

Case Report

Delayed bleeding complication due to internal mammary artery injury after ultrasound-guided percutaneous catheter drainage for liver cyst infection

Tomoyuki Arai,¹ Shinichiro Masuda, Tomotsugu Nakano, Rintaro Hojo, Takaaki Tsuchiyama, Seiji Fukamizu, and Takashi Shibui

Department of Cardiology, Tokyo Metropolitan Hiroo Hospital, Tokyo, Japan

Background: Ultrasound-guided percutaneous catheter drainage (PCD) is widely accepted as a primary treatment for pyogenic liver abscess. Severe PCD-related complications have been reported; however, delayed bleeding complications due to internal mammary artery injury are unknown.

Case Presentation: An 84-year-old man undergoing hemodialysis owing to chronic kidney disease due to focal segmental glomerulosclerosis was admitted to our hospital for liver cyst infection. Ultrasound-guided PCD was carried out through the normal liver at the upper abdominal midline at the level of the sixth intercostal space. Two days later, an abdominal hematoma occurred at the puncture site. Contrast-enhanced computed tomography revealed extravasation of the distal right internal mammary artery, which was successfully treated with percutaneous coil embolization.

Conclusion: Internal mammary artery injury should be considered as a differential diagnosis when a progressing hematoma develops after PCD.

Key words: Complication, internal mammary artery, liver cyst infection, percutaneous catheter drainage

INTRODUCTION

ULTRASOUND-GUIDED PERCUTANEOUS catheter drainage (PCD) for pyogenic liver abscess has been accepted as a safe procedure in clinical settings, because of real-time monitoring for guiding the insertion of the needle at the target liver lesion.^{1,2} Severe complications related to PCD, such as hepatic rupture, hepatocolic fistula, and upper gastrointestinal bleed, have been reported;^{3–5} however, PCD-related delayed vascular complications are rare. Herein, we describe a rare case of internal mammary artery (IMA) injury due to ultrasound-guided PCD for liver infection, presenting with abdominal hematoma 2 days after the procedure.

***Corresponding:** Tomoyuki Arai, MD, Department of Cardiology, Tokyo Metropolitan Hiroo Hospital, 2-34-10, Ebisu, Shibuya-ku, Tokyo, 150-0013, Japan. E-mail: tomoyuki.arai1207@gmail.com. Received 16 Dec, 2019; accepted 12 Apr, 2020

Funding information

No funding information provided.

CASE PRESENTATION

AN 84-YEAR-OLD MAN presented with fever and abdominal pain. He had a history of liver cyst infection and chronic kidney disease owing to focal segmental glomerulosclerosis and was undergoing hemodialysis. On admission, contrast-enhanced computed tomography (CT) showed multiple liver cysts with increased contrast enhancement of the wall and fat stranding around the cysts. He was diagnosed with liver cyst infection. We considered undertaking PCD to the infected small cyst (Fig. 1A) as soon as possible after the admission; however, we could not carry out the procedure by the trans-hepatic approach because the infected cyst was small and situated in the surface of the body. For this reason, this patient was first treated with i.v. antibiotics (levofloxacin 250 mg/day, metronidazole 750 mg/day). Despite this therapy for 13 days, his condition did not improve. Another giant cyst enlarged and compressed the bile duct (Fig. 1B). This caused elevation of hepatic and biliary enzymes. Therefore, on day 14 of hospitalization, we undertook PCD of the giant cyst in the lateral abdomen at the level of the seventh intercostal space to release the compression of the bile duct. Following the

PCD, his condition improved, and the size of the giant cyst decreased (Fig. 1C). However, on day 60 of hospitalization, a second PCD was required because the patient's fever relapsed, and his white blood cell counts and C-reactive protein levels were elevated. A second PCD was undertaken through the normal liver at the upper abdominal midline at the level of the sixth intercostal space, as a result of the reduction of the giant cyst after the first PCD.

