Primary Pyomyositis of the Pelvis in Children: A Retrospective Review of 8 Cases

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abstract

Full article available online at ORTHOSuperSite.com. Search: 20111021-07

Primary pyomyositis of the pelvic musculature is a condition rarely seen in temperate climates, although its frequency has been increasing in the United States. The condition should be considered in the initial differential diagnosis of an adolescent presenting with fever, difficulty ambulating, and hip pain. This is a retrospective review of 8 cases of primary pelvic pyomyositis in patients aged 18 years or younger who were treated at the Children’s Medical Center in Augusta, Georgia. The site of infection was the obturator internus in the majority of the cases (5). The site was the gluteus, iliopsoas, and iliacus in 1 case each. Four patients who were diagnosed early responded to intravenous antibiotics with no need for further intervention. Two patients required incision and drainage of an abscess combined with antibiotics. Two patients had prolonged hospital courses requiring intensive unit care and mechanical ventilation. Blood cultures were positive in 87.5% of patients, and all patients presented with elevated acute phase reactants.

One of the most difficult diagnostic aspects of presentation is an inconclusive symptom profile. It is noteworthy that patients with pelvic pyomyositis may present with limited range of motion in a specific plane (the motion placing the infected muscle on stretch) vs global limited range of motion of the joint as is commonly seen in septic arthritis. Early diagnosis is essential to prevent systemic illness and complications associated with this condition. Magnetic resonance imaging with gadolinium is helpful to diagnose and guide treatment.

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doi: 10.3928/01477447-20111021-07
Primary pyomyositis, also referred to as tropical pyomyositis, is a suppurative, subacute, bacterial infection of the muscle that is not secondary to any other infection of neighboring tissues and occurs primarily in tropical regions.\(^1\)\(^,\)\(^3\) It predominantly affects the largest muscle groups located around the pelvic girdle and lower extremities.\(^1\)\(^,\)\(^4\)

Although reported by Scriba in 1885,\(^5\) the first report of pyomyositis in North America did not appear until 1971.\(^3\) Responsible for 2% to 4% of surgical cases in tropical zones, it is much more familiar to physicians in those regions\(^6\)\(^,\)\(^7\); however, it is still rare in temperate zones, especially in North America.\(^3\)\(^,\)\(^8\) A true incidence is unknown,\(^9\)\(^,\)\(^10\) although it has been estimated to be approximately 1 per 3000 to 4000 visits in the pediatric population.\(^1\)\(^,\)\(^12\) According to Christin and Sarosi,\(^13\) approximately 100 cases in North America were described in the literature up to 1992. Since then, a few North American case reports and retrospective studies have emerged.\(^4\)\(^,\)\(^11\)\(^,\)\(^14\)\^-\(^28\)

Constituting approximately 35% of the reported pyomyositis cases, the pediatric population is an especially difficult subset of patients to diagnose.\(^6\)\(^,\)\(^13\) When the muscles of the pelvic girdle and hip are involved, the differential diagnosis becomes extensive, and pyomyositis is frequently overlooked due to its rarity.\(^1\)\(^,\)\(^11\)\(^,\)\(^29\)\^-\(^30\)

This article describes 8 children who were diagnosed with pelvic pyomyositis and identifies a symptom and laboratory profile, contrasted with the literature, which could assist in the diagnostic process.

**Materials and Methods**

A retrospective review was conducted to identify cases of primary pelvic pyomyositis. The search included all patients aged 18 years or younger at the time of discharge from the Children’s Medical Center in Augusta, Georgia, between January 1999 and September 2009. In addition, 1 earlier case from memory was included (March 1992; patient 4). Cases were identified on the basis of discharge International Classification of Disease, 9th revision codes (ICD-9) 728.0 and 567.31 (infective myositis and psoas muscle abscess, respectively). The charts were reviewed to ensure that the discharge diagnosis was primary pyomyositis involving the muscles of the pelvis.

