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**Case Report**

# A case of postoperative pericardial effusion progressing to tamponade

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Biodata:

Richard is a third year medical student with a passion for global health and a keen interest in all things cardiology. He has enjoyed his experiences with international medical volunteering and clinical cardiology research, and hopes to gain further involvement with both.

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Highlights:

- It is important to monitor for pericardial effusion post-cardiac surgery, as large effusions can lead to cardiac tamponade.
- Cardiac tamponade is largely a clinical diagnosis with Beck's Triad as the common clinical sign, even though echocardiography is useful when evaluating a patient with suspected tamponade.
- Cardiac tamponade is best treated by ultrasound-guided percutaneous pericardiocentesis, which can be performed quickly and at bedside, though more invasive pericardial window surgery may be indicated in cases of active bleeding and recurrent fluid accumulation.

## Abstract

**Introduction:** Pericardial effusions often occur after cardiac surgery, usually asymptomatically. However, large postoperative effusions may cause cardiac tamponade, which is a medical emergency. **Case overview:** We report a case of a 62-year-old businessman who presented with worsening paroxysmal nocturnal dyspnoea, orthopnoea, and an episode of near-syncope. Echocardiography revealed evidence of cardiac tamponade, most likely due to recent coronary artery bypass graft and aortic valve replacement surgery. He was treated with pericardiocentesis and ongoing review revealed no recurrence of the effusion. **Discussion overview:** We discuss the incidence and risk factors for postoperative pericardial effusion and the possibility of tamponade after cardiac surgery. Though rare, recognising tamponade after cardiac surgery is vital and a thorough understanding of the treatment of tamponade is necessary.

## Introduction

Pericardial effusion occurs when excess fluid accumulates between the visceral and parietal layers of the pericardium. There are many causes of pericardial effusion, including post-surgery, viral illness, direct injury to the pericardium, malignancy, but it can also be idiopathic [1]. Pericardial effusions are common after cardiac surgeries, with a prevalence of up to 84% in cardiac surgery patients [2]. Though most are small and non-life threatening, larger effusions can compress the heart and prevent proper ventricular filling, causing cardiac tamponade in 4.1% of these patients [2]. Management of postoperative pericardial effusion (PPE) varies based on the size and location of the effusion, and whether there is evidence of cardiac tamponade. This case highlights the need to be acutely aware of clinical and echocardiographic features of cardiac tamponade, and the need for urgent intervention in life-threatening cardiac tamponade.

## The Case

*Assessment at cardiology clinic*

A 62-year-old retired businessman presented to his cardiologist for assessment a week after discharge from hospital, after undergoing coronary artery bypass graft and metallic mechanical aortic valve replacement for presumed infective endocarditis (IE) and ischaemic heart disease. He reported worsening paroxysmal nocturnal dyspnoea, orthopnoea, and an episode of near syncope since discharge. The patient had known hypertension and a 30 pack-year history of smoking but had no other cardiovascular risk factors and no other previous surgeries. During his earlier admission, he was treated for presumed IE with a six-week course of antibiotics.

On physical examination, the patient's blood pressure was 105/70 mmHg, and heart rate was regular at 90 bpm. Respiratory rate was 20 breaths per minute. He appeared diaphoretic. Heart sounds were muffled, no murmurs were appreciated. The jugular venous pressure (JVP) could not be assessed accurately, as he was tachypnoeic with shallow breathing. Chest auscultation revealed reduced air entry bilaterally.

Electrocardiogram revealed sinus rhythm with low electrical voltages in all leads with no ischaemic changes or changes consistent with pericarditis.

He underwent an urgent echocardiogram revealing a mildly dilated left ventricle with an ejection fraction of 30-35%. Most remarkably, there was a large pericardial effusion measuring up to 30 mm (Figure 1). There was significant mitral inflow variation of 34% and tricuspid inflow variation of 48%.

*Upon admission to hospital*

He was urgently readmitted to hospital and was promptly assessed by the cardiothoracic surgical team, who immediately decided an urgent chest ultrasound-guided percutaneous drainage was most appropriate. Approximately 800 mL of blood-stained fluid was drained which led to immediate improvement in his symptoms and haemodynamic status. A drain was placed for 48 hours. The pericardial fluid was sent to microbiology and cytology, where no evidence of infection or malignancy was found. The patient was reviewed by the infectious disease team and recommenced on a short course of intravenous antibiotics. Echocardiography performed post-pericardial drain removal revealed only a trivial effusion. He was discharged home three days later for ongoing cardiology review.

*After discharge*

Upon review with his cardiologist four weeks after discharge, the patient felt well with no recurrence of dyspnoea or syncope. Follow-up echocardiography revealed no re-accumulation of his pericardial effusion and there were no signs of cardiac tamponade (Figure 2). He was also reviewed by the infectious disease team four weeks after discharge, where no further antibiotics were recommended, and the patient was discharged from the clinic.

## Discussion

*Pericardial effusion after cardiac surgery*

A pericardial effusion constitutes any fluid in excess of 50 mL in the pericardial sac [1]. Pericardial effusion can occur in any disease affecting the pericardium, after injury to the pericardium, or due to obstruction of the lymphatics draining the pericardial fluid. In the context of cardiac surgery, as with our patient, PPE can occur due to any of postoperative impairment of lymphatic drainage, pericardial inflammation in response to injury during the surgery, and post-pericardiotomy syndrome [3,4]. A chest tube is usually inserted after cardiac surgery to drain fluid in the mediastinum, but a pericardial drain is not routinely placed unless there is evidence of cardiac effusion [1].

