

A Critical Case Report of Delayed Massive Hemorrhage after Percutaneous Transhepatic Gallbladder Puncture and Drainage

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Abstract:

Background: Percutaneous transhepatic gallbladder puncture and drainage (PTGD) play a critical role in controlling biliary tract infections. However, this procedure may also be associated with significant complications, such as major hemorrhage resulting from inadvertent puncture of hepatic artery branches along the needle trajectory.

Case presentation: Recently, we encountered a case of a patient with acute calculous cholecystitis who was admitted to our department. Given the severity of the infection, initial management included PTGD. After one month of adequate drainage, the patient underwent definitive surgical intervention, during which the drainage catheter was removed without evidence of bleeding. Nevertheless, one week postoperatively, the patient experienced sudden massive hematemesis of bright red blood from the surgical site drainage tube. Angiography confirmed active bleeding originating from a branch of the middle hepatic artery located along the previous gallbladder puncture path. Interventional embolization therapy was promptly performed, successfully achieving hemostasis. Following recovery, the patient was discharged in stable condition.

Conclusion: Meticulous planning of the puncture pathway is essential to avoid both major and minor branches of the hepatic pedicle. In cases where hepatic pedicle injury is suspected, vigilant monitoring of the patient's condition is warranted. Prompt angiography and embolization should be performed upon identification of intrahepatic arterial bleeding to achieve hemostasis.

Key words: acute cholecystitis; percutaneous transhepatic gallbladder puncture and drainage; delayed massive hemorrhage

Introduction

PTGD has been widely recognized and adopted in clinical practice as an effective method for decompression and drainage in the management of severe acute cholecystitis [1]. This procedure not only avoids the risks associated with emergency surgery but also rapidly alleviates infection symptoms, reduces biliary pressure, and promotes the resolution of acute cholecystitis, thereby creating favorable conditions for subsequent treatment [2]. Under real-time ultrasound guidance, PTGD can be performed safely, efficiently, and minimally invasively by carefully avoiding major blood vessels and bile ducts. Common complications include biliary peritonitis, hemopneumothorax, biliary hemorrhage, gastrointestinal injury, and dislocation of the drainage tube. When these complications arise, they are typically managed according to standard protocols without leading to adverse outcomes [3]. However, our team recently encountered a case of delayed massive hemorrhage following PTGD. This condition was insidious, rare, and potentially life-

threatening. Through prompt and appropriate intervention, we successfully prevented a poor outcome.

Case report

A 58-year-old male patient was admitted to the hospital on October 2, 2024, due to severe upper abdominal pain lasting one day. The patient reported intense upper abdominal pain radiating to the back, accompanied by high fever and chills one day prior to admission. Physical examination revealed tenderness in the right upper quadrant with a positive Murphy's sign. Laboratory tests performed on October 2, 2024, showed a white blood cell count of $15.7 \times 10^9/L$ and a neutrophil ratio of 81.8%. Abdominal ultrasound indicated acute suppurative cholecystitis with suspected perforation. An emergency ultrasound-guided PTGD were performed upon admission. Postoperatively, dark green bile was drained without any evidence of bloody fluid. Abdominal computed tomography (CT) demonstrated post-drainage changes in the gallbladder, multiple

gallstones with cholecystitis, and no signs of xanthogranulomatous cholecystitis or pseudoaneurysm (Figure 1).

