

CASE REPORT

A clinical case of tuberculosis with transient constrictive pericarditis and perimyocarditis

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Summary

Tuberculous pericarditis is a rare diagnosis seen among as few as 1% of tuberculosis (TB) patients in developed countries. We present a case of a 60-year-old male suffering from a transient constrictive pericarditis and subclinical involvement of the myocardium in a clinical case of tuberculous pericarditis with corresponding improvement after the initiation of anti-tuberculous treatment. We suggest monitoring of myocardial function using global longitudinal strain by myocardial speckle tracking strain analysis as supplement to routine left ventricular ejection fraction to assess clinical improvement in patients at risk of developing constrictive pericarditis.

Key Words

- ▶ tuberculosis
- ▶ perimyocarditis
- ▶ constrictive pericarditis
- ▶ echocardiography
- ▶ global longitudinal strain

Learning points:

- Tuberculous pericarditis is rare and a diagnostic challenge in low-incidence countries.
- Patients with tuberculosis and involvement of the heart are at high risk of developing constrictive pericarditis.
- Novel imaging techniques, such as estimation of global longitudinal strain using myocardial speckle tracking analysis, may be useful in assessing cardiac involvement in tuberculosis patients.

Background

Tuberculous pericarditis is a rare diagnosis seen among as few as 1% of tuberculosis (TB) patients in developed countries (1). The disease presents within the spectrum of acute pericarditis with or without larger effusions including cardiac tamponade and with subsequent development of chronic constrictive pericarditis (2). In Africa, Asia and other TB high-incidence regions, it is among the most common etiologies of pericarditis, constrictive disease and heart failure (3). The pericardial involvement in this condition is associated with a significant morbidity and mortality although the disease is potentially curable (4).

Case presentation

A 60-year-old male presented with coughing and yellowish, blood-tinged sputum, chest pain, activity-related dyspnea (NYHA class II), night sweats, chills, diffuse joint pain and an unintended weight loss of approximately 5 kg during the last 2 months. The patient had a history of 30 years in relief work with stationing in several TB high-incidence locations and a history of Bacillus Calmette-Guérin immunization and a previously negative Mantoux test.

Physical examination upon admission was without any abnormal cardiopulmonary findings.



Biochemistry showed elevated C-reactive protein 120.7 (mg/L), leucocytosis 12.2 (10⁹/L), thrombocytosis 534 (10⁹/L), hemoglobin 9.0 (mmol/L), and low albumin 26 (g/L).

Extensive and repeated blood sampling and microbiological testing, including 19 samples sent for TB

microscopy, PCR and culturing, was not able to establish a definitive diagnosis. Nevertheless, an interferon-gamma release assay was positive. Pathological examination of biopsies, obtained during thoracoscopy, revealed sparse chronic inflammation in the pericardial tissue. However, biopsies were obtained after TB treatment was commenced.

