Pyomyositis: A Case Report and Literature Review

Iman Ali, MD
Iyad Rashdan, MD

Pyomyositis is an acute bacterial infection occurring in skeletal muscle with no obvious local or adjacent source of infection. Initial symptoms include localized muscle pain, swelling, and tenderness. The diagnosis of pyomyositis is often delayed because other primary diagnoses are first considered. This article discusses a case of staphylococcal pyomyositis in a 66-year-old woman. A review of the medical literature is also presented.

CASE PRESENTATION

A 66-year-old woman with insulin-dependent diabetes mellitus presents to the emergency department with a 24-hour history of fever and exquisite left paraspinal lumbar pain. The patient has no urinary symptoms and denies recent trauma, insect bite, or lumbar infiltration. She has not traveled outside of the United States for the past year. She is admitted to the hospital for further evaluation.

Physical Examination

On admission, the patient's temperature is 100.8°F; pulse is 78 bpm; and blood pressure is 172/88 mm Hg. Physical examination reveals diffuse left paraspinal tenderness radiating to the left lower quadrant and into the left medial thigh. Examination of the patient's skin reveals no evidence of local inflammation or fluctuation.

Laboratory and Imaging Studies

The patient's hematocrit is 35%; the leukocyte count is 15,900/mm^3 with a left shift (16% band forms). The erythrocyte sedimentation rate (Westergren method) is 136 mm/hr (normal, 0 to 20 mm/hr). Results of urine analysis and culture are negative. Lumbar spine radiography reveals slight degenerative spurring in the lower lumbar spine. Two sets of blood cultures obtained on admission reveal methicillin-susceptible *Staphylococcus aureus.*

Treatment and Further Evaluation

The patient is treated with intravenous antibiotic therapy (nafcillin 2 g/4 hr). Despite therapy, no clinical improvement is evident. Further laboratory evaluation during the third week of therapy demonstrates a persistent increase in the patient's leukocyte count (up to 26,100/mm^3) and erythrocyte sedimentation rate (up to 150 mm/hr). The patient's serum ferritin level increases to 831 ng/mL. All repeated blood cultures are negative. Results of a technetium Tc 99m tagged leukocyte study of the patient's entire body are normal, and a technetium Tc 99m scintigram of the bony skeleton confirms the degenerative joint disease previously noted on radiography.

Computed tomography (CT) of the lumbar spine reveals that the left paraspinal muscles posterior to the L_3 and L_4 vertebrae are larger than the corresponding paraspinal muscles on the right side (**Figure 1**). Magnetic resonance imaging (MRI) confirms the enlarged left paraspinal muscles and demonstrates a 2-cm × 2-cm collection of fluid in the left erector spinal muscle. After 3 weeks of unsuccessful antibiotic therapy, needle aspiration and biopsy guided by CT scan reveal rare gram-positive cocci, but cultures are negative.

Surgery and Outcome

Three weeks after the initiation of antibiotic therapy, surgery is scheduled because of the patient's lack of clinical improvement and the persistence of low-grade fever and general signs of inflammation on laboratory studies. Guided by ultrasound, a surgical incision is made at the L_3 level of the left paraspinal area and reveals a purulent collection extending into the paraspinal muscle. The fluid is drained, and Gram stain

Dr. Ali is a rheumatologist in private practice, Oklahoma City, OK, and Dr. Rashdan is a Cardiology Fellow, University of Oklahoma Health Sciences Center, Oklahoma City.

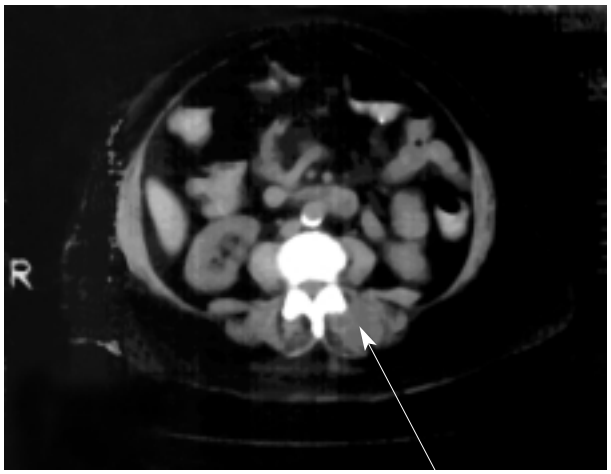

Figure 1. Computed tomography scan shows swelling in the left erector spinal muscle posterior to vertebrae L_3 and L_4 (*arrow*).

examination of the drained fluid reveals clusters of gram-positive cocci and numerous leukocytes, but cultures remain negative.