The catchment area for these patients was approximately half of the state of Georgia, often requiring travel to our tertiary facility.

**Results**

Over the 10-year period, 7 cases were identified. One case from 1992 was added, totaling 8 cases for review. Four girls and 4 boys had a mean age of 12 years and 9 months (range, 6-18 years). A summary of the patients and their presenting symptoms is shown in Table 1. None of the patients had a prior medical history of significant systemic illness, including any immunocompromising conditions. One patient had Alagille syndrome, which is a benign arteriobiliary genetic disorder, but no others had congenital conditions. None of the patients were on chronic medications or steroids, and no family history of infection existed. Moreover, no trauma was reported in any patient, and the patients were from all socioeconomic groups.

**Presenting Signs and Symptoms**

All of the patients presented with pain, described as hip, anterior or posterior thigh, buttock, or groin in location. Six presented with difficulty ambulating, decreased range of motion (ROM), or inability to ambulate. Six of the 8 reported fevers at home, and on admission, 5 were febrile with a temperature \(>38.5^\circ\text{C}\). Four had a temperature \(>39.5^\circ\text{C}\). Mean temperature on examination was \(38.8^\circ\text{C}\) (range, \(36.6^\circ\text{C}-40.3^\circ\text{C}\)). Three patients had decreased appetite, 3 had decreased energy, and 3 had upper respiratory symp-

<table>
<thead>
<tr>
<th>Table 1 Summary of Patients on Admission</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient No./ Sex/Age, y</strong></td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>1/F/10.3</td>
</tr>
<tr>
<td>2/F/9</td>
</tr>
<tr>
<td>3/M/15.9</td>
</tr>
<tr>
<td>4/M/11.6</td>
</tr>
<tr>
<td>5/M/15.1</td>
</tr>
<tr>
<td>6/M/13.9</td>
</tr>
<tr>
<td>7/F/6.5</td>
</tr>
<tr>
<td>8/F/18.2</td>
</tr>
<tr>
<td>Average</td>
</tr>
</tbody>
</table>
toms such as cough and congestion. Two reported emesis, and 1 also noted knee pain.

Physical examination revealed moderate to severe pain on ROM of the hip in all patients, especially internal rotation. Range of motion seemed to be physically limited in only 3 patients (patients 5, 7, and 8). Physical examination elicited a positive straight-leg raise test in 2 patients (patients 2 and 4) and a positive psoas sign in 1 patient (patient 6). The patient with knee pain also had an effusion about the knee, but no other effusion or superficial changes were noted about the hips or knees in any patient.

The average duration between symptom onset and diagnosis was 5.9±1.9 days. As a subset of that, the duration from physician contact to diagnosis was 4.0±2.6 days. This included transfer between facilities. One-half of the patients (n=4) were seen in a local emergency department and discharged before returning for admission.

**Laboratory Findings**

All of the patients had an elevated erythrocyte sedimentation rate (ESR). Mean ESR was 76 mm/hour (range, 30-133 mm/hour). C-reactive protein (CRP) was measured in 5 patients, and it was elevated (>5 mg/L) in 4 of them. Mean CRP at admission was 13.9 mg/L (range, 4.4-38.8 mg/L). White blood cell count at admission ranged from 4.9 to 34.0 10^3/μL. However, 50% of the patients had a white blood cell count >18,000 cells/μL.

Seven patients (87.5%) had a bacterial source identified by blood culture, with group A Streptococcus, methicillin-susceptible Staphylococcus aureus (MSSA), and methicillin-resistant Staphylococcus aureus (MRSA) the responsible organisms. Methicillin-susceptible S. aureus was the most common, infecting 4 patients; MRSA was cultured in 2 patients and group A Streptococcus in 1. Two patients had hip aspirates with positive cultures that matched the blood cultures; 3 had abscess drainage that cultured the same organism as the blood; and 1 had a sputum sample and another had a knee aspirate that all matched the organism previously cultured in the blood. These laboratory findings are summarized in Table 2.

