

# Management of iatrogenic right ventricular puncture: A case report

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## Summary

A 100-year-old female patient was admitted for a pericardial effusion with unknown etiology. Pericardiocentesis was performed and the pigtail drainage catheter was noted to be in the right ventricle and not pericardial space. A separate pigtail catheter was placed in the pericardial space and the existing pigtail catheter was removed under close hemodynamic monitoring. The patient subsequently stabilized. This case demonstrates that puncture of the right ventricle may be treated conservatively.

**Keywords:** Right ventricular puncture, drainage, management.

## 1. Background

Pericardiocentesis is a crucial, life-saving procedure with associated risks for complications, such as pneumothorax, ventricular laceration, ventricular puncture, cardiac tamponade, liver laceration, and splenic laceration. The rates of such complications are estimated to be about 3.9% [1]. Several complications are easily recognized, while a few may not be detected quickly without paying close attention to the patient's hemodynamics. This case report describes the management of a patient with an iatrogenic right ventricular (RV) puncture following pericardiocentesis.

## 2. Case presentation

A 100-year-old female patient was admitted to the Department of Cardiology due to shortness of breath. She denied any medical illnesses and

reported that she did not take any medications on a regular basis. Medical examination at hospitalization revealed stable vital signs with normal neurological status, pink skin, the irregular heartbeat of 67bpm and blood pressure of 110/80mmHg. Laboratory test results were in normal range as follows: Red blood cell count 3.9T/L, hemoglobin 128g/L, and hematocrit 35%, liver and renal functions also were normal. A chest X-ray performed revealed an enlarged heart silhouette and moderate pleural effusion. Transthoracic echocardiography (TTE) showed a normal left ventricular ejection fraction of 70%, left ventricular end-diastolic diameter of 45mm, and no wall motion abnormalities. There was a large pericardial effusion with echocardiographic signs of tamponade, including RV and atrial collapse during inspiration. The decision was made to perform an urgent ultrasound-guided pericardiocentesis with a needle, which resulted in the removal of 900mL of hemoserous fluid. The patient reported feeling better with less dyspnea, and she was hemodynamically stable. TTE showed a small effusion left.

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**Received:** 16 August 2021, **Accepted:** 8 December 2021

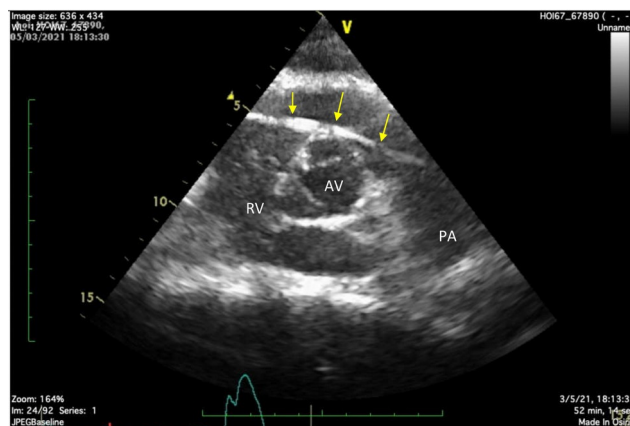
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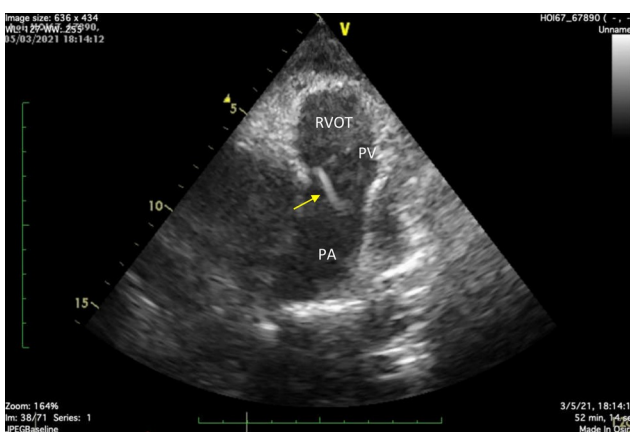
On the second day of hospitalization, the patient complained of difficulty breathing again, and there was no sign of hemodynamic compromise. TTE revealed that the pericardial space was refilled with a large amount of fluid with signs of tamponade. Based on the quick recovery of pericardial fluid, intermittent pericardial drainage was initiated with an interventional pigtail device guided by echocardiography. The pigtail catheter was inserted and 350mL of fluid was drained with the patient's clinical improvement.

On the third day of hospitalization, the patient complained of chest pain and breathlessness and 350mL of fluid was drained again. Suddenly, the patient became pale, cold, and hemodynamically compromised with a heart rate of 98bpm, blood pressure of 60/40mmHg, and oxygen saturation of 80%. Blood tests showed that erythrocyte count was low at 2.5T/L, hemoglobin was 85g/L, and hematocrit was 29%. A bedside TTE showed moderate pericardial effusion and also revealed that the pigtail catheter was in the pulmonary artery along with a thrombus (Figures 1-3). The diagnosis of iatrogenic RV puncture with a pigtail catheter in the pulmonary artery was made. A cardiac surgeon was consulted and the decision was made to not perform surgery due to the patient's age and frailty and family concern about surgical intervention. We were unable to move the patient to the catheterization laboratory or to attempt computer tomography because the patient was in critical condition. The decision was made to insert another catheter into the pericardial space. There was also continued close hemodynamic monitoring, as well as blood transfusions as needed. After 2 hours of monitoring, transfusion of 700mL of blood, and drainage of 500mL of pericardial fluid, the patient became stable with a blood pressure of 100/70 mmHg, heart rate of 67bpm, and oxygen saturation of 98%. A large thrombus was detected in the epicardial space (Figure 4), which may have sealed the puncture site in the RV free wall. The J-tip wire was removed and TTE was repeated every hour. Her hemodynamic was stable at the end of stay.

