Tropical pyomyositis with *S. aureus* bacteremia in a patient with newly diagnosed diabetes mellitus type 2 who presented with muscle weakness and rhabdomyolysis

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ABSTRACT

Background: Pyomyositis is a medical condition characterized by pus collection and abscess formation within the skeletal muscles. There are two main loci, where pyomyositis develops; tropic regions that primarily occur in healthy children along with temperate areas, where the affected population is primarily immunocompromised adults. The most common predisposing factor is any state of immunodeficiency. The most common cause of pyomyositis is *Staphylococcus aureus* (*S. aureus*). The classic clinical presentation of the disease is cramping muscle pain accompanied by fever. The anatomical parts most commonly affected are the lower extremities. Complications include pericarditis, endocarditis, septic emboli, and even rhabdomyolysis. Cultures of drainage specimens and radiographic imaging point to the correct diagnosis. Antibiotic coverage and drainage of purulent material are the treatments of choice.

Case presentation: Herein, we cite a case of an 82-year-old male patient with pyomyositis, *S. aureus* bacteremia, and a newly diagnosed type 2 diabetes mellitus, who had presented with muscle weakness complicated by rhabdomyolysis.

Conclusion: Diabetes mellitus may be the substrate for the development of pyomyositis.

Keywords: Pyomyositis, *Staphylococcus aureus*, muscle tenderness, type 2 diabetes mellitus, antibiotics, surgical drainage.

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Introduction

Muscle weakness can be a feature of various medical conditions [1]. A distinctive cause can be an infection, which takes place within the skeletal muscles, and this is called pyomyositis [1,2]. As already mentioned, the incidence of pyomyositis is increased in tropical areas, while it is now highly emerging in regions with temperate climates due to the emergence of human immunodeficiency virus (HIV) infection [3]. Patients who live at temperate climates are almost always immunocompromised and are being treated either for hematologic malignancies, diabetes mellitus type 2, or HIV. Subjects with cirrhosis, renal failure, and organ transplant recipients are also at very high risk [4]. Trauma, intravenous (I/V) drug abuse, and any kind of skin infection are also predisposing factors for pyomyositis [4]. Not only viruses but bacteria (including mycobacteria) and less commonly, fungi and parasites have also been implicated. The most common pathogen is *S. aureus*, while methicillin-resistant species are now emerging. Other species that do secondary follow are Group A Beta-hemolytic Streptococci, *Escherichia coli*, and various mycobacteria [2]. Characteristically, polymicrobial species do cause infectious myositis in patients with diabetes mellitus. The presentation escalates through different stages; initially, the patient presents with low-grade fever, muscle tenderness, and leukocytosis, while 10–21 days after the onset of symptoms, edema and abscess formation develops. Here is the decisive part, where drainage of the abscess is mandatory in order to simmer down the inflammation. Pus is usually drained and should be sent for culture and sensitivity. Susceptibility testing is essential to direct antimicrobial therapy. If the aforementioned treatment is delayed, then systemic toxicity may result due to bacteremia. End-organ damage may result and fatality rate can reach up to 20% [5,6]. In this case report, an 82-year-old male patient with type 2 diabetes mellitus, who developed muscle weakness and rhabdomyolysis from *S. aureus* bacteremia is being presented.

Case Presentation

An 82-year-old Caucasian male presented to the hospital with fatigue, gait instability, muscle weakness and tenderness (Grade 2; a complete range of motion with gravity eliminated), which was more pronounced in the lower extremities than the upper part and the trunk. His past medical history is significant for hypertension, chronic kidney

disease stage IIIb; (estimated glomerular filtration rate: 44.2 ml/minute/1.73m², and his baseline creatinine levels were up to 1.5–1.6 mg/dl) and hypertriglyceridemia. His current medications were an angiotensin receptor blocker and gemfibrozil. Upon the arrival at the hospital, his vital signs were as follows: blood pressure 120 mmHg over 60 mmHg, SaO2 96% (on room air), heart rate 78 bpm, and temperature of 37°C. The patient was right-handed, alert, attentive, and oriented (Glasgow coma scale 15/15). Cranial nerves were intact. Muscle tone and strength were reduced. Deep tendon reflexes were also diminished (Grade 1+) and the plantar responses were flexors bilaterally. Sensory system and cerebellar function were intact. Romberg was negative. However, gait was unsteady with abnormal steps and turning. The musculoskeletal exam was normal since joints had no limited range of motion and there was no palpable nodule on the skin. Head and neck examination were normal. The thyroid was not palpable and no lymphadenopathy was noted. On cardiac auscultation, no murmurs or gallops were noted and the jugular venous pressure was normal. Lung auscultation was normal and abdominal examination revealed no pathological findings. The laboratory findings were as follows: white blood cell count: 19.430 (4–10.5×10^3), erythrocyte sedimentation rate: 61 mm/hour (0–20mm/hour), urea: 64 mg/dl (10–50 mg/dl), creatinine: 2.5 mg/dl (0.6–1.4 mg/dl), lactate dehydrogenase: 220 IU/l (0–225 IU/l), creatinine phosphokinase (CPK): 2,565 U/l (10–173 IU/l), high-sensitive C-reactive protein (hs-CRP): 31 mg/dl (0–0.5 mg/dl), glucose (GLU): 250 mg/dl (70–110 mg/dl), phosphate: 2.2 mg/dl (2.5–5 mg/dl), and hemoglobin A1C: 7.8% (3%–6%). Thyroid, liver function tests, creatinine kinase-muscle brain, and all the bone parameters were within the reference range. Computed tomography (CT) of the head, and the results of the lumbar puncture, done in the emergency setting, were absolutely normal. CT of the cervical and thoracic spine, as advised by the neurologist to exclude threatened spinal cord lesions, was also unyielding. Chest X-ray and electrocardiogram were normal

