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## Case Report

# Calciophylaxis on bone scan: correlation between molecular and cross-sectional findings

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## ARTICLE INFO

## Article history:

Received 1 November 2016

Accepted 21 November 2016

Available online 24 December 2016

## Keywords:

Calciophylaxis

Bone scan

Calcific uremic microangiopathy

## ABSTRACT

Calciophylaxis is a rare devastating medical condition commonly associated with end-stage renal disease and characterized by extensive microvascular calcifications. We describe a case of calciophylaxis presenting on Tc-99m MDP bone scan imaging with asymmetric radiotracer uptake within the lower extremities corresponding to extensive soft tissue calcifications on Computed tomography. Familiarity with the classic clinical presentation and imaging features of this rare entity may help its early identification and treatment.

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## Introduction

Calciophylaxis is a rare condition characterized by calcific uremic microangiopathy, a disease process in which extensive vascular calcifications are seen in the microvasculature, usually in the skin and subcutaneous fat. Systemic calciophylaxis refers to involvement of the visceral organs, such as the heart or the stomach. Calciophylaxis is reported in 1%-4% of patients with end-stage renal disease, and is occasionally seen with other disease processes such as multiple myeloma [1]. We describe a case of calciophylaxis detected on technetium-99m methyl diphosphonate (Tc-99m MDP) bone scan with correlative cross-sectional imaging findings.

## Case report

A 65-year-old male with long-term end-stage renal disease and diabetes presented with a long-term nonhealing ulcer of

the right lower extremity and bilateral ankle pain of unclear etiology. A whole-body bone scan was obtained and demonstrated that diffuse increased soft tissue uptake thought to be contributed by delayed soft tissue clearance secondary to renal failure. However, there was asymmetric pronounced radiotracer deposition in the bilateral calves subcutaneous tissues more pronounced compared with the rest of the body soft tissue uptake (Fig. 1). Patient could not tolerate the single-photon emission computed tomography (CT) portion of the examination due to severe pain, so a low attenuation CT was obtained for further characterization of the planar images findings. CT images showed extensive subcutaneous and a few cutaneous calcifications corresponding to the areas of abnormal radiotracer uptake on bone scan (Fig. 2) pathognomonic for calciophylaxis in this patient with a classic presenting history of end-stage renal disease and nonhealing lower extremity ulcers. Skin punch biopsies of the right lateral calf and right shin were performed, and pathology showed ulcer with ischemic necrosis and underlying calcification of

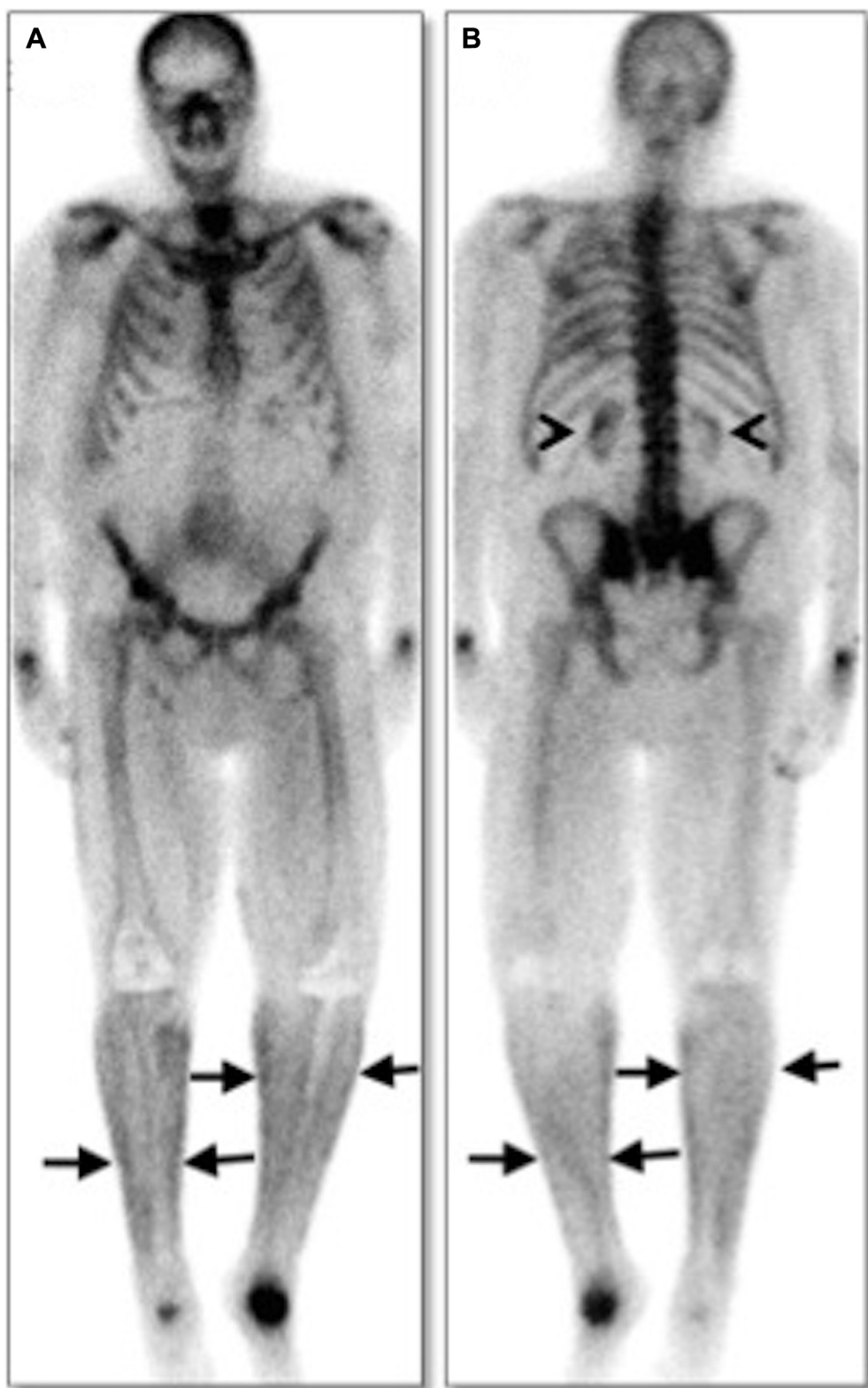
Competing Interests: The authors have declared that no competing interests exist.