**Imaging**

Magnetic resonance imaging (MRI) with contrast proved to be the most useful diagnostic study to identify the muscle infection and was used to select aspiration and drainage management. It was performed on all patients within 3 days of evaluation by the Children’s Medical Center orthopedic service. Radiographs obtained from 5 patients prior to MRI were unable to elucidate any changes, and thus were read as normal. Computed tomography (CT) scan obtained from patient 4 demonstrated a fluid collection underlying the obturator internus. Magnetic resonance imaging in the earlier stages of infection showed edematous changes in the pelvic musculature. In later stages, abscess formation was identified (Figures 1-3). A summary of the MRI findings is shown in Table 3.

**Muscle Involvement**

The most commonly involved muscle was the obturator internus (n=5). The iliopsoas, gluteus medius, and iliacus were each involved in 1 child. Some secondary involvement of the gemellus muscles and paraspinal musculature occurred in 1 case.

**Treatment**

All patients received intravenous antibiotics followed by oral antibiotics. For each patient, the antibiotic therapy was chosen for the specific organism and its particular sensitivities. Due to MRSA in 4 patients and the possibility of MRSA while awaiting sensitivities on patients with gram-positive cocci in clusters on gram stain, vancomycin was used most frequently (n=5). Average antibiotics duration was 50 days. Three had pelvic abscess surgically drained, with 2 of these having a hip

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**Table 2**

Summary of Laboratory Findings

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>WBC, 10^3/μL Adm.</th>
<th>Max.</th>
<th>ESR, mm/hr Adm.</th>
<th>Max.</th>
<th>CRP, mg/L Adm.</th>
<th>Max.</th>
<th>Pathogen</th>
<th>Culture Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>21.0</td>
<td>21.7</td>
<td>78</td>
<td>78</td>
<td>–</td>
<td>78</td>
<td>GAS</td>
<td>Blood</td>
</tr>
<tr>
<td>2</td>
<td>10.2</td>
<td>11.0</td>
<td>58</td>
<td>68</td>
<td>9.0</td>
<td>68</td>
<td>MSSA</td>
<td>Blood</td>
</tr>
<tr>
<td>3</td>
<td>9.1</td>
<td>10.4</td>
<td>40</td>
<td>64</td>
<td>–</td>
<td>64</td>
<td>MRSA</td>
<td>Blood, abscess</td>
</tr>
<tr>
<td>4</td>
<td>11.4</td>
<td>13.1</td>
<td>25</td>
<td>133</td>
<td>10.3</td>
<td>133</td>
<td>MSSA</td>
<td>Blood, hip aspirate, abscess</td>
</tr>
<tr>
<td>5</td>
<td>6.7</td>
<td>18.7</td>
<td>40</td>
<td>54</td>
<td>–</td>
<td>54</td>
<td>MSSA</td>
<td>Blood, knee aspirate</td>
</tr>
<tr>
<td>6</td>
<td>9.4</td>
<td>34.0</td>
<td>87</td>
<td>87</td>
<td>38.8</td>
<td>87</td>
<td>MRSA</td>
<td>Blood, hip aspirate, abscess</td>
</tr>
<tr>
<td>7</td>
<td>–</td>
<td>4.9</td>
<td>–</td>
<td>95</td>
<td>6.8</td>
<td>95</td>
<td>MSSA</td>
<td>Blood</td>
</tr>
<tr>
<td>8</td>
<td>15.1</td>
<td>19.0</td>
<td>30</td>
<td>30</td>
<td>4.4</td>
<td>30</td>
<td>None</td>
<td>–</td>
</tr>
</tbody>
</table>

Average 11.8 16.6 51 76 13.9

Abbreviations: CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; GAS, group A Streptococcus; Max, maximum; MRSA, methicillin-resistant Staphylococcus aureus; MSSA, methicillin-sensitive Staphylococcus aureus; WBC, white blood cells.
joint irrigation and debridement as well. One case with inflammatory changes in the muscles without abscess but with fluid in the hip had irrigation and debridement of the hip joint only. All had an anterior approach, with 1 patient also requiring a posterior approach to the short external rotators. A summary of treatment methods and antibiotic durations is presented in Table 3.