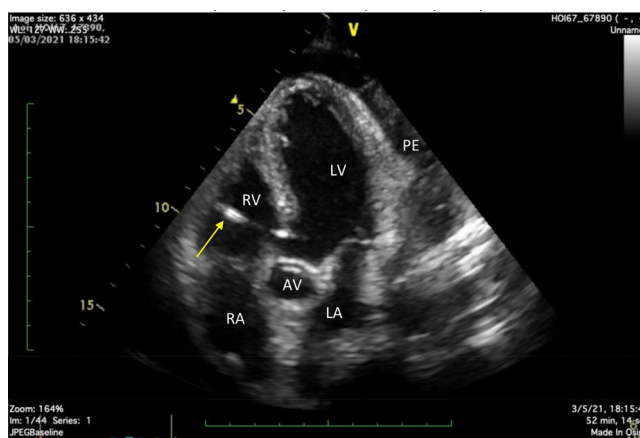
Subsequent test showed that the effusion was from malignancy and the patient was transferred to the department of oncology for treatment.



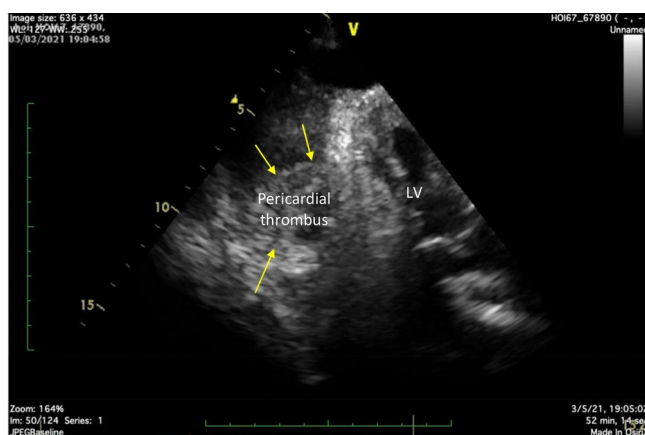
**Figure 1.** 5F pigtail catheter (yellow arrows) in the right ventricle (RV), across pulmonary valve to pulmonary artery (PA); AV–aortic valve.



**Figure 2.** Yellow arrow showed a pigtail catheter in the pulmonary artery. RVOT–right ventricular outflow tract; PV–pulmonary valve; PA–pulmonary artery.



**Figure 3.** Echocardiographic image showed the puncture site of right ventricle. Yellow arrow indicates



**Figure 4.** After withdrawing the pigtail catheter, a pericardial thrombus was formed in the epicardial space which may have stopped further bleeding.

### 3. Discussion

We highlight an important case of iatrogenic RV puncture during pericardiocentesis and important clinical points in the management.

Iatrogenic RV puncture is a rare complication of urgent pericardiocentesis, which accounts for approximately 1% of the possible complications [2]. This complication could be deadly without timely management. Many techniques and methods have been developed to prevent this complication, such as fluoroscopic or ultrasound guidance. These techniques have been used routinely at our department for years and the safety profile of the procedure was approved. In order to prevent such complications, we often see looping of wire on fluoroscopy before put in a pigtail to make sure truly in pericardial space or do a bubble test on needle to see bubbles in pericardial space. If blood aspirated can send for analysis and if it shows high hemoglobin we know we are in the RV and not pericardial space or if got pressure connected and measure pressure if pericardial space should not have RV or PA waveform. However, these preventive measurements were not applied to this patient and she was stable after the second drainage as the amount of blood was

pigtail catheter. RV–right ventricle; LV–left ventricle; LA–left atrium; RA–right atrium; AV–aortic valve.

insignificant. She collapsed only after the drained blood impacts on hemodynamics.

Few strategies exist to manage this kind of complication. Traditionally, surgical repair with a purse-string or patch closure is the first choice [3]. However, with the development of interventional cardiology, other methods of closure have been reported, such as an arterial closure device [4] or Amplatzer septal closure device [5]. In our case, as the family denied any surgical or interventional procedure, we opted for a more conservative approach of reinserting a new drain in the pericardial space before removal of the first drain and for close echocardiographic and hemodynamic monitoring after removal of the drain in the right heart.

Iatrogenic puncture of the left ventricle (LV) usually can be self-sealed because the LV wall is thick. In contrast, the RV wall is thin and less likely to self-close. In this case, we saw a large hematoma near the RV (Figure 4) and found that the puncture site was closed spontaneously

### 4. Conclusion

Iatrogenic RV puncture is a rare complication of pericardiocentesis which may be managed medically with close echocardiographic and hemodynamic monitoring in select cases.

### References

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