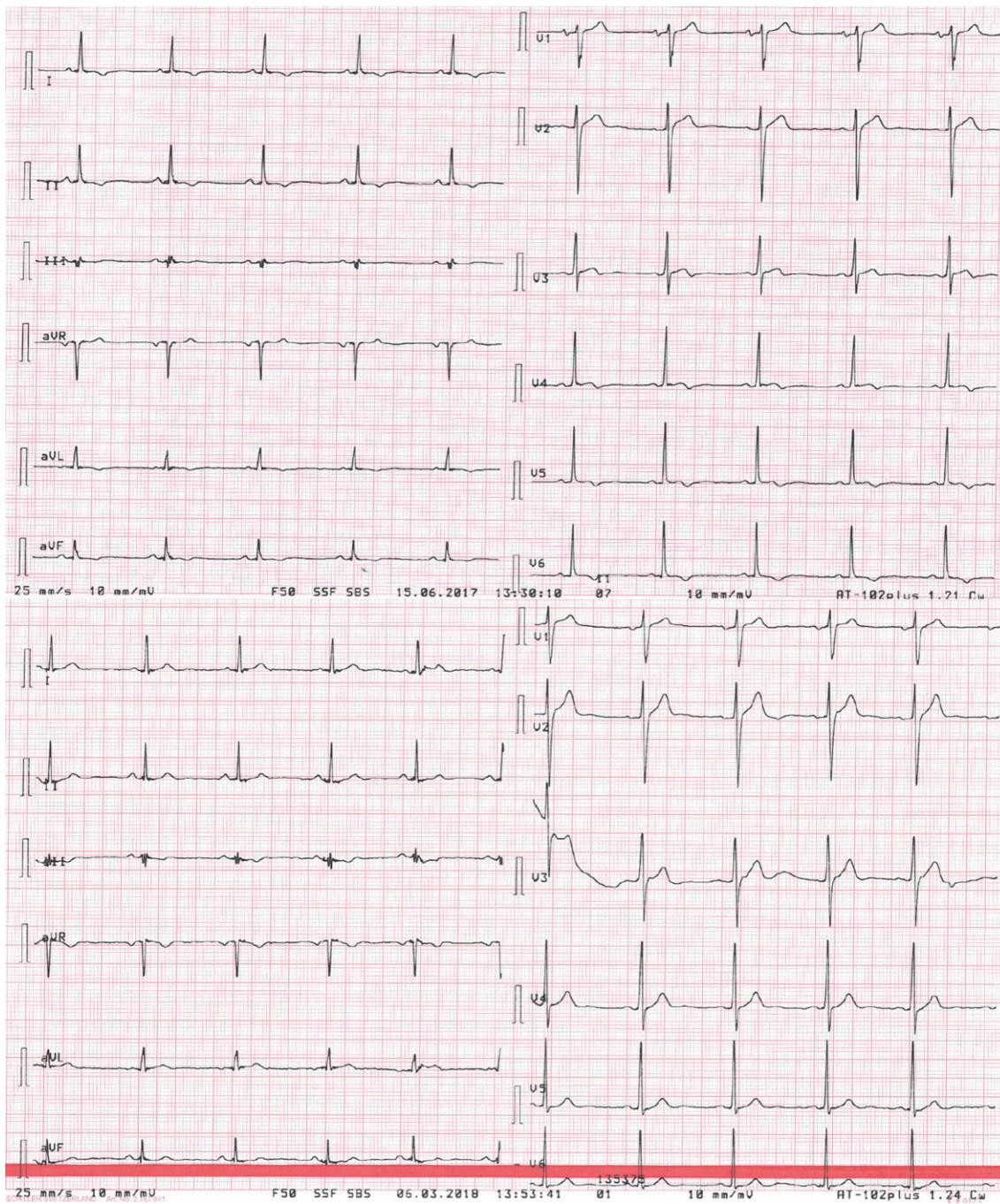


Figure 1

Upper panel: electrocardiography (ECG) during the initial phase of treatment when the patients had clinical symptoms and suspicion of myocardial involvement. Significant T-wave abnormalities may be observed in I, II, aVR, aVF and V3-V6. Lower panel: ECG after complete treatment. T-wave abnormalities have been resolved.

The patient was treated for 6 months with isoniazid and rifampin and 3 months with ethambutol, and pyrazinamide, and adjuvant prednisolone and pyridoxine throughout the period, based on clinical suspicion of tuberculous pericarditis.

Investigation

Initial evaluations

Chest X-ray displayed left-sided pleural effusions and subsegmental atelectasis contralaterally, while computed tomography (CT) revealed a right-sided upper lobe infiltrate, and also bilateral pleural effusions, a pericardial effusion and enlarged mediastinal lymph nodes.

The first electrocardiography (ECG) showed sinus rhythm and no abnormalities. However, during the initial clinical course significant T-wave abnormalities developed in I, II, aVR, aVF and V3-V6. These changes resolved completely at the end of treatment (Fig. 1). The initial transthoracic echocardiography (TTE) revealed left-sided pleural fluid accumulation, a modest pericardial effusion and no suggestion of constrictive physiology.

Positron emission tomography (PET) showed enhanced metabolic activity in the pericardium, indicative of active inflammation and supportive of the presumed diagnosis (Fig. 2). FDG uptake in the adjacent myocardium is uncertain.

Echocardiography

A Vivid E9STM (GE Healthcare) ultrasound system equipped with a M5Sc phased array transducer was used for all examinations.

Seven weeks after the initial evaluation, the patient deteriorated with increased dyspnea (NYHA class III), decreasing saturation and CT progression of the pericardial effusion. TTE revealed thickening of the visceral pericardium, ventricular septal bounce, a 29% increase in early mitral inflow velocity during expiration, hepatic vein diastolic reversal ratio of 0.89, medial e' velocity of 11.7 cm/s and a medial e'/lateral e' ratio of 1.5 (Fig. 3). The relationship between the medial and lateral e' velocities represents a reversal of the typical pattern, this is termed 'annulus versus' (5). All these signs are highly indicative of constrictive pericarditis.

