

Pyomyositis; A Rare but Dangerous Adverse Effect of Anabolic Steroids

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1. Summary

Pyomyositis is an acute bacterial infection of soft tissue and results in intramuscular localized abscess formation. Anabolic steroid injections are frequently used by athletes in recent years despite their well-documented adverse effects. Pyomyositis is one of their infrequently reported side effects.

We would like to present a previously healthy young gentleman who was admitted with left upper arm pyomyositis secondary to intramuscular anabolic steroid injections. He was treated with intravenous antibiotics and underwent examination under anesthesia, and surgical drainage of the suspected infection.

Anabolic steroid injections have been associated with pyomyositis. We would like to emphasize that early diagnosis and prompt treatment of this rare complication are crucial steps to reduce its associated mortality and morbidities.

2. Background

Pyomyositis is an acute bacterial infection of soft tissue that often arises from hematogenous spread and results in intramuscular localized abscess formation [1].

It has been associated with three clinical stages and limb or life-threatening complications including tissue necrosis, septic shock, and various cardiac complications.

Staphylococcus Aureus is the predominant causative organism of pyomyositis, followed by Methicillin-resistant S. aureus (MRSA). The term “tropical pyomyositis” refers to this infection, which is very prevalent in tropical nations. It has also been linked with temperate climates, trauma, malnutrition, immunodeficiency such as

HIV, diabetes mellitus, malignancy, liver or renal insufficiency and organ transplantation [2].

For the diagnosis of pyomyositis, Magnetic Resonance Imaging (MRI) scan and Ultrasound Scan (USS) have been the most useful tools, whilst specimen and blood cultures guide antimicrobial therapy [3].

Recreational intravenous and intramuscular drug use is a recognised risk factor for pyomyositis resulting in either “true” pyomyositis which is caused by haematogenous spread of bacteria distant from the injection entry or in local infection at the injection site and abscess extension along the muscular planes [4].

Steroids have been used intramuscularly in recent years to increase muscle mass and strength. Anabolic-androgenic drugs, also known as steroids, replicate the effects of the male hormone testosterone and they can speed up the healing process following exercises while simultaneously promoting muscular growth.

A small number of cases of pyomyositis secondary to anabolic steroid injections have been documented. The majority of the reported cases have developed polymyositis in the lower limbs and gluteal regions and they have been treated with antibiotics and drainage of the suspected infection.

Hereon in, we present a case of a previously healthy 27-year-old gentleman who developed left upper arm pyomyositis secondary to intramuscular anabolic steroid injections. The aim of this study is to highlight a rare adverse effect from these substances and emphasize the importance of immediate intervention in such cases.

3. Case Presentation

A gentleman in his late 20's with no previous past medical history was admitted with a five-day history of increasing pain, swelling and erythema of his left arm. He last self-administered the steroid into his left deltoid five days prior to admission. The patient reported an onset of mild swelling just hours following administration. On arrival to our hospital, he was seen in the resuscitation bay of the emergency department clinically septic. The left arm was grossly tense swollen and erythematous from the proximal part of the upper arm to the fingertips (Figure 1), but there was no any neurovascular deficit. Laboratory findings revealed hyponatremia, leukocytosis, neutrophilia and elevation of C-Reactive Protein (CRP). Following initial resuscitated, an MRI scan was performed and demonstrated diffuse soft tissue oedema of the left upper arm along with subcutaneous oedema and swelling. The MRI findings correlated to clinical suspicion of pyomyositis.

Ongoing resuscitation continued before shortly proceeding with surgical debridement. A two incisional approach was taken. The superolateral incision extended along the lateral arm down into between biceps and brachialis muscles revealed frank pus between the long head of the biceps and up to the deltoid (Figure 2). Additionally, numerous locules of pus were noted in the deltoid muscle. The inferomedial incision over the medial surface of the arm showed no clinical evidence of collection.

Both incisions were washed with iodine solution and normal saline, left open and dressed with mepitel dressings, betadine-soaked gauzes, velband and crepe.

Post-operatively, the patient continued to be tachypneic, hypotensive and tachycardic. He was taken to ITU for ongoing resuscitation and monitoring, prior to a second look 48 hours later. Further pus was drained from the prior inferomedial incisional scar.

Staphylococcus aureus was grown on the culture of the specimen that had been drained. Microbiology guidance to sensitivities suggested co-amoxiclav and clindamycin intravenously. The patient's clinical condition improved after the second review. He underwent a third re-look where a small amount of necrotic muscle and subcutaneous tissue were debrided.