**Complications**

Two patients (25%) experienced difficult hospital courses with significant morbidity at the outcome. Patient 5 developed overwhelming sepsis and experienced respiratory distress that required intubation and pediatric intensive care unit placement. Moreover, he developed a septic knee requiring multiple aspirations and developed osteomyelitis of the tibia. The sepsis and osteomyelitis, in addition to the pelvic pyomyositis, resolved; however, at follow-up he reported continued pain with difficulty in ambulation. Patient 6 was transferred to our facility late in the course of the disease with systemic sepsis and acute respiratory distress syndrome requiring intubation. He required multiple...
surgical procedures due to pelvic, hip joint, and ischiorectal abscesses and pelvic osteomyelitis. On final radiographic evaluation, severe hip arthritis was noted, yet he was able to ambulate unassisted.

CASE REPORT

Patient 6 was the most severe case in the series, requiring a hospital stay of 45 days, of which 38 days were spent in the pediatric intensive care unit. Mechanical ventilation was required for 30 days.

A 13-year-old boy was transferred to our institution for intensive care unit management 5 days after initially presenting to another facility with anorexia, emesis, temperature of 103.9°F, and left thigh and groin pain. He was initially seen in the emergency department of the transferring hospital and diagnosed with the flu. The patient was admitted to the transferring institution.

Vital signs on admission included a temperature of 39°C measured orally, a pulse of 120 beats per minute, respirations of 46 breaths per minute, and a blood pressure of 115/65. The patient’s oxygen saturation was 95% on room air. Laboratory data on admission included a white blood cell count of 9.4, ESR of 87, CRP of 38.8, hemoglobin of 10.6, and blood culture positive for MRSA. Prior to transfer, the patient was started on cloxacillin by the transferring institution.

Radiologic studies were obtained prior to transfer, which included a CT scan and MRI of his pelvis. These studies demonstrated fluid collections and edema in the adductors, in the inner wall of pelvis posterior to the acetabulum, in the obturator internus muscle, between the tip of the sacrum and rectum, and in the hip joint (Figure 2).

The patient was brought to the operating room on the date of admission for irrigation and debridement of his left obturator internus abscess and left hip joint. Intraoperative cultures were positive for MRSA. He subsequently required 4 additional irrigation and debridement procedures, as well as 2 operative procedures by pediatric surgery for irrigation and debridement of a perirectal abscess.

The hospital course was complicated by acute respiratory distress syndrome, tension pneumothorax, pancreatitis, esophagitis, and acute renal failure.

At final follow-up at 16 years of age, the patient reported no hip pain but occasional knee pain. He was able to ambulate without the use of assistive devices. Physical examination revealed a mild Trendelenburg gait, and hip ROM of 0° to 90° of flexion, arc of rotation of 40°, and 25° of abduction. Plain radiographs revealed significant left hip joint space.

