J Microbiol Immunol Infect
2002;35:121-124



# Clinical characteristics of staphylococcal pyomyositis

**Hueng-Chuen Fan, Wen-Tsung Lo, Mong-Ling Chu, Chih-Chien Wang**

*Department of Pediatrics, Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan, ROC*

Received: April 23, 2001 Revised: August 24, 2001 Accepted: January 15, 2002

Pyomyositis is common in the tropics but rarely reported in temperate climates. This disease may give rise to obscure, non-specific, or misleading signs and symptoms. Delayed diagnosis and treatment may lead to death. The most common pathogen is *Staphylococcus aureus*. We analyzed 8 cases treated in the Tri-Service General Hospital between 1989 and 2001. There were 3 males and 5 females with age ranging from 2 to 66 years. Fever was found in all patients. The mean time lag between the onset of minor symptoms and diagnosis was 10 days. The imaging tools used included sonography, gallium-67 scan, computed tomography, and magnetic resonance imaging. Early application of sonography to any suspected lesions can help to establish diagnosis. All 8 patients recovered smoothly without complications after incision, drainage, and administration of adequate antibiotics for 2 to 4 weeks.

**Key words:** Pyomyositis, *Staphylococcus aureus*

Pyomyositis is an acute pyogenic infection of the skeletal muscle, usually accompanied by abscess formation. This disease may occur in all age groups, but reported cases have been mainly in children or patients with immunocompromised conditions such as human immunodeficiency virus infection [1], diabetes mellitus [2,3], and in individuals living in temperate climates. Pyomyositis has been estimated to be responsible for one in 30 000 pediatric admissions [4]. The mortality of this disease ranged from 5% to 25%, depending on whether the patients received adequate treatment [5]. Approximately 90% to 95% of cases are caused by *Staphylococcus aureus* [6]. Because of its rarity and the obscure, non-specific, or misleading signs and symptoms, pyomyositis may cause diagnostic problems for physicians working in temperate climates. This retrospective study analyzed the clinical characteristics and outcomes in 8 cases of staphylococcal pyomyositis treated in a medical center in Taiwan during a 12-year period from October 1989 through October 2001.

## Patients and Methods

Medical records of patients with staphylococcal pyomyositis treated in the Tri-Service General Hospital (TSGH) between 1989 and 2001 were reviewed. There were 8 patients including 3 males and 5 females (age range, 2-66 years). Data was collected on clinical presentation, location of involvement, diagnostic tools, time lag in diagnosis, treatment modalities, outcome, associated medical diseases and laboratory data including white blood cell counts, C-reactive protein (CRP) level, erythrocyte sedimentation rates (ESR), serum creatinine kinase (CK), culture and antibiotic susceptibility test. Time lag in diagnosis was defined as the time interval from initial symptoms to the time of definite diagnosis. Bacteriologic results were confirmed by using either blood or pus cultures. Cases without culture proof were excluded from the study. Diagnostic tools used included sonography, gallium-67 scan, computed tomography (CT), and magnetic resonance imaging (MRI).

## Results

Pyomyositis caused by *S. aureus* was diagnosed in 8 patients in TSGH. All the patients had fever. The most common presentations included change of texture in the involved muscle into an erythematous, edematous appearance, and pain. The locations of involvement were gastrocnemius (2 cases), gluteus maximus (2), psoas muscle (1), quadriceps (1), infraspinatus muscle (1), and multiple abscesses in the latissimus dorsi muscle, gluteus maximus muscle, gastrocnemius, and brachio-radialis muscle (1). The mean time lag in diagnosis was 10 days from the onset of initial symptoms. Sonography was performed in all patients, gallium-67 scan in 3, CT in 3, and MRI in one. Incision

*Corresponding author: Dr. Chih-Chien Wang, Department of Pediatrics, Tri-Service General Hospital, 325, Cheng-Kung Road, Section 2, Neihu, Taipei 114, Taiwan, ROC. E-mail: ndmcccw @yahoo.com.tw*

and drainage of the abscess were done in all patients. All patients recovered well without complications after 2 to 4 weeks of antibiotic treatment (either oxacillin or vancomycin, combined with gentamicin) (Table 1). Antibiotics were adjusted according to the blood or pus culture results. Methicillin-resistant *S. aureus* (MRSA) infection was found in only one patient. Two adult patients had diabetes, whereas no underlying diseases were found in pediatric patients. There were 3 of 8 patients with a history of trauma. Positive blood culture was found in 3 of 8 patients, whereas pus culture was positive in all 8 patients. White blood cell count was elevated in 7 of 8 patients. C-reactive protein, ESR, and serum CK were measured in 5 patients; CRP and ESR were elevated, whereas CK was at normal level in all 5 patients.

