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# Embolitic Hypodermic Needle Causing Traumatic Cardiac Tamponade: A Case Report

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**Objectives:** We present a unique case of a broken fragment of a hypodermic needle breaking and embolizing to the heart. This needle subsequently penetrated the right ventricle and the patient developed hemopericardium which resulted in cardiac tamponade physiology.

**Data Sources:** None.

**Study Selection:** None.

**Data Extraction:** None.

**Data Synthesis:** Recognizing the potential for unusual and serious complications of IV illicit drug use is an important part of providing effective and timely medical care in this vulnerable population.

**Conclusions:** An embolic needle phenomenon can have significant sequela, including direct cardiac trauma leading to tamponade and subsequent cardiac collapse. Partnering with the patient to take a detailed history was critical in uncovering the underlying etiology of this patient's cardiogenic shock.

**Key Words:** cardiac tamponade (C14.280.155); embolism (C14.907.355.350); needle (E07.612); pericardial effusion (C14.280.695); substance abuse—intravenous (C25.775.793)

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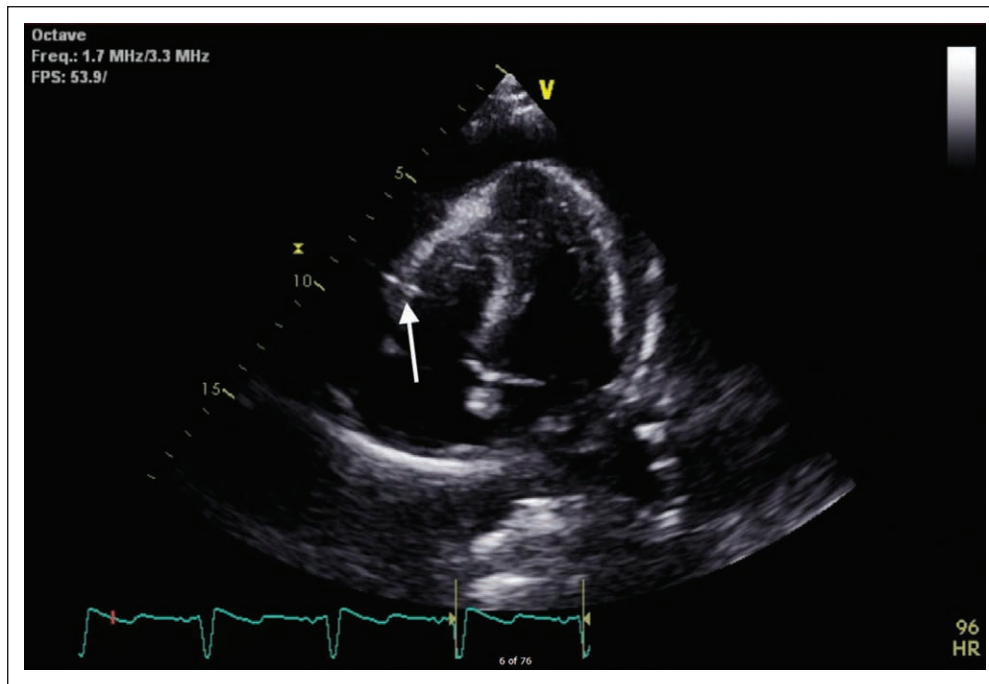
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Pericardial effusions can be a source of significant morbidity and mortality. Most pericardial effusions are incidental findings of a systemic illness such as malignancy, autoimmune disease, or infection. Pericardial effusions may cause hemodynamic changes including cardiac tamponade. Loss of pericardial compliance may lead to subsequent reduced cardiac output and shock. Here, we present a unique case of an embolic hypodermic needle causing penetrating trauma from the cavity of the right ventricle into the pericardial space, leading to hemopericardium complicated by tamponade and normotensive obstructive shock.

## CASE PRESENTATION

A 52-year-old male with past medical history significant for well-controlled HIV on antiretroviral therapy and active IV drug use presented with 3 days of pleuritic chest pain. The patient reported a recent hospitalization for cellulitis and had completed a course of antibiotics 2 days prior to admission. In the emergency department, he was normotensive, despite a well-documented baseline of untreated hypertension. Initial laboratory values were notable for a lactate of 10.0 mmol/L, WBC count of 12.2K/ $\mu$ L, and a hemoglobin level that was stable from previous admission at 10.0g/dL. Despite 2L of IV fluid resuscitation, his lactate rose to 12.8 mmol/L. A bedside cardiac ultrasound revealed a large pericardial effusion; therefore, a formal transthoracic echocardiogram was obtained, showing a pericardial effusion measuring up to 2 cm anteriorly and 1.6 cm posteriorly (Fig. 1). The patient underwent a CT scan of the chest that again demonstrated a moderately sized, high-density, pericardial effusion but also revealed a linear 1.8 cm metallic foreign body in the right ventricle, penetrating the right ventricular free wall (Figs. 2 and 3).

