Case Reports

Tropical Pyomyositis of the Abdominal Wall Musculature Mimicking Acute Abdomen

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FIRST DESCRIBED by Scriba in 1885, tropical pyomyositis is a necrotizing infection of skeletal muscle.[1] A common disorder in equatorial zones, tropical pyomyositis accounts for as much as 4% of surgical admissions in certain regions of Africa, Southeast Asia, and the South Pacific.[2] Although historically uncommon in the continental United States, the first cases were reported by Levin and co-workers in 1971 in three patients who had recently immigrated from India, Puerto Rico, and Biafra.[3] Most cases have a subacute presentation with muscle pain as the dominant early manifestation. Overlying erythema and tactile warmth, followed by edema and eventual fluctuance, occur late in the course of the disease. Secondary bacteremia with metastatic abscess formation is an infrequent but well-recognized complication. A delay in diagnosis occurs commonly as overt inflammatory signs are often absent. *Staphylococcus aureus* is the dominant pathogen and accounts for more than 95% of cases. Recent reports have implicated *Streptococcus pneumoniae,* group G streptococci, *Neisseria gonorrheae, Yersinia enterocolitica, Klebsiella pneumoniae,* and *Aeromonas hydrophila* as pathogens capable of causing pyomyositis.[4-9] Noninvasive imaging with ultrasonography or computed tomography will locate the abscess in most cases.[10,11] Percutaneous needle aspiration will provide adequate material for a microbiologic diagnosis, but incision and drainage combined with parenteral antibiotics remain the standard of management. With this report we would add abdominal wall tropical pyomyositis to the differential diagnosis in patients presenting with symptoms and physical findings indicative of an acute abdominal process.

Report of a Case

The patient, a 19-year-old man, presented to the emergency department with abdominal pain and fever of three weeks' duration. Night sweats and weight loss of 7.3 kg (16 lb) occurred during the month preceding evaluation. Intermittent right lower quadrant pain that was stabbing in character and worsened by defecation, coupled with nausea and intractable vomiting, prompted an emergency evaluation.

The patient had immigrated to the United States from El Salvador ten months before being seen. His medical history was remarkable only for malaria and intestinal parasitosis. He admitted to infrequent melena over a five-year period but said he did not have a history of inflammatory bowel disease, ethanol abuse, peptic ulcer disease, or the use of aspirin or nonsteroidal anti-inflammatory agents. He specifically said he had never had blunt abdominal trauma. No previous episodes of soft tissue or visceral infection had occurred, and the patient adamantly denied intravenous drug use.

On physical examination he was thin and appeared ill and in acute distress. The temperature was 39.6°C (103.2°F), the blood pressure 110/70 mm of mercury, with a pulse rate of 106 in the supine position. On standing his blood pressure fell to 70/50 mm of mercury, with a pulse rise to 134 beats per minute. Respirations were 18 per minute and unlabored. The sclerae were anicteric, and conjunctival injection was absent. The jugular venous pressure was reduced and the carotid pulsations hyperdynamic. The oropharynx was parched. Splinting of the right hemithorax was noted with inspiration, and breath sounds in the right lung base were diminished. A grade 2/6 systolic murmur was heard across the precordium. The abdomen was firm and bowel tones infrequent. Hepatosplenomegaly was not detected. Rebound tenderness and guarding were pronounced in the periumbilical and right lower quadrant zones. The rectal examination was remarkable for Hemoccult-positive stool. Increased tactile warmth was present in the right hemiabdomen without soft tissue swelling, erythema, or fluctuance.

Electrolytes, blood urea nitrogen level, and the serum creatinine value were normal. The hematocrit was 0.44, the platelet count 292×10^9 per liter, and the leukocyte count 15.2×10^9 per liter with 0.71 segmented neutrophils, 0.18 band forms, and 0.06 eosinophils. Liver function studies revealed a bilirubin level of 26 μmol per liter, alkaline phosphatase of 135 units per liter, and normal aminotransferase levels. The serum amylase level was 774 nmol per liter, and a routine analysis of urine showed no abnormalities. Plain and upright abdominal radiographs failed to show intraperitoneal air or evidence of bowel obstruction. Abdominal ultrasonography showed a homogeneous liver without biliary duct dilatation. The appendix was visualized, and no abnormalities suggestive of a periappendiceal abscess were detected. Blood specimens for culture were obtained, intravenous access established, and a regimen of a combination drug, ampicillin sodium and sulbactam sodium, with gentamicin sulfate was begun for presumed intra-abdominal sepsis. Computed tomography of the abdomen revealed no parenchymal abnormalities in the liver, spleen, pancreas, or kidneys. The right rectus abdominis and oblique musculature was notably edematous. Multiple hypodense abscess cavities were present deep in the abdominal wall musculature without overlying soft tissue swelling (Figure 1). Needle aspiration yielded overt pus, and a Gram's stain showed copious gram-positive cocci in clusters with polymorphonuclear granulocytes. The ampicillin-sulbactam therapy was discontinued and nafcillin sodium substituted. A surgical consultation was

