



CASE REPORT

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Exercise-induced Staphylococcus Aureus Pyomyositis of the Shoulder and Septic Oligoarthritis of the Pelvis

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Introduction

Pyomyositis is an infection of large skeletal muscle groups that is typically spread by the hematogenous route and can lead to abscess formation. It is typically a condition of the tropical regions, although recognition of the condition in more temperate climates is increasing, where it is commonly preceded by a predisposing event such as immunodeficiency (particularly HIV), trauma, injection drug use, or concomitant infections. By contrast, cases of primary or spontaneous pyomyositis in otherwise healthy individuals are more predominant in tropical regions. Cases of exercise-induced pyomyositis have been reported sporadically in the literature; here, we report a case of exercise-induced pyomyositis in a middle-aged woman that manifested initially in the shoulder [1-7].

Case Presentation

A 49-year-old Caucasian female with a history of granulomatosis with polyangiitis in remission presented to the hospital with a two-week history of progressively worsening right upper extremity pain and swelling that was associated with limited range of motion in the right shoulder joint. She denied a history of IV drug use and intra-articular injections. She did not recall any form of trauma, abrasions, or insect bites. The patient reported that she has been in remission for granulomatosis with polyangiitis for over seven years and had not received any of her prior medications, rituximab, methotrexate, or corticosteroids since then. Initial outpatient evaluation including shoulder MRI was negative and she received an intramuscular gluteal NSAID injection in addition to a short course low dose oral corticosteroid

taper regimen; however, her pain worsened. The patient presented to the hospital and was found to have tachycardia and significant right shoulder erythema, swelling, tenderness, and painful range of motion. The patient also reported three episodes of fever with a maximum temperature of 102° F.

Lab tests showed leukocytosis of 16.9 X10E9/L [ref. range 4.8 - 10.8 X10E9/L] with left shift, procalcitonin of 0.20 ng/mL [ref. range <0.05 ng/mL], total CK 27 U/L [ref. range 24 - 170 U/L], ESR 101mm/h [ref. range 0 - 20 mm/h], and CRP 26.7 mg/dL [ref. range 0.000 - 0.744 mg/dL]. Initial right shoulder arthrocentesis was performed synovial fluid analysis was consistent with septic arthritis. It showed grossly purulent fluid, 67,3350 RBC/uL, 763,800 Nucleated cell/uL with 97% neutrophils, 1% lymphocytes and 2% macrophages and was negative for crystals. Repeat MRI of the shoulder (Figure-1) showed numerous abscesses involving the supraspinatus muscle, subacromial/subdeltoid bursa, and multiple abscesses along the humerus with concern for diaphysis osteomyelitis, and shoulder girdle, trapezius, latissimus dorsi, biceps, triceps myositis. Additionally, there was a right lung mass suspicious for the septic embolus. The patient subsequently had right hip pain and MRI (Figure-2) revealed early septic arthritis and anterior compartment myositis. Needle aspiration was suggestive of septic arthritis and negative for crystals (Table 1). The whole spine MRI was negative for infectious processes.

She underwent incision and drainage of both the right shoulder and right hip. Blood cultures and intraoperative deep tissue cultures grew methicillin-susceptible Staphylococcus aureus (MSSA) (Table 2). AFB smear and anaerobic cultures were negative. Trans-esophageal echocardiogram was negative for valvular vegetations.

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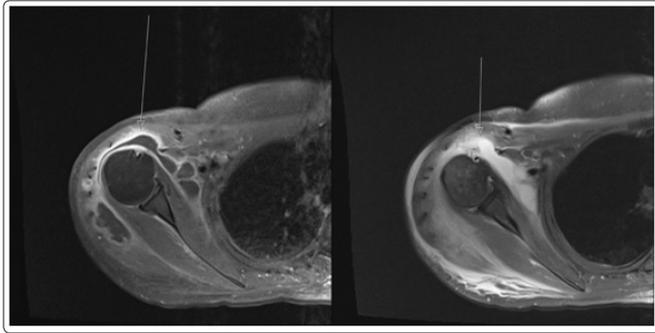


Figure 1: MRI axial views of the right humerus showing diffusely abnormal enhancement indicative of abscesses along the humerus and surrounding skeletal muscles.

