Tuberculous Pericarditis: A multimodality imaging approach

Poster No.: C-1612
Congress: ECR 2011
Type: Educational Exhibit
Authors: A. S. Udare\textsuperscript{1}, P. K. Mondel\textsuperscript{1}, A. A. Raut\textsuperscript{2}; \textsuperscript{1}Mumbai, Maharastra/IN, \textsuperscript{2}Mumbai, MH/IN
Keywords: Infection, Diagnostic procedure, Contrast agent-intravenous, Comparative studies, Plain radiographic studies, MR, CT, Cardiac
DOI: 10.1594/ecr2011/C-1612

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Learning objectives

- To illustrate the spectrum of imaging appearances in tuberculous pericarditis
- To demonstrate the advantages and pitfalls of various imaging modalities
- To elucidate the role of Cardiac CT and Cardiac MRI in tuberculous pericarditis

Background

Worldwide, pericarditis is found in 1% of autopsied subjects with tuberculosis and it is responsible for approximately 4% of all patients with acute pericarditis, 7% of cardiac tamponade and 6% of patients with constrictive pericarditis.

It is the most common cause of pericarditis in Indian subcontinent as tuberculosis remains a major public health problem. The prevalence of tuberculous pericarditis is increasing as a result of the HIV epidemic and rise in cases of XDR-TB.

Tuberculous pericarditis presents clinically in 3 forms:

1. Pericardial effusion
2. Constrictive pericarditis
3. Combination of effusion and constriction.

The pathological stages of tuberculous pericarditis are:

1. Fibrinous exudation
2. Serosanguineous effusion
3. Absorption of effusion with organization of granulomatous caseation and subsequent pericardial thickening

The invasive nature of confirmative tests and fastidious nature of tuberculous mycobacterium, make imaging of vital importance in prompt clinical decision-making and guiding further management of the patient.
Due to the insidious nature and vague symptomatology early in the course of disease; it is necessary to know the key features on a screening chest radiograph. Although 2D echocardiography is a bedside, non-invasive modality for initial assessment; CT and MRI help delineate accurately the disease extent and complications. Also the findings of mediastinal lymphadenopathy or pleuropulmonary stigmata of tuberculosis, aid in making a definitive etiological diagnosis.

**Imaging findings OR Procedure details**

We reviewed the plain radiograph, echocardiography, CT, and Cardiac MRI findings of 20 patients diagnosed with tuberculous pericarditis at our institute.

On plain chest radiographs, increase in the transverse diameter of the cardiac silhouette was the most common finding in tuberculous pericarditis. In patients with moderate effusion there was rounding of the cardiac borders and fullness of the retrosternal space. With increasing effusion, the classic "water-bottle" cardiac configuration with bilateral hilar overlay sign was seen (Fig.1).

Biatrial enlargement in constrictive pericarditis was inferred from a widened subcarinal angle and the "double density" sign (Fig.2).

Pericardial calcification, especially in the atroventricular groove was common in chronic pericarditis (Fig.3 and 4).

2D echocardiography (Fig.5) was the most commonly used initial investigation, however narrow acoustic windows limited the evaluation of the pericardium in its entirety. Pericardial thickening, calcification, loculated effusion and the extent of tuberculous involvement were difficult to assess on ultrasound alone.

The extent of pericardial calcification, especially in the pericardial sinuses and recesses was well delineated on CT (Fig 6, on page 7, on page 8 on page and 9). Loculated pericardial effusion was better seen on CECT with thickened enhancing pericardium. The pericardial thickness was more than 4mm in all cases (Fig 10, on page 11 on page and 12).

In patients with constrictive pericarditis, there was biatrial enlargement with other back-pressure changes like dilated SVC,IVC and hepatic veins. In severe cases, reflux of
contrast into IVC with bowing of interventricular septum was also seen (Fig. 13) on page.

Ancillary findings of tuberculosis like calcified and rim-enhancing mediastinal lymph nodes, pleural and pulmonary involvement were also seen (Fig. 14 on page and 15). on page

The heart is oriented in the thoracic cavity in a double oblique plane.

Cardiac MRI due to its inherent superior soft tissue contrast and multiplanar capability allows viewing of the heart in its true planes (Fig. 16 on page, 17 on page and 18 on page). Both black-blood [HASTE] (Fig. 19 on page, 20 on page and 21 on page) and white-blood images (Fig. 22, on page 23 on page and 24 on page) are used in cardiac evaluation.

Pericardial thickening and its extent [localised (Fig. 25 on page and 26 on page) or generalised (Fig. 27) on page] could be accurately delineated. High signal seen in the acutely inflamed myocardium on TIRM sequence was useful in staging the disease process (Fig. 28) on page. One patient diagnosed to have effusive-constrictive pericarditis had thick enhancing pericardium with signs of constriction (Fig. 29 on page and 30 on page).

Dynamic imaging with CineMR illustrated the "septal bounce" sign and the "constrictive physiology". (Video 1) on page

**Conclusion**

The invasive nature of confirmative tests, fastidious nature of the tuberculous mycobacterium, and the complications of delayed diagnosis; make imaging extremely important in prompt clinical decision-making.

Early recognition of subtle signs of tuberculous pericarditis on chest radiographs is vital. 2D Echocardiography is a useful, non-invasive bedside modality for disease detection and follow-up. However it is user dependent and does not evaluate the pericardium in its entirety.

Calcification is common in tuberculous pericarditis; with CT being excellent in its detection and delineation. However it involves the risk of radiation and contrast reaction, especially for patients requiring repeated examinations.
CT and MRI depict the ancillary findings of pleuropulmonary and mediastinal tuberculosis which help in making a etiological diagnosis.

Cardiac MRI is a highly accurate, reproducible & non-invasive technique of assessment of patients with tuberculous pericarditis.

It is useful in disease prognosis & also vividly depicts the altered hemodynamics in pericardial tuberculosis.

A multimodality imaging approach helps in early diagnosis and in better characterisation of tuberculous pericarditis. This is vital for appropriate management and follow-up of patients.

Personal Information

A. S. Udare, P. K. Mondel. Department of Radiology, Seth GS Medical College and KEM Hospital, Acharya Donde Marg, Parel, Mumbai, Maharashtra, India. 400012

Mail to: ashleshaudare@gmail.com

A. A. Raut. Department of Radiology, Seven Hills hospital, Mumbai

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