

CASE REPORT

BEGINNER

CLINICAL CASE

Acute Marginal Artery Laceration as a Complication of Pericardiocentesis



Boskey Patel, DO,^a Sai Vikram Alampoondi Venkataramanan, MD,^b Robert Bojar, MD,^c Mark Kranis, DO,^a Mazen Roumia, MD^a

ABSTRACT

The safety of pericardiocentesis as a therapy for cardiac tamponade has improved since the advent of echocardiography-guided pericardiocentesis. The most life-threatening, albeit rare, complication is injury to the coronary vessels or ventricular wall resulting in recurrent tamponade. We present a rare case of acute marginal artery laceration resulting from pericardiocentesis. (**Level of Difficulty: Beginner.**) (J Am Coll Cardiol Case Rep 2022;4:501-504) © 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-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

HISTORY OF PRESENTATION

A 72-year-old man presented for routine outpatient transthoracic echocardiogram (TTE) for evaluation of tricuspid regurgitation and pulmonary hypertension. He endorsed 2 weeks of intermittent, sharp, left-sided chest pain aggravated by deep inspiration. He also admitted to worsening exertional dyspnea when climbing up 1 flight of stairs. The patient had a chronic cough with no change in sputum production, frequency, or severity. He denied orthopnea, paroxysmal nocturnal dyspnea, peripheral edema, or fever.

Vital signs included a heart rate of 72 beats/min, blood pressure of 104/76 mm Hg, and an oxygen saturation of 98% on room air. Cardiac examination revealed distant heart sounds but a normal S1 and S2 and no obvious friction rub, gallop, or murmur. Pulsus paradoxus was absent. The rest of the examination was unremarkable.

PAST MEDICAL HISTORY

Medical history included paroxysmal atrial fibrillation on apixaban, chronic obstructive pulmonary disease not on home oxygen, pulmonary hypertension, moderate tricuspid regurgitation, hypothyroidism, hypertension, and hyperlipidemia. Two years previously, the patient had been admitted with chest pain and an upper respiratory tract infection. TTE showed a moderate pericardial effusion. His Coxsackie virus titers were positive, and he was diagnosed with viral pericarditis. The patient responded well to conservative medical management. A repeat TTE 9 months later revealed a small pericardial effusion with

LEARNING OBJECTIVES

- To review the minor and major complications of pericardiocentesis.
- To discuss methods and techniques that mitigate the risk of these complications.
- To be able to diagnose and manage coronary artery laceration after pericardiocentesis.

From the ^aDivision of Cardiovascular Medicine, Saint Vincent Hospital, Worcester, Massachusetts, USA; ^bDepartment of Internal Medicine, Saint Vincent Hospital, Worcester, Massachusetts, USA; and the ^cDivision of Cardiothoracic Surgery, Saint Vincent Hospital, Worcester, Massachusetts, USA.

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**ABBREVIATIONS
AND ACRONYMS****TTE** = transthoracic
echocardiogram

normal biventricular systolic function and a pulmonary artery systolic pressure of 45 mm Hg.

DIFFERENTIAL DIAGNOSIS

Initial differential diagnoses included chronic obstructive pulmonary disease exacerbation, angina, pneumonia, heart failure, recurrent viral or autoimmune pericarditis, cardiac tamponade, or hemopericardium in the setting of anticoagulation use.