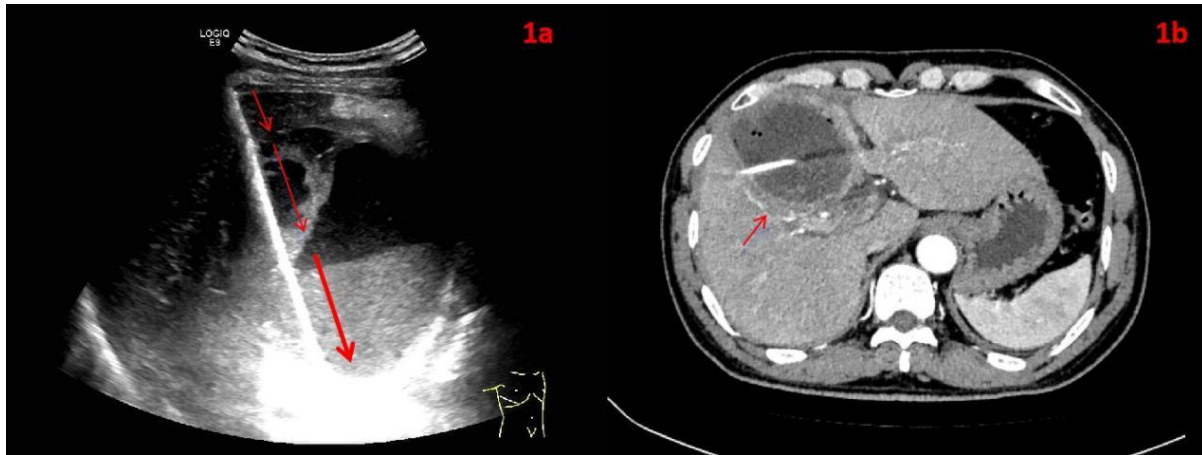


Figure 1: (1a) Under the guidance of color Doppler ultrasound, the puncture trajectory traversed the peripheral liver tissue and the purulent lesion in the gallbladder bed, with the guidewire being successfully positioned within the gallbladder cavity. (1b) Postoperative CT evaluation confirmed that the drainage catheter was accurately placed in the gallbladder, and no evidence of hematoma or pseudoaneurysm was observed along the puncture pathway (arrow).

Magnetic resonance imaging (MRI) suggested inflammatory changes around the gallbladder and suspected penetration of the gallbladder drainage tube through the segment V hepatic pedicle (Figure 2). On October 31, 2024, laparoscopic cholecystectomy was planned; however, dense adhesions between the gallbladder and surrounding structures (omentum, stomach, duodenum, and colon) precluded complete dissection of the gallbladder. Consequently, laparoscopic cholecystotomy with stone removal and partial resection of the gallbladder wall were performed. During the procedure, the cystic artery was precisely ligated, and the liver-facing portion of the gallbladder wall was preserved. The gallbladder drainage tube was subsequently removed without evidence of bleeding or bile leakage. An abdominal drainage tube was placed, and the operation was successfully completed.

On November 7, 2024, at 14:10, a large volume of bloody fluid was drained from the abdominal tube. The patient's vital signs at that time

included a heart rate of 49 beats per minute, respiratory rate of 17 breaths per minute, and blood pressure of 75/45 mmHg. Based on preoperative and intraoperative findings, it was suspected that the bleeding originated from the original gallbladder puncture site. At 16:45 on November 7, 2024, transcatheter hepatic arterial angiography and selective embolization were performed. During the procedure, patchy contrast agent extravasation was noted in branches of the middle hepatic artery. A microcatheter was used for superselection of the lesion branch of the middle hepatic artery, and embolization was achieved using 350 μ m gelatin sponge particles to slow local blood flow. Subsequently, one QC-3-6-HELIX and two QC-4-8-HELIX detachable coils were deployed for additional embolization. Follow-up celiac trunk artery angiography confirmed the disappearance of contrast agent extravasation (Figure 3). The patient received anti-infective therapy, abdominal fluid drainage, and nutritional support and was discharged in stable condition.

