CHAPTER 19
PYOMYOSITIS

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Introduction

Pyomyositis is a primary acute bacterial infection of skeletal muscles associated with abscess formation. The use of the term "tropical pyomyositis" should be restricted to primary muscle abscess arising de novo. It should not be used to describe intermuscular abscess; abscess extending into muscles from adjoining tissues, such as bone or subcutaneous tissues; or abscess secondary to septicaemia.

Pyomyositis is predominantly experienced in the tropics and relatively low-income countries, but it can also occur in temperate and developed countries. Zur first described the condition in 1885 as an endemic disease in the tropics;[1] since then, there have been reports from tropical as well as temperate regions.[2–11]

Demographics

Pyomyositis is common among children in the tropics, accounting for 1–4% of all hospital admissions in some tropical countries[10,11] and 1 per 3,000 paediatric admissions in Southern Texas. In sub-Saharan Africa,[2] 70% of affected children are younger than 10 years of age and both sexes are equally affected. In another large report from sub-Saharan Africa,[3] 36% of all affected patients were children.

Although cases are seen throughout the year, maximum incidence has been noted during the rainy and wet monsoon season in India.[9]

Microbiology

Staphylococcus aureus is the most common primary causative pathogen. It is seen in up to 90% of cases in tropical areas and 75% of cases in temperate countries.[9,11] Group A streptococci account for another 1–5% of cases. Several other microorganisms implicated include streptococcus groups B, C, and G, *Pneumococcus, Salmonella, Escherichia coli*, *Neisseria*, *Haemophilus*, *Aeromonas*, *Serratia, Yersinia*, *Pseudomonas*, *Klebsiella*, *Citrobacter*, *Fusobacterium*, and *Mycobacterium*.

In tropical regions, pus cultures are sterile in 15–30% of cases[9] and 90–95% of patients also have sterile blood cultures, due largely to use of antibiotics before presentation. Blood cultures are positive in 20–30% of cases in temperate regions. Better microbiological culture techniques in the temperate regions may account for this difference.

Pathogenesis and Pathology

The precise pathogenesis of pyomyositis remains obscure. It is believed that staphylococcal bacteraemia and muscle damage are prerequisites for the clinical scenario. Skeletal muscle tissue is known to be intrinsically resistant to bacterial infection under normal circumstances, but it has been shown experimentally that if normal muscle is damaged, it becomes vulnerable to haematogenous invasion by bacteria, with subsequent abscess formation.[12]

A number of conditions predispose to skeletal muscle damage. These include trauma, nutritional deficiencies, immunosuppression, parasitic infestations, viral infections, and intravenous drug abuse.

In one report involving adults with pyomyositis,[13] serum immunoglobin M (IgM) level was found to be significantly lower, and mean levels of IgG and IgA significantly higher, than in controls. Complement levels were normal. This prompted the proposition that defects of opsonising and complement fixing IgM antibodies against microorganisms are implicated in the aetiology of pyomyositis, at least in adults.

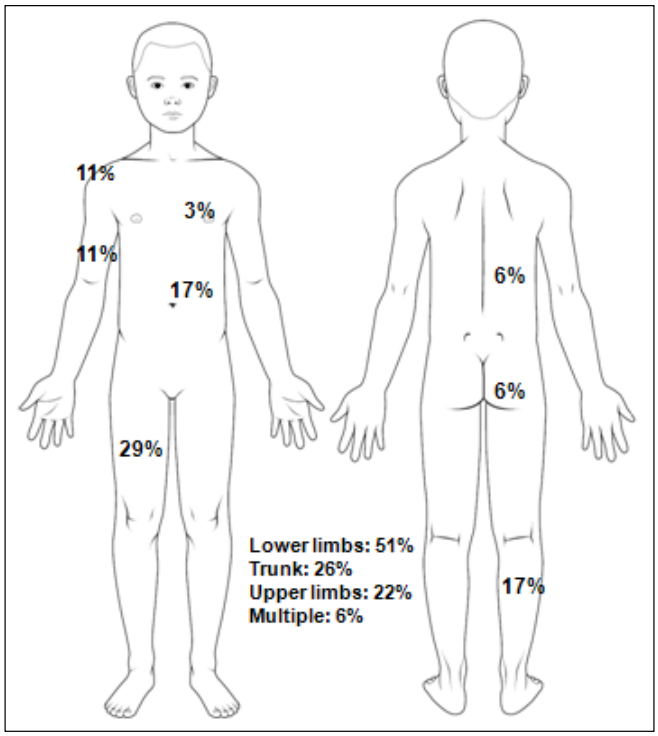
Human immunodeficiency virus (HIV) infection may have led to an increasing incidence of pyomyositis in areas with a high prevalence of HIV infection;[14,15] this is now thought to be an important predisposing factor in the aetiopathogenesis of pyomyositis.