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>MRI Findings</th>
<th>Treatment Method</th>
<th>Surgical Approach</th>
<th>Antibiotic Duration, d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Edema around psoas and iliacus</td>
<td>Antibiotics</td>
<td>NA</td>
<td>48</td>
</tr>
<tr>
<td>2</td>
<td>Edema around obturator internus and ischium</td>
<td>Antibiotics</td>
<td>NA</td>
<td>46</td>
</tr>
<tr>
<td>3</td>
<td>Edematous and inflammatory changes of right paraspinal musculature; edematous changes around left obturator internus and superior and inferior gemellus; abscess forming within affected external rotators</td>
<td>Antibiotics, I&amp;D of abscess</td>
<td>Anterior and posterior approach</td>
<td>39</td>
</tr>
<tr>
<td>4</td>
<td>Abscess underlying obturator internus</td>
<td>Antibiotics, I&amp;D of abscess and hip joint</td>
<td>Anterior (iliac) approach</td>
<td>53</td>
</tr>
<tr>
<td>5</td>
<td>Diffuse edema and inflammation of anterior compartment of thigh and gluteus medius</td>
<td>Antibiotics</td>
<td>NA</td>
<td>43</td>
</tr>
<tr>
<td>6</td>
<td>Diffuse edematous changes throughout pelvis with abscess around obturator internus; involvement of acetabulum, iliac, and pubis</td>
<td>Antibiotics, I&amp;D of abscess and hip joint</td>
<td>Anterior (ilio) approach, multiple debridements</td>
<td>89</td>
</tr>
<tr>
<td>7</td>
<td>Edematous changes of left iliacus</td>
<td>Antibiotics</td>
<td>NA</td>
<td>32</td>
</tr>
<tr>
<td>8</td>
<td>Inflammatory changes around obturator internus</td>
<td>Antibiotics, I&amp;D of hip joint</td>
<td>Anterior (iliac) approach</td>
<td>49</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

Abbreviations: I&D, irrigation and debridement; NA, not available.
narrowing and heterotopic ossification (Figure 3). Overall, the patient was content with his function despite the radiographic findings.

DISCUSSION

Although pyomyositis is more common in tropical regions, there have been only a few large retrospective studies in North America.\textsuperscript{13,25} In a more recent report from Texas Children’s Hospital, 45 pediatric pyomyositis cases were reported over 6 years, 13 involving the pelvic musculature.\textsuperscript{29} In our retrospective review of pelvic pyomyositis in the pediatric population, 8 patients were identified. All of our patients were primarily managed on the pediatric orthopedic service. Two of the patients required consultation from intensive care unit intensivists, and consultation with infectious diseases was done in all cases.

The cause of pyomyositis is still unclear. Skeletal muscle is one of the least susceptible tissues to bacterial infection.\textsuperscript{21} However, transient bacteremia is believed to be the initiating situation of pyomyositis. It has been demonstrated that injection of bacteria, even directly into a muscle, will not produce pyomyositis, but in the setting of a traumatizing event, such as shock, blunt force, or ischemia, it will cause infection.\textsuperscript{32} Therefore, local trauma has been considered a facilitating factor necessary for pyomyositis.\textsuperscript{31,13} However, the highest reported percentage of trauma in temperate pyomyositis reports is 39%.\textsuperscript{5,13} More recently, Bickels et al\textsuperscript{1} reviewed >676 patients, of which <5% reported trauma. None of our patients noted any recent injury prior to presentation. Others have identified certain conditions, such as diabetes or immunocompromise, that serve as a prerequisite for pyomyositis, yet none of the patients in this study had any predisposing conditions.\textsuperscript{13} None of our patients had systemic illness, a history of recurrent infections, or immunity-compromising conditions. Additionally, no pattern of race or socioeconomic status existed.

Reports from tropical and temperate climates found that a majority of the pediatric pyomyositis cases occurred in children within the first decade of life.\textsuperscript{6,11,26,34,35} Our study includes only pelvic pyomyositis, which may present more often in teenage patients. With an average age of 12.8 years, the patients detailed here are older than those in reports including all cases of pyomyositis, regardless of infection site. Six of our 8 patients were older than 10 years. Although the group examined in this review consists of only 8 patients, this age distribution is important to recognize.

Some authors have outlined 3 stages of pyomyositis as a gradual progression from diffuse inflammation to focal abscess formation to a septic state.\textsuperscript{3,6,18,29} The first stage, preabscess, is characterized by progressive pain and possible systemic signs of infection. It is within this first stage that diagnosis is the most difficult due to the vagueness of symptoms that mimic many other disease processes. With MRI, edematous changes are seen, thus aiding in the diagnosis prior to a need for surgical treatment. In our series, patients 1, 2, 7, and 8 were diagnosed as stage I with only edematous changes but no abscess noted on MRI (Figure 1A). As expected, they responded to an appropriate course of intravenous antibiotics without the need for surgical management or the development of subsequent sequela.