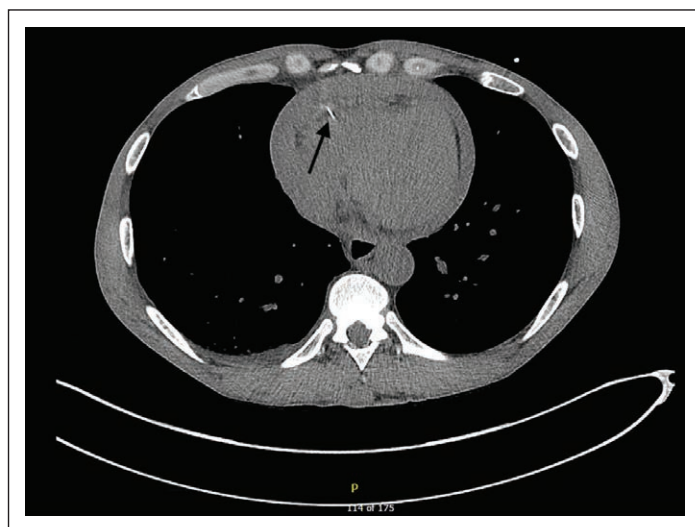
The patient was admitted to the medical ICU for monitoring and treatment. His lactate continued to rise despite resuscitation with IV fluids; thus, he was determined to be in normotensive cardiogenic shock. Emergent pericardiocentesis was performed by left paraxiphoid approach. The pressure in the pericardial space was 17 mm Hg, and 450 mL of bloody fluid was drained from the pericardial sac with minimal remaining effusion. The hemoglobin in the pericardial fluid was 10.7g/dL, closely matching the serum hemoglobin level. On further questioning, the patient recalled



**Figure 1.** Transthoracic echocardiogram in the apical four chamber view with the echogenic needle in the right ventricle penetrating the myocardium into an observed pericardial effusion. FPS = frames per second, HR = heart rate.

losing the tip of a hypodermic needle after injecting heroin into his femoral vein approximately 1 month prior to admission. Notably, the needle fragment was not immediately apparent on the echocardiogram performed prior to CT scan; on review, there is an artifact that correlates with the position of the metallic body seen on CT. His lactate cleared after pericardial drain placement, with decreasing drain output over the next 24 hours. The patient remained stable, so emergent surgical removal of the needle was deferred.

In discussion with the Interventional Radiology and the Cardiothoracic Surgery services, an endovascular approach was attempted to snare the needle. However, this was unsuccessful, as the needle appeared to be embedded in the myocardium. Ultimately,



**Figure 2.** Axial CT chest demonstrating the radio dense needle in the right ventricle penetrating into the pericardial space in the presence of an effusion.

the Cardiothoracic Surgery team performed an open exploration with a full median sternotomy. A laceration was found on the anterior right side of the right ventricle, but the needle was not immediately visible and appeared to be fully contained within the ventricle wall. Given the risks of inflicting worse myocardial injury by removing the needle when it was not readily accessible, the decision was made to leave the needle in place and repair the laceration to prevent further extravasation and effusion re-accumulation. A pericardial patch was sutured over the repair site. The patient's condition remained stable, and he was discharged home after ensuring hemodynamic stability and no further re-accumulation of the pericardial effusion. On repeat transthoracic echocardiogram 2 months after presentation, no further pericardial effusion was seen.

