

## CASE REPORT

## MSSA brain abscess and pyomyositis presenting as brain tumour and DVT

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**SUMMARY**

A 66-year-old man with a recent radiographic diagnosis of a parietal brain tumour presented with severe left thigh pain that prevented ambulation. On examination, his left anterior thigh was mildly swollen without erythema. Initial concern was for deep vein thrombosis in the setting of brain malignancy or necrotising soft tissue infection. Subsequent imaging and biopsies revealed methicillin sensitive *Staphylococcus aureus* (MSSA) pyomyositis of the left thigh and MSSA brain abscess.

**BACKGROUND**

Pyomyositis is a life-threatening infection if not diagnosed and treated promptly; this case reviews the clinical signs, symptoms and management of this rare but dangerous syndrome. In addition, this case reminds clinicians to be vigilant regarding signed-out diagnoses that are not proven and could influence medical decision-making.

**CASE PRESENTATION**

A 66 year-old man with a medical history of coronary artery disease, diet-controlled diabetes and a recent diagnosis of a brain tumour presented to the emergency department with acute, severe, anterior thigh pain that prevented ambulation. He denied fevers, chills, numbness or paresthesia in this extremity. Two weeks prior to this presentation, he had experienced dysarthria, dizziness and right-sided visual defects that prompted MRI of the brain. This showed a ring-enhancing left parietal lobe mass with surrounding vasogenic oedema and restricted diffusion concerning for malignancy.

The patient was born in Korea and moved to the USA in his 30s. He had quit smoking 15 years prior, drank 2–3 alcoholic beverages per week and denied intravenous drug use.

On examination, his temperature was 37.1°C, heart rate was 92, blood pressure was 111/75 and oxygenation was 95% on room air. His examination was notable for mild swelling of his left thigh and extreme pain with palpation. Cranial nerve examination was normal and had no neurological deficits.

**INVESTIGATIONS**

A complete blood count showed a white cell count of 17.71 thousand/ $\mu$ L (normal 4.3–10 thousand/ $\mu$ L), C reactive protein (CRP) was elevated at 15.4 mg/L (normal <10 mg/L), creatine kinase (CK) was 147 units/L (normal 30–285 units/L), and glycated haemoglobin (HbA1C) was 8.3%. HIV antibody and antigen were non-reactive. Four sets

of blood cultures were negative. Venous duplex ultrasound was negative for deep vein thrombosis (DVT). MRI of the left leg showed enlarged lateral thigh muscles with high signal on fluid sensitive sequences. After the administration of gadolinium, the lateral thigh muscles showed diffuse enhancement except within a few central areas. These findings were suggestive of myositis with abscess formation in the left thigh. CT-guided biopsy of the left vastus lateralis muscle grew methicillin sensitive *Staphylococcus aureus* (MSSA) and pathology showed suppurative inflammation without evidence of neoplasm. A transthoracic echocardiogram was performed to assess for endocarditis; this showed normal left and right ventricular size and function and normal valves. A repeat brain MRI was unchanged from the prior MRI described above. As the aetiology of the brain mass remained unclear, a craniotomy was performed for resection of the mass. The pathology showed gliotic brain tissue overlying an abscess cavity containing mixed inflammation and bacteria; there was no evidence of malignancy. Bacterial cultures eventually grew MSSA.

**DIFFERENTIAL DIAGNOSIS**

The differential diagnosis for acute onset of leg pain without trauma in a patient with diabetes is broad. We initially considered cellulitis, DVT, ischaemia, polymyositis (both autoimmune and infection associated), radiculopathy/neuropathy, necrotising soft tissue infection (NSTI) and pyomyositis. Based on initial history and basic laboratory tests, DVT (due to the recent presumptive diagnosis of brain cancer) and NSTI (given the pain and leukocytosis) were thought to be the most likely diagnoses. However, MRI of the thigh narrowed the differential to infectious inflammation versus skeletal muscle necrosis, and a muscle biopsy confirmed the diagnosis of pyomyositis.

The identification of thigh pyomyositis promoted reconsideration of the radiographic diagnosis of presumed brain cancer.