## Discussion

Pyomyositis has become an increasingly recognized entity in recent years. This disease was first described by Scriba in 1855 [7], and was often referred to as pyomyositis tropicans, reflecting its geographic distribution. In 1968, Horn and Master [8] reported that pyomyositis accounted for 3% to 4% of surgical admissions in their Ugandan hospital. During a 10-year period between 1970 and 1980, pyomyositis was diagnosed in 18 patients at a hospital in Hawaii [9]. Gubbay and Isaacs [10] reported 16 cases during a 10-year period from 1989 to 1998. Diagnosis of pyomyositis is often delayed due to the vague presentation. Lack of familiarity with this disease may also be an obstacle to accurate diagnosis. The diagnosis was made before admission in only 5 of 18 patients in the Hawaiian study [9]. The mean delay from onset to correct diagnosis was about 12 days in temperate areas [11]. In this study, the mean time lag was 10 days.

In tropical areas, pyomyositis occurs in all age groups [8,9]. Reported cases in the temperate climates are mainly children, and boys are affected more often than girls [12]. Most cases in this series were children, with a female preponderance (5/8), similar to that reported by Liaw *et al* [13].

*S. aureus* is the most common causative pathogen, while *Streptococcus pyogenes*, *Streptococcus pneumoniae*, and *Escherichia coli* are occasionally responsible for the disease. Predisposing factors that have been considered include trauma, parasitic infection, nutritional deficiencies, and several other underlying conditions, such as diabetes mellitus, virus infection, neoplasm, and chemotherapy for malignant

**Table 1.** Clinical features of 8 patients with pyomyositis at the Tri-Service General Hospital

| Case no. | Sex/age | Presentations | Underlying disease | Location | Diagnostic tools | Time lag in diagnosis (days) | Trauma history | Result of blood/ pus culture | Antibiotics/ Duration | Outcome |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | F/2 | Fever | Nil | Gluteus maximus muscle | Sonography<br>Gallium-67 scan | 7 | – | –/MSSA | Oxacillin/ 4 weeks | Recovery |
| 2 | F/6 | Fever<br>Abdominal pain | Nil | Psoas muscle | Sonography | 14 | + | –/MSSA | Oxacillin/ 2 weeks | Recovery |
| 3 | F/8 | Fever<br>Leg pain | Nil | Latissimus dorsi. muscle<br>Gluteus maximus muscle<br>Gastrocnemius<br>Brachioradialis muscle | Sonography<br>MRI | 13 | + | –/MRSA | Vancomycin/ 2 weeks | Recovery |
| 4 | F/11 | Fever<br>Hip pain | Nil | Gluteus maximus muscle | Sonography<br>CT scan | 14 | – | MSSA/MSSA | Oxacillin/ 4 weeks | Recovery |
| 5 | F/66 | Fever<br>Leg pain | DM | Gastrocnemius | Sonography<br>CT scan | 14 | + | MSSA/MSSA | Oxacillin/ 4 weeks | Recovery |
| 6 | M/4 | Fever | Nil | Gastrocnemius<br>Leg pain | Sonography<br>Gallium-67 scan | 7 | – | MSSA/MSSA | Oxacillin/ 4 weeks | Recovery |
| 7 | M/10 | Fever<br>Shoulder pain | Nil | Infraspinatus muscle | CT scan | 6 | – | –/MSSA | Oxacillin/ 2 weeks | Recovery |
| 8 | M/51 | Fever | DM | Quadriceps | Sonography<br>CT scan<br>Gallium-67 scan | 6 | – | –MSSA | Oxacillin/ 4 weeks | Recovery |

Abbreviations: DM = diabetes mellitus; CT = computed tomography; MRI = magnetic resonance imaging; MRSA = methicillin-resistant *Staphylococcus aureus*; MSSA = methicillin sensitive *Staphylococcus aureus*

neoplasms [14]. In this study, there was no other associated medical diseases in the pediatric patients. Two adult patients had diabetes mellitus. The importance of diabetes, known to decrease susceptibility to infection, as a predisposing factor in the patients in this study is uncertain. It has been reported that defect in host immunity renders individuals more susceptible to the occurrence of pyomyositis [9].