## DISCUSSION

Clinically significant pericardial effusions can result in cardiac tamponade and hemodynamic collapse due to compromise of diastolic filling and diminished cardiac output. This is most commonly due to acute effusion causing a sudden increase in pericardial pressures; however, chronic occlusion can also result in tamponade once the pericardium expands beyond its structural limit. Pericardial effusions have a variety of etiologies. The most common cause is viral infection, leading to severe inflammation and irritation of the pericardium. Other pathogens, including *Mycobacterium tuberculosis* and certain bacteria and fungi, are relevant causes of effusion in resource-poor nations and among the immunocompromised patient population. Some effusions are malignant or autoimmune, while a minority result from metabolic derangements. External penetrating or blunt trauma to the chest is a common mechanical source (1). However, to our knowledge, there are no reports of hypodermic needle embolization causing myocardial injury, leading to cardiac tamponade. There are rare case reports describing orally ingested safety pins (2) or sewing needles (3) causing cardiac injury or pericardial effusion. Additionally, iatrogenic complications, such as embolization of inferior vena cava filter fragments (4, 5) or needle-like cement (6), have caused cardiac trauma. Although the use of IV illicit drugs is a global health concern, this is the first report of hemorrhagic pericardial effusion leading to tamponade related to a fractured needle (7). Perhaps patients with substance use disorders who do not have access to fresh supplies are at higher risk for this type of complication due to paraphernalia failure with needle reuse over time (8). Although rare, case reports have proven that these needle fragments can embolize and lodge in central structures (9–11),



**Figure 3.** Sagittal CT chest redemonstrating the radio dense needle.

including the heart (12). This can serve as a nidus for infection (13), leading to chronic constrictive pericarditis (14) or endocarditis. In the case presented here, the hypodermic needle created a conduit from the ventricular chamber to the pericardial sac, leading to hemopericardium and obstructive shock due to tamponade. Although the shock was efficiently treated, this case demonstrates how an embolic needle fragment could be difficult to diagnose in the absence of a complete history, as it was not immediately obvious on echocardiogram. Additionally, without a high index of suspicion, small embolic needle fragments could be missed on routine workup, potentially placing patients at risk of serious complications, including death.

## CONCLUSIONS

Illicit IV drug use poses a broad range of health concerns, including a risk of hypodermic needle embolization during injection. This can theoretically cause infectious endocarditis or direct trauma to the heart. As we report here, penetrating myocardial injury can cause hemopericardium progressing to obstructive shock from tamponade. Building rapport with patients who use IV drugs allows physicians to obtain important information during a thorough history and physical examination that may expedite the recognition of more unusual and serious complications of IV drug use.

## REFERENCES

1. Vakamudi S, Ho N, Cremer PC: Pericardial effusions: Causes, diagnosis, and management. *Prog Cardiovasc Dis* 2017; 59:380–388
2. Kalayci AG, Baysal K, Uysal S, et al: Hemopericardium caused by ingested safety pin. *Endoscopy* 2002; 34:93
3. Choudhary S, Pujar Venkateshacharya S, Reddy C: Sewing needle: A rare cause of intra-cardiac foreign body in a 3-year-old child. *Cardiol Young* 2016; 26:1425–1427
4. Shennib H, Bowles B, Hickie K: Migration of a fractured inferior vena cava filter strut to the right ventricle of the heart: A case report. *J Cardiothorac Surg* 2014; 9:183
5. Kalavakunta JK, Thomas CS, Gupta V: A needle through the heart: Rare complication of inferior vena caval filters. *J Invasive Cardiol* 2009; 21:E221–E223
6. Kim SY, Seo JB, Do KH, et al: Cardiac perforation caused by acrylic cement: A rare complication of percutaneous vertebroplasty. *AJR Am J Roentgenol* 2005; 185:1245–1247
7. Norfolk GA, Gray SF: Intravenous drug users and broken needles—a hidden risk? *Addiction* 2003; 98:1163–1166
8. Wilson RJ, Crosby SN, Lee DH: Removal of a venous intraluminal needle: A case report. *J Hand Microsurg* 2015; 7:170–172
9. Monroe EJ, Taylor TD, McNeeley MF, et al: Needle embolism in intravenous drug abuse. *Radiol Case Rep* 2012; 7:714
10. Kulaylat MN, Barakat N, Stephan RN, et al: Embolization of illicit needle fragments. *J Emerg Med* 1993; 11:403–408
11. Angelos MG, Sheets CA, Zych PR: Needle emboli to lung following intravenous drug abuse. *J Emerg Med* 1986; 4:391–396
12. Gyrttrup HJ, Andreassen KH, Pedersen JH, et al: Central embolization of needle fragment following intravenous drug abuse. *Br J Addict* 1989; 84:103–105
13. Ngaage DL, Cowen ME: Right ventricular needle embolus in an injecting drug user: The need for early removal. *Emerg Med J* 2001; 18:500–501
14. LeMaire SA, Wall MJ Jr, Mattox KL: Needle embolus causing cardiac puncture and chronic constrictive pericarditis. *Ann Thorac Surg* 1998; 65:1786–1787