Unusually seen pattern of ^{99m}Tc-DPD soft tissue uptake in a patient with AL amyloidosis. Is it an amyloid type indicator in specific cases?

Abstract

Technetium-99m (^{99m}Tc)-labeled pyrophosphate (PYP) and 3,3-diphosphono-1,2-propanodicarboxylic acid (DPD) are currently the most established imaging agents for the diagnosis of cardiac amyloidosis, being able to distinguish light chain (AL) from transthyretin (TTR) type of the disease. We present a pattern of increased uptake in all soft tissues, sparing the organs that are usually most affected.

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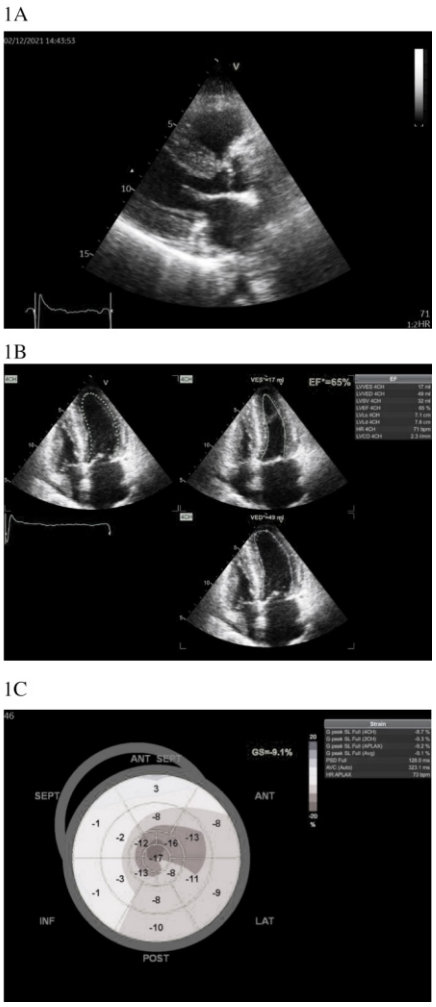

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Figure 1. Transthoracic echocardiogram of a 76 year-old woman, presenting with shortness of breath, relapsing peripheral congestion and bilateral hand numbness during the last 12 months. Echocardiography (ECG) showed low QRS potentials and pseudoinfarction pattern in the left precordial leads. Laboratory screening revealed elevated natriuretic peptides and high-sensitivity troponin [1] and previously unknown abnormal renal function (serum creatinine 1.6mg/dL). Echocardiography showed concentric left ventricular hypertrophy (wall thickness 15mm, 1A), right v entricular hypertrophy (RV free wall thickness 8mm), interatrial septum thick ening and degenerative valve lesions. Severe diastolic dysfunction with very low diastolic velocities at tissue doppler imaging and high transmitral flow velocities (restrictive filling pattern with elevated filling pressures, E/e' >15) was also present. Left ventricular systolic function as determined with ejection fraction was normal, despite reduced ventricular volumes (1B). However, longitudinal function was severely impaired (1C), with an apical sparing pattern compatible with cardiac amyloidosis. Magnetic resonance imaging (MRI) findings were atypical.