Pericardial effusion is often asymptomatic, especially for small or moderate effusions. In symptomatic cases, dyspnoea and malaise occur most frequently. Some features of tamponade, such as hypotension and tachycardia due to decreased cardiac output, can manifest in large effusions [1].

Diagnosis of pericardial effusion is most commonly done by echocardiography, which allows for real-time assessment of the pericardial effusion size, location, and possible haemodynamic effects, from which it can be classified as shown in Table 1 [6]. Since transthoracic echocardiography is routine after cardiac surgeries, PPE is often picked up, and can be monitored. Effusions are visualised as anechoic separation of the visceral and parietal layers of the pericardium and are best detected from parasternal short and long-axis and sub-xyphoid views [5]. Electrocardiography may demonstrate low voltages in large effusions, which occurred with our patient. It may also reveal electrical alternans, characterised by alternating QRS amplitude, due to the anterior-posterior swinging of the heart with each contraction in the fluid-filled pericardium.

*Risk factors for PPE*

Risk factors for PPE include type of surgery, urgency of operation, larger body surface area, pulmonary thromboembolism, hypertension, renal failure, and immunosuppression [7]. Early chest tube removal after cardiac surgery is also associated with PPE requiring invasive treatment [8].

*The problem of tamponade*

As discussed, though rare, the most feared complication of a large PPE is cardiac tamponade. If fluid accumulates rapidly, as is the case in PPE, the pericardium has low compliance and intrapericardial pressure rises rapidly. This compresses the heart, impairing ventricular filling and ultimately decreasing cardiac output. If fluid accumulates slowly, the parietal pericardium can stretch and can hold larger volumes of fluid before compressing the heart [9]. Haemodynamic tamponade occurs when right atrial pressures are affected by the effusion but can have no echocardiographic or clinical significance [10].

Cardiac tamponade is a clinical diagnosis, though echocardiography is useful when evaluating a patient with suspected tamponade. Classically, the clinical signs of tamponade are described by Beck's Triad, which consists of hypotension, elevated JVP, and muffled heart sounds. Pulsus paradoxus, defined as a decrease of > 10 mmHg in systolic blood pressure on inspiration, can also be a common clinical finding. Early echocardiographic signs

of tamponade include a dilated inferior vena cava and increased respiratory variation in mitral (> 25%) and tricuspid (> 40%) inflows. Late signs include collapse of the cardiac chambers. However, loculated effusions, which are more common after cardiac surgery, may compress select chambers causing regional tamponade, and may require additional imaging such as transoesophageal echocardiography or computed tomography [11].

The incidence of late tamponade after cardiac surgery is 4.1% [2,12]. Moreover, tamponade is more common in patients receiving oral anticoagulants (8%) than in those without anticoagulants (2%) [12].

*Treatment of PPE*

Treatment of PPE depends on the size and location of the effusion. Small and most moderate effusions are generally asymptomatic and require no treatment. Tamponade requires immediate drainage. However, large effusions can be asymptomatic but can progress to tamponade. Treatment is less clear in these cases, with no existing guidelines for treating PPE [10]. Colchicine, a nonsteroidal anti-inflammatory drug (NSAID), can be effective in preventing post-surgical pericardial effusion and some surgical units routinely commence patients on a six-week course of colchicine post-operatively to help reduce the incidence of postoperative pericarditis and pericardial effusion. However, recent evidence shows NSAIDs do not reduce either the size of the effusion or the incidence of late tamponade [13-15].

Drainage of excess fluid in PPE can be accomplished by pericardiocentesis, where a needle is used to aspirate the excess fluid, or pericardial window surgery, where an excision of part of the pericardium allows fluid to drain into another body cavity. For PPE, percutaneous pericardiocentesis is preferred as it can be performed expeditiously at bedside, avoiding the need for general anaesthesia which can be risky in the case of cardiac tamponade.

Ultrasound-guided pericardiocentesis is the traditional gold standard for treatment. Loculated effusions must be treated differently and may require pericardiocentesis at nonstandard entry sites. Traditional sub-xyphoid pericardiocentesis is most effective in circumferential effusion or if the effusion is inferior or anterior to the heart [16].

However, pericardiocentesis does not control continuous fluid accumulation in the pericardium. Therefore, the surgical window is preferred in traumatic hemopericardium, where there may be active bleeding, and aortic dissection or myocardial rupture, where relief of the tamponade may lead to increased bleeding. Moreover, in cases of recurrence, posteriorly located effusions, or when biopsy material is required, more invasive strategies such as pericardial window are preferred [11].

It has not been formally studied whether IE changes the management of PPE, as was the case in our patient, but in general, pericardiocentesis is done in all pericardial effusions which have a background of bacterial infection for diagnostic purposes. The pericardial fluid drained is then sent for fluid analysis and microscopy, culture, and sensitivity to determine the infective aetiology, which will dictate the treatment.

## Conclusion

PPE is a common complication after cardiac surgery and, though usually asymptomatic, can progress to tamponade. It is, therefore, essential to recognise features of clinical cardiac

tamponade and to confirm it with imaging modalities and institute immediate treatment for this potentially fatal complication.

## Consent Declaration

Informed consent was obtained from the patient for publication of this case report and accompanying figures.

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## Conflicts of interest

None.

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None.

## Authors' Contributions

RZ wrote the manuscript. GWT and VC collected the patient data and supervised RZ in writing the manuscript. All authors revised the final manuscript.

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