Two days after the second PCD, the patient presented with upper abdominal pain. Contrast-enhanced CT revealed an abdominal hematoma around the drain catheter and extravasation of the distal IMA; therefore, we diagnosed the patient with IMA injury due to PCD (Fig. 2). Laboratory data showed reduction of serum hemoglobin levels from 8.2 to 6.6 g/dL, and 2 units of blood cells were transfused. Selective IMA angiography revealed extravasation of the distal segment of the right IMA (Fig. 3A). Following angiography, emergent percutaneous coil embolization was carried out through the right femoral artery using a 6-Fr guiding catheter IM (Mach1 guide catheter; Boston Scientific, Boston, MA, USA) and an extension catheter (Guide-Plus K; Nipro, Osaka, Japan). We advanced a microcatheter (Michibiki; Hanako Medical, Saitama, Japan) to the extravasation site and deployed four coils (VolteX; Boston Scientific). A final angiography showed that the perforation was completely sealed (Fig. 3B). Thirteen days after coil embolization, a follow-up contrast-enhanced CT revealed improvement of the hematoma, and the daily local drainage volume had decreased; thus, the drainage catheter was removed. The patient needed prolonged hospitalization for

rehabilitation after coil embolization, and he was discharged on day 117 of hospitalization.

DISCUSSION

WE PRESENT A case of IMA injury arising as a complication of ultrasound-guided PCD for liver cyst infection. This complication was identified by contrast-enhanced CT 2 days after the procedure, which was successfully treated with percutaneous coil embolization. Ultrasound-guided PCD for focal liver lesion could cause IMA injury. When we confirm the occurrence of delayed hematoma after the treatment, IMA injury should be considered as a differential diagnosis.

Although ultrasound-guided PCD is a safe treatment, a previous review article has reported complications after interventional sonography of focal liver lesions, showing a mortality rate of 0.018–0.06%, with major complications occurring in 0.18% of the cases.^{6,7} Biliary cyst fistula, intracystic hemorrhage, and cholangitis have been reported as severe vascular injury complications.⁷ Regarding extrahepatic vascular injuries, superficial bleeding complications have been reported;⁶ however, in all cases these were self-limiting, and delayed complications have not been confirmed.⁶ In this patient, a possible mechanism of delayed bleeding might be repeat heparinization for hemodialysis. Heparinization was required twice after the PCD. It was speculated that the bleeding stopped because it was self-limiting after the PCD; however, heparin administration during hemodialysis could cause