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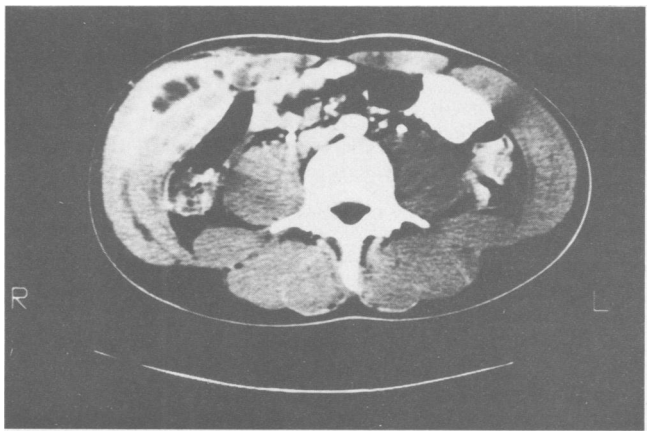

Figure 1.—A computed tomographic scan of the abdomen shows pronounced edema and multiple septate, hypolucent abscess cavities within the right internal oblique, external oblique, and rectus abdominis muscles. Note the absence of soft tissue swelling overlying the area of pyomyositis.

done and incision and drainage carried out. Cultures of specimens obtained at the time of needle aspiration grew *Staphylococcus aureus* sensitive to methicillin, vancomycin, erythromycin, cefazolin, clindamycin, and gentamicin. The organism was resistant to penicillin, ampicillin, tetracycline, and trimethoprim-sulfamethoxazole. Cultures of three sets of blood specimens drawn in the emergency department were negative for pathogens. Defervescence was rapid, and the abdominal wound was allowed to heal by secondary intention. Ova and parasite examination of the stool revealed eggs of *Ancylostoma duodenale,* and Hemoccult-positivity resolved after a short course of oral mebendazole. The patient completed a 14-day regimen of intravenous antibiotics followed by 1 week of oral dicloxacillin sodium. On follow-up examination, the wound was entirely healed and no residual tenderness was present.

Discussion

Tropical pyomyositis, a suppurative infection of striated muscle, was first reported by Scriba in 1885.[1] Called "tropical" because of its prevalence in equatorial regions of Africa, Asia, and the Caribbean, pyomyositis has rarely been reported in the continental United States. Levin and associates in 1971 described three cases of staphylococcal pyomyositis in patients who had recently immigrated to America from India, Puerto Rico, and Biafra.[3] Since the original description fewer than 50 cases have been reported in the United States. *Staphylococcus aureus* accounts for 95% of reported cases. More recently *Streptococcus pneumoniae,* group G streptococci, *Neisseria gonorrheae, Yersinia enterocolitica,* and *Aeromonas hydrophila* have been reported as pathogens capable of causing pyomyositis.[4-9]

Tropical pyomyositis occurs more frequently in men than in women. Blunt trauma to large muscle groups, without disruption of the overlying soft tissue, is reported in a substantial percentage of patients and may explain the male predominance of this disease. More cases of tropical pyomyositis are seen during the summer and early fall months than at other times of the year. Most patients with pyomyositis lack serious underlying disease, but this disorder has been reported in a variety of immunocompromised states including diabetes mellitus, granulocytic and lymphocytic leukemias, aplastic anemia, and, most recently, in progressive systemic sclerosis and the acquired immunodeficiency syndrome.[5,12-16] We have seen three patients with the acquired immunodeficiency syndrome and staphylococcal pyomyositis (manuscript in preparation). Murphy and colleagues have recently reported delayed intracellular killing of *S aureus,* despite increased levels of superoxide anion, in neutrophils of patients infected with the human immunodeficiency virus.[17]

Tropical pyomyositis predominantly involves large muscle groups of the upper and lower extremities. The axial musculature is infrequently involved. Most patients have a single abscess, but multiple abscess cavities occur in as many as 40% of cases. Chiedozi, in a series of 112 patients from Nigeria with pyomyositis, described involvement of the paravertebral and gluteal musculature in 43 patients, but no abscesses occurred in the rectus abdominis or oblique groups.[18] Brown and Wheeler reported 18 cases of tropical pyomyositis from Hawaii, and no patients in their series had abdominal wall involvement.[19] In the pediatric literature, Beck and Grose in 1984 reported the cases of two children with tropical pyomyositis of the abdominal wall musculature.[20] To our knowledge, after extensive review of the literature, this is the first case of abdominal wall pyomyositis in an adult reported in the United States.

