To drain, or not to drain: diagnostic and therapeutic challenges associated with cardiac tamponade in Right heart failure and pulmonary hypertension

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Introduction

In clinical practice, cardiac tamponade is not an "all-or-none" phenomenon, but rather a continuum of hemodynamic impairment. Diagnosis of cardiac tamponade in the context of pulmonary arterial hypertension (PAH) is challenging, with its management controversial and not straightforward. (1-3) The recognition of cardiac tamponade in this setting can be complex, given the unique set of hemodynamics, with the "classic" right-side clinical findings (pulsus paradoxus, right ventricular compression and hypotension) and echocardiographic findings (right ventricular diastolic collapse) not observed due to the high right-sided pressures. (2, 4) Instead, cardiac tamponade assumes a rare atypical presentation, resulting mainly from substantial changes occurring in the left ventricle (LV) as a result of concomitant pressures from the right-side and pericardial effusion, with a degree of LV diastolic collapse in echocardiography. (4, 5) Hence, an overall assessment of clinical and echocardiographic findings, hemodynamic measurements, and other corresponding patient-level variables must be considered to make a diagnosis and initiate timely intervention.

Our case illustrates the challenges on diagnosis and clinical management of a patient with circumferential pericardial effusion and PAH, exhibiting hemodynamic compromise but absent common typical features of tamponade.

Case Presentation

44 years old lady with background of Interstitial lung disease (ILD), PAH, Right ventricle failure (RVF) and anti-synthetase syndrome, with previous Intensive care unit (ITU) admission for COVID pneumonitis and discharged on home oxygen. On this occasion, she was admitted to hospital after boarding a flight without oxygen, feeling generally unwell with tachycardia, lethargy and dyspnea. Initially, she was treated with diuretics and corticosteroids due to exacerbation of interstitial lung disease, RVF and moderate pericardial effusion, with good clinical improvement. Later, she developed orthostatic collapses with persistent hypotension, increased oxygen requirements, hyperlactatemia and reduced urinary output. A CT Pulmonary angiogram was performed showing unchanged moderate circumferential pericardial effusion, and no Pulmonary embolism.

At this stage, she was reviewed by Critical care outreach team and a bedside echocardiogram was performed (Figure 1), showing features of Right ventricle pressure overload (Right Ventricle dilatation with severely impaired systolic function, D-shaped left ventricle throughout the cardiac cycle) consistent with chronic changes due to PAH, small LV cavity with moderate impairment of the systolic function, moderate pericardial effusion and mild signs of LV diastolic collapse. She was urgently reviewed by Cardiology and transferred to ITU, for invasive hemodynamic monitoring and conservative management with inotropes, diuretics and inhaled pulmonary artery vasodilators. The decision was taken not to drain the pericardial effusion.

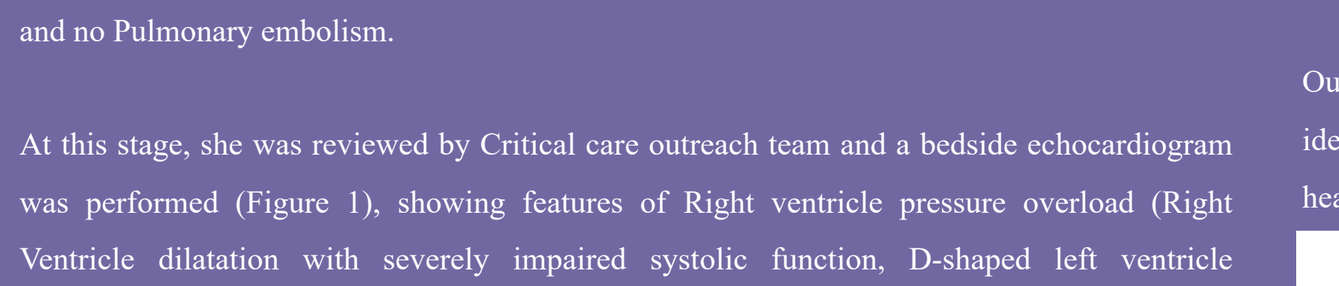

Figure 1 – Echocardiographic images

Case Discussion

Pericardial effusion in the context of PAH is common, ranging from 25–30%, typically small in size and rarely causes hemodynamic compromise. (2, 6) The presence of circumferential pericardial effusion results in biventricular tamponade and equalization of intracardiac and pericardial pressure during diastole, involving the right or left ventricle, with isolated left ventricular tamponade rare outside of the postoperative spectrum. (1, 4) Apart from mild left ventricular diastolic compression, in our case none of the typical features of the tamponade were present despite the moderate circumferential pericardial effusion. The lack of right side diastolic collapse was due to the high atrial and ventricular pressures, impeding the pericardial pressures to overcome right-sided intracardiac diastolic pressures, thereby preventing the classic features of cardiac tamponade.

Pericardial effusion associated with PAH exaggerates the paradoxical interventricular septal motion characterized by displacement of the interventricular septum into the left ventricle, with reduction in the left ventricular filling during inspiration. (1, 2) This interventricular asynchrony worsens the preload of the left ventricle, leading to further decreases in cardiac output, and consequent hemodynamic instability accentuated by a small LV cavity and increasing filling pressures. (1, 2) All these dynamic changes are likely to provide a transient mechanism of obstructive shock, resulting in severe hypotension, orthostatic collapses and worsening organ perfusion demonstrated in our patient. Some evidence suggests that RVF. and circumferential pericardial effusion can trigger atypical tamponade, characterized by isolated left ventricle compression (1), as illustrated in our case.

In literature routine treatment of patients with PAH and moderate to large pericardial effusion by drainage remains controversial (5) and has been accompanied by catastrophic, sudden hemodynamic collapse. (6, 7) It has been postulated that the presence of pericardial fluid limits right ventricular distension in response to pressure and volume overload. (1, 7) When the pericardial fluid is removed, rapid enlargement of the right ventricle causes: (1) reduced right ventricular systolic function due to muscle fiber distension and enlargement of the RV cavity; (2) further compression of the left ventricle by the interventricular septum, which leads to impaired diastolic filling and left ventricular outflow track obstruction, resulting in hypotension and death. (5, 7)

Our case stresses the relevance of competent use of bedside Echocardiogram in timely identifying the atypical features of cardiac tamponade in patients with pre-existing right sided heart failure, preventing clinical deterioration through early escalation of care.

Conclusion

The literature fails to provide strict guidelines or formal consensus regarding this clinical presentation, with the management tailored to individual cases. (1, 3) There is controversy in draining moderate pericardial effusions, being associated with high mortality and complications. Pericardiocentesis may be beneficial in symptomatic patients with potentially treatable comorbidities, after weighing risks and benefits. (1) Beside Echocardiography may represent a useful tool when used appropriately by experient users, enabling rapid identification of atypical features of cardiac tamponade and early management of this clinical condition.

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