catheter over 5 minutes. The balloon was held in position for an additional 10 minutes, and on balloon deflation and catheter removal from the stump, no further hemorrhage was seen emanating from the major papilla. The patient's hemodynamics and hemoglobin stabilized after this step of the multidisciplinary procedure, and he

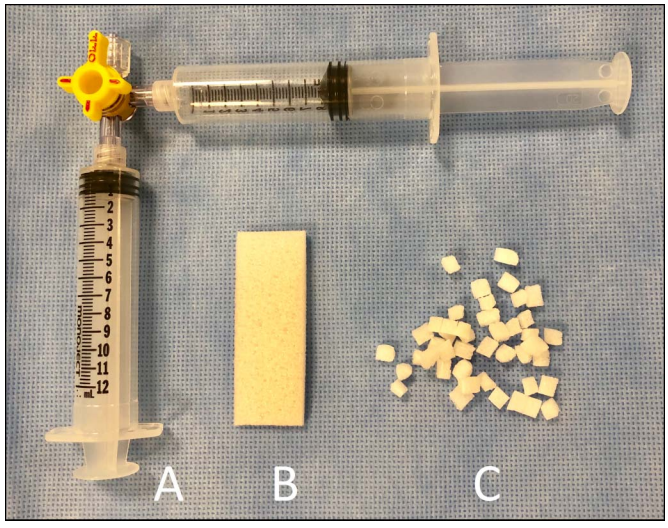

Figure 4. Gelfoam setup showing syringes connected by a (A) 3-way valve, (B) intact Gelfoam, and (C) prepared Gelfoam cut for endoscopically deliverable slurry.

was discharged home without further intervention on hospital day 8. At the follow-up endoscopic retrograde cholangiopancreatography 125 days from the transplant, he remained without recurrence of hemorrhage or delayed complications related to the procedure.

DISCUSSION

Gelfoam is a sterile compressed sponge prepared from purified porcine skin gelatin and is commonly used as a hemostatic device in surgical procedures. It has more recently been adopted by VIR for transarterial embolization of bleeding vessels and in targeted cancer treatments.[4–6] Gelfoam is water-insoluble and absorbs up to 45 times its weight of whole blood, achieving hemostasis both by acting as a physical artificial clot and by providing a matrix for physiological clot formation.[7,8] The gelatin matrix is thought to induce thromboplastin release from damaged platelets which then produces thrombin, activating fibrinogen, and the clotting cascade.[9,10] Gastrointestinal adverse events of gelatin sponge suspension introduced into the vasculature, although uncommon, have included appendicitis and necrotizing pancreatitis because of presumed distal vascular embolization of the material.[9,11] Larger VIR case series using gelatin sponge suspension report adverse events of rebleeding, ischemic bowel, and partial splenic infarction, although these do not distinguish between patients who received Gelfoam and other hemostatic agents or coils.[12,13] Another theoretical risk, using the corollary of endoscopic injection of cyanoacrylate for treatment of gastric and other varices, is pulmonary embolization. Cyanoacrylate glue injection is associated with up to 50% risk of asymptomatic pulmonary embolization in previous series, although no data currently exist regarding this risk with gelatin sponge injection.[14]

There are few reports of gelatin sponge application during endoscopic hemostatic procedures. A recent report detailed successful endoscopic ultrasound-guided obliteration of gastric varices using an endoscopic ultrasound-guided fine-needle injection of embolization coils and gelatin slurry.[15] Hayashi et al reported the use of gelatin sponge for the treatment of bile leak emanating from a transected bile duct after hepatic lobectomy.[16] Our case highlights both a rare complication of liver transplantations and a unique use of intraductal Gelfoam injection during endoscopic retrograde cholangiopancreatography, after failure to achieve hemostasis through VIR embolization therapy.

It is worth mentioning that for management of native bile duct-associated hemobilia, the use of gelatin sponge suspension may not be advisable, given a theoretical risk of biliary obstruction, which could result in cholangitis. This risk remains theoretical because no cases have been currently reported in the literature and further study needs to be undertaken should this method become more widely adapted. VIR with conventional hemostasis remains the treatment of choice for controlling hemobilia. However, in patients who fail conventional hemostatic methods, alternative therapies including endoscopically applied gelatin sponge slurry may be considered as an emerging and potentially lifesaving measure as demonstrated by this case.

DISCLOSURES

Author contributions: XJ Wang wrote the manuscript and is the article guarantor. N. Buttar and AC Storm revised the manuscript.

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