Hemoperitoneum, Hepatic Laceration, and Hepatic Artery Pseudoaneurysm as a Complication of Emergent Pericardiocentesis

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ABSTRACT

Emergent pericardiocentesis is a potentially life-saving therapeutic procedure. We report a case of hemoperitoneum, a rare but known complication of pericardiocentesis; due to hepatic artery laceration and hepatic artery pseudoaneurysm formation resulting in delayed hemorrhagic shock as a complication of emergent pericardiocentesis. (Level of Difficulty: Intermediate.) (J Am Coll Cardiol Case Rep 2023;5:101686) © 2022 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

An 82-year-old woman with severe degenerative mitral regurgitation (MR) and NYHA functional class III symptoms, who was using maximally tolerated medical therapy, presented for elective transcatheter mitral valve edge-to-edge repair (TEER).

The patient underwent successful TEER with a MitraClip device by the use of fluoroscopy and transesophageal echocardiography (TEE). After the procedure, good hemostasis was accomplished, and TEE did not reveal any pericardial effusion. The patient was extubated and transferred to the recovery room in stable condition.

Ninety minutes after the procedure, the patient became hypotensive; her mean arterial pressure (MAP) was 37 mm Hg, and she was tachycardic (heart rate 144 beats/min), and encephalopathic. A rapid response was called, and a bedside transthoracic echocardiogram (TTE) revealed new-onset moderate, predominantly anterior, pericardial effusion with pericardial tamponade (Figure 1, Video 1).

The patient was resuscitated with intravenous fluids and vasopressors for hemodynamic support. No chest compressions were done. Bedside attempts to perform pericardiocentesis by a substernal approach using ultrasound guidance were unsuccessful because of her inability to lie flat and her small body frame. The patient was taken to the catheterization laboratory and underwent...
successful pericardiocentesis through a fluoroscopy-guided substernal approach, with removal of 270 mL bloody fluid and no significant residual effusion on TTE after the procedure. An 8-F pigtail catheter was placed.

On day 2, the patient reported right lower quadrant abdominal pain. TTE revealed no significant pericardial effusion (Figure 2, Video 2).

After the procedure, the patient’s hemoglobin dropped from 13.4 g/dL to 7.9 g/dL prompting a packed red blood cell transfusion and computed tomography (CT) of the torso without IV contrast, which demonstrated hemoperitoneum (Figure 3).

CT angiography (CTA) of the torso with IV contrast, obtained to evaluate the hemoperitoneum, revealed hyperdense fluid throughout the peritoneal cavity in keeping with hemoperitoneum and was stable from earlier noncontrast CT. An indeterminate hypodense lesion in the left lobe of the liver with surrounding hyperemia measuring 1.1 × 1.3 cm was also noted. Adjacent hyperenhancement on arterial phase represented some shunting. No evidence of active hemorrhage or blood pooling was noted. A pericardial drain was noted in situ without significant pericardial effusion (Figures 4 and 5).

The patient continued to require a relatively low dose of IV norepinephrine for vasopressor support. Continued TTE monitoring did not reveal any significant pericardial effusion, although the patient continued to have pericardial drain output.

On postprocedure day 3, the patient became unresponsive during placement of a peripherally inserted central catheter (PICC). Her MAP decreased to 40s mm Hg, with palpable pulses. IV norepinephrine was uptitrated. A bedside examination revealed soft but significantly distended abdomen.

**MEDICAL HISTORY**

The patient’s medical history included hypertension, right subclavian artery stenosis, carotid stenosis, coronary artery disease, atrial fibrillation, COPD, thyroid cancer, heart failure with mildly reduced EF at 45%, and MR.

**DIFFERENTIAL DIAGNOSIS**

The differential diagnosis included pericardial effusion and hemoperitoneum secondary to pericardiocentesis.

