the average MIC is $1 \mu g/mL$ [2]. However, the use of ciprofloxacin is contraindicated in children, who constitute the most common age group with CSD.

Azithromycin penetrates into both macrophages and neutrophils; this uptake accounts for the extremely high ratio of 40 for intracellular-to-extraacellular concentrations [5, 10]. It has also been suggested that phagocytes may transport azithromycin into areas of inflammation and infection. Furthermore, a separate experiment demonstrated that the concentration of azithromycin—but not that of clarithromycin or erythromycin—remained high within the phagocytes when drugs were removed from the incubation medium.

Azithromycin is highly effective against Bartonella species in a cell-free medium, with an MIC ranging from 0.006 to 0.015 $\mu g/mL$, which is far below the achievable intracellular concentration. The preferential concentration of azithromycin within infected lymph node tissue and phagocytes may be the reason for the drug’s effectiveness against sequestered yet drug-susceptible B. henselae.

The optimal dose and duration of azithromycin therapy for patients with CSD was not adequately addressed in this study. A 5–7 day course of therapy may be enough because of the long tissue half-life and high intracellular concentration of this drug. Although the true effectiveness of antibiotics for the treatment of CSD cannot be established without a controlled trial, our preliminary data, along with the aforementioned scientific basis, should encourage the use of azithromycin for the treatment of symptomatic cases of CSD.

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Note Added in Proof
Since the acceptance of this paper, we have treated five more patients with bartonella lymphadenitis, confirmed by serology or by detection of B. henselae DNA in a lymph node aspirate. Four patients with painful, non supplicative lymph nodes ranging in size from 2.5 cm × 3 cm to 7 cm × 4 cm responded to 7–10 day courses of azithromycin, with resolution of lymphadenopathy within 10–21 days. One patient with a completely fluctuant anterior cervical node (2.5 cm × 1.5 cm), who had received two prior courses of ciprofloxacin and clarithromycin, failed to respond to treatment with azithromycin; however, the lymph node gradually regressed after repeated aspiration of pus.

References

Proteus Pyomyositis of the Piriformis Muscle in a Swimmer

Nontropical or “temperate” pyomyositis, a bacterial infection of skeletal muscle, has been reported with increasing frequency over the past 2 decades, although it remains an unusual infection in children [1, 2]. Pyomyositis most commonly involves the large muscles of the extremities, often after muscular trauma or exertion [1–5]. Gram-positive organisms are the usual etiologic agents [1, 2]. We recently treated a boy who presented with a confusing clinical picture of sepsis with severe back and leg pain suggestive of an epidural abscess. The boy, a competitive swimmer, was ultimately determined to have pyomyositis of the piriformis muscle due to Proteus mirabilis.

A 17-year-old male was admitted to the hospital with fever and severe leg and back pain. The pain worsened to the point that walking became difficult. He was febrile (temperature to 104°F). His WBC count was 18,900 cells/µL (87% polymorphonuclear cells, 4% band forms, 3% lymphocytes, 1% eosinophils, and 5% monocytes), his hematocrit was 45%, and his platelet count was 201,000 cells/µL. The erythrocyte sedimentation rate was 1 mm/h, and findings of a urinalysis were unremarkable. Culture of urine yielded no growth.

The patient underwent a neurosurgical evaluation because of concern that he had an epidural abscess. On physical evaluation he appeared to be unable to find a position of comfort. Straight leg raises were limited to 55° on the left and 35° on the right. There was no swelling over the back or pain to percussion. He was a high school football player, but his last game had been 2 weeks before admission. He was also a competitive swimmer (breaststroke) and had practiced vigorously 2 days before admission. He denied drug use or sexual activity.
Because of its location within the pelvis near the sciatic notch, inflammation of the piriformis is often associated with severe sciatic pain, as was noted in our case [4, 7]. This can lead to the erroneous conclusion that lumbar or epidural inflammation is present. Appropriate imaging techniques usually allow rapid diagnosis of the actual area and nature of the infection [8].

Most cases of pyomyositis are due to gram-positive organisms, particularly *Staphylococcus aureus* and *Streptococcus pyogenes* [1, 2]. The few cases that are due to gram-negative organisms have occurred primarily in patients with immunologic deficiencies [9]. To our knowledge, there are no previously reported cases of proteus pyomyositis.

The source of our patient’s organism is unknown. Findings of an evaluation of the patient’s genitourinary and gastrointestinal tracts were normal. There was no evidence of parenteral drug use, and cardiac evaluation was unremarkable. Hot tubs and swimming pools have been previously implicated in the development of invasive gram-negative infections, presumably through inhalation of aerosolized organisms [10].

In most previously reported cases of pyomyositis, prolonged (2–4 weeks) parenteral antibiotic therapy has been administered after evacuation of a defined intramuscular abscess [1, 2]. It appears that in cases where frank suppuration has not occurred, briefer therapy be effective, as long as disease resolution is documented by radiographs and laboratory test results.

**Figure 1.** T₂-weighted axial MRI image through the pelvis of a 17-year-old male swimmer with pyomyositis of the piriformis muscle due to *Proteus mirabilis*. The right piriformis muscle (arrow) is enlarged and edematous.

An MRI of the lumbar spine revealed an abnormal signal in the right piriformis muscle just anterior to the sacroiliac joint (figure 1). No epidural abscesses was noted. Therapy with iv vancomycin and cefotaxime was initiated after the blood cultures were performed. Morphine was required for pain relief.

The next day a technetium bone scan confirmed a lack of involvement of osseous structures. A C-reactive protein level was obtained because this acute-phase reactant often becomes elevated before the erythrocyte sedimentation rate. The C-reactive protein level was highly abnormal at 12.8 mg/L (normal range, <1 mg/dL). The creatinine kinase level was high (1,113 IU/L [normal range, 0–206 IU/L]), further suggesting muscle involvement. Two blood cultures yielded *P. mirabilis*. Antibiotic therapy was switched to cefotaxime and tobramycin. The patient became afebrile by the fourth hospital day. A CT of the abdomen and pelvis with contrast medium demonstrated marked swelling of the right piriformis muscle and bilateral pulmonary effusions that were too small to tap. No gastrointestinal or gastrourinary lesions were noted. Findings on a cardiac echogram were normal.

The patient was discharged from the hospital to complete 2 weeks of iv antibiotic therapy. By day 10 of treatment, the patient’s C-reactive protein level had returned to normal (0.7 mg/dL), as had his creatinine kinase level (67 IU/L). A follow-up CT showed only minimal swelling of the piriformis muscle. The development of pyomyositis is assumed to be secondary to traumatic injury to a muscle during a period of bacteremia [1–5]. In an animal model of experimentally induced pyomyositis, muscle infection did not occur in association with staphylococcal bacteremia unless the muscle was first physically damaged [6]. There are reports of bacterial pyomyositis occurring in children after arm wrestling or volleyball [3, 5]. It seems significant that this boy’s infection developed in one of the pelvic muscles used in the frog kick employed in his specialty event, the breaststroke.

References