**TREATMENT**

Initial empiric treatments included low-molecular-weight heparin for possible DVT and vancomycin, gentamicin, penicillin and ceftriaxone to target NSTI. Once the thigh biopsy result returned positive for MSSA, the antibiotics were narrowed to ceftriaxone alone and therapeutic anticoagulation was stopped.

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### OUTCOME AND FOLLOW-UP

The patient was discharged home with a peripherally inserted central catheter to complete 6 weeks of intravenous ceftriaxone. His thigh pain decreased and he regained the ability to ambulate with the aid of on-going physical therapy. After completion of the antibiotic course, his CRP returned to normal and he returned to his premorbid functional status.

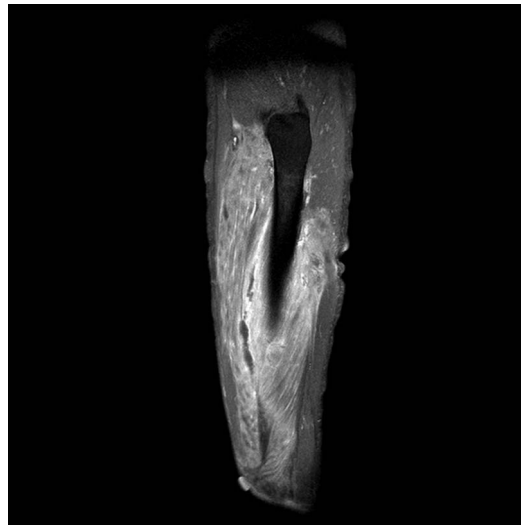
### DISCUSSION

Pyomyositis is an infection of the skeletal muscle usually arising from haematogenous spread. It is frequently seen in bulky muscular groups such as the quadriceps, gluteal muscles and iliopsoas. The most common causative organism is *S aureus*.<sup>1 2</sup> Although common in tropical countries, pyomyositis is increasingly recognised in temperate conditions. There have been more than 45 cases of pyomyositis reported in diabetic patients in temperate climates; all but two cases were caused by *S aureus*.<sup>3–10</sup> Brain abscess associated with pyomyositis has been less frequently reported; to our knowledge this has been reported five times in tropical climates and never in temperate climates.<sup>11 12</sup>

Risk factors for pyomyositis include trauma, poor nutrition, immunosuppression, HIV infection, diabetes, malignancy, rheumatological disease and cirrhosis.<sup>1 2 13</sup> In temperate conditions the most salient risk factors appear to be HIV infection, malignancy, diabetes and steroid use.<sup>1 2 14 15</sup> It has been postulated that diabetics are at increased risk of this syndrome due to impaired immunity, increased colonisation with *S aureus* and spontaneous muscle infarction due to atherosclerosis.<sup>16</sup>

The diagnosis of pyomyositis can be challenging. CK may not be elevated as one would expect; this lack of CK elevation was seen in our patient.<sup>13</sup> Furthermore, the microbiological diagnosis of pyomyositis can be difficult without biopsy as bacteraemia is present in only about 25–35% of patients.<sup>2</sup>

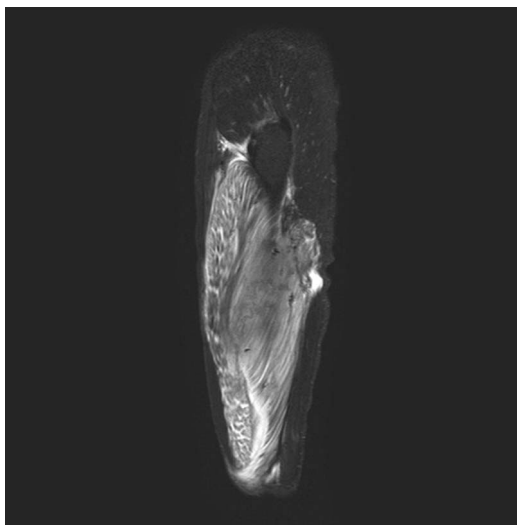
MRI is the most sensitive imaging modality for pyomyositis as there are specific T1 and T2 findings. As described by Soler *et al*,<sup>17</sup> MRI findings in pyomyositis can include increased signal intensity on T2-weighted or short T1 inversion recovery images suggesting muscle inflammation and oedema (figure 1). Our patient had similar findings on MRI (figure 2). In early pyomyositis, leukocytosis and elevated inflammatory markers may not be seen and symptoms can be non-specific, making imaging



