Non-traumatic pericardial effusion presenting as shortness of breath

非創傷性心包膜積液以呼吸困難作為表徵

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Dyspnoea is a very common presentation in the emergency department (ED). Although cardiac and respiratory failures are common causes, we demonstrated the importance to consider non-traumatic pericardial effusion as a differential diagnosis for dyspnoea. Use of the ultrasound in the ED setting can help reach the diagnosis and provide timely and appropriate care for the patient. (Hong Kong j.emerg.med. 2011;18:42-46)

呼吸困難在急診科是很常見的表現。雖然心臟和呼吸衰竭是常見的原因，但我們發現非創傷性心包膜積液為呼吸困難的一個重要鑑別診斷。在急診部，利用超聲波裝置可以幫助達到診斷和及時提供病人適當的治療。

Keywords: Cardiac tamponade, pericardial effusion, ultrasound

關鍵詞：心包填塞、心包膜積液、超聲波

Introduction

Dyspnoea is a very common emergency department (ED) presentation with cardiac and respiratory failure as the main aetiologies. However, this case demonstrated that we should consider non-traumatic pericardial effusion as one of the important differential diagnosis of dyspnoea. Traditional investigations like electrocardiogram (ECG) and chest-X ray (CXR) will help raise the suspicion. The diagnosis can be rapidly confirmed by a bed-side ultrasound in the emergency department. Thus, timely and appropriate management can be provided.

Case report

A 41-year-old Malay man presented to the ED with three weeks history of increasing shortness of breath and chest tightness that affected his exercise tolerance and sleep. He also complained of bilateral lower limb oedema, unproductive cough and nocturnal fever without chills, rigours or night sweats. He had past history of diabetes mellitus, hypertension, systemic lupus erythematosus and rheumatoid arthritis and was admitted and treated for a chest infection about a month ago. One week after his discharge he stopped taking the prednisolone and other medications as he felt he was improving. On arrival, he was tachypnoeic at a respiratory rate of 24/min. The oxygen saturation was 93% on room air. He was tachycardic at a rate of 110/min. The blood pressure was 120/80 mmHg. He was able to speak in full sentences. His jugular venous pulse (JVP) was raised and he had distended neck veins. Pulsus paradoxus was not checked for. Heart sounds were dual but muffled and bilateral fine crepitations were heard at both lung bases. His abdomen was soft with no ascites and there was bilateral pitting oedema.
up to mid-shin. Bedside ECG (Figure 1) showed sinus tachycardia with no ischemic changes. The complexes were of normal size suggesting normal voltages with absence of electrical alternans and the PR interval was not depressed.

CXR (Figure 2) showed gross cardiomegaly with features suggestive of interstitial fluid and right middle and lower zone haziness. Clinical features were suggestive of decompensated heart failure. No such findings were observed in previous CXR taken one month ago (Figure 3). Compared to his previous ECG (Figure 4) taken two months ago, the new ECG showed smaller complexes. This raised the suspicion that the patient’s current presentation could more likely be a pericardial effusion rather than purely a cardiac failure. A bedside cardiac ultrasound was done by the emergency physician to confirm the presence of a large pericardial effusion. Computed tomography thorax was performed and showed a large pericardial effusion causing cardiac compression indicating tamponade with pericardial adhesions anteriorly. He subsequently underwent an emergency pericardiotomy in view of his impending cardiac tamponade. Intraoperative findings showed sero-purulent collection and subsequent cultures were positive for tuberculosis (TB). Patient was started on anti-TB treatment. The rest of his hospitalisation was uneventful and he was discharged well.

**Discussion**

Pericardial effusion can be due to medical or surgical causes. The pericardial sac consists of an outermost parietal pericardium and the inner visceral pericardium (epicardium) which continues directly over the heart surface. There is usually no more than 15 to 30 ml of fluid between the two layers and the intrapericardial pressure approximates that of the pleural pressure or about five mmHg lower than the central venous pressure. When pericardial fluid accumulates slowly, the intrapericardial pressure will increase with a resultant increase in the compliance of the parietal pericardium to accommodate the increasing pressure. Cardiac filling will not be affected as the central venous

![Figure 1. Current ECG.](image-url)
Figure 2. Current CXR showing gross cardiomegaly.