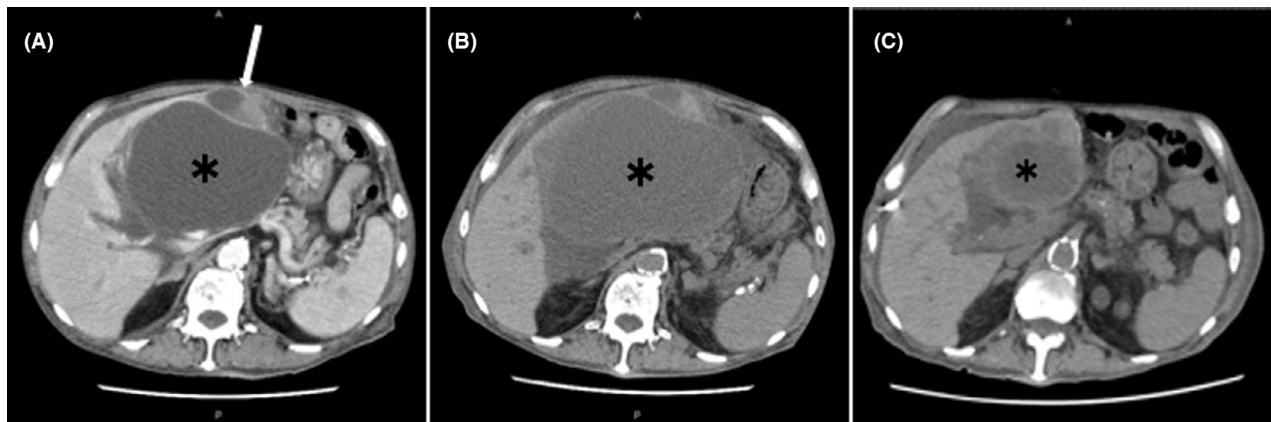


Fig. 1. Time course of liver cysts on contrast-enhanced computed tomography until after the first percutaneous catheter drainage in an 84-year-old man. A, Contrast-enhanced computed tomography on admission. Small, infected cysts (white arrow) presenting with increased contrast enhancement of the wall and fat stranding around the cysts on the surface of the body. B, Seven days before the first percutaneous catheter drainage. Presence of the giant cyst is confirmed (asterisk). C, After the first percutaneous catheter drainage, the size of the giant cyst decreased (asterisk).

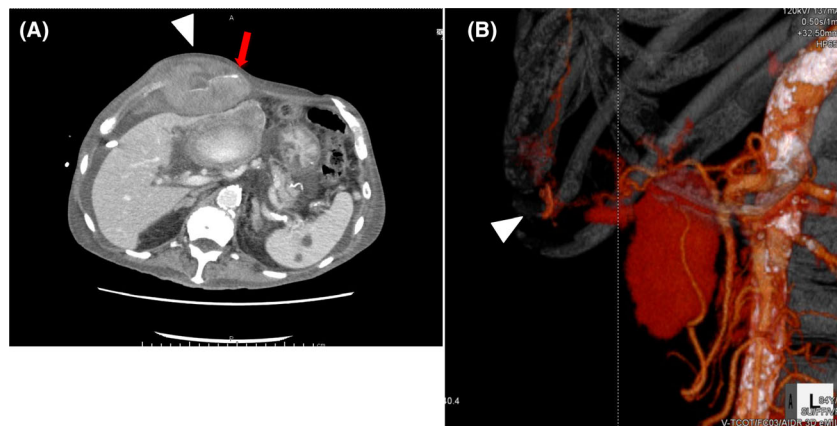


Fig. 2. Contrast-enhanced computed tomography carried out 2 days after the second percutaneous catheter drainage of infected liver cysts in an 84-year-old man. A, Abdominal hematoma (white arrowhead). Extravasation of a branch of the right internal mammary artery (red arrow). B, 3-D computed tomography image showing extravasation at the branch of the distal internal mammary artery (white arrowhead).

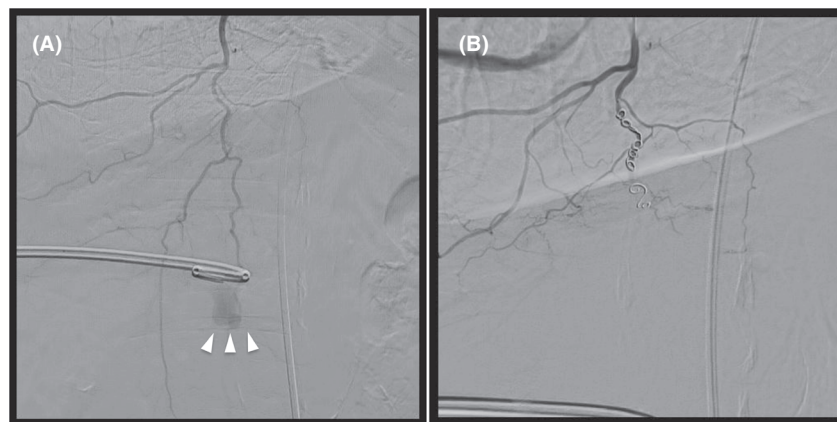


Fig. 3. Right internal mammary artery angiogram undertaken before and after percutaneous coil embolization in an 84-year-old man with internal mammary artery injury after ultrasound-guided percutaneous catheter drainage for liver cyst infection. A, Selective right internal mammary artery angiogram at anteroposterior view. White arrowheads show extravasation of right distal internal mammary artery. B, Angiogram after percutaneous coil embolization. Extravasation was completely sealed by implantation of four coils.

rebleeding. A previous study reported that blood flow in the left IMA could be detected by echocardiography at the supraclavicular fossa and up to the level of the third or fourth intercostal space; however, the accuracy of ultrasonography was limited by the skill of the operator.⁸ Previous studies have not evaluated IMA in the sixth and seventh intercostal spaces because it was assumed that, as the diameter of the peripheral blood vessels becomes smaller, it would be difficult to distinguish the IMA from other superficial blood vessels. Thus, it would be difficult to evaluate IMA at the level of the sixth to seventh intercostal space by echography for PCD.