In stage II, an abscess begins to form. Patients 3 and 8 presented in stage II and were found to have an abscess on MRI (Figure 1B). This group was successfully managed with irrigation and debridement of the abscess in addition to intravenous antibiotics. An anterior (iliac crest) approach was used to access the true pelvis to drain abscess formation within the obturator internus or iliacus. One patient also required a posterior approach to drain the external rotators as well. These procedures were performed by the orthopedic service.

Stage III proceeds to systemic manifestations of sepsis and toxicity. Spread of infection locally can lead to multiple abscesses, septic arthritis, and osteomyelitis. Patients 5 and 6 in our case series presented in septic shock and required admission to the pediatric intensive care unit and mechanical ventilation. The hospital course for both patients was protracted with the development of infection of other tissues and multiple complications. Both required consultation with pediatric intensivists, and 1 had drainage of a perirectal abscess by pediatric surgery.

One of the most difficult diagnostic aspects of early presentation is the inconclusive symptom profile. In our patients, the primary symptoms were fever, hip/thigh pain, and difficulty ambulating (limp). These symptoms agree with previously documented findings.\textsuperscript{12,27,36,37} Other authors have noted that many of the patients tend to hold the hip flexed, abducted, and externally rotated and resist movements.\textsuperscript{15,38,39} It is noteworthy that the movements of the hip seem to be painful, but not necessarily limited.\textsuperscript{37,40} Patients with pelvic pyomyositis may present with limited motion in a specific plane vs global limited ROM of the joint as is commonly seen in septic arthritis. In our series, patient 3 presented with severe pain and limited ROM on left hip abduction and internal rotation; however, he was able to range his hip from 0\textdegree\ to 100\textdegree\ of flexion and to bear weight on the leg as long as the extremity remained externally rotated. In the majority of patients (n=5), no ROM limitation existed, but motion was painful.

An additional physical examination maneuver that can be useful in diagnosis is the straight-leg raise test. Although positive in only 2 patients in our series, it can signify involvement of the obturator internus. The positive straight-leg test is likely due to inflammation in the area of the greater sciatic notch where the obturator internus and the sciatic nerve pass. The 2 patients in this series who had a positive straight-leg test had involvement of the obturator internus confirmed on MRI. In
Delay between initial symptoms and a visit to a physician was >3 days in only 1 patient (patient 5). However, the average duration between symptom and diagnosis was 5.9 days. Included in this time were initial visits to a local emergency department or local physician before referral to the Children’s Medical Center. This delay likely springs from the nonspecific symptoms that patients present with during the early stages of pelvic pyomyositis and the fact that they can usually walk.

In our review, no one laboratory test was specific for pyomyositis; however, elevation of inflammatory markers (CRP and ESR) are common. Erythrocyte sedimentation rate was elevated in every patient, and CRP was elevated in all but 1. Unnikrishnan et al\textsuperscript{15} agreed that primary pyomyositis is unlikely without elevated CRP and ESR. Browne et al\textsuperscript{41} showed through examination of a pediatric population that if the CRP is <3.6 mg/dL or the ESR is <22 mm/hour, then these children would be unlikely to have pyomyositis. Our findings agree with these conclusions. Moreover, previous studies have reported 50% to 80% to have a leukocytosis on presentation.\textsuperscript{4,13,26,35} In our patients, 63% presented with a leukocytosis, suggesting that an elevated white blood cell count is much less sensitive compared with inflammatory markers. In our study, 7 patients (87.5%) had a positive blood culture, which is much higher than the reported rates of 30% to 60% in patients with septic arthritis or osteomyelitis, further suggesting a systemic process. The causative organism in 6 of the 7 cases was 
\textit{S. aureus}. This is consistent with previous articles on pyomyositis.\textsuperscript{1,3,4,6,8,20,25,27,31,41-46} Only 2 of the patients infected with 
\textit{S. aureus} in our patient population had a methicillin-resistant variant; however, some of these cases predate the recent MRSA epidemiologic trend.