The pathogenesis of pyomyositis is unclear, but this disease may develop by hematogenous spread to susceptible muscle tissue during a period of transient bacteremia [2]. Antecedent trauma was reported in 25% to 67% of the patients in 3 series [9-11]. In this study, there were 3 patients who had a history of trauma, with one presenting with multiple site involvement. These findings suggest that hematomas, which could easily form even after minor trauma, may be a nidus for muscle abscesses to form in the presence of a transient bacteremia.

Clinical manifestations in both tropical and non-tropical pyomyositis are very similar and can be categorized in 3 stages. The initial, invasive stage, during which the organism enters the muscle, is characterized by an insidious onset of dull, cramping pain, with or without fever and anorexia. There is localized edema, which is indurated or woody but usually causes little or no tenderness, lasts from 10 to 21 days. Most of the patients in this study presented in this initial stage, and all had an excellent prognosis. The second purulent stage (suppurative stage) occurs when a deep collection of pus has developed in the muscle. The patient may complain of fever with chills. The overlying skin is mildly erythematous and fluctuant. Leukocytosis is present, with elevated ESR or CRP and aspiration in the affected area will yield purulent material. If the condition is not treated, it can progress into the late or septic stage of pyomyositis, characterized by high fever or septic shock. In the septic stage, overlying skin is severely erythematous and tender. Abscess may be disseminated and serious complications may occur. Half of the patients may have extramuscular complications such as pneumonia, empyema, pericarditis, meningitis, osteomyelitis, and arthritis [16]. Fever was the major clinical manifestation in all of the cases in this series as well as in the report of Lee *et al* [17]. In patients of this study, the change of the texture in the involved muscle included an erythematous, edematous appearance, and pain. Large muscles are more frequently involved, and the most common site of involvement in tropical countries is the thigh, occurring in 36% of patients from North America and 44% from Nigeria [11]. Consistent with these reported findings, the most common site of involvement in this study was the gastrocnemius and gluteus maximus. No major morbidity or permanent deformities occurred in this series, and no case progressed to the septic stage. These results may be attributable to early diagnosis and treatment.

Although white blood cell count has been reported to be elevated in 50% to 60% of cases [11], ESR and CRP are also frequently elevated [9,11,17], while serum CK is often within normal limits [9,17,18]. This implies that the abscess is only displacing muscle in the early phase of the disease rather than invading it. In severe cases, particularly in patients who present late in the course of the disease, the serum CK level may dramatically elevate, suggesting extensive muscle destruction [9,17,18]. In this study, there were 5 cases with serum CK level within the normal range. The positive rate of blood culture of patients with pyomyositis ranges from less than 5% to 31% [11,19]. Pathogens are most commonly identified only after pus is obtained at the time of surgical drainage [11]. In this study, 3 (38%) of 8 patients had positive blood culture, and all 8 patients had a positive wound culture. It is important to note that although patients may have normal muscle enzyme levels and negative finding of blood culture, these do not exclude pyomyositis.

Because of the lack of specificity of laboratory testing, early radiological evaluation is a key to diagnosis of pyomyositis. When a high index of suspicion exists, sonography should be used first as it is inexpensive and widely available, without the disadvantage of delivering a relatively high radiation dose to the children [20]. Two other studies [16,18] also concluded that early application of sonography to any suspected lesion can help to establish early diagnosis of pyomyositis. If occult muscle abscesses or multifocal lesions are suspected, gallium-67 scan [21], CT [3], or MRI [22] can be used to identify the lesions, and to localize the extent of the abscess. Surgical incision and drainage have an important role in the treatment of pyomyositis, even when the disease is multifocal.

In summary, fever may be the only manifestation of early pyomyositis and may mimic a variety of diseases; however, a correct diagnosis is based on a high index of suspicion, especially in pediatric patients and in persons with diabetes mellitus or other immunocompromised conditions. When persistent localized muscle pain, and erythematous and edematous skin texture accompanied by leukocytosis, an elevated CRP or ESR, and a recent history of trauma are present, physicians should be alerted about the possibility of pyomyositis. Use of sonography, CT, gallium scan, or

MRI provides helpful information for any suspected lesions in the diagnosis of this disease. Penicillinase-resistant penicillin is the choice of antibiotic therapy. If suppuration has occurred, surgical drainage with debridement of necrotic tissue is mandatory. The overall results are generally good if aggressive management is started early, as in all of the patients in this study.

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