The patient was admitted to the hospital and received I/V fluids and empiric antibiotic treatment with piperacillin-tazobactam. Detailed radiological studies, such as magnetic resonance (MRI) of the cervical and thoracic spine and bone scanning excluded spondylodiscitis. After fluid administration, antibiotic coverage, and discontinuation of gemfibrozil, the patient felt better, the fever subsided, and his muscle weakness and tenderness got improved (Grade 4, a complete range of motion against gravity with some resistance) in the fourth day of hospitalization. Specifically, inflammatory markers were decreased; hs-CRP: 8 mg/dl (0–0.5 mg/dl), while his renal function returned to the baseline level. However, after 3 days, he developed a mild fever and the inflammatory markers began to rise again; hs-CRP: 20 mg/dl (0–0.5 mg/dl). Three sets of blood cultures were sent and they were positive for methicillin-sensitive *S. aureus*. His antibiotic regimen was changed to ciprofloxacin, according to the susceptibility testing results. Transthoracic echocardiogram and transesophageal echocardiogram did not reveal vegetations and thus endocarditis was immediately excluded. Considering the fact that the patient was still suffering from muscle tenderness, muscle biopsy of the quadriceps was ordered and the histopathological findings were compatible with infectious myositis or pyomyositis (Figure 1). Positron emission tomography scan showed hypodense lesions with abscess formation at the gluteal and femoral muscle area, both right and left areas (Figure 2). Aspiration of the cystic lesion at the lower third of quadriceps (around 40 ml), under ultrasound guidance revealed pus; the result of the culture was positive for MSSA. Temporary arrow for continued pus drainage was placed.

At the end of his hospitalization (20th day), the patient had an excellent clinical outcome; two new blood cultures were negative, his muscle weakness and tenderness improved efficaciously, and the inflammatory markers along with CPK returned back to normal levels. His serum GLU levels were pretty controlled (serum GLU: 105 mg/dl) during the hospitalization after receiving insulin therapy. Thus, the patient was discharged on oral ciprofloxacin and clindamycin for 1-week period, for the completion of pyomyositis therapy. In addition, he was prescribed with a dipeptidyl peptidase-4 inhibitor for his diabetes. The patient returned at the outpatient setting for follow-up after 15 days. He had no complaints; his vital signs were stable, the serum GLU was within the normal range and his muscle tone and strength were normal (Grade 5; a complete range of motion against gravity with full resistance).

Discussion

Pyomyositis is an infection of any of the skeletal muscle. It is more common in the tropical zone, and that's why it is also called tropic pyomyositis. Nowadays, it is emerging in regions having a temperate climate [1,2]. In the temperate areas, subjects who are consistently suffering from pyomyositis are immunocompromised. HIV infection, diabetes mellitus, malignancy, cirrhosis, end-stage renal failure, and organ transplantation are the main predisposing factors. The pathogenesis of pyomyositis is multifactorial [3]. Transient bacteremia with concomitant muscle damage may be a causative factor. Diabetes mellitus is an essential contributing factor to pyomyositis since it predisposes the skeletal muscle to damage and increases the susceptibility to a number of infections [4]. It is well established that the incidence of the combination of diabetes and pyomyositis has increased from 8% to 31% in some cases. The muscles of the pelvic girdle and those of the lower extremities are the groups that are more commonly affected. The notorious bacterium that is most implicated in the pathogenesis of pyomyositis is *S. aureus*. Nonetheless, *Streptococcus pyogenes,*