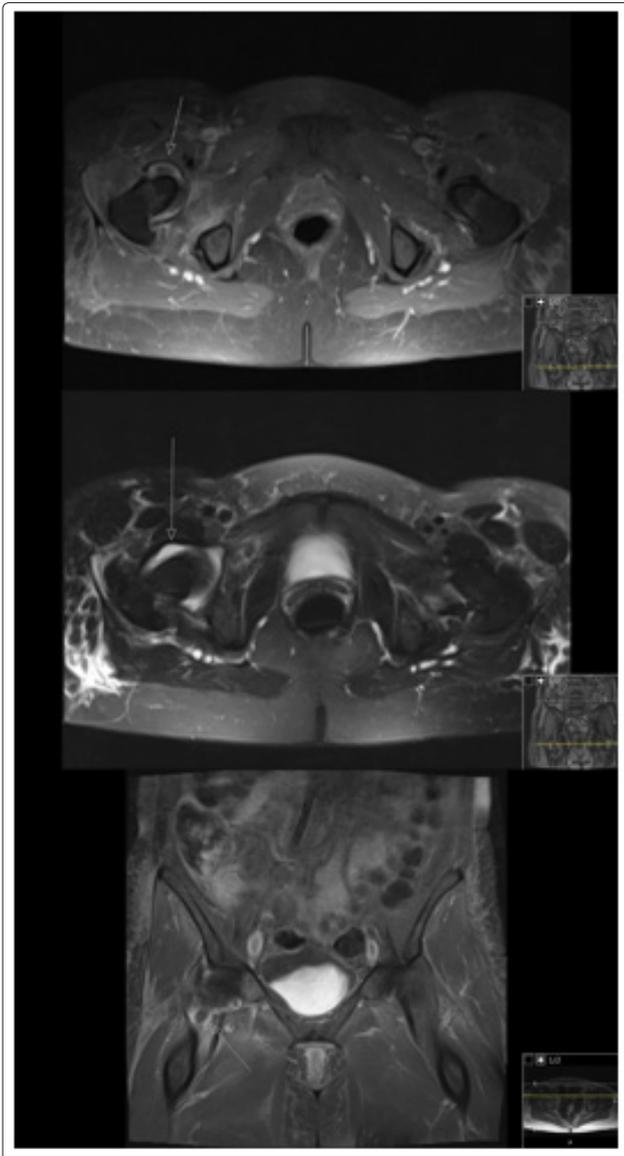


Figure 2: MRI axial and frontal views of the pelvis showing bilateral diffuse soft tissue edema along with anterior compartment myositis, with the right side more severely affected.

Table 1

Component	Right shoulder needle aspirate	Right hip needle aspirate
Specimen type	ASPIRATE	ASPIRATE
Fluid neutrophils %	97	98
Fluid lymphocyte %	1	0
Macrophages %	2	2
Fluid color	RED	STRAW
Fluid clarity	GROSSLY PURULENT	CLOUDY
Fluid RBC /uL	673350	8390
Nucleated cell ct / uL	763800	28364

Table 2

Susceptibility		
Staphylococcus Aureus ZZ00	MIC value (ug/ml)	Interpretation
Cefazolin		SSD
Clindamycin	0.25	SS
Daptomycin	0.5	SS
Doxycycline	<=0.5	SS
Erythromycin	<=0.25	SS
Gentamicin	<=0.5	SS
Oxacillin	0.5	SS
TRIMETH/ SULFAMETHOXAZOLE	<=.5/9.5	SS
Vancomycin	1	SS
Cefazolin		SSD
SS: susceptible, SSD: susceptibility deduced		

Further evaluation to reveal potential risk factors and predisposing behaviors included evaluation by rheumatology. Additionally, she tested negative for HIV 1&2. Upon detailed personal and social history taking, we learned that the patient had recently started a new exercise program that included weightlifting and running.

