

Subperiosteal Abscess of the Distal Radius in a 13-Year-Old Boy: A Case Report

Anastasiya K. Haponyuk, BS*; Deana M. Mercer, MD†

*School of Medicine, The University of New Mexico, Albuquerque, New Mexico

†Department of Orthopaedics & Rehabilitation, The University of New Mexico Health Sciences Center, Albuquerque, New Mexico

Corresponding Author Deana M. Mercer. Department of Orthopaedics & Rehabilitation, MSC 10 5600, 1 University of New Mexico, Albuquerque, NM 87131 (email: dmerc@salud.unm.edu).

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ABSTRACT

Children and adolescents have the tendency to develop osteomyelitis in metaphyseal sinusoids because turbulent blood flow increases the probability of bacterial growth. Osteomyelitis in children is frequently misdiagnosed owing to lack of symptoms and specific findings from laboratory tests. Without rapid antibiotic treatment of osteomyelitis, complications such as subperiosteal abscesses may occur. We describe a 13-year-old boy who underwent irrigation and debridement to treat a subperiosteal abscess of the right distal radius and ulna, caused by acute osteomyelitis. After debridement, the patient was placed on a continuous 6-week course of nafcillin infusion through a peripherally inserted central catheter (PICC). The patient's condition notably improved in the 2-, 6-, 10-, and 18-week follow-ups. Use of PICC to deliver antibiotics after irrigation and debridement may be clinically effective within certain pediatric populations.

Keywords: Adolescent, Osteomyelitis, Abscess, Wrist, Catheters

INTRODUCTION

A subperiosteal abscess, defined as a collection of pus under the periosteum, forms after an infection breaks through the metaphyseal cortex.¹ Subperiosteal abscesses may form as complications of osteomyelitis caused by inflammation and infection of the bone marrow.² The prevalence of acute osteomyelitis (<14 days in duration) amongst children and adolescents is 8 to 13 per 10,000, with boys affected more than girls (1.9:1).³ Acute osteomyelitis most commonly occurs from hematogenous spread of *Staphylococcus aureus*, but studies have also reported extension from soft-tissue infections or direct inoculation of bacteria with open fractures.⁴

Non-specific symptoms such as fever, erythema, edema, and intensity-increasing pain make acute

osteomyelitis difficult to diagnose. Noninvasive laboratory tests to determine C-reactive protein (CRP) levels and erythrocyte sedimentation rate (ESR) reveal successful but non-sensitive and non-specific treatment options.^{5,6} Plain radiograph findings can be useful to detect lytic bone lesions, but lesions are only visible when greater than 50% of the bone has been demineralized.⁷ Findings of T-1 weighted magnetic resonance imaging (MRI) scans can also reveal signs of acute osteomyelitis, including bone marrow edema and periosteal collections, seen with subperiosteal abscesses.^{6,8}

Surgical irrigation and debridement of the necrotic bone can treat subperiosteal abscesses in acute osteomyelitis. Intraoperatively, culture samples are collected for postoperative antibiotic treatment. However, a positive culture is found in only 50% to 60% of patients owing to previous antibiotic therapy and difficulty with detecting the causative organism.⁶ Patients with methicillin-susceptible *Staphylococcus aureus* (MSSA) can be prescribed anti-staphylococcal methicillin such as nafcillin, whereas patients with methicillin-resistant *Staphylococcus aureus* receive clindamycin or vancomycin.^{6,9} Duration of antibiotic treatment is typically 3 to 6 weeks, depending on the progression of osteomyelitis.

In the current case, our adolescent patient presented with subperiosteal abscesses of the right distal radius and ulna. He underwent surgical irrigation and debridement, followed by continuous PICC infusion of nafcillin for 6 weeks.

CASE REPORT

In August 2016, a 13-year-old boy presented to the emergency department with a 3-day history of fever, peaking at 102°F and progressively worsening. Pain, swelling, and erythema of the right dorsal forearm and wrist were noted, which resulted in limited flexion, extension, and gripping motions. The patient reported a family history of rheumatoid arthritis but did not

have any previous trauma, overuse, or autoimmune disease. Laboratory test results showed the following: mild levels of leukocytes, $10.3 \times 10^9/L$; increased levels of neutrophils s-segmented, $8.1 \times 10^9/L$; and elevated CRP, 10.5 nmol/L. Findings on MRI scans showed a subperiosteal abscess of the right distal radius and ulna. During 24 hours, a mild improvement was seen with use of intravenous ceftriaxone. The patient was scheduled for same-day irrigation and debridement.

Before periosteum incision, fluid from the distal radius was extracted and sent for culture testing (Figure 1). On gross appearance, the periosteum of the distal dorsal radius and ulna were swollen. After aspiration, the periosteum was incised, elevated, curetted, and irrigated. The pus of the distal radius appeared localized and organized, whereas the subperiosteal fluid of the distal ulna appeared murky



Figure 1. Gross appearance of fluid aspirated from the right distal radius before incision.