INVESTIGATIONS

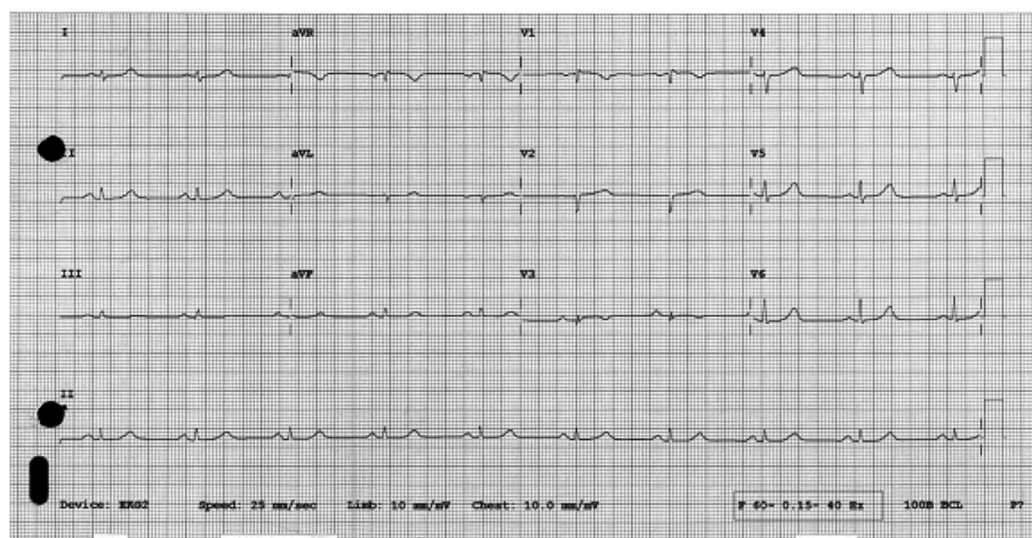
Results of the complete blood count, metabolic panel, liver function test, thyroid studies, and cardiac biomarkers were within normal range. C-reactive protein level was elevated. An electrocardiogram showed normal sinus rhythm, right-axis deviation, and low voltage (**Figure 1**). Chest radiograph showed borderline cardiomegaly with no consolidations or pulmonary vascular congestion (**Figure 2**). TTE showed a large circumferential pericardial effusion and dilated right ventricle with early to mid-diastolic collapse, a dilated inferior vena cava without collapse, and a markedly elevated pulmonary artery systolic pressure of 70 mm Hg, suggestive of early tamponade physiology (**Videos 1 and 2**).

MANAGEMENT

The patient was initially started on colchicine and ibuprofen for presumed pericarditis, particularly

since he had responded well to this treatment on previous presentation. Apixaban was held. The next day, the patient continued to have dyspnea and became tachycardic. Given the echocardiographic findings, the patient's symptoms were attributed to cardiac tamponade, and a decision was made to proceed with pericardiocentesis. He was taken to the cardiac catheterization laboratory. Right heart catheterization was performed and revealed equalization of pressures. Pericardiocentesis was performed successfully via the subxiphoid approach under echocardiographic and fluoroscopic guidance. Pericardial opening pressure was elevated and exceeded right atrial filling pressure. One liter of serosanguineous fluid was removed with improvement in right heart filling pressures, and a pericardial drain was placed. A postprocedure bedside echocardiogram showed almost complete resolution of the effusion. The patient reported symptomatic improvement and was taken back to the cardiac intensive care unit.

Two hours later, 300 mL of bloody output was noted from the drain. Results of repeat laboratory tests showed a 2 g/dL drop in hemoglobin, but the patient remained hemodynamically stable. Four hours later, he became hypotensive, with a blood pressure of 60/40 mm Hg with minimal response to intravenous fluids or vasopressors. A bedside TTE revealed re-accumulation of a large-sized pericardial effusion with heterogeneous echodensity suggestive of pericardial thrombus (**Video 3**). The patient was taken emergently to the operating room for evacuation of the clot and drainage of the recurrent effusion

FIGURE 1 Admission Electrocardiography

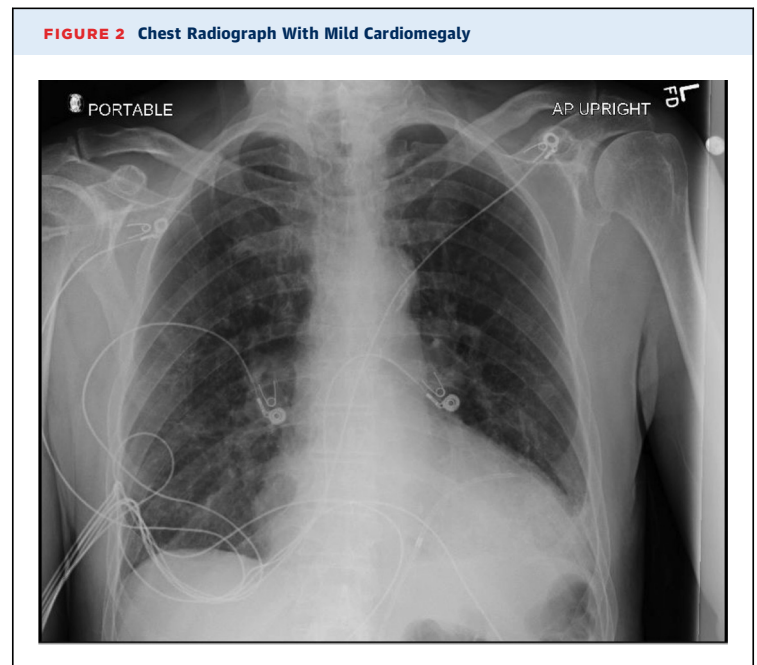
through a median sternotomy incision. He was found to have a partial laceration of the distal acute marginal artery with pulsatile bleeding (Video 4). The laceration was oversewn, and 700 to 800 mL of thrombus was extracted from behind the heart, with hemodynamic improvement (Figure 3). Surgical drains were placed, and the patient was taken to the cardiac intensive care unit in stable condition. On postoperative day 4, a follow-up TTE showed no recurrent effusion, and apixaban was restarted.

