

# Calcific constrictive pericarditis demonstrated on 99mTc-MDP bone scintigraphy

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## ABSTRACT

The authors present a case of calcific constrictive pericarditis, imaged with bone scintigraphy. The patient presented with three months of shortness of breath, chest pain, and chest tightness during exercise, among other nonspecific symptoms. Although the diagnosis was made based on chest radiography and cardiac MRI, bone scintigraphy was used to corroborate the diagnosis of calcific constrictive pericarditis. Bone scintigraphy showed a pattern of tracer accumulation consistent with pericardial uptake. Calcific constrictive pericarditis was also confirmed at the time of surgery.

## CASE REPORT

### CASE REPORT

A 49 year old male with a history of hypertension, diabetes mellitus and dyslipidemia, presented with three months of shortness of breath, chest pain and tightness during exercise, lower extremity edema, occasional palpitations and two episodes of syncope. A chest radiograph faintly demonstrated pericardial calcifications and also signs of pulmonary vascular congestion (Fig. 1). An MRI was requested to corroborate that constrictive physiology was present. At MRI, pericardial thickening was demonstrated as well as signs of constriction, including septal bounce, and disproportionately large atria compared to relatively small, cone-shaped ventricles (Fig. 2A and 2B). Bone scintigraphy after administration of 20 mCi of 99m Tc-Methylene Diphosphonate (MDP) demonstrated an

ovoid area of uptake in the mediastinum beyond the expected contour of the left ventricle, consistent with tracer in the pericardium (Fig. 3). SPECT images further delineated the pattern of uptake as pericardial (Fig. 4). An image of a different patient, with end-stage renal disease and extensive myocardial uptake of MDP is provided to demonstrate the difference in the pattern of uptake seen in the patient presented, as contrasted with myocardial uptake (Fig. 6). At surgery, a densely calcified and thickened pericardium was found. Total pericardiectomy was performed. The patient clinically improved after surgery, and was discharged on post-operative day 5.

## DISCUSSION

Calcific constrictive pericarditis can often be a difficult diagnosis to make clinically, since symptoms are frequently nonspecific. Imaging is essential in arriving at the correct diagnosis (1, 8, 9). Many imaging modalities offer potential choices for making the correct diagnosis. Plain radiography is helpful, but notoriously insensitive for demonstrating pericardial calcifications. Other plain radiographic evidence of constrictive pericarditis may be seen including cardiac enlargement, left atrial enlargement, and pulmonary vascular congestion (2). MRI is helpful at demonstrating findings of constrictive physiology, but has difficulty in demonstrating calcification. Thickening may be identified at MRI, however. Other findings seen on MRI and present in this case include septal bounce, enlarged atria, and small cone-shaped ventricles (3, 4, 11). CT can exquisitely demonstrate pericardial calcifications, but gated imaging is necessary to prove constriction, and the temporal resolution of CT is inferior to other dynamic modalities for imaging the heart, including MRI and echocardiography (4, 5). Echocardiographic findings indicate wall motion abnormalities and cardiac morphologic features consistent with constrictive pericarditis, and may demonstrate pericardial calcifications and thickening as well. In the setting of dense calcifications or in the presence of normal pericardial thickness, however, evaluation of the pericardium can be difficult (6-8).

To our knowledge, nuclear scintigraphy has not been previously reported for the demonstration of calcific constrictive pericarditis, although previously some reports have described uptake of 99m Technetium radiopharmaceuticals including MDP and pyrophosphate in the myocardium in the case of infarcts and myocarditis (11, 12). Identification of calcifications in the setting of constrictive pericarditis is important from the perspective of the surgeons who may have to alter the method of pericardiectomy depending on how dense calcifications are and whether other structures (coronary arteries etc.) are adhered to the calcified pericardium. Adhesions to the epicardial coronary vessels and to the myocardium are more frequently found in calcific pericarditis compared to fibrous or other forms of non-calcified constrictive pericarditis. As a result, the surgical approach to total pericardiectomy is performed more cautiously and in a more piecemeal fashion in the setting of calcific constrictive pericarditis. (13) In this case, specific identification of calcific constrictive pericarditis lead to a different surgical approach than the method of total pericardiectomy that would have been employed if fibrous constrictive pericarditis were identified. Further study is needed to delineate the sensitivity and specificity of scintigraphy in the identification of pericardial calcifications.