Normal coronary arteries were demonstrated by coronary angiography, and simultaneous left and right heart catheterization revealed no signs of constrictive physiology including normal atrial and ventricular diastolic pressures. These examinations were however performed relatively late (week 10) in the clinical course, when the patient had improved clinically.

In addition, the pericardial involvement was assessed with serial TTEs (Fig. 4).

Initially, TTEs showed signs of pericardial involvement with effusion and transient constrictive physiology. Interestingly, even though left ventricular ejection fraction (LVEF) were within the normal range at all times, we observed reduced regional and

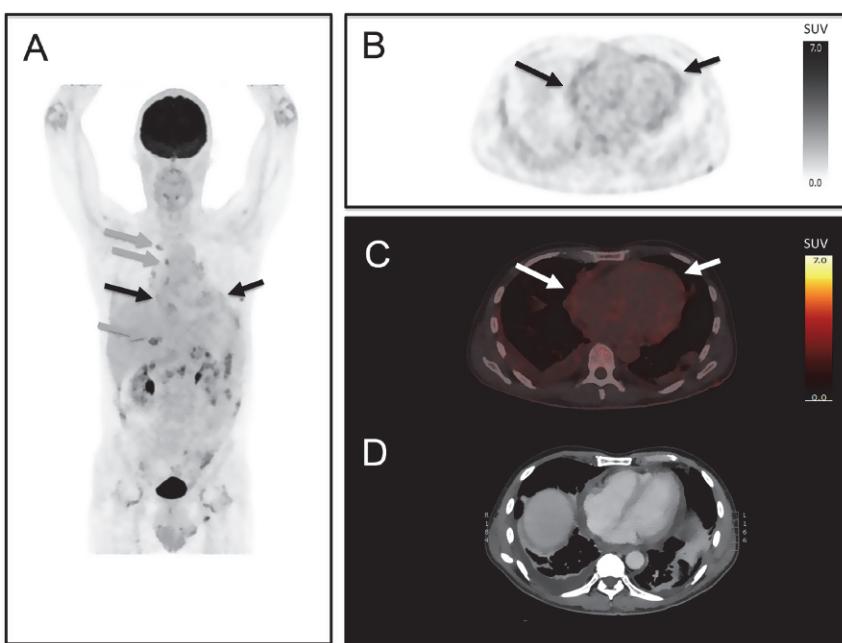


Figure 2

(A) Maximum intensity projection (MIP) image of the patient. Black arrows mark the discretely increased pericardial uptake. Gray arrows mark reactive lymph nodes. (B) Transaxial 18F-fluorodeoxyglucose (FDG) positron emission tomography-computed tomography (PET/CT) of the cardiac region. Discrete pericardial 18F-FDG uptake is noted with the highest intensity (SUV_{max} 3.1) in the thickened parts of the pericardium. (C) Fused axial 18F-FDG PET/CT. (D) Contrast-enhanced CT performed 14 days prior to the PET/CT. Sparse pericardial fluid and thickening as well as some pleural effusion is present.

global longitudinal strain (GLS) corresponding to the affected pericardial areas visualized on TTE (Fig. 4). Gradually, and along with anti-tuberculous treatment, the pericardial involvement decreased and only limited persistent calcifications were noted. Furthermore, regional and global myocardial deformation completely returned to normal values.

Treatment and outcome

The patient was followed regularly and continued to respond to the anti-tuberculous treatment with clinical improvement. After 4–5 months, the pericardial effusion and thickening had resolved completely. Yet, the ECG abnormalities with negative T-waves and the impaired left ventricular systolic longitudinal deformation were still present. A final evaluation after 11 months showed

normalization of the ECG and myocardial longitudinal deformation regionally as well as globally.

Discussion

Pericarditis is an important disease manifestation of TB, and myocardial involvement and hemodynamic status should always be meticulously evaluated in these patients to detect potential perimyocarditis or constrictive pericarditis (6).