Many patients describe antecedent, nonpenetrating trauma before the development of staphylococcal pyomyositis. Ashken and Cotton in 1963 reported a series of pyomyositis cases in military recruits, two thirds of whom had experienced previous trauma.[21] In 12 of 18 patients described by Brown and Wheeler, previous trauma to muscle was reported; in some patients, however, the traumatized area was not in the anatomic distribution where pyomyositis subsequently developed.[19] Many have postulated that hematoma formation is a prerequisite for the development of pyomyositis, which provides a nutrient-rich focus for bacteremic seeding. Of interest, in established cases of pyomyositis, bacteremia is distinctly uncommon and is documented in less than 5% of patients.[18] As early as 1904, Miyake was unsuccessful in his attempt to develop an animal model of tropical pyomyositis by simply inducing staphylococcal bacteremia. After crush injury, however, ligation of a vascular supply, or the application of electrical shock, staphylococcal bacteremia easily induced pyomyositis in damaged muscle groups.[22]

Pyomyositis has been divided into three distinct phases characterized by clinical manifestations. In stage I, pain in the affected muscle group predominates, with fever and diffuse myalgias being common associated symptoms. Early in the course of pyomyositis, leukocytosis with a left shift and an elevated erythrocyte sedimentation rate are found. Diagnostic imaging at this stage rarely reveals a discrete abscess, and needle aspiration does not yield purulent material. Stage II occurs 10 to 21 days after the beginning of symptoms and is characterized by pronounced fever, localized pain, muscle edema, and overlying erythema and induration. Aspiration during the second phase yields polymorphonuclear granulocytes, and organisms are easily identified on Gram's stain. Despite extensive muscle necrosis, elevations of the creatine kinase and aldolase levels virtually never occur. Secondary bacteremia may occur in stage III of the disease with the formation of metastatic abscesses. Pneumonia, purulent

pericarditis, septic arthritis, and a toxic shock-like syndrome have been reported as secondary manifestations of tropical pyomyositis.[18,19,23]

Of interest, our patient had fecal occult blood, and microscopic examination of the stool revealed eggs of *Ancylostoma duodenale.* Some authors have postulated underlying parasitic infection as a possible predisposing factor in tropical pyomyositis. In the largest published series of 112 patients, no data are provided regarding concomitant parasitic infection. In this cohort of patients from Nigeria, eosinophilia was common and it is safe to assume that coexisting parasitic infection was prevalent. A causal relationship between parasitic infection and tropical pyomyositis has not been definitively proved, and it is likely that this association reflects the endemic prevalence of two commonly occurring diseases. Furthermore, Taylor and co-workers have suggested, on the basis of histopathologic studies and electron microscopy, that antecedent Coxsackie virus infection may predispose to the development of staphylococcal pyomyositis.[24,25]

Our patient presented with fever, abdominal pain, and localizing peritoneal signs. Leukocytosis with bandemia, tachycardia, and postural hypotension were present. The findings of a physical examination strongly suggested an acute abdomen. Of note was the lack of erythema or induration in the area of guarding and rebound tenderness. Abdominal ultrasonography failed to show a recognizable focus of intra-abdominal infection. Despite previous reports describing the usefulness of ultrasonography in localizing pyomyositis, the abscess cavities were completely overlooked in this case.[10,11] Computed tomography revealed massive edema and multiple abscess cavities within the rectus abdominis and oblique musculature. Infection of the abdominal wall musculature directly overlying the peritoneum produces physical findings that are indistinguishable from those of an acute abdomen. Despite localizing abdominal findings, the septic focus in our patient was entirely extraperitoneal. During surgical drainage, the muscle was found to be infected through its full thickness and peritoneal hyperemia was noted without evidence of intra-abdominal communication.

No data exist on the appropriate duration of therapy for tropical pyomyositis. Likewise, no clinical trials have been published comparing the efficacy of various antibiotic regimens. In cases of possible tropical pyomyositis, empiric antibiotic therapy should consist of a semisynthetic penicillin or first-generation cephalosporin in combination with gentamicin, as *S aureus* is epidemiologically the most likely pathogen. While historical data suggest that some cases of tropical pyomyositis may resolve spontaneously, surgical drainage and parenteral antibiotic administration for a two- to three-week period remain the standard of care and protect against secondary infectious complications.

Acute appendicitis, periappendiceal abscess, ileocecal tuberculosis, inflammatory bowel disease, and hepatitis were diagnostic considerations in our patient. Plain radiographs and ultrasonography were unhelpful. Computed tomography of the abdomen followed by needle aspiration yielded the correct diagnosis. Open surgical drainage and antistaphylococcal therapy resulted in complete resolution.

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Successful Medical Treatment of Listerial Brain Abscess

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Listeria monocytogenes is a gram-positive bacillus that can be differentiated from other gram-positive bacilli by its motility at room temperature and its hemolysis of blood agar. It is well recognized as an opportunistic pathogen.[1,2] *Listeria* is known to have a predilection for neural tissue, but listerial brain abscesses occur rarely.[1,3] The necessity for surgical abscess drainage, the choice of antibiotic regimen, and the optimal duration of therapy are unresolved issues. We report

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