## TEACHING POINT

Although the clinical presentation of constrictive pericarditis may be protean, there are a number of modalities available to confirm the diagnosis. In addition to corroborating the diagnosis of constrictive pericarditis, scintigraphy was useful in this case to demonstrate a calcified nature of the pericardial

thickening. This altered the method of pericardiectomy utilized by the surgeons in this case.

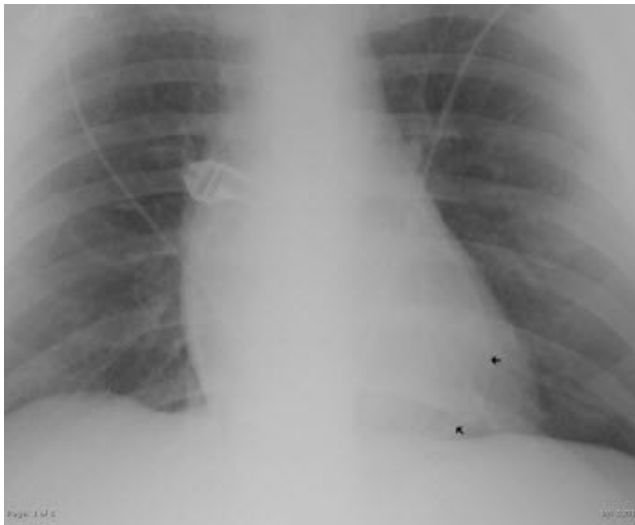
## ABBREVIATIONS

CT: Computed Tomography  
MRI: Magnetic Resonance Imaging  
MDP: Methylene Diphosphonate  
SPECT: Single Photon Emission Computed Tomography

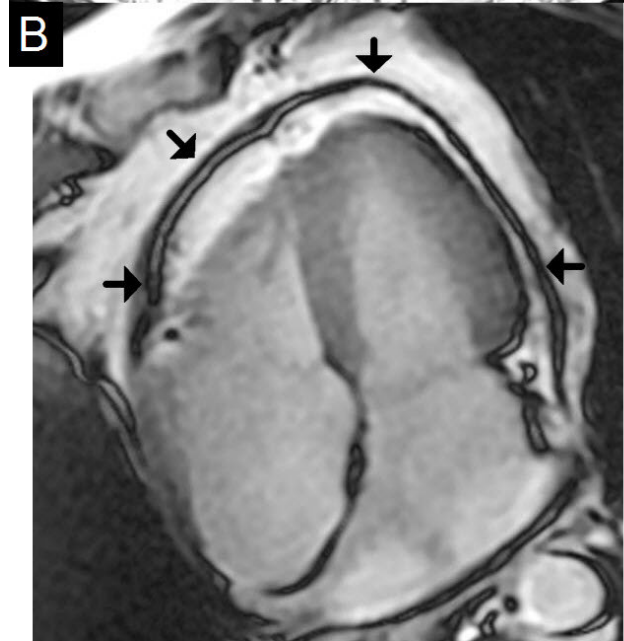
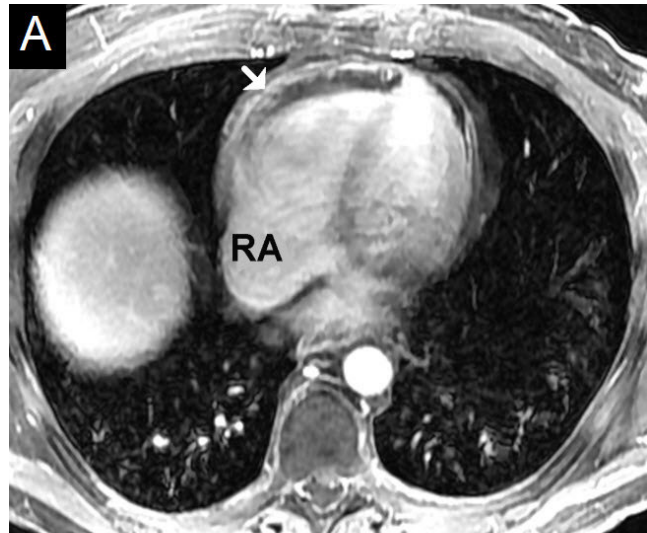
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## FIGURES