Following the surgical drainage, the patient becomes afebrile. The left paraspinal tenderness and inflammation progressively disappear. One week postsurgery (4 weeks after the initiation of antibiotic therapy), the patient is started on oral cephalexin (500 mg/6 hr for 2 weeks) and discharged home. At 2-month follow-up, the patient remains symptom-free.

DISCUSSION

Epidemiology

Pyomyositis is a suppurative infection of striated muscle characterized by localized muscle pain, swelling, and tenderness. Pyomyositis, also termed *tropical pyomyositis*, was first described by Scriba[1] in 1885 and has been primarily recognized as a tropical disease occurring in young and relatively healthy persons, although pyomyositis occurs in patients of all ages. Pyomyositis accounts for 1% to 4% of hospital admissions in some tropical areas.[2] Several unproved hypotheses have attempted to connect the demographic factors associated with pyomyositis to such tropically predisposed circumstances as malnutrition,[3,4] protozoal infection,[5,6] viral muscle infection,[7] and disordered immunity.[8,9] Pyomyositis is very rare in the United States. Levin et al[10] first reported the unusual infection in 1971; since then, only a small number of pyomyositis cases have been reported in temperate climates. No epidemiologic differences have been found between the cases of pyomyositis reported in tropical climates and cases in temperate climates.[11]

Etiology

Causative organisms. *Staphylococcus aureus* is responsible for 95% of cases of pyomyositis.[10,12–14] Other more rare bacterial causes of pyomyositis include group A β-hemolytic streptococci, α-hemolytic streptococci and nonhemolytic streptococci, *Peptostreptococcus, Streptococcus pneumoniae, Staphylococcus epidermidis, Staphylococcus pyogenes, Streptococcus anginosus, Streptococcus pyogenes,* coliform, *Fusobacterium, Haemophilus influenzae, Escherichia coli, Neisseria gonorrhoeae, Citrobacter freundii, Klebsiella, Yersinia enterocolitica, Pasteurella* species and *Pseudomonas* species.[11,13,15–21]

Other etiologic factors. The etiology of pyomyositis is uncertain. In 20% to 50% of cases, recent trauma has occurred to the involved muscular area;[2,14,22] therefore, trauma with subsequent bacteremia is a likely mechanism of infection. Normal skeletal muscle is resistant to bacterial infection, and clinical studies have demonstrated that bacteremia alone can not cause muscle infection. Studies found that intravenous injection of *Staphylococcus aureus*[23] was unable to produce abscesses in canine muscle tissue unless the muscle was first traumatized by pinching, electric shock, or ischemia.[24] In humans, muscle abscess is rarely a complication of severe staphylococcal sepsis. One study reviewed 327 fatal cases of treated and untreated staphylococcal septicemia and reported that abscess formation in skeletal muscle was found in only two patients.[25]

The medical literature on contusions of the quadriceps muscle suggests that trauma alone does not cause pyomyositis.[26] Most patients with pyomyositis have demonstrated predisposing factors such as diabetes mellitus,[12,27,28] hematologic diseases,[29–31] connective tissue disorders,[32–35] and AIDS.[11,36,37] Any of these factors can make patients more susceptible to bacteremia and have commonly been reported in patients with pyomyositis. The association between HIV infection and pyomyositis can be explained by the increased frequency of the *Staphylococcus aureus* carrier state[38] and dysfunctional neutrophil activation, which predispose HIV-infected patients to bacterial infection.[39]

Clinical Presentation

The rarity of pyomyositis in temperate climates and the paucity of diagnostic symptoms on initial evaluation have deterred extensive laboratory and radiographic investigations and have delayed diagnosis of the disease. Typically, three clinical stages of pyomyositis can occur.[13,40,41]

Early invasive stage. Pain and mild swelling of the involved muscles are the first signs of pyomyositis and indicate the early invasive stage of the infection. During

this stage, the involved muscles become increasingly tender and indurated and eventually develop a firm "wooden" texture to palpation. Because the muscle abscess is contained by the overlying fascia, local erythema and heat may be minimal until days or even weeks after symptom onset when the infectious process extends to the subcutaneous tissues. Localized signs and symptoms can precede systemic manifestation by weeks.

Suppurative stage. The second stage is the suppurative stage, which occurs ten to 21 days after symptom onset and includes fever, malaise, leukocytosis, elevated erythrocyte sedimentation rate, and chronic anemia. After abscess formation, the involved muscles can become fluctuant as the disease progresses. At this time, needle aspiration yields a purulent exudate. Approximately 90% of pyomyositis patients present during the suppurative stage,[15] such as the patient in this case study. If the infection is not recognized and treated, pyomyositis can progress to the septicemic stage.