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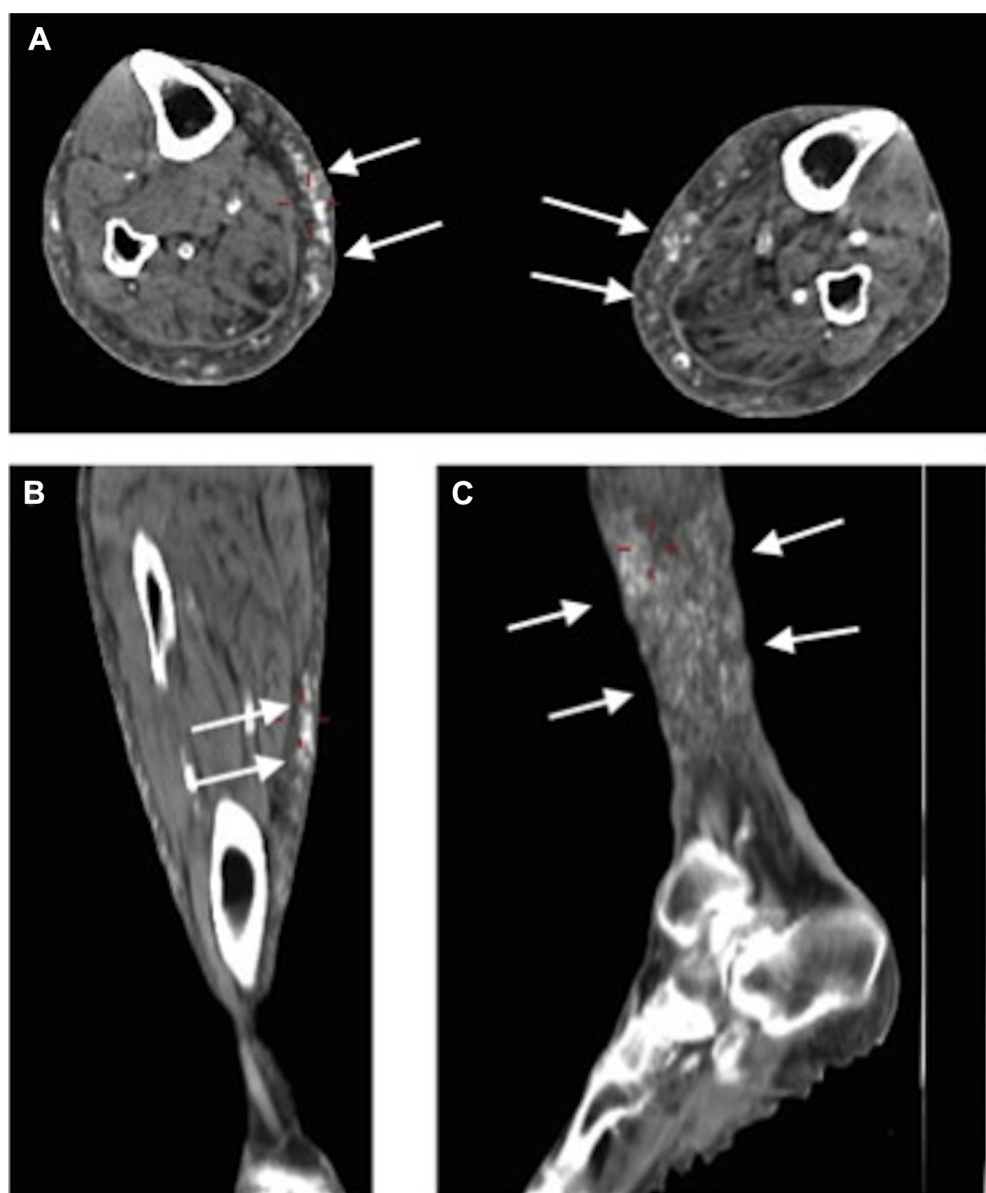
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<http://dx.doi.org/10.1016/j.radcr.2016.11.027>