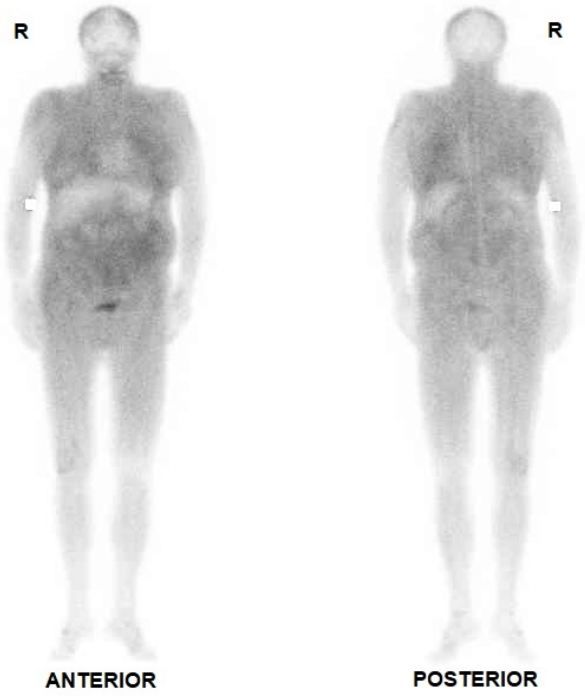

Figure 2. Total body images of ^{99m}Tc labeled DPD of the same patient. Total body anterior, posterior, and single photon emission computed tomography (SPECT) views of the thorax are presented. Severely increased soft tissue uptake is seen at the visceral, lung and muscle region, sparing the cardiac, liver, spleen and renal parenchyma, which appear "cold". Minimal bone activity is seen. These are the organs usually showing the most avid ^{99m}Tc-DPD uptake in cases of both AL and mainly TTR amyloidosis [2-7]. At the single photon emission computed tomography (SPECT) images, increased lung, but no cardiac uptake is clearly seen. The diagnosis of AL amyloidosis was proven by soft tissue biopsy (both adipose and rectal), as well as a positive Bence-Jones protein urine test (0.4g/day) and increased urine λ light chain excretion. The patient was at cardiac stage IIIb, according to her laboratory findings. She is currently in good shape under medication (daratumumab, bortezomib, melphalan and dexamethasone). We wonder if ^{99m}Tc-DPD soft tissue uptake in uncommonly seen areas, can serve as an indicator for AL type amyloidosis [2-6]. The use of PYP on the other hand, due to its minimal soft tissue uptake, may not serve as a suitable agent for this purpose [7, 8].

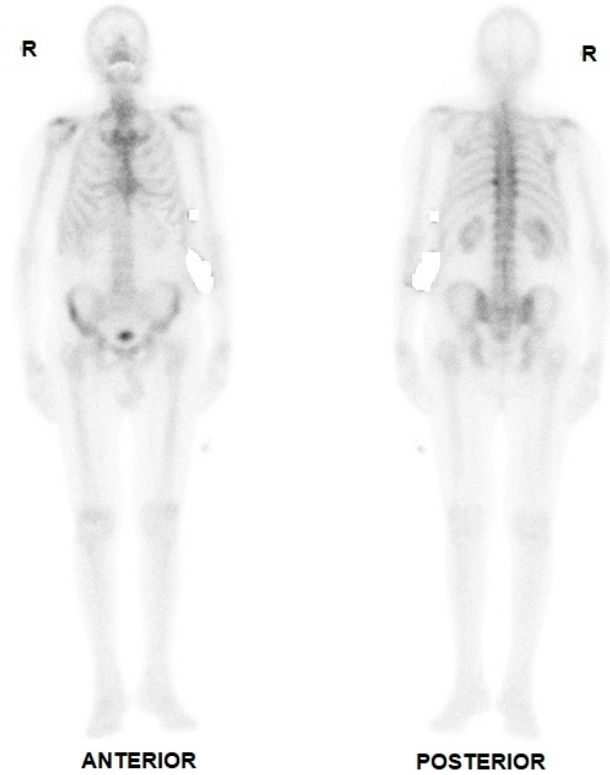

Figure 3. The probability of any radiopharmaceutical mislabeling or technical problem was excluded, since the rest of the patients imaged by the same camera and injected by the same vial were as expected.

The authors declare that they have no conflicts of interest.

Bibliography

1. Dispenzieri A, Gertz MA, Kyle RA et al. Serum cardiac troponins and N-terminal pro-brain natriuretic peptide: a staging system for primary systemic amyloidosis. *J Clin Oncol* 2004; 22: 3751-7.
2. Lee J, Kim K, Choi JO et al. ^{99m}Tc-DPD scintigraphy and SPECT/CT in patients with AL and ATTR type amyloidosis. Potential clinical implications. *Medicine* 2020; 99: 4.
3. Li W, Uppal D, Chiang Wang Y et al. Nuclear Imaging for the Diagnosis of Cardiac Amyloidosis in 2021. *Diagnostics* 2021; 11: 996.
4. Quarta CC, Zheng J, Hutt D et al. ^{99m}Tc-DPD scintigraphy in immunoglobulin light chain (AL) cardiac amyloidosis. *Eur Heart J Cardiovasc Imaging* 2021; 22: 1304-11.
5. Hutt DF, Quigley AM, Page J et al. Utility and limitations of 3,3-diphosphono-1, 2-propanodicarboxylic acid scintigraphy in systemic amyloidosis. Eur Heart *J Cardiovasc Imaging* 2014; 15: 1289-98.
6. Sperry BW, Gonzalez MH, Brunken R et al. Non-cardiac uptake of technetium-99m pyrophosphate in transthyretin cardiac amyloidosis. *J Nucl Cardiol* 2019; 26: 1630-7.
7. Razvi Y, Patel RK, Fontana M et al. Cardiac Amyloidosis: A Review of Current Imaging Techniques. *Front Cardiovasc Med* 2021; 8: 751293.
8. Papantoniou V, Valsamaki P, Kastritis S et al. Imaging of cardiac amyloidosis by ^{99m}Tc-PYP scintigraphy. *Hell J Nucl Med* 2015; 18: 42-50.

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