In cases of IMA injury, immediate contrast-enhanced CT is known to be a useful technique to diagnose the bleeding source.⁹ The blood flow rate of the IMA is 150 mL/min, with many branches;¹⁰ therefore, the delayed diagnosis resulted in deterioration of the patient's hemodynamic state. In this case, immediate contrast-enhanced CT assisted in the rapid diagnosis, and we successfully treated the patient with percutaneous coil deployment. Selective angiography showed focal bleeding at the distal IMA without the involvement of the collateral artery. Moreover, the patient's vitals were stable; therefore, percutaneous coil embolization was the appropriate strategy in this scenario.

In summary, ultrasound-guided PCD for focal liver lesion could cause IMA injury. When a progressing hematoma is confirmed after PCD, IMA injury should be considered as a differential diagnosis and should not be limited to immediately after the procedure. Immediate contrast-enhanced CT is recommended as soon as possible to prevent a fatal outcome.

ACKNOWLEDGEMENTS

NONE.

DISCLOSURE

Approval of the research protocol: Approval of the research protocol was obtained.

Informed consent: Informed consent was obtained from the patient.

Registry and the registration no. of the study/trial: N/A.

Animal studies: N/A.

Conflict of interest: None.

REFERENCES

- 1 Rismiller K, Haaga J, Siegel C, *et al.* Pyogenic liver abscesses: a contemporary analysis of management strategies at a tertiary institution. *HPB (Oxford)* 2017; 19: 889–93.
- 2 Haider SJ, Tarulli M, McNulty NJ, *et al.* Liver abscesses: factors that influence outcome of percutaneous drainage. *AJR Am. J. Roentgenol.* 2017; 209: 205–13.
- 3 Zhang L, Wan D, Zhang L, *et al.* Hepatic rupture: a case report of a severe complication of percutaneous catheter drainage. *Medicine (Baltimore)* 2018; 97: e9499.
- 4 Satoh H, Matsuyama S, Mashima H, *et al.* A case of hepatocolic fistula after percutaneous drainage for a gas-containing pyogenic liver abscess. *J. Gastroenterol.* 1994; 29: 782–5.
- 5 Nayak HK, Saraswat VA, Mohindra S, *et al.* Upper gastrointestinal bleed following percutaneous liver abscess drainage. *J. Clin. Exp. Hepatol.* 2015; 5: 349–51.
- 6 Giorgio A, Tarantino L, de Stefano G, *et al.* Complications after interventional sonography of focal liver lesions: a 22-year single-center experience. *J. Ultrasound Med.* 2003; 22: 193–205.
- 7 Fornari F, Civardi G, Cavanna L, *et al.* Complications of ultrasonically guided fine-needle abdominal biopsy: results of a multicenter Italian study and review of the literature. The Cooperative Italian Study Group. *Scand. J. Gastroenterol.* 1989; 24: 949–55.
- 8 Pârv A, Ober C, Bindea D, *et al.* Transthoracic Doppler echocardiography of the left internal mammary artery graft. *Med. Ultrason.* 2013; 15: 45–50.
- 9 Kawakami S, Noguchi T, Doi T, *et al.* Internal mammary artery injury related to chest compressions in a patient with post-cardiac arrest syndrome. *Intern. Med.* 2016; 55: 1299–303.
- 10 Henriquez-Pino JA, Gomes WJ, Prates JC, *et al.* Surgical anatomy of the internal thoracic artery. *Ann. Thorac. Surg.* 1997; 64: 1041–5.