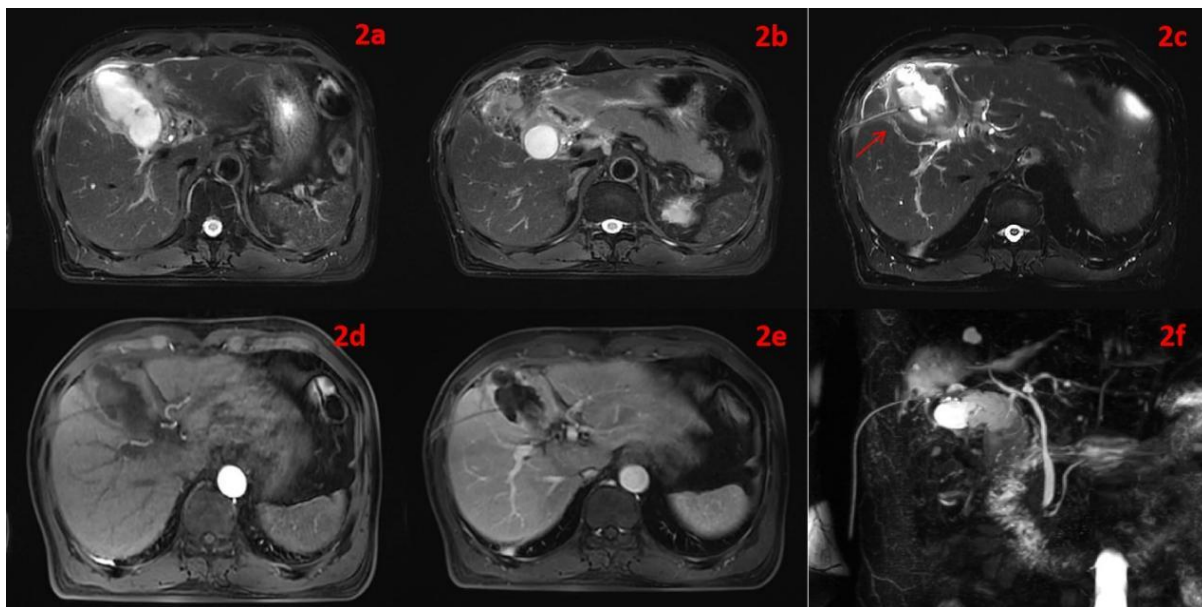


Figure 2: (2a) MRI T2-weighted imaging revealed chronic inflammatory changes in the gallbladder. (2b) The gallbladder was densely adherent to the surrounding tissues. (2c) The gallbladder puncture drainage tube traversed the terminal portion of the segment V hepatic pedicle (arrow). (2d-2f) No significant abnormalities were noted in the remaining arterial phase, portal venous phase, or MRCP.

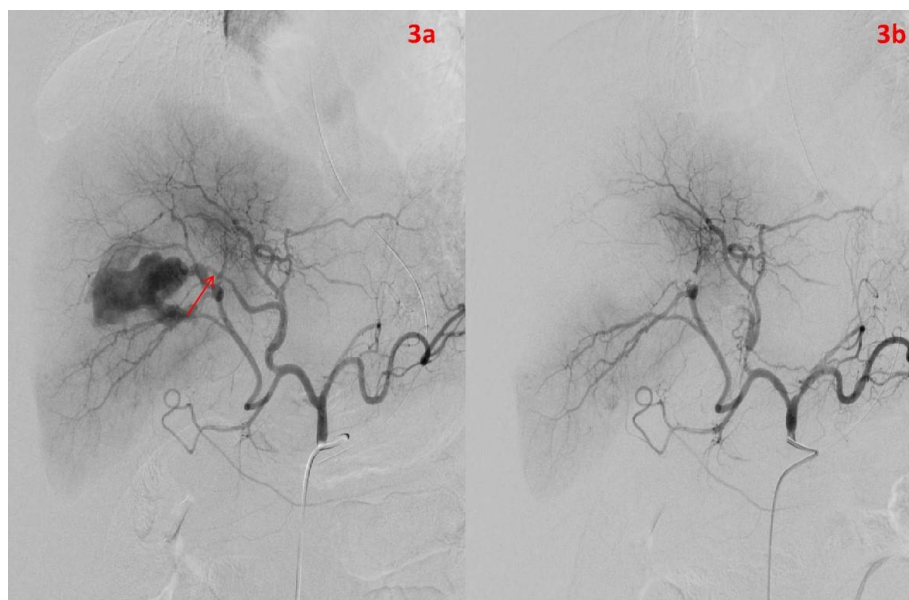


Figure 3: (3a) Arteriography demonstrated active bleeding from the terminal portion of the middle hepatic artery (arrow). (3b) Following embolization with coils and gelatin sponge particles, the hemorrhage was successfully controlled.

Discussion

Biliary tract hemorrhage represents one of the potential complications associated with PTGD [4]. In cases of venous injury, compression via the drainage tube combined with conservative pharmacological treatment typically leads to gradual resolution. However, arterial injuries within the hepatic pedicle, even involving small arteries, are often refractory to healing. This may be attributed to the relatively high arterial pressure, which can compromise vascular integrity and result in active bleeding. The percutaneous transhepatic approach is commonly selected for gallbladder puncture due to its ability to provide structural support for the drainage tube, thereby reducing the risk of dislodgement. During the procedure, real-time ultrasound guidance is employed to avoid critical structures such as the cystic artery and major branches of the hepatic pedicle. Following successful catheter placement, the color of the drained fluid is closely monitored [5].

In this case, the percutaneous transhepatic route was utilized, traversing peripheral liver tissue while attempting to minimize contact with major hepatic pedicles. Initial drainage was unobstructed, and no evidence of bloody fluid was observed. Serial enhanced CT scans failed to reveal pseudoaneurysms. Nevertheless, a rare occurrence of massive bleeding was noted one week after removal of the drainage tube. Based on preoperative MRI findings and subsequent angiography, the bleeding was attributed to localized arterial wall damage incurred during the gallbladder puncture procedure. The cessation of drainage tube compression, coupled with the inability of the arterial wall to heal spontaneously, ultimately resulted in intrahepatic arterial hemorrhage [6].

Through the management of this case, it has been recognized that meticulous planning of the puncture pathway is essential to avoid both major and minor branches of the hepatic pedicle. In cases where hepatic pedicle injury is suspected, vigilant monitoring of the patient's condition is warranted. Prompt angiography and embolization should be performed upon identification of intrahepatic arterial bleeding to achieve hemostasis. Furthermore, the role of prophylactic arterial embolization in patients with hepatic pedicle injury merits further investigation.

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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