Magnetic resonance imaging with gadolinium enhancement is considered the best imaging test for the diagnosis of pyomyositis and the various musculoskeletal infections.\textsuperscript{1,2,6,26,37,40,47,48} Computed tomography has been shown to produce false negatives.\textsuperscript{36,49} During early pyomyositis, low-signal intensity changes on T1-weighted images may be seen around the periphery of the muscle (Figure 1A).\textsuperscript{50} Studies have shown that plain radiographs and ultrasound are of little use in diagnosing pyomyositis.\textsuperscript{20,37} Although ultrasound has little usefulness in making a diagnosis, it can be helpful to rule out septic arthritis and may be a more appropriate first-line test due to its ability to show joint fluid with decreased invasiveness and cost.\textsuperscript{29,34,49} Early exclusion of septic arthritis is essential because delay may be costly to the joint.\textsuperscript{38}

Many authors believe that MRI should follow a negative ultrasound.\textsuperscript{15,20,24,29,51} In our experience, MRI with gadolinium contrast is the test of choice for diagnosing pyomyositis, especially in the early stages, because it can show early inflammatory muscle changes. It should be obtained when symptoms suggest, but are not convincing for, a septic hip, in those cases where hip aspiration is negative despite evidence of infection about the hip, and in cases of older children who less often develop primary septic arthritis. Moreover, if a septic hip diagnosis is uncertain after an ultrasound, MRI should be considered to rule out pyomyositis.

Treatment of pyomyositis should be tailored to the stage of the disease, the causative organism, and any other coexisting infection.\textsuperscript{36} When first described in temperate regions, antibiotics were rarely sufficient alone, and incision and drainage were necessary.\textsuperscript{3,8} However, others have noted that antibiotics used early in the disease process prevent abscess formation and suffice for resolution of the infection.\textsuperscript{26,27,34,36,37,52} Antibiotics are recommended for 2 to 6 weeks.\textsuperscript{4,12} Fifty percent of our patients who presented in stage I needed only antibiotics for resolution (Table 3). The average antibiotic duration for this patient group was 50 days. The remaining 4 patients required more invasive treatment with drainage of pelvic abscess and, in some cases, the hip as well. Drainage of pyomyositis in the pelvis is indicated for those who remain febrile and with pain for >5 to 7 days despite antibiotic treatment, or have an abscess evident on imaging.\textsuperscript{27,36,38} In our patient group, once a fluid collection was identified by MRI, irrigation and debridement was performed.

After adequate treatment in stage I or II, there is usually little functional disability.\textsuperscript{1,2,14,40,42} However, if the infection progresses to involve adjacent structures and produces a serious septic state, as demonstrated in patients 5 and 6, the outcome can be poor. These 2 patients with difficult hospital courses had residual pain and ambulation difficulties. At latest follow-up, we noted significant hip arthritis in patient 6 due to hip joint involvement with pyomyositis. Others have also noted additional long-term sequelae such as osteomyelitis, muscle scarring, and functional weakness and impairment.\textsuperscript{1}

**CONCLUSION**

Pyomyositis, once considered a disease of the tropics, is now appearing more frequently in North America and other temperate climates, especially in the pediatric population. When pyomyositis involves the pelvic musculature, diagnosis becomes more difficult because the deep structures cannot be examined directly and the differential diagnosis increases substantially. Early-stage pelvic pyomyositis is often mistaken for septic arthritis of the hip.\textsuperscript{20,24,26,34,36,39,48} Specifically, infection of the obturator internus causes symptoms similar to a septic hip, presenting with fever, hip pain, and limp.\textsuperscript{15,27} This diagnosis should be strongly considered in the teen-


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DECEMBER 2011 | Volume 34  Number 12