In developed countries, most cases of acute pericarditis are due to viral infections whereas TB is a very rare etiology of acute pericarditis. Complications are infrequent in acute pericarditis, while 30–60% of patients with TB pericarditis may develop constrictive disease (7). Additionally, the myocardium may be affected, possibly as frequent as in 50% of human immunodeficiency

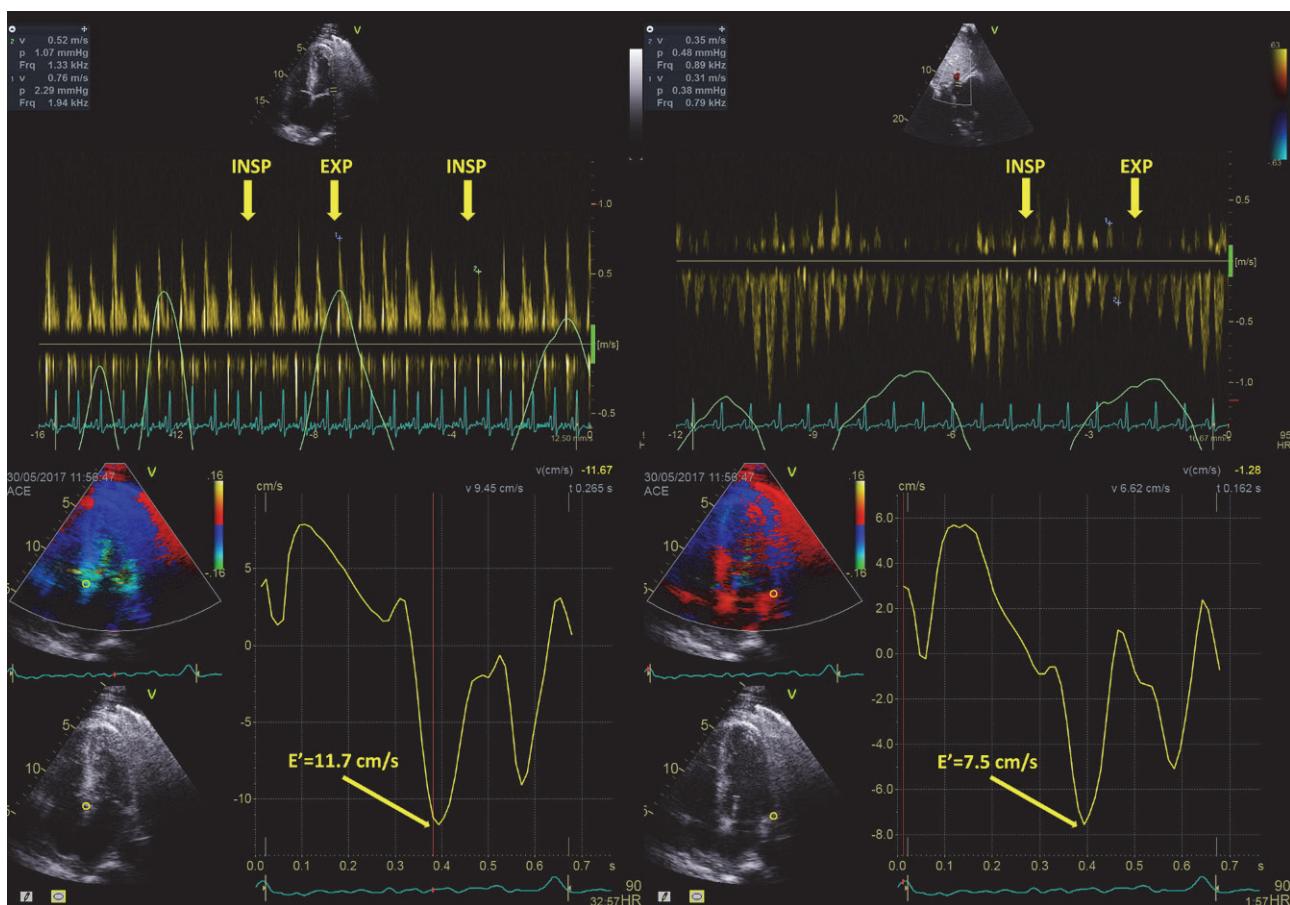
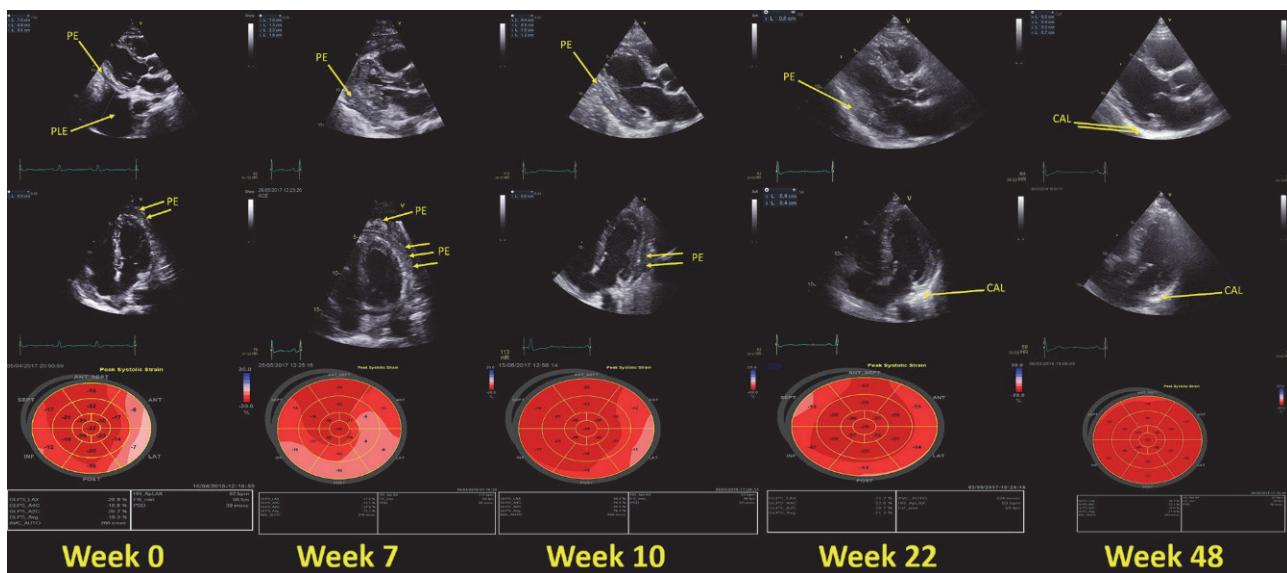


