CASE REPORT

Message in a bottle. The use of chest radiography for diagnosis of pericardial effusion

**Aute bouteille à la mer. L’utilisation de la radiographie thoracique pour le diagnostic d’un épanchement pericardique**

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**Introduction:** The diagnosis of pericardial effusion may be elusive, and only diagnosed with echocardiography. Here we report the cases of two patients who presented to the emergency centre (EC) with dyspnoea, and their chest X-rays (CXR) revealed the “water bottle sign”, which is the typical appearance of the cardiac silhouette that is present when there is a large pericardial effusion.

**Discussion:** This clinched the diagnosis of pericardial effusion, where the diagnosis may have otherwise been delayed. We discuss these cases, and the relevant literature and discuss the benefits of standard chest radiography in aiding in the diagnosis of pericardial effusion.

**African relevance**

- Chest X-ray is commonly performed for chest pain and shortness of breath in the emergency centre.
- The water bottle sign can point to a diagnosis of pericardial effusion in the absence of other investigations.
- Based on the chest X-ray findings, an echocardiogram can then be performed to confirm the diagnosis.

**Introduction**

The diagnosis of pericardial effusion may be elusive, and only diagnosed with echocardiography. Here we report the cases of two patients who presented to the emergency centre (EC) with dyspnoea, and their chest X-rays (CXR) revealed the “water bottle sign”, which is the typical appearance of the cardiac silhouette that is present when there is a large pericardial effusion. This clinched the diagnosis of pericardial effusion, where the diagnosis may have otherwise been delayed. We discuss these cases, and the relevant literature and discuss the benefits of standard chest radiography in aiding in the diagnosis of pericardial effusion.

**Case report 1**

A forty year old gentleman presented to the emergency centre (EC) with shortness of breath on exertion for 4 days. He had no significant past medical history but of note, he had an elevated body mass index (BMI) of 40 kg/m² (Normal 18–25 kg/m²). Examination revealed distant heart sounds and his vital signs were within normal parameters.

ECG revealed low-voltage QRS complexes but was otherwise unremarkable. Laboratory results revealed an elevated C-reactive protein (CRP) of 18 mg/L (Normal <0.8 mg/L) but a normal white cell count, erythrocyte sedimentation rate, brain natriuretic peptide, thyroid function tests and troponin T. The CXR revealed the water bottle sign; indicative of a pericardial effusion (Fig. 1). Echocardiography was subsequently performed confirming the diagnosis and under radiological guidance 900 ml of fluid was drained from the effusion. The diagnosis in this case was determined as myopericarditis, given the elevated CRP and the patient’s haemodynamic stability. The low-voltage QRS complexes and distant heart sounds were possibly due to the effusion but the elevated BMI may have been a contributing factor.
A twenty-three year old woman presented to the EC with a one month history of intermittent central chest pain, palpitations and shortness of breath on a background of systemic lupus erythematosus (SLE), antiphospholipid syndrome, lupus nephritis and recurrent pulmonary emboli (PE) being treated with warfarin. Of note she had a viral pharyngitis one month prior to presentation.

ECG showed a low voltage QRS, but was otherwise unremarkable. The vital signs were normal. Her bloods revealed a troponin T of 106 (normal 0–15 mg/ml) a CRP of 16 mg/l, and an elevated international normalised ratio (INR) of 4.26 (normal INR range for PE 2.0–3.0) but did not reveal any other abnormalities. The CXR displayed the water bottle sign, prompting echocardiography, which confirmed the diagnosis of a pericardial effusion (Fig. 2). 1200 ml of haemorrhagic fluid was drained subsequently. Following further investigations, the cause of the pericardial effusion was attributed to active lupus complicated by warfarin treatment. The patient was commenced on oral steroids, her INR was corrected and she had no further complications.

Discussion

Given the wide variety of causes of pericardial effusions, the clinical presentation can be varied. This is due to the aetiology, but the speed of onset of fluid accumulation will determine the patient’s symptoms. In the case of a traumatic pericardial effusion, there will be rapid deterioration and development of cardiac tamponade, but the volume of fluid may be minimal to cause these symptoms. However, as in our case series, there may be a slow but stable volume increase for days or weeks and the patient may not become symptomatic until the volume is significant enough to cause chest discomfort or shortness of breath.

The most common causes include infectious (viral, bacterial, tuberculosis) and non-infectious causes such as malignancy, pericardial injury (post-mi, post pericardiotomy, post-traumatic pericarditis), pericardial disease (pericarditis, myocarditis), systemic inflammatory disease (SLE, rheumatoid arthritis, vasculitis), drugs (phenytoin, penicillin, methotrexate), trauma, aortic dissection and haemodynamic compromise (heart failure, hypoalbuminemia. In some instances the diagnosis may be suspected by linking symptoms with certain conditions such as end-stage renal failure, a recent myocardial infarction, chest radiation treatment or recent invasive cardiac surgery.

The diagnostic standard for pericardial effusions is echocardiography and this is the most readily accessible tool for rapid diagnosis. However, in the EC this will not be performed urgently for a haemodynamically stable patient as there may be low clinical suspicion for pericardial effusion. The accessibility to ultrasonography may also be limited in some hospitals and use of the water bottle sign on CXR may lead to rapid echocardiography and subsequent diagnosis of a pericardial effusion.

Standard chest radiography has an important function in diagnosing the aetiology of patients presenting to the EC with shortness of breath or chest pain and in our case series, the diagnosis of pericardial effusion was suspected on viewing the CXR. The water bottle sign refers to the enlargement of the cardiac silhouette on posterior–anterior CXR. This is usually due to stretching of the pericardium secondary to large volume of fluid accumulating over a period of time. It causes the pericardium to appear like a water bottle. Eisenberg et al. reported in 1993 that when compared to echocardiography, the sensitivity of cardiomegaly on CXR was determined as 71% for this study but only 41% specific. The diagnostic value of chest radiography for pericardial effusion is at its most optimal when a predominantly left-sided pleural effusion
or pericardial fat stripe is present but is not diagnostic of an effusion. A similar study was performed by Kerber on patients with myxoedema induced pericardial effusions, and showed that while cardiomegaly tended to be associated with effusions, it had a 30% false negative rate, and a 38% false positive rate. This shows that an enlarged cardiac silhouette may be suggestive of a pericardial effusion but echocardiography is ultimately required for a confirmed diagnosis. Similarly, if there is suspicion of an effusion with other clinical findings, echocardiography may reveal an effusion in the absence of the water bottle sign.

In both these cases, the posterior-anterior view was utilised rather than a lateral view. On review by Woodring in 1998, he concluded that the pericardial fat pad sign and the posterior–inferior bulge sign visible on the lateral CXR may detect a small pericardial effusion, whereas the water bottle sign is only seen in larger effusions. A lateral CXR was not performed for our case series given the obvious findings on posterior–anterior CXR. However, while the signs above may be suggestive of a pericardial effusion, they should be confirmed by echocardiography before a diagnosis of a pericardial effusion is made.

Our case series demonstrates that performing a chest X-ray in a patient presenting with shortness of breath or chest pain can point to a diagnosis of pericardial effusion in the absence of other investigations.

**Author contributions**

JF collected the detail of case report. JF, LPT wrote the first draft. JF, LPT and NR reviewed and made corrections to the final manuscript. JF, LPT and NR subsequently accepted the final draft.

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