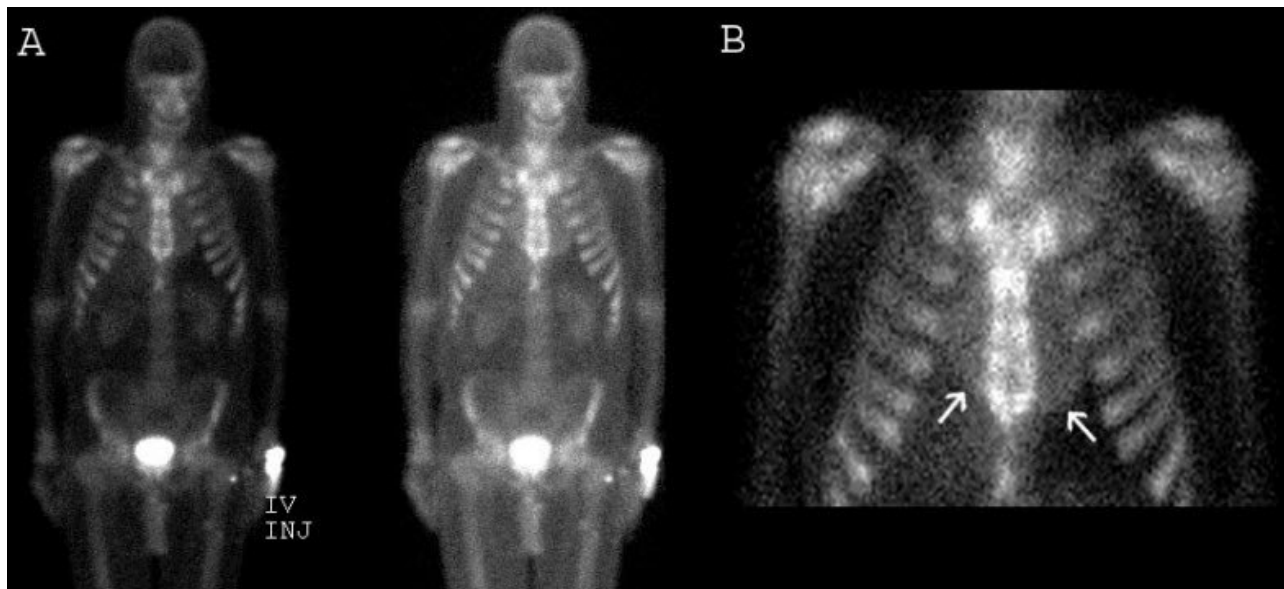


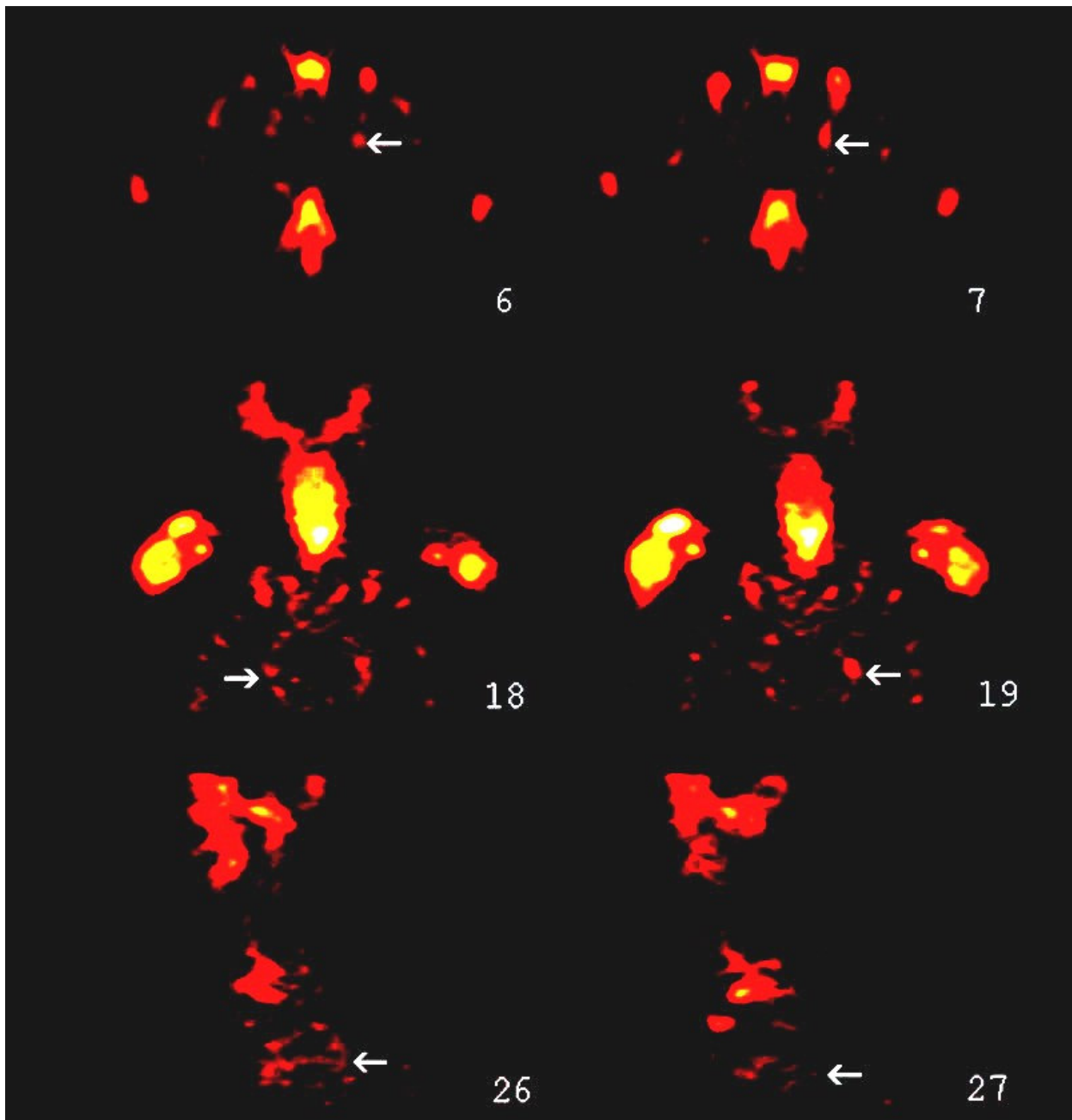
**Figure 1 (top):** 49 year old male with calcific constrictive pericarditis. PA chest radiograph faintly demonstrated pericardial calcifications (black arrows) and also signs of pulmonary vascular congestion.



**Figure 2 (right):** 49 year old male with calcific constrictive pericarditis. An MRI was requested to corroborate that constrictive physiology was present. An image from an axial post-contrast, T1 weighted gradient echo (A) and a single image from a 4-chamber steady state free precession sequence (B) are shown. At MRI, pericardial thickening was demonstrated (white arrow on A and black arrows on B) as well as signs of constriction, including septal bounce, and disproportionately large atria compared to relatively small, cone-shaped ventricles. (RA = right atrium)

**Figure 3 (bottom):** 49 year old male with calcific constrictive pericarditis. Whole body images are presented from an MDP bone scan after the administration of 20 mCi of 99m-Techneium methylidiphosphonate. The view of the torso (A) and more focused view of the chest (B) demonstrate uptake in the region of the pericardium (white arrows). The pattern of uptake encircles the heart, and was correctly interpreted as corresponding to the pericardium.





**Figure 4:** 49 year old male with calcific constrictive pericarditis. SPECT images are shown in the axial (top two images), coronal (middle two images), and sagittal (bottom two images). SPECT helps to confirm that the uptake seen is in the expected region of the pericardium (white arrows).



**Figure 5:** An image from a whole body bone scan in a different patient shows extensive myocardial uptake. Note that the uptake is predominantly located within the myocardium, and is therefore, conforming to the morphology of the left ventricle. The appearance shown is distinct from a predominantly pericardial uptake pattern. This was thought to be due to end stage renal disease, in this case.

KEYWORDS

Calcific constrictive pericarditis, constrictive pericarditis

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