Figure 3

Upper left panel. Doppler measurements of mitral inflow velocities. A 29% increase (0.76 m/s versus 0.52 m/s) in early mitral inflow velocity can be observed during expiration. Upper right panel. Doppler measurements of hepatic vein flow velocities. The hepatic vein expiratory diastolic reversal ratio was 0.89 (0.35 m/s versus 0.31 m/s). Lower left panel. Tissue Doppler assessment of early septal mitral annular velocity. Lower right panel. Tissue Doppler assessment of early lateral mitral annular velocity.

**Figure 4**

Serial transthoracic echocardiographies during the course of 48 weeks. Upper panels. Parasternal long axis views. Middle panels. Apical four-chamber views. Lower panels. Corresponding global longitudinal strain bullseye plots based on myocardial speckle tracking analysis. CAL, calcification; PE, pericardial effusion; PLE, pleural effusion.

virus co-infected (8). Although isolated myocardial TB is claimed to be extremely rare (9), the present case appeared to be consistent with a severe case of perimyocarditis with transient constrictive pericarditis caused by TB, despite the lack of a microbiological confirmation. Isolated pericarditis may in rare cases progress to involve the myocardium with subsequent elevation of biomarkers (i.e. troponins and creatinine kinase-MB), ECG changes and impaired cardiac function proven by imaging techniques (10).

The pericardial effusion disappeared gradually when TB treatment was initiated during the first 3 months. In the initial course of the treatment, echocardiography demonstrated signs of pericardial constriction (Fig. 3), but these findings resolved within 2 weeks. The later was also confirmed by simultaneous right and left heart catheterization. During the entire course of the disease and treatment, LVEF was normal indicating that the overall myocardial function was unaffected. However, ECG revealed significant negative T-waves during a prolonged period of 6 months, these normalized after 9–12 months. Negative T-waves have been reported in acute pericarditis and have traditionally been considered due to inflammation of the pericardium. Whether this conception holds true alone can be challenged by our detailed examination of the myocardial function by speckle tracking strain analyses demonstrating impaired

left ventricular GLS (Fig. 4). The normalization of both the ECG abnormalities and the impaired GLS was timely superimposed (9–12 months) indicating a close relation between the ECG abnormalities and myocardial function that was not detected by LVEF measurements. The improvement of GLS was also coincident with gradual and complete resolution of patient complaints (6–12 months).

Analysis of myocardial performance beyond assessment of LVEF by GLS analysis has previously been shown to be of clinical and diagnostic value in the evaluation of perimyocarditis and has shown to correlate well with magnetic resonance imaging (MRI) findings in this patient group (5). Therefore, it seems relevant to perform an analysis of myocardial deformation by strain imaging in patients with pericarditis, although LVEF is normal. Myocardial involvement in acute pericarditis is indicated by increased cardiac biomarkers that might lead to advanced diagnostic such as strain imaging by echocardiography or late gadolinium enhancement MRI. Regrettably, cardiac biomarkers were not measured serially in this case, as the patient was not initially suspected of heart disease and only the discrete pericardial calcifications were highly suggestive of transient constrictive pericarditis. However, during clinical deterioration and abnormal strain values an elevated Pro-BNP value was measured (444 ng/L).