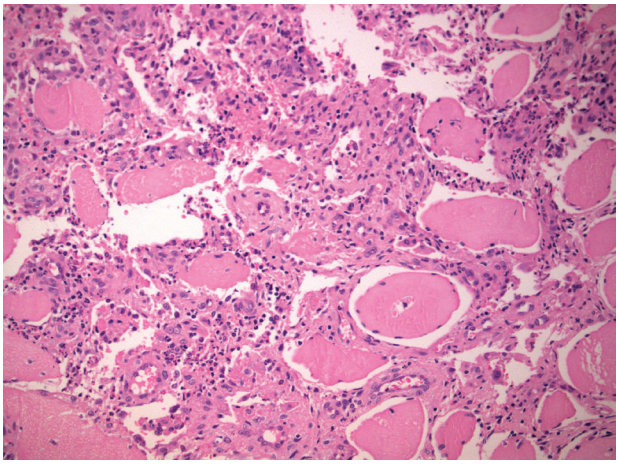

***Figure 1**. Intense acute inflammatory cells infiltrate between muscle fibers.*

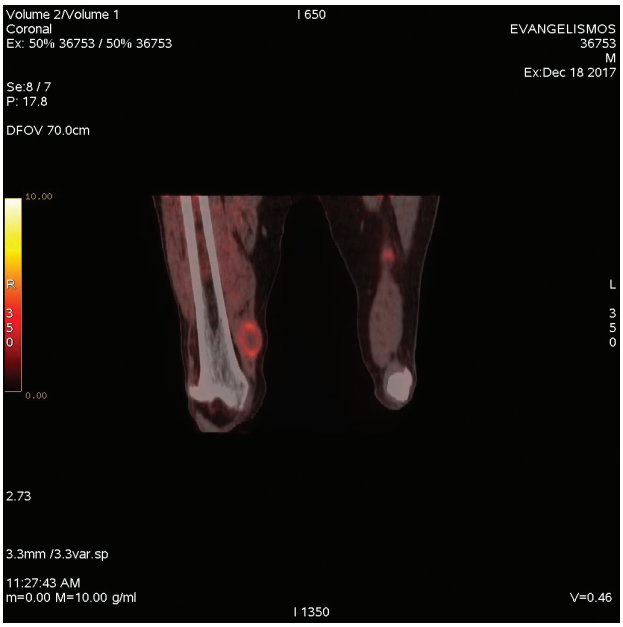

***Figure 2**. PET-SCAN image of a hypodense lesion with abscess formation at the right lower femoral muscle area.*

Streptococcus pneumoniae, Escherischia coli, mycobacteria, and Gram-negative bacteria have been incriminated to a lesser extent [6].

Tropical pyomyositis is characterized by three different clinical stages. Initially, low-grade fever and muscle tenderness in the affected area (Stage 1) are mentioned. After 10 to 20 days, it progresses to stage 2, where abscess formation is characteristic. Herein, the high-grade fever and exquisite muscle tenderness are unique. Drainage of the abscess displays pus. If left untreated, systemic manifestations, toxicity, and septic shock define the third stage [5].

Laboratory findings are nonspecific, with elevated inflammatory markers and variable levels of muscle enzyme levels. Blood cultures may be positive in 20%–50% of cases. MRI is the imaging modality of choice, by which diffuse muscle inflammation and abscess formation may be demonstrated [4]. Yet, CT and ultrasonography are helpful in localizing intramuscular abscesses and guiding needle aspiration [2].

The treatment consists of I/V antibiotics alone during the initial stage. Since *S. aureus* is the most common pathogen, antibiotic coverage should be directed against staphylococci. Nonetheless, immunocompromised individuals should be treated for Gram-positive, Gram-negative, and anaerobes. Abscess formation, however, requires surgical drainage and culture of pus. Antibiotic treatment regimen is adapted according to antibiotic sensitivities [5].

Our patient presented with *S. aureus* pyomyositis, which was the first manifestation of diabetes mellitus type 2 in this patient.

Conclusion

In conclusion, subjects with diabetes, high-grade fever, and muscle tenderness should be evaluated for the suspicion of pyomyositis. MRI is the diagnostic modality of choice that identifies the loci of inflammation and sequentially surgical drainage may follow. Favorable treatment requires not only appropriate use of antibiotic therapy but drainage of the affected tissues as well.

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List of abbreviations

CPK	Creatinine phosphokinase
CT	Computed tomography
HIV	Human immunodeficiency virus
hs-CRP	high-sensitive C- reactive protein
I/V	Intravenous
MRI	Magnetic resonance imaging

Consent for publication

Informed consent of parents was taken to report this case.

Ethical approval

Not applicable.

Author details

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Summary of the case

Patient (gender, age)	1	82-year-old man
Final diagnosis	2	Tropic pyomyositis
Symptoms	3	Instability due to muscle weakness
Medications	4	Ciprofloxacin
Clinical Procedure	5	Pus drainage and culture of the pus
Specialty	6	Internal Medicine