The patient was discharged three days later and brought back to the clinic for wound assessment. When the wounds were deemed healthy enough for reconstruction, closure of the wound sites with split-thickness skin graft was performed 40 days following discharge.



Figure 1: Initial Findings of Pyomyositis

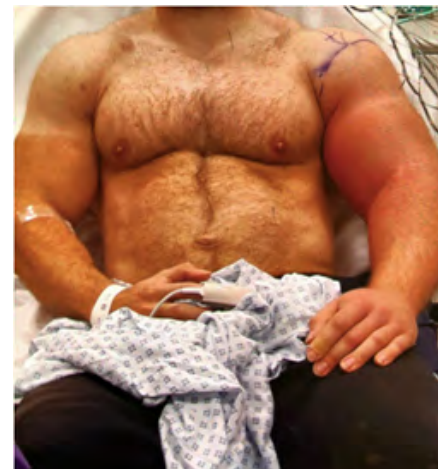


Figure 2: Superolateral Incision Between Biceps and Brachialis Muscles

4. Discussion

Pyomyositis is a purulent infection of skeletal muscles. It has been associated with three clinical stages.

Stage 1: Initial stage, characterized by low grade fever, local cramping muscle pain and mild leukocytosis. The affected muscle may have a “woody” texture on palpation.

Stage 2: It occurs 10 to 21 days after the initial onset of symptoms. It is characterized by fever, exquisite muscle tenderness, and oedema. Leukocytosis and a clinically apparent frank abscess can be present.

Stage 3: It is the final stage and characterized by systematic toxicity. Several complications have been reported during this stage including septic shock, endocarditis, septic emboli, pneumonia, pericarditis, septic arthritis, brain abscess, acute renal failure and rhabdomyolysis [5].

Anabolic steroids (also referred to as androgenic steroids) are synthetic derivatives of testosterone. Male sex organ development and maintenance, as well as growth of secondary sex characteristics,

are attributed to endogenous androgen. In skeletal muscle, anabolic steroids regulate the transcription of target genes which in turn control the accumulation of DNA in muscle tissue necessary for muscle growth [6].

In recent years, both their legal and illegal use have been increased significantly. Despite having a number of well-documented adverse effects, they have been a common supplement for many bodybuilding athletes.

Coronary heart disease, cardiomyopathy, hypertension, hyperlipidemia, gastrointestinal hemorrhage, testicular atrophy, hypogonadism, prostate carcinoma, abnormal bone growth, and hemarthrosis are a few of the serious side effects of anabolic steroids. Pyomyositis is one of their rare adverse effects and only few cases have been reported [7-10]. Most cases have developed polymyositis in the lower limbs and gluteal regions, whilst only few cases have been reported with associated symptoms in the upper limbs [11]. MRI and USS were the main diagnostic tools whereas the management was based on antibiotics and drainage of the suspected infection.

Pyomyositis is diagnosed clinically, and imaging tests only serve to support the diagnosis.

Tools for diagnosis – Radiographic imaging has been the optimal diagnostic tool, supported by cultures and laboratory data. While ultrasound scan can identify soft tissue collections, and Computed Tomography scan can detect oedema and abscess formation, Magnetic Resonance Imaging is even more sensitive and has traditionally been the modality of choice in these situations. Drainage specimen cultures facilitate bacteriologic diagnosis and prompt therapeutic intervention. Laboratory studies consist an additional adjunct diagnostic tool. The most frequent findings are leukocytosis with left shift and elevation of the inflammatory markers.

Serum creatine kinase (CK) is usually normal and blood culture results are positive in less than 50% of cases [12].

In our case, blood cultures were negative whilst CK levels were significantly elevated 2,743 (normal range 40-320 U/L). Additionally, the most frequent causative organism, *Staphylococcus aureus*, was identified in our case as well.

Pyomyositis stage 1 is treated solely with the use of antibiotics whereas both antibiotics and drainage are required for the definitive management of pyomyositis stage 2 or 3. Our case is one of the few instances of persistent pyomyositis that required multiple surgical washouts and debridements. In addition to antibiotics and surgery, other treatments may include: pain management to control pain, resting the affected muscle to allow it to heal, and physical therapy to help regain strength and range of motion in the muscle once the infection has resolved.

Pyomyositis has been linked to a number of cardiac complications, as well as metastatic abscesses, septic shock and renal failure [13-15].

5. Conclusion

Anabolic steroid injections which are commonly used by athletes have been associated with several adverse effects. Pyomyositis is one of their rare complications and we would like to emphasize that early diagnosis and prompt treatment are crucial steps to reduce its associated mortality and morbidities.

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