Although the classical presentation is with muscle abscess, the hallmark of the disease is not an abscess but finding myositis in a biopsy specimen of involved muscle.

In the early stages of pyomyositis, muscles show oedematous separation of fibres, followed by patchy myocytolysis, progressing to complete disintegration. The fibres are surrounded by lymphocytes and plasma cells. Muscles fibres may heal without abscess formation or degenerate, progressing to suppuration with bacteria and polymorphonuclear leucocytes.

Clinical Presentation

The large muscles of the lower limbs and trunk are particularly prone to involvement, but small muscles, such as those of the orbit may rarely be involved. Commonly affected muscle groups are shown in Figure 19.1.[2]



Source: Drawing of child taken from http://images.medscape.com/pi/features/ald/fb/fbc-ap.pdf.

Figure 19.1: Distribution of pyomyositis at 35 sites in African children.

Rarely, pyomyositis can present with acute fever and chills, also with toxic shock syndrome or pyrexia of unknown origin. It may present as an acute abdomen or spinal compression or compartment syndrome, depending on the anatomic location of the affected muscle. It has been reported that about 5% of patients present in this stage.[3]

In children younger than 5 years of age, when the lower limb is affected the main complaint on presentation may be that of an inability or refusal to walk.

In the tropics, the abscess is usually solitary,[9] but multiple abscesses may be seen in some patients. The clinical manifestations in both tropical and nontropical pyomyositis are similar and can be categorised in three stages: invasive, suppurative, and late or septic[3] (Table 19.1).

Table 19.1: Clinical stages of pyomyositis.

Clinical stage	Features
Invasive	Duration of symptoms <10 days Pain in affected muscle Low-grade fever Wooden or hard stiffness on palpation of muscle Mild leucocytosis Needle aspiration negative for pus
Suppurative	Duration of symptoms 10–21 days Oedema Marked tenderness of affected muscle Pyrexia Leucocytosis Needle aspiration yields pus
Late or septic	Duration of symptoms >21 days Fluctuant swelling in muscle High-grade fever Severely ill Septicaemia Leucocytosis Needle aspiration yields pus

Invasive Stage

The invasive stage is characterised by an insidious onset of dull cramping pain, with or without fever and anorexia. There is localised oedema, which is indurated or woody but usually causes little or no tenderness and lasts for about a week. Only about 2% of all patients (both adults and children) present in this stage.[3]

Suppurative Stage

The suppurative stage occurs when a deep collection of pus has developed in the muscle, usually from the second to the third week of the infection. The patient may complain of fever with chills. The overlying skin is mildly erythematous, and the swelling is fluctuant. Leucocytosis may be present, with elevated erythrocyte sedimentation rate (ESR) or C-reactive protein (CRP). A needle aspiration test is usually productive of pus. A little more than 90% of patients seen in sub-Saharan Africa[3] would typically present in this stage.

Late or Septic Stage

If the abscess remains untreated, dissemination of infection occurs. Bacteraemia, septicaemia, septic shock, multiple organ dysfunction syndrome, and metastatic abscesses are some of the complications.

