

Pericardiocentesis in Massive Pericardial Effusion in the Setting of Pulmonary Hypertension: Is It Beneficial?

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Background: A serious complication of pulmonary hypertension (PH) is pericardial effusion (PE), which can significantly increase the mortality rate of affected patients. While managing this condition is critical, there is ongoing debate regarding the best therapeutic approaches. Although pericardiocentesis is mostly indicated in patients with cardiac tamponade, it may inadvertently increase mortality in the context of PH.

Case Presentation: This case series reports on three patients who experienced PE associated with PH. Each patient received a different treatment, resulting in varying outcomes. One patient, unfortunately, died within 24 hours after undergoing pericardiocentesis. In contrast, the other two patients did not receive the procedure; instead, they were treated with medication. One of them has shown significant improvement after receiving more aggressive medical treatment. Both are alive with unremarkable limitations.

Conclusion: The coexistence of pulmonary hypertension and massive pericardial effusion presents a complex challenge for management decisions. An effective approach requires a multidisciplinary strategy to optimize patient outcomes. While pericardiocentesis is essential in cases of massive pericardial effusion, it should be reconsidered if the underlying cause is pulmonary hypertension.

Keywords: Pericardiocentesis; Massive Pericardial Effusion; Pulmonary Hypertension; Cardiac Tamponade; Management Guidelines

INTRODUCTION

Pulmonary hypertension (PH) is a serious condition with important complications such as pericardial effusion. The etiology of pericardial effusion in patients suffering from PH is poorly recognized. Although there is consensus that pericardial effusion in the setting of PH is associated with high mortality, its management is still controversial (1). The severity of pericardial effusion was reported to be independently associated with mortality (2). Thus, management of pericardial effusion in these patients is critical. Lack of right arterial and right ventricular collapse, “pulsus paradoxus”, and hypotension in these patients

make their management more complex (3–5). While health providers urge the conduct of pericardiocentesis in patients with tamponade, some reports revealed increased mortality by pericardiocentesis in the setting of PH (6–8). We believe escalating treatment with PH-specific medications may be more beneficial compared to pericardiocentesis, and aggressive management should weigh the risk against the benefit of pericardiocentesis (1).

In this case series, we present three patients suffering from severe PH who were complicated by massive pericardial effusion. Though pericardiocentesis is recommended in patients with massive pericardial

effusion, if the underlying cause is PH, it might lead to higher mortality.

CASE SUMMARIES

Case 1

Our first case is a 36-year-old woman diagnosed with pulmonary hypertension who had been treated with sildenafil and bosentan for 6 years before pericardiocentesis. Pulmonary hypertension in this patient was idiopathic, and it was confirmed by right heart catheterization (mean PAP:70 mmHg). One of the periodic follow-up echocardiographic studies showed massive pericardial effusion (the diameter of the effusion on the posterior side of the LV was 2.2cm). Other echocardiography findings included EF:50% and severe RV enlargement with severe dysfunction; there was also mild ascites. The patient underwent pericardiocentesis under ultrasound guidance to relieve exacerbated dyspnea and massive pericardial effusion. It was considered that the exacerbation of dyspnea was possibly due to massive PE. Pericardiocentesis was performed without any complications, but the patient developed weakness and worsening dyspnea immediately after the procedure, so she was admitted to the intensive care unit (ICU), and supportive treatment was started. Unfortunately, her hemodynamics were complicated by shock and she died within 24 hours after the procedure, and the patient expired in the ICU.

Case 2

The second case is a 49-year-old woman with a known case of idiopathic pulmonary artery hypertension, who was referred due to exacerbation of cough and shortness of breath. Echocardiography revealed severe pulmonary artery hypertension (systolic PAP = 100-120mmHg); left ventricular function was preserved, but massive pericardial effusion was seen (diameter of effusion at the posterior side was about 4cm). She had been managed with furosemide, spironolactone, and sildenafil. Macitentan was added to the medication, and despite dreadful pericardial

effusion, close follow-up was substituted for pericardiocentesis. During the course of management, she reported significant improvement in terms of symptoms, although massive pericardial effusion remained with no considerable change.

Her follow-up has been exceeding a couple of years, and her other medical conditions, similar to severe anemia, were managed concomitantly. She has not reported syncope, and there was no hospital admission during this period.

Case 3

The third case is a 65-year-old man who is a known case of chronic thromboembolic pulmonary hypertension who could not undergo pulmonary endarterectomy due to significant pulmonary involvement. The patient had massive PE (diameter of effusion at the posterior of LV was 3.5 cm); other echocardiographic findings were EF:55% with septal motion abnormality due to RV overload, severe RV enlargement with moderate RV dysfunction, and severe PH (systolic PAP=100 mmHg). Due to the exacerbation of symptoms, the patient had undergone a surgical pericardial window, but after a few weeks, follow-up echocardiography depicted massive PE again. Then, the patient was referred to our clinic. He had been treated with tadalafil, macitentan, and colchicine. Just follow-up echocardiography was his approach. During the first year of management, the severity of PE did not change significantly, and the patient did not experience tamponade physiology. Then, in the course of follow-up, the patient developed epigastric pain, and his evaluation showed abnormal liver function tests. The serum bilirubin level increased, and the patient developed jaundice. His gastrointestinal evaluation was unremarkable, and he was scheduled for a liver biopsy. During this period of management, selexipag was added to medical treatments, and surprisingly, the patient's abdominal pain improved, LFT returned to an average level, and jaundice disappeared. Furthermore, the patient's follow-up echocardiography revealed a significant decrease in pericardial effusion.