Septicemic stage. The third stage is the septicemic stage, which is noted by the formation of metastatic abscesses and abscess complications. Truncal and proximal large lower limb muscles are most commonly involved.[11] Multiple abscesses occur in up to 60% of patients with pyomyositis.[42]

Diagnosis

Laboratory studies. Most of the laboratory findings in pyomyositis are nonspecific. A left shift in leukocyte count and an increase in the erythrocyte sedimentation rate are the most helpful findings.[16] Chronic anemia is also a common finding. Positive blood cultures have been documented in fewer than 5% of pyomyositis cases in tropical climates.[14] Despite extensive muscle deterioration, elevated serum creatine kinase levels are uncommon.[16,43]

Histopathologic findings from patients in the early invasive stage of pyomyositis show edematous separation of muscle fibrils and fibers.[21] Patchy myocytolysis follows and leads to complete disintegration of the muscle fiber, with foci of suppuration containing bacteria and polymorphonuclear leukocytes. The muscle fibers may also heal without abscess formation.

Imaging studies. Radiography tends not to facilitate diagnosis. However, CT images with or without contrast are helpful, and MRI has been found to be more diagnostically sensitive than CT scanning, as evident in the patient in this case study. In addition, MRI and newer imaging techniques (ie, gadolinium enhancement), seem to be more accurate in delineating the extent of pyomyositis progression. The most specific diagnostic method is needle aspiration of the involved muscle followed by the appropriate Gram's stain and culture. A CT scan or ultrasound can be helpful in needle guidance.

Differential Diagnosis

Conditions that may mimic pyomyositis include muscle strain, contusion, cellulitis, hematoma, perinephric abscess, deep vein thrombophlebitis, osteomyelitis, synovitis, septic arthritis, or soft tissue sarcoma.

CONCLUSION

Because pyomyositis is relatively uncommon in temperate climates, this infection is often considered late in a diagnostic workup; thus, substantial delays in diagnosis are common and may contribute to prolonged hospital stays. The mortality rate of pyomyositis in tropical climates, reported to be as high as 14%,[17] reflects the severity of the underlying disease. Fortunately, after the diagnosis of pyomyositis, incision and drainage coupled with antibiotic therapy eradicate the infection in most patients. Residual functional deficiencies are minor or absent.[16] **HP**

REFERENCES

1. Scriba J: Beitrag zur aetiologie der myositis acuta. *Deutsche Zeitschrift Fur Cir* 1885;22:497–507.
2. Horn CV, Master S: Pyomyositis tropicans in Uganda. *East Afr Med J* 1968;45:463–471.
3. Trotter JL, Doyle JR: Tropical myositis, the great imitator: a case report. *Hawaii Med J* 1988;47:468.
4. Earle KV: Sulphanilamide derivatives in the treatment of tropical pyomyositis. *Trans R Soc Trop Med Hyg* 1939;33: 169–172.
5. Anand SV, Evans KT: Pyomyositis. *Br J Surg* 1964;51: 917–920.
6. O'Brien DD: Tropical pyomyositis, a manifestation of larvae migrans? *J R Army Med Corps* 1963;109:43–50.
7. Taylor JF, Fluck D, Fluck D: Tropical myositis: ultrastructural studies. *J Clin Pathol* 1976;29:1081–1084.
8. Giasuddin AS, Idoko JA, Lawande RV: Tropical pyomyositis: is it an immunodeficiency disease? *Am J Trop Med Hyg* 1986;35:1231–1234.
9. Idoko JA, Oyeyinka GO, Giassudin AS, Naida A: Neutrophil cell function and migration inhibition studies in Nigerian patients with tropical pyomyositis. *J Infect* 1987; 15:33–37.
10. Levin MJ, Gardner P, Waldvogel FA: An unusual infection due to Staphylococcus aureus. *N Engl J Med* 1971; 284:196–198.
11. Rodgers WB, Yodlowski ML, Mintzer CM: Pyomyositis in patients who have the human immunodeficiency virus. Case report and review of the literature. *J Bone Joint Surg [Am]* 1993;75:588–592.
12. Goldberg JS, London WL, Nagel DM: Tropical pyomyositis: a case report and review. *Pediatrics* 1979;63:298–300.