Investigations

Needle Aspiration

When the diagnosis of pyomyositis is suspected, particularly for patients presenting in the suppurative or late stages, the swelling should be aspirated with a large-bore needle (not smaller than 18 gauge) to confirm the presence of pus. The aspirated pus is usually yellowish in colour but may be brownish or blood-stained.

Microbiology

Any aspirated and/or drained pus should be cultured (aerobic and anaerobic). A biopsy of the abscess wall and/or muscle taken at time of open drainage should also be cultured. The culture should help to identify the bacteria involved in the pathology. Blood should also be cultured to identify any septicaemic process. A sensitivity test would be helpful in the choice of antibiotics, but this should not delay institution of antibiotic therapy.

Imaging

Early radiological evaluation is a key to diagnosis of pyomyositis when a high index of suspicion exists. Ultrasonography should be used first because it is inexpensive and widely available, without the disadvantage of delivering a relatively high radiation dose to children. It has been shown that early application of sonography to any suspected lesson can help to establish early diagnosis of pyomyositis.[16,17]

Ultrasound features in the muscle include:[16]

- muscle swelling;
- hypoechoic areas in the muscle belly;
- heterogenous hypoechoic areas; and
- hyperechoic areas.

Other advanced imaging techniques, such as magnetic resonance imaging (MRI), computed tomography (CT) scan, and radionuclide scanning, if available, could help in identifying occult muscle abscesses or multifocal involvement. MRI, due to its excellent soft tissue resolution properties, is particularly useful, especially in deeply sited muscles that are not readily accessible to clinical examination. MRI features of pyomyositis include the following.[18]

- The affected muscle may appear swollen, with loss of architectural definition.
- Heterogenous areas of low intensity appear on T1-weighted images.
- In the early stage, the only finding may be oedema (area of high signal intensity on fluid-sensitive sequences).

It has been noted that MRI with gadolinium enhancement can increase the confidence of identifying or excluding the presence of abscess,[11,19] but this may give high-dose irradiation to the child.

Plain radiograph of the affected limb should always be done to exclude acute osteomyelitis, but it should always be remembered that, in the early stages, x-ray may not diagnose osteomyelitis. Clinical suggestion of complication by pneumonia, pleural effusion, and pyopericardium should warrant that a chest radiograph may need to be done serially. If the latter complication is suspected, an echocardiogram would be helpful.

Haematological Tests

A complete blood count should be done. Leucocytosis, neutrophilia, or eosinophilia may be present, and patients presenting late are often anaemic.

Excluding Underlying Disease

A serological test for HIV infection should be done, after appropriate counselling. Diabetes mellitus should also be excluded by ascertaining the blood sugar level.

Differential Diagnosis

The differential diagnoses are varied and include osteomylitis, septic arthritis, intermuscular abscess, muscle contusion, polymyositis, cellulitis, rhabdomyosarcoma, pyrexia of unknown origin, and appendix abscess. Pyomyositis of a limb may be difficult to differentiate from acute osteomyelitis at the early stage, and radiography may not be helpful in excluding osteomyelitis. As the latter is more serious and damaging, it is safer to make that diagnosis and institute appropriate treatment until proven otherwise.

Another area of clinical diagnostic difficulty is differentiating pyomyositis of the anterior abnormal wall from appendix abscess. Localisation of the abscess can be done easily by ultrasonography. Differentiating between pyomyositis and a rapidly growing rhabdomyosarcoma with erythema and tenderness of the overlying skin is extremely difficult in children and requires a high index of suspicion, especially when the history and site of the lesion are not entirely typical of pyomyositis.

Management

Early diagnosis and treatment are critical to survival and outcome. Diagnosis may be missed due to unfamiliarity with the disease, atypical presentation, a wide range of differential diagnoses, and lack of early specific signs. The treatment includes resuscitation, abscess drainage, antibiotics, analgesia, and rest of the affected limb.

Resuscitation

Patients may be anaemic, particularly those presenting late. Any severe anaemia may require correction by blood transfusion. Patients who are malnourished will require some form of nutritional support and rehabilitation.