Conclusion

Using novel imaging techniques, we demonstrated transient constrictive pericarditis and subclinical involvement of the myocardium in a clinical case of tuberculous pericarditis with improvement following the initiation of anti-tuberculous treatment.

We suggest monitoring of myocardial function using GLS by myocardial speckle tracking strain analysis as supplement to routine LVEF, to assess clinical improvement in TB patients at high risk of developing constrictive pericarditis.

Declaration of interest

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of this case report.

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Patient consent

Written informed consent for publication of clinical details and clinical images was obtained from the patient.

Author contribution statement

V D M drafted the first manuscript with contributions from C A F, C W and S H P. The patient was examined and treated by C W and S H P. All authors interpreted and discussed study findings as well as contributed with intellectual content to the final manuscript. All authors agree with the results and conclusions of this article.

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References

- 1 Larrieu AJ, Tyers GF, Williams EH & Derrick JR. Recent experience with tuberculous pericarditis. *Annals of Thoracic Surgery* 1980 **29** 464–468. ([https://doi.org/10.1016/s0003-4975\(10\)61681-5](https://doi.org/10.1016/s0003-4975(10)61681-5))
- 2 Mayosi BM, Burgess LJ & Doubell AF. Tuberculous pericarditis. *Circulation* 2005 **112** 3608–3616. (<https://doi.org/10.1161/CIRCULATIONAHA.105.543066>)
- 3 Syed FF & Mayosi BM. A modern approach to tuberculous pericarditis. *Progress in Cardiovascular Diseases* 2007 **50** 218–236. (<https://doi.org/10.1016/j.pcad.2007.03.002>)
- 4 Mayosi BM, Wiysonge CS, Ntsekhe M, Gumede F, Volmink JA, Maartens G, Aje A, Thomas BM, Thomas KM, Awotedu AA, *et al.* Mortality in patients treated for tuberculous pericarditis in sub-Saharan Africa. *South African Medical Journal* 2008 **98** 36–40.
- 5 Reuss CS, Wilansky SM, Lester SJ, Lusk JL, Grill DE, Oh JK & Tajik AJ. Using mitral ‘annulus reversus’ to diagnose constrictive pericarditis. *European Journal of Echocardiography* 2009 **10** 372–375. (<https://doi.org/10.1093/ejechocard/jen258>)
- 6 Logstrup BB, Nielsen JM, Kim WY & Poulsen SH. Myocardial oedema in acute myocarditis detected by echocardiographic 2D myocardial deformation analysis. *European Heart Journal Cardiovascular Imaging* 2016 **17** 1018–1026. (<https://doi.org/10.1093/eihci/jev302>)
- 7 Ntsekhe M, Matthews K, Syed FF, Deffur A, Badri M, Commerford PJ, Gersh BJ, Wilkinson KA, Wilkinson RJ & Mayosi BM. Prevalence, hemodynamics, and cytokine profile of effusive-constrictive pericarditis in patients with tuberculous pericardial effusion. *PLoS ONE* 2013 **8** e77532. (<https://doi.org/10.1371/journal.pone.0077532>)
- 8 Syed FF, Ntsekhe M, Gumede F, Badri M & Mayosi BM. Myopericarditis in tuberculous pericardial effusion: prevalence, predictors and outcome. *Heart* 2014 **100** 135–139. (<https://doi.org/10.1136/heartjnl-2013-304786>)
- 9 Rose AG. Cardiac tuberculosis. A study of 19 patients. *Archives of Pathology and Laboratory Medicine* 1987 **111** 422–426.
- 10 Adler Y, Charron P, Imazio M, Badano L, Barón-Esquivias G, Bograert J, Brucato A, Gueret P, Klingel K, Lionis C, *et al.* 2015 ESC Guidelines for the diagnosis and management of pericardial diseases: the task force for the Diagnosis and Management of Pericardial Diseases of the European Society of Cardiology (ESC) endorsed by the European Association for Cardio-Thoracic Surgery (EACTS). *European Heart Journal* 2015 **36** 2921–2964. (<https://doi.org/10.1093/eurheartj/ehv318>)

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