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**Fig. 1** – A 65-year-old male with end-stage renal disease (ESRD) and a long-term nonhealing ulcer of the right lower extremity. (A) Anterior and (B) posterior planar images demonstrate marked radiotracer uptake in the subcutaneous tissues of the lower extremities bilaterally, predominantly in the bilateral calves (arrows). There is faint activity in the diminutive bilateral kidneys (arrowheads) consistent with history of long-term renal failure. Incidental note of photopenia in the bilateral knees related to prior knee arthroplasties, and severe uptake in the left midfoot joints and to a lesser degree in the right midfoot joints secondary to degenerative changes.



**Fig. 2** – A 65-year-old male with ESRD and a long-term nonhealing ulcer of the right lower extremity. (A) Axial image of the bilateral lower extremities at the level of the midcalves and (B) coronal and (C) sagittal images through the right lower extremity demonstrate extensive soft tissue calcifications (arrows) corresponding to the areas of asymmetric pronounced soft tissue uptake on bone scan.

arteries and subcutaneous fat, consistent with calciphylaxis. Prominent uptake within the midfoot joints corresponded to severe degenerative changes on CT (images not shown).

## Discussion

Calciphylaxis represents extensive microangiopathy and small vessel calcifications with secondary progressive cutaneous necrosis. Other terms used to describe calciphylaxis include calcific uremic microangiopathy, calcifying panniculitis, or vascular calcification-cutaneous necrosis syndrome. The process occurs often in the lower extremities, with preservation of pulses. Less often, it affects the breasts, abdomen, and male genitalia. Calciphylaxis can be seen with

primary, secondary, or tertiary hyperparathyroidism, and is associated with elevated calcium and phosphate levels, which exceed their solubility in blood causing them to deposit in vessels, which in turn leads to progressive vascular compromise in skin and subcutaneous fat, and less often in the muscles. Clinically, patients with calciphylaxis present with bilateral symmetric lesions, pruritus, pain, and tenderness [2]. On histopathology, diagnosis is made by demonstration of subcutaneous calcific arteriopathy and calcific uremic arteriopathy.

Tc-99m MDP bone scan is thought to be positive because of the presence of neo-osteogenesis within the soft tissues, as it detects osteoblastic activity by chemisorption to hydroxyapatite crystals in new forming bone [1]. Although a few prior case reports in the literature described calciphylaxis findings

on bone scan, this is the first report to show correlative cross-sectional imaging findings [3,4]. For imaging differential diagnosis, other causes of delayed radiotracer clearance from soft tissues (such as renal failure, venous insufficiency) and of soft tissue calcification in the lower extremities (such as long-term venous thrombosis, diabetes, metastatic calcifications, scleroderma, dermatomyositis and other connective tissue disease syndromes, post-traumatic and neurologic injuries, and tumor calcinosis) should be considered. Considering the planar imaging findings are not specific, presenting clinical history (long-term nonhealing ulcers in the setting of end-stage renal failure) is usually a clue pointing in the direction of calciphylaxis.

There can be significant morbidity and mortality from the disease, most commonly resulting from septicemia due to impaired integrity of the epidermis and dermis. More than 50% of patients die (most commonly from sepsis) within 1 year of being diagnosed. Treatment depends on the etiology. In cases of primary hyperparathyroidism, treatment consists of surgical removal of the autonomous parathyroid gland. Other possible treatment options include sodium thiosulfate,

bisphosphonates, and hyperbaric oxygen [2]. Radionuclide bone scan may be useful for diagnosis and for monitoring response to intravenous medication therapy such as sodium thiophosphate [5].

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