Abscess Drainage

The definitive treatment of full-blown pyomyositis remains adequate drainage. Following this, the abscess cavity must be prevented from premature closure by any one of several methods, such as packing and daily dressing. EUSOL or honey[20] are effective, but sterile saline may serve the same purpose. Closure of the skin and drainage with a Penrose drain or other appropriate drain are also effective and obviate the need for daily dressing.

If properly drained, the abscess is unlikely to recur. In the very early stage of the disease, before an abscess has formed, antibiotic administration and resting the affected part may suffice.

Percutaneous drainage,[11] preferably under imaging guidance (ultrasonography), is also effective and avoids an incision and resulting scar, which would otherwise prolong the hospital stay.

Antibiotics

Appropriate antibiotics should always be given (initially intravenously). Before culture and antibiogram results are received, the choice of antibiotics should be based on the microbiological knowledge of commonly involved bacteria. Any antibiotic regime should include a potent antibiotic effective against *Staphylococcus aureus,* which is the most common bacteria involved.

In patients presenting early, treatment with antibiotics alone may control infection.[11] However, the duration of antibiotic therapy is often long (2–8 weeks).[11,19]

Analgesia

When pain is a prominent symptom, appropriate analgesics should be given to control it.

Rest of Affected Limb

When a limb muscle is affected, some form of splinting and resting of that limb helps to relieve pain. Elevation of the limb would be helpful in the presence of oedema and should help to prevent a compartment syndrome.

Prognosis and Outcome

Although mortality is low, morbidity could be high and hospital stay prolonged for several weeks. Extramuscular involvement, especially of the lung and heart, is life threatening and could lead to death, despite treatment.

In one report,[2] extraskeletal complications (pneumonia, pericarditis) occurred in 6.5% of patients. Complications with pericarditis resulted in the only mortality of 3% in that report. In one large series,[3] mortality in all patients (adults and children) was <1%.

Evidence-Based Research

Table 19.2 presents one of the few reports on pyomyositis in children in sub-Saharan Africa.

Table 19.2: Evidence-based research.

Title	Pyomyositis in children: analysis of 31 cases
Authors	Ameh EA
Institution	Paediatric Surgery Unit, Department of Surgery, Ahmadu Bello University Teaching Hospital, Zaria, Nigeria
Reference	Ann Trop Paediatr 1999; 19:263–265
Problem	Pyomyositis in children.
Intervention	Open drainage, local dressing of abscess cavity, antibiotics.
Results	Thirty-one children were treated for 35 instances of pyomyositis in Nigeria. Most (71%) were younger than 10 years of age, and the lower limb (51%) and trunk (26%) muscles were mostly afflicted. Patients presented after a symptom duration of 2–12 days (mean, 6 days) and a preceding history of trauma was obtained only in one patient. A pure culture of *Staphylococcus aureaus* was obtained in 75% of cultured specimens, but mixed growth of staphylococci and streptococci and sterile growth were also obtained in a few patients.
Outcome/ effect	Recurrence of abscess occurred in one abscess (3%) after 3 days of open drainage. The hospital stay for survivors was long, at an average of 20 days (range, 12–30 days). Two patients (6.5%) developed extramuscular complications (pneumonia, pneumonia and pericarditis), resulting in mortality in one patient (3.2%) from pericarditis.
Historical significance/ comments	This is only one of the few reports of pyomyositis in children from sub-Saharan Africa. It characterises the clinical profile of the disease in African children and shows that life-threatening complications, although uncommon, can occur and even result in mortality.

Key Summary Points

1. Pyomyositis could be encountered in children in Africa.
2. A high index of suspicion is needed to make early diagnosis.
3. Symptoms are usually nonspecific; pain of the affected muscle, swelling, and pyrexia of more than a week may indicate the presence of the disease.
4. Intravenous antibiotics followed by oral administration for 3–6 weeks should be started early.
5. In established abscesses, adequate incision and drainage must be done.

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