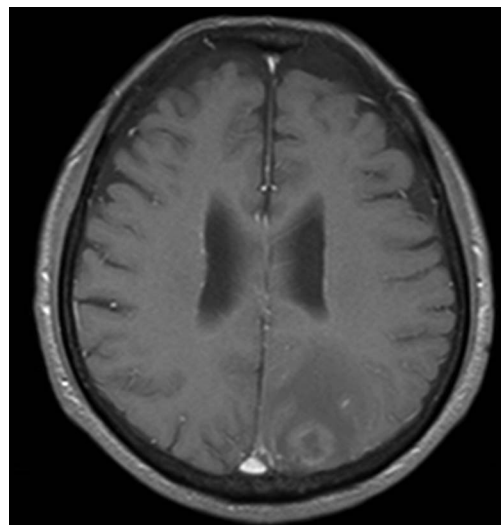
**Figure 2** T1 postcontrast MRI of the femur showing thigh inflammation and abscess formation.

essential for the diagnosis.<sup>2 18</sup> Antibiotics alone are usually sufficient for cure in early stage pyomyositis, but in advanced stages surgery is often required for drainage and debridement.<sup>2 9</sup>

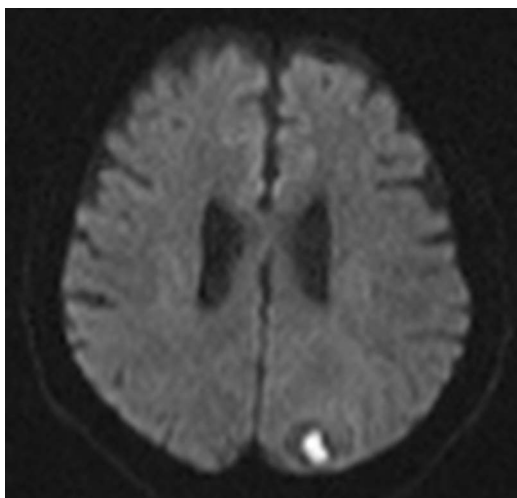
Disseminated suppurative *Staphylococcus* infection can be associated with pyomyositis. Our patient had a brain lesion that was initially felt to be most consistent with malignancy. Both brain abscesses and neoplasms appear as ring-enhancing masses on MRI (figure 3); however, diffusion-weighted imaging (DWI) and apparent diffusion coefficient (ADC) calculations can help differentiate between the two. When water molecules are restricted in their motion due to a pathological process, the imaging is bright or hyperintense on DWI. Brain abscesses most often are hyperintense on DWI with low ADC scores and neoplasm are hypointense or isointense with high ADC scores.<sup>19</sup> In our patient, the MRI showed restriction diffusion and a bright lesion on DWI (the ADC was not calculated; figure 4), but it was only after the mass was resected that the diagnosis of abscess was definitively performed.



**Figure 1** Short T1 inversion recovery MRI of the femur showing inflamed left lateral thigh muscles high-intensity signal.



**Figure 3** T1-weighted gadolinium-enhanced MRI of the brain showing a left parietal ring-enhancing lesion.



**Figure 4** Diffusion-weighted imaging MRI of the brain showing the brain abscess.

In summary, pyomyositis is a difficult disease to diagnose but should be suspected in immunosuppressed or patients with diabetes with pain in large muscles with or without signs and symptoms of infection or elevated markers of muscle damage. Imaging can be helpful in narrowing the differential diagnosis, but a biopsy is often needed to confirm the diagnosis and tailor treatment.

### Learning points

- ▶ Pyomyositis should be considered in patients with acute muscle pain especially when effecting bulky muscle groups (quadriceps, gluteus, iliopsoas).
- ▶ Patients with pyomyositis may be afebrile, have negative blood cultures and normal creatine kinase levels.
- ▶ Notable risk factors for pyomyositis in temperate areas include HIV, diabetes, malignancy and steroid use.
- ▶ MRI is often suggestive of pyomyositis; a biopsy is required to make a definitive diagnosis and tailor treatment.
- ▶ Clinicians should avoid anchoring on signed-out diagnoses which have not been proven.

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**Patient consent** Obtained.

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