The patient was treated with intravenous daptomycin due to her multiple antibiotic allergies with plans to be ultimately transitioned to oral doxycycline for suppressive therapy.

Discussion

Originally described in 1885 by Scriba in Japan, pyomyositis is an infection of the large skeletal muscle groups, often resulting in abscess formation [8]. The quadriceps, gluteal, and iliopsoas muscles, respectively, are the most commonly affected [3]. The disease affects males more often than females by approximately a 3:1 ratio and has been reported in patients of all ages, although it is more common among the pediatric population [2,3,9]. Staphylococcus aureus is identified as the causative agent in the majority of pyomyositis cases but other pathogens, including Gram-negative bacteria and polymicrobial infections, have also been reported [4]. Three distinct, progressive stages of the disease are described, starting with the invasive stage which

is characterized by muscle pain and swelling, the suppurative stage characterized by abscess formation 10-21 days later, and potential progression to disseminated disease in the form of metastatic abscesses and septic shock [4].

Naturally, the presence of a soft tissue abscess prompts the clinician to determine its etiology. The development of cellulitis and/or soft tissue abscess is classically associated with risk factors such as trauma, ulcers, inflammation, obesity, diabetes, lymphedema, venous insufficiency, IV drug use, or prior history of skin infections. However, our patient had none of these common risk factors and was otherwise healthy except for a history of granulomatosis with polyangiitis (GPA) in remission. Although cases of pyomyositis in the setting of the active rheumatological disease have been reported, our patient had been symptom-free and off medication for GPA for over seven years [10-15].

The patient's recent medical history was otherwise significant only for the initiation of a combined aerobic and endurance-based exercise program that involved both running and weightlifting; she had just started weightlifting two weeks before the onset of symptoms. A history of exercise or trauma to a muscle before the development of primary pyomyositis is not uncommon, although the exact mechanism of exercise-induced pyomyositis remains unclear [4-7,9]. It is posited that injured muscle tissue provides a nidus for infection which progresses to bacteremia, further seeding the injured muscle tissue [5]. Mouse experiments performed by Miyake in the early 1900s, not to mention our own patient's history of arm exercise, also support the hypothesis that muscle injury is necessary for the development of pyomyositis and specifically muscle abscess formation. However, taking into account the relatively common incidence of injuries to the local extremities and the relatively rarity of pyomyositis, there is debate as to whether muscle trauma is truly a causative factor for pyomyositis [3-16].

Previously reported cases of exercise-induced pyomyositis involved only lower extremity muscles. To the best of the authors' knowledge, this is the first report of exercise-induced pyomyositis of the shoulder involving supraspinatus, trapezius, deltoid, latissimus dorsi, biceps, triceps, and infraspinatus muscles with subdeltoid bursitis [5-7]. Although rare in temperate climates, pyomyositis should be kept on the differential for any patient presenting with localized muscle/soft tissue pain and edema along with signs of infection. The clinical picture of common ailments following exercise such as muscle strain and joint sprains, as well as chronic degenerative diseases such as osteoarthritis often overlaps with that of the initial onset of exercise-induced pyomyositis. Further investigation in the form of basic research, case reports, and clinical observations is necessary to delineate the pathophysiology of this condition and identify its natural course and susceptible populations. Left untreated, pyomyositis can progress to life-threatening systemic infection in the form of bacteremia and sepsis. Early and aggressive treatment, including antibiotics and surgical drainage, is critical to ensure good patient outcomes.

Conclusion

Pyomyositis is typically an infection of the tropical regions and is rare in temperate regions where it is usually preceded by a predisposing event such as immunodeficiency, trauma, injection drug use, or concomitant infections. Vigorous exercise has also

been proposed as a predisposing factor to pyomyositis, and as such a history of vigorous exercise should raise suspicion for this condition and prompt close monitoring with further investigation. Reports of pyomyositis in temperate climates are relatively scarce, making the diagnosis challenging even though timely recognition and initiation of treatment are critical to prevent life-threatening complications such as sepsis or limb loss.

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