Figure 3. CXR done 1 month ago during his last admission.

Figure 4. Patient’s previous ECG done 2 months ago.
pressure will increase to maintain the gradient. As more fluid accumulates, the pericardial compliance cannot increase further and the intrapericardial pressure will equalise with the right ventricular diastolic pressure first and then with pressure in the left ventricle. At this juncture, the cardiac output will start to drop and in order to maintain the circulation, tachycardia, increased contractility and peripheral vasoconstriction will occur. Ensuing cardiac tamponade requires emergent care. Beck’s triad (defined as muffled heart sounds, hypotension and distended neck veins) describes cardiac tamponade that occurs acutely which is more common in trauma situations when there is a rapid accumulation of blood within the pericardial sac thus not allowing enough time for the pericardial membrane to stretch. However in pericardial effusions secondary to chronic medical conditions, large amount of fluid may accumulate gradually over a period of time before haemodynamic instability occurs and these patients may not present acutely with circulatory collapse but rather may present with increasing dyspnoea, chest pain, abdominal pain or fullness and nausea secondary to hepatic, visceral congestion or dysphagia from oesophageal compression. They may also present with vague systemic complaints such as lethargy, fever, cough, weakness, fatigue, anorexia or palpitations suggesting poor systemic circulation.

Jugular venous pulse (JVP), distended neck veins, vital signs, pulsus paradoxus, muffled heart sounds, low voltages in ECG, PR segment depression, electrical alternans and CXR with globular cardiac silhouette or an epicardial fat stripe or "double lucency" sign on lateral views are 'common' features that we are taught to look for to diagnose cardiac tamponade and pericardial effusion. Traditional thinking is that the absence of these features excludes the diagnosis. However, recent studies suggested there may be a misconception. A meta-analysis by Roy et al showed that in patients with tamponade, dyspnoea was the most sensitive symptom amongst the symptoms of fever, chest pain, cough, lethargy and palpitations; paradoxical pulse greater than 10 mmHg was the most sensitive physical sign amongst signs such as tachycardia, hypotension and elevated jugular venous pressure and cardiomegaly on CXR was the most sensitive amongst diagnostic tests such as low QRS voltage, electrical alternans and atrial dysrhythmia on ECG. Another study by Eisenberg et al found that low voltage, PR segment depression and electrical alternans were specific but not sensitive for pericardial effusion and cardiac tamponade. Thus the traditional 12-lead ECG is poorly diagnostic. Additional testing beyond the basic investigations is needed to diagnose cardiac tamponade.

Use of ultrasonography in the ED has proven to be extremely helpful in the initial evaluation of trauma patients. Its use in non-trauma situations has yet to be defined. It is a noninvasive diagnostic test that can be carried out rapidly and accurately under expert hands. Pericardial effusions can be recognised easily by trained personnel. Focused training on the important views and looking for features such as diastolic collapse of the right ventricle and compression of the right atrium will help recognise cardiac tamponade especially when patient does not have signs of circulatory collapse. This will help provide appropriate treatment in a timely manner. Price et al showed that goal-directed cardiac ultrasound in the ED can be accomplished in 10 minutes. A study published by Mandavia et al showed that the use of ultrasonography by ED physicians had a sensitivity of 96%, specificity of 98% and accuracy of 97.5% in detecting pericardial effusion. Other studies have shown that ED physicians can be effectively trained in the use of ultrasound in the ED. Guidelines for training and development of an appropriate curriculum for ED physician training in ultrasonography are important for skill acquisition.

**Conclusion**

This case illustrates the timely decision to carry out an ultrasound in the ED by a trained emergency physician after considering pericardial effusion as a differential diagnosis. The technique helps provide appropriate treatment for this patient. Pericardial effusion as a cause for dyspnoea is not uncommon in the initial ED presentation and its diagnosis can still be overlooked despite a thorough history, physical examination and investigations such as ECG and CXR.
The rightful consideration of pericardial effusion as a differential diagnosis and the timely use of ultrasound by a trained ED physician can help in identifying such patients with unexplained dyspnoea.

References