The patient remained hemodynamically stable until postoperative day 7, when he had a severe coughing fit resulting in transient loss of consciousness. Shortly thereafter, he experienced a witnessed pulseless electrical activity cardiac arrest. Advanced cardiac life support was immediately initiated, and return of spontaneous circulation was achieved after 2 rounds of cardiopulmonary resuscitation. A repeat TTE revealed a moderate pericardial effusion with a large echodensity over the right ventricle, along with right ventricular systolic dysfunction (Video 5). An emergent redo sternotomy was performed at the bedside, after which the patient was rushed to the operating room. There was re-accumulation of a large thrombus burden, which was removed anteriorly, inferiorly, and laterally. Fibrin and clot accumulation was noted, presumably an inflammatory response from the first surgery, and this was meticulously peeled off to visualize any bleeding sites. A faint trickle of blood was seen from the fat in the inferior epicardium, near the area of the prior repair, and an additional suture was placed. No other source of bleeding was identified.

The patient's subsequent postoperative course was uncomplicated. Serial TTEs showed only a small residual effusion, no recurrent tamponade or thrombus formation, and normalization of right ventricular systolic function. After additional days of observation, the patient was discharged to a short-term rehabilitation facility 21 days after admission. Given his complicated hospital course and because he had maintained sinus rhythm, the decision was made to hold off on anticoagulation until outpatient follow-up.

DISCUSSION

The concept of pericardiocentesis was first described in 1653, but the procedure was not performed until 1840. Even then, morbidity and mortality rates with the “blind approach” were high enough that the procedure fell out of favor until the development of ultrasound-guided techniques in the 1970s.¹ The echo-guided technique involves identifying the



location of the largest pocket of pericardial fluid and entering with a sheathed needle at a point on the chest wall near that fluid pocket, away from vital structures.² With the advent of imaging guidance, the rates of major and minor complications have dropped significantly, with a large retrospective survey estimating them to be ~1.2% and 3.5%, respectively.³ Major complications include ventricular perforation, infection, larger pneumothorax, ventricular arrhythmias, cardiac arrest, pericardial thrombus, and pulmonary edema. Minor complications include transient arrhythmias, small pneumothorax, and pericardial catheter occlusion.

Coronary artery perforation is a lethal but rare complication. To the best of our knowledge, there have been only 3 other cases of coronary artery laceration after pericardiocentesis in the published reports.⁴⁻⁶ Two underwent microcoil embolization, while one required open repair of the lacerated artery. Our patient underwent the procedure with echocardiographic and fluoroscopic guidance but still experienced an arterial laceration requiring sternotomy. Even with imaging guidance, there are several ways to increase the safety of this procedure.⁷⁻⁹ Knowledge of the pertinent anatomy is of the utmost importance, especially to ensure proper needle positioning. After echo-guided needle puncture, the position of the needle and the sheath can be confirmed by injecting agitated saline, with bubbles being seen by TTE only in the pericardial space and not in any of the cardiac chambers. Real-time imaging can also be performed by using continuous, in-plane

FIGURE 3 Pericardial Thrombus

Large thrombus burden that was manually extracted from the pericardial space in the operating room.

ultrasound monitoring. Similar to the injection of agitated saline under echo guidance, the addition of fluoroscopy allows for injection of contrast to verify positioning. Finally, computed tomography-guided

pericardiocentesis can be considered in patients with poor acoustic windows on TTE or with posterior or loculated effusions.

FOLLOW-UP

At 2-week follow-up, the patient remained stable. A repeat TTE showed no recurrent pericardial effusion (Video 6).

CONCLUSIONS

Coronary artery laceration is a rare but life-threatening complication of pericardiocentesis. Cardiologists should be aware of this complication, as ongoing bleeding requires emergent treatment with open sternotomy and ligation, without which the mortality is very high.

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ADDRESS FOR CORRESPONDENCE: Dr Boskey Patel, Division of Cardiovascular Medicine, Saint Vincent Hospital, 123 Summer Street, Worcester, Massachusetts 01608, USA. E-mail: patelboskey@gmail.com. Twitter: [@OneMoreDrPatel](https://twitter.com/OneMoreDrPatel).

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KEY WORDS complication, pericardial effusion, tamponade

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