13. Moore DL, Delage G, Labelle H, Gauthier M: Peracute streptococcal pyomyositis: report of two cases and review of the literature. *J Pediatr Orthop* 1986;6:232–235.
14. Chiedozi LC: Pyomyositis. Review of 205 cases in 112 patients. *Am J Surg* 1979;137:255–259.
15. Adams EM, Gudmundsson S, Yocum DE, et al: Streptococcal myositis. *Arch Intern Med* 1985;145:1020–1023.
16. Hall RL, Callaghan JJ, Moloney E, et al: Pyomyositis in a temperate climate. Presentation, diagnosis, and treatment. *J Bone Joint Surg [Am]* 1990;72:1240–1244.
17. Bonafede P, Butler J, Kimbrough R, Loveless M: Temperate zone pyomyositis. *West J Med* 1992;156:419–423.
18. Swarts RL, Martinez LA, Robson HG: Gonococcal pyomyositis. *JAMA* 1981;246:246.
19. Schwab R, Panwalker AP: Klebsiella pyomyositis. *Am J Med* 1986;81:1116–1117.
20. Brennessel DJ, Robbins N, Hindman S: Pyomyositis caused by *Yersinia enterocolitica*. *J Clin Microbiol* 1984;20:293–294.
21. Gaut P, Wong PK, Meyer RD: Pyomyositis in a patient with the acquired immunodeficiency syndrome. *Arch Intern Med* 1988;148:1608–1610.
22. Chacha PB: Muscle abscesses in children. *Clin Orthop* 1970;70:174–180.
23. Halstead WS: *Surgical Papers*. Baltimore: John Hopkins Press, 1924:103.
24. Miyake H: Beiträge (Beitraege) zur kenntnis der sogenannten myositis infectiosa. *Mitt Grenzgeb Med Chir* 1904;13:155–198.
25. Smith MI, Vickers AB: Natural history of 338 treated and untreated patients with staphylococcal septicemia. *Lancet* 1960;1:1318–1322.
26. Jackson DW, Feagin JA: Quadriceps contusions in young athletes. Relation of severity of injury to treatment and prognosis. *J Bone Joint Surg [Am]* 1973;55:95–105.
27. Caldwell DS, Kernodle GW Jr, Siegler HF: Pectoralis pyomyositis: an unusual cause of chest wall pain in a patient with diabetes mellitus and rheumatoid arthritis. *J Rheumatol* 1986;13:434–436.
28. Schlech WF 3d, Moulton P, Kaiser AB: Pyomyositis: tropical disease in a temperate climate. *Am J Med* 1981;71:900–902.
29. Mitsuyasu R, Gale RP: Bacterial pyomyositis in a patient with aplastic anaemia. *Postgrad Med J* 1980;56:61–62.
30. Peller JS, Bennett RM: Bacterial pyomyositis in a patient with preleukemia. *J Rheumatol* 1985;12:185–186.
31. Sarubbi FA, Gafford GD, Bishop DR: Gram-negative bacterial pyomyositis: unique case and review. *Rev Infect Dis* 1989;11:789–792.
32. Blatt J, Reaman G, Pizzo PA: Pyomyositis in acute lymphocytic leukemia heralded by cutaneous vasculitis: brief communication. *Med Pediatr Oncol* 1979;7:237–239.
33. Lachiewicz PF, Hadler NM: Spontaneous pyomyositis in a patient with Felty's syndrome: diagnosis using computerized tomography. *South Med J* 1986;79:1047–1048.
34. Minor RL Jr, Baum S, Schulze-Delrieu KS: Pyomyositis in a patient with progressive systemic sclerosis. Case report and review of the literature. *Arch Intern Med* 1988;148:1453–1455.
35. Gelfand MS, Holladay R, Bertorini T, Adams RF: Staphylococcal pyomyositis with idiopathic dermatomyositis. *J Tenn Med Assoc* 1989;82:243–244.
36. Watts RA, Hoffbrand BI, Paton DF, Davis JC: Pyomyositis associated with human immunodeficiency virus infection. *Br Med J (Clin Res Ed)* 1987;294:1524–1525.
37. Schwartzman WA, Lambertus MW, Kennedy CA, Goetz MB: Staphylococcal pyomyositis in patients infected by the human immunodeficiency virus. *Am J Med* 1991;90:595–600.
38. Ganesh R, Castle D, McGibbon D, et al: Staphylococcal carriage and HIV infection. *Lancet* 1989;2:558.
39. Ellis M, Gupta S, Galant S, et al: Impaired neutrophil function in patients with AIDS or AIDS-related complex: a comprehensive evaluation. *J Infect Dis* 1988;158:1268–1276.
40. Sirinavin S, McCracken GH Jr: Primary suppurative myositis in children. *Am J Dis Child* 1979;133:263–265.
41. Kallen P, Nies KM, Louie JS, et al: Tropical pyomyositis. *Arthritis Rheum* 1982;25:107–110.
42. Gibson RK, Rosenthal SJ, Lukert BP: Pyomyositis. Increasing recognition in temperate climates. *Am J Med* 1984;77:768–772.
43. Echeverria P, Vaughn MC: "Tropical pyomyositis." A diagnostic problem in temperate climates. *Am J Dis Child* 1975;129:856–857.