

# Bone Scan in Identification, Assessment of Initial Extent and Response to Therapy in Polymyositis

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## ABSTRACT

This is a 51-year-old male who presented with abdominal pain, bilateral proximal upper and lower extremities pain and weakness, and decreased urine output with abnormal kidney function test; Urea and creatinine levels were elevated at 231.5 mg/dl and 11.05 mg/dl, respectively. Initial bone scan showed increased uptake within several muscles suspicious for polymyositis, this was confirmed by biopsy of the right triceps, identified by bone scan as the best superficial biopsy site. Pelvis and thigh MRI demonstrated diffuse hyperintense signal on fluid sensitive sequences involving several muscles. Renal biopsy showed acute tubular injury. He was treated with steroids resulting in significant improvement. A repeat bone scan showed near complete resolution of the muscular uptake seen at presentation. This case nicely illustrates the role of bone scanning in the initial recognition and determination of the extent of polymyositis with identification of a suitable biopsy site as well as assessment of response to treatment.

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## Introduction

Polymyositis is a subtype of idiopathic inflammatory myopathy (IIM) of unknown etiology characterized by thoracic and pelvic girdle weakness (1). Its main symptom is symmetric proximal muscle weakness developing over 3-6 months (1). Diagnosis is based on clinical examination, muscle enzyme laboratory results, electromyography and histopathology of one of the involved skeletal muscles, considered essential for diagnosis (1, 2).

Imaging studies, such as MRI can provide additional information on inflammatory myopathies by detecting intramuscular differences in signal intensities (3). Muscle uptake of Tc-99m phosphate compounds on bone scan has been reported in conditions, such as polymyositis/dermatomyositis, rhabdomyolysis and traumatic myositis (2, 4-7). Steroids represent the treatment of choice beginning

with high doses (1-2 mg/kg/d) or lower doses in patients with mild symptoms. Unresponsive patients to high doses of steroids may require various immunosuppressive agents, such as methotrexate, azathioprine and cyclophosphamide and cyclosporine A. Total body irradiation may also be effective as a second line of therapy (8).

## Case

A 51-year-old male presented with abdominal pain, bilateral proximal upper and lower extremities pain and weakness and decreased urine output with abnormal kidney function. Urea and creatinine were elevated at 231.5 mg/dl and 11.05 mg/dl, respectively. Anterior and posterior whole body bone scan performed at presentation (Figure 1a) demonstrated increased uptake in several muscles. The right triceps (black arrow) was identified by bone scan as the best superficial

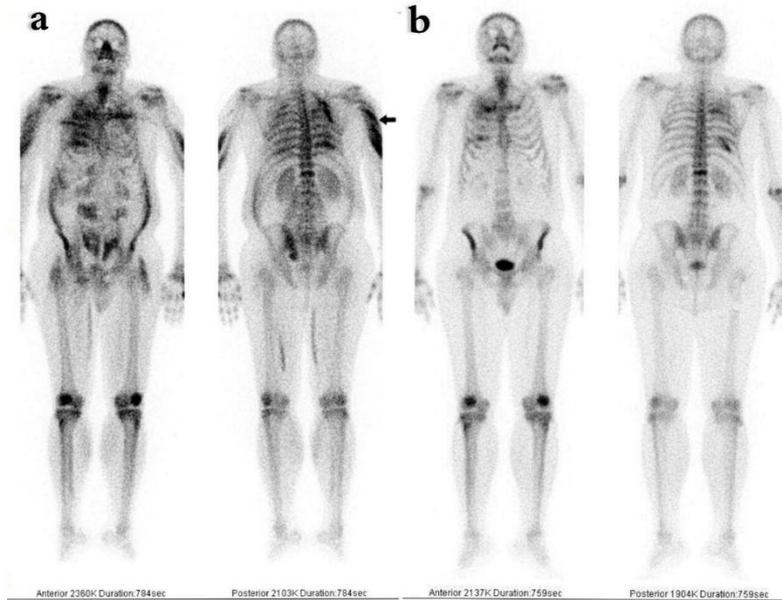
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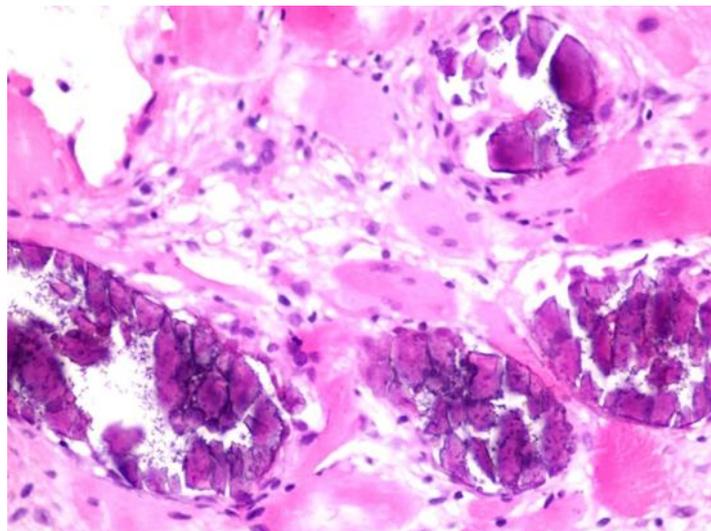
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biopsy site. Triceps muscle biopsy (Figure 2) showed features suggestive of myositis with extensive calcification. Renal biopsy showed acute tubular injury. Multiplanar pelvis and thigh MRI without contrast was also performed (Figure 3). The patient was treated with high-