**INVESTIGATIONS**

Bedside TTE revealed unchanged nonsignificant pericardial effusion with no signs of hemodynamic compromise or tamponade. Bedside abdominal ultrasonography was concerning for free fluid/blood in the abdomen. Bedside i-STAT revealed a hematocrit of 15%. A complete blood count revealed hemoglobin of 5.1g/dL down from 7.5g/dL earlier that morning. After hemodynamic stabilization, the patient was immediately transported to the radiology suite for CTA of the torso, which revealed an enlarging hypoattenuating lesion within the left lobe of the liver, previously thought to be an indeterminate mass and
now favored to represent liver laceration, with the pericardial drain lying in close proximity to it. Also noted were ill-defined areas of hyperattenuation on the arterial phase of the study without definite pooling on the delayed phase, representing intrahepatic extravasation and pseudoaneurysm formation. The hypoattenuating lesion/laceration now extended to the posterior capsule of the liver and was the source of moderate hemoperitoneum, which had increased slightly in volume from the prior CT (Figure 6).

**MANAGEMENT**

A massive transfusion protocol was initiated, and multiple vasopressors were started for a brief period. Left hepatic artery digital subtraction angiography (DSA) performed by the interventional radiology service demonstrated a pseudoaneurysm arising from segment III branch of the left hepatic artery (Figures 7 and 8). Coil embolization was performed with a 2 mm × 4 Penumbra Ruby soft coil and 5 cm packing coil (× 2). Postembolization arteriography demonstrated complete occlusion of the pseudoaneurysm (Figure 9). The patient received a transfusion of 4 units of packed red blood cells over the course. The patient was extubated on day 4 and was weaned off vasopressors on day 5. The pericardial drain had significant amounts of bloody output.

**DISCUSSION**

Pericardiocentesis, when performed with imaging guidance, is a relatively safe procedure, with the risk of complications ranging from 4% to 10%.1 The most common complications are arrhythmias, coronary artery or cardiac chamber puncture, hemothorax, pneumothorax, and pneumopericardium.1 We report a rare and novel case of hemoperitoneum due to hepatic laceration and hepatic artery pseudoaneurysm formation as a complication of emergent pericardiocentesis. To our knowledge, there has been no case report of liver laceration with hepatic artery pseudoaneurysm complicating pericardiocentesis.

The precise incidence of hemoperitoneum after pericardiocentesis is not known. Etiologies like injury to the left inferior phrenic artery have been described in case reports.7 The presentation can vary depending on the severity and nature of the cause; in our case it was gradual onset followed by acute decompensation.
hepatic artery pseudoaneurysm with guidance by the interventional radiology service.

**FOLLOW-UP**

Because of the continued significant drain output, the pericardial drain was kept in situ with monitoring of drain output and TTEs. The pericardial drain was removed on postprocedure day 12. Follow-up TTE did

**FIGURE 5** Computed Tomography Angiogram With Intravenous Contrast Material

*Arrow* points to the adjacent hyperenhancement on arterial phase representing shunting.

**FIGURE 6** Computed Tomography Angiogram of Torso With Intravenous Contrast Material

Enlarged hypoattenuating lesion within left lobe of liver, previously thought to be indeterminate mass, and now favored to represent liver laceration. *Arrow* points to ill-defined area of hyperattenuation on the arterial phase of the study without definite pooling on delayed phase representing intrahepatic extravasation and pseudoaneurysm formation.

**FIGURE 7** Digital Subtraction Angiography of Left Hepatic Artery

Image demonstrating pseudoaneurysm arising from segment III branch of left hepatic artery.

**FIGURE 8** Angiogram

Image showing pericardial drain course.
not reveal any significant effusion (Figures 10 and 11, Videos 3 to 5).

The patient was planned for discharge to subacute rehabilitation, but she had a new-onset leukocytosis and complete opacification of the left lung. Intravenous antibiotic therapy was started because of possible pneumonia. Bronchoscopy revealed a large yellow-tan mucus plug down the left main bronchus, with corresponding left lung atelectasis. After 10 days of intravenous antibiotics and repeated bronchoscopy, the patient’s condition improved, and a postbronchoscopy chest x-ray showed significant improvement of the left hemithorax. The patient was discharged to subacute rehabilitation in stable condition after 35 days of hospitalization.

CONCLUSIONS

Pericardiocentesis is a potentially life-saving procedure that carries a high risk of complications. In this regard, imaging support and careful planning of the
proper entry site are fundamental for a safe and successful procedure.

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**KEY WORDS** hemoperitoneum, hepatic artery laceration, pericardiocentesis, pericardial tamponade

**APPENDIX** For supplemental videos, please see the e version of this paper.