DISCUSSION

The coexistence of pulmonary hypertension and massive pericardial effusion is a complicated case scenario (9, 10). Diagnosing these conditions requires a multidisciplinary approach. These can provide additional insights, particularly in understanding the etiology of the effusion.

Pericardial effusion in PH is a poor prognostic complication. In patients with PH, managing the underlying cause is vital. Both PH and PE can lead to elevated right heart pressures. However, their management strategies are different. In cases with both conditions, the increased pressure from pericardial effusion can exacerbate the right ventricular strain previously imposed by PH. The combination can lead to a cycle of worsening cardiac output and further fluid accumulation, complicating clinical outcomes. The management of massive pericardial effusion is different in patients with PH than in patients without PH. While pericardiocentesis is one of the most crucial management strategies for massive pericardial effusion and tamponade, in patients with PH, this procedure may lead to sudden cardiac death (11).

In patients with both conditions, a personalized treatment approach is essential. Management should include the cautious use of diuretics, with low-dose furosemide reserved for the treatment of complications related to fluid overload. Administration of a high dose of diuretics can decrease the preload volume, which, combined with high pericardial pressure, can lead to cardiac collapse. It is crucial to have short interval follow-ups in these patients, and it is a rule that any intervention for one condition can influence the other.

In this case series, we discussed three patients. In the first case, we experienced cardiac arrest immediately after the pericardiocentesis, and in the second case, we have been tolerating massive pericardial effusion even with some concomitant conditions such as severe anemia. Her massive pericardial effusion has been left without manipulation, and no complications have been reported so

far. The last case showed re-accumulation of pericardial effusion even after the pericardial window, and advanced treatment with selexipag improved not only pericardial effusion but also liver disturbances related to heart disease (12).

Although we lost the first case in this experience, two other cases are alive and satisfied.

CONCLUSION

The relationship between pulmonary hypertension and massive pericardial effusion is still a complex, challenging scenario. Understanding the pathophysiology of both PH and PE, recognizing their potential coexistence, and implementing a multidisciplinary management strategy are crucial for optimizing patient outcomes. Although pericardiocentesis is essential in massive pericardial effusion, PE, which is coexistent with PH, may not only be useless but also life-threatening. Thus, it is essential to individualize our approach to these patients, different from patients with pericardial effusion due to other etiologies. If the underlying cause is PH, management of PH with advanced PH target treatment is a priority.

Although this case series only discussed three patients, more studies are necessary.

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Informed consent

We obtained informed consent from all three patients to report this paper.

REFERENCES

1. Sahay S, Tonelli AR. Pericardial effusion in pulmonary arterial hypertension. *Pulm Circ* 2013;3(3):467-77.
2. Raymond RJ, Hinderliter AL, Willis PW, Ralph D, Caldwell EJ, Williams W, Ettinger NA, Hill NS, Summer WR, de Boisblanc B, Schwartz T, Koch G, Clayton LM, Jöbsis MM, Crow JW, Long W. Echocardiographic predictors of adverse outcomes in

- primary pulmonary hypertension. *J Am Coll Cardiol* 2002;39(7):1214-9.
3. Luisada AA. Development and structure of the cardiovascular system. *Academic Medicine* 1962;37(1):84.
 4. Plotnick GD, Rubin DC, Feliciano Z, Ziskind AA. Pulmonary hypertension decreases the predictive accuracy of echocardiographic clues for cardiac tamponade. *Chest* 1995;107(4):919-24.
 5. Aqel RA, Aljaroudi W, Hage FG, Tallaj J, Rayburn B, Nanda NC. Left ventricular collapse secondary to pericardial effusion treated with pericardiocentesis and percutaneous pericardiotomy in severe pulmonary hypertension. *Echocardiography* 2008;25(6):658-61.
 6. Nafsi T, Bopanna S, Vedavalli A, Al-nassir K. Pericardial Effusion in Pulmonary Arterial Hypertension. To Drain or Not? *Chest* 2011;140:178A.
 7. Hemnes AR, Gaine SP, Wiener CM. Poor outcomes associated with drainage of pericardial effusions in patients with pulmonary arterial hypertension. *South Med J* 2008;101(5):490-4.
 8. Krikorian JG, Hancock EW. Pericardiocentesis. *Am J Med* 1978;65(5):808-14.
 9. Chopra A, Highland KB, Kilb E, Huggins JT. The Relationship of Pleural and Pericardial Effusion with Pulmonary Hemodynamics in Patients With Pulmonary Hypertension. *Am J Med Sci* 2021;361(6):731-5.
 10. Chandel A, Verster A, Rahim H, Khangoora V, Nathan SD, Ahmad K, et al. Incidence and prognostic significance of pleural effusions in pulmonary arterial hypertension. *Pulm Circ* 2021;11(2):20458940211012366.
 11. Lazaros G, Imazio M, Tsioufis P, Lazarou E, Vlachopoulos C, Tsioufis C. Chronic Pericardial Effusion: Causes and Management. *Can J Cardiol* 2023;39(8):1121-31.
 12. Mandras SA, Mehta HS, Vaidya A. Pulmonary Hypertension: A Brief Guide for Clinicians. *Mayo Clin Proc* 2020;95(9):1978-88.