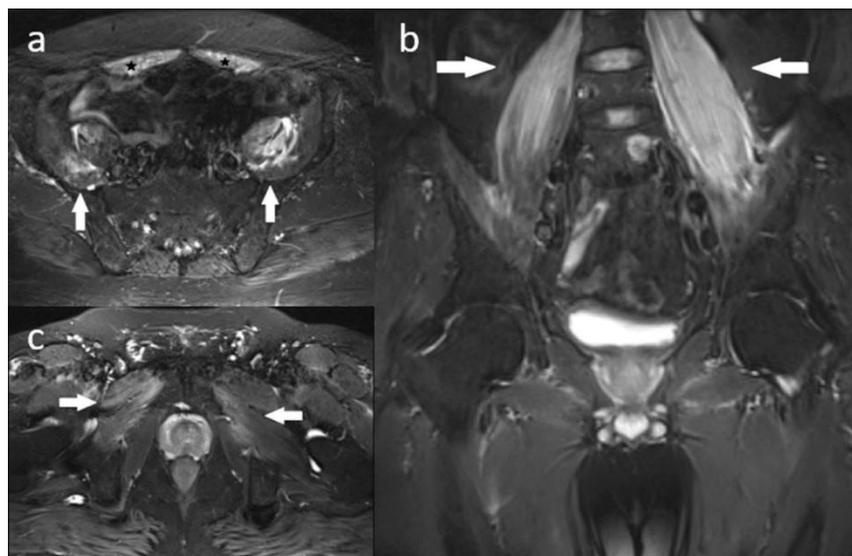
dose steroids resulting in significant improvement and was discharged after 18 days. Repeat bone scan showed near complete resolution of the increased radiotracer uptake in the involved muscles at presentation (Figure 1b).



**Figure 1.** A) Anterior and posterior whole body bone scan at presentation demonstrates increased uptake in several muscles of the arms, chest wall, upper back, abdominal wall and thighs, including bilateral triceps (black arrow showing right triceps), rectus abdominis, iliopsoas, bilateral adductor and tensor fascia lata muscles, all suspicious for polymyositis. B) Bone scan demonstrates almost complete resolution of abnormal increased radiotracer uptake in the previously mentioned muscles of proximal upper and lower extremities, chest wall, upper back and abdominal wall



**Figure 2.** Triceps muscle biopsy findings of numerous skeletal muscles with coarse calcifications surrounded by multinucleated giant cells. Some of the muscle fibers are atrophic with internalization of the nuclei. Many fibrotic areas are seen with chronic inflammatory cell infiltrate, features suggestive of myositis with extensive calcification



**Figure 3.** Multiplanar pelvis and thigh MRI without contrast. (a) Axial STIR at the level of S1 demonstrates patchy myositis involving the visualized portions of iliopsoas (white arrows) and rectus femoris (stars) muscles. (b) Coronal STIR demonstrates diffuse myositis involving the iliopsoas muscles (white arrows) more on the left side down to their insertion. (c) Axial STIR at the level of the ischium demonstrates patchy myositis involving the visualized portions of adductor muscles (white arrows)

## Discussion

Although several associations have been implicated, polymyositis and related disorders remain of uncertain origin (1). Clinically, proximal muscular weakness is the main symptom (3), yet various systemic manifestations including renal, cardiac, gastrointestinal, cutaneous, and pulmonary might also be observed (9). Muscle biopsy is the gold standard to obtain a definite diagnosis (2). Muscle biopsy typically shows necrosis and regeneration of muscle fiber with infiltration of perivascular and interstitial spaces by small and large lymphocytes, macrophages and plasma cells. If the disease process has been chronic, accumulation of lipid in conjunction with muscle atrophy are seen (9).

Bone scan is typically used in detecting bone disorders; nevertheless, it has the ability to unmask non-osseous deregulations and can be used to exclude occult malignancy (2, 4-7). However, muscular physical activity could potentially cause increased uptake of bone-seeking tracers and should be considered in otherwise healthy patient (10). In our case, a bone scan performed at presentation revealed increased uptake in several muscles, which raised the suspicion of polymyositis, later proven by biopsy and MRI. The scan not only pointed to the most likely diagnosis but was also very helpful in identifying the best superficial site for biopsy. Furthermore, a repeat bone scan performed after successful treatment showed

near normalization of scan confirming the success of therapy with steroids. Interestingly, our patient also presented with renal failure due to acute tubular injury. Renal involvement can occur in patients with polymyositis/dermato-myositis with two main types of renal lesions identified: acute tubular necrosis with renal failure related to myoglobinemia and myoglobinuria and chronic glomerulonephritis (11).

In summary, bone scanning appears to have a role in the initial recognition and determination of the extent of polymyositis with identification of a suitable biopsy site as well as assessment of response to treatment. Tomographic imaging using SPECT/CT is likely to improve the diagnostic accuracy of bone scan by distinguishing muscular from bone uptake and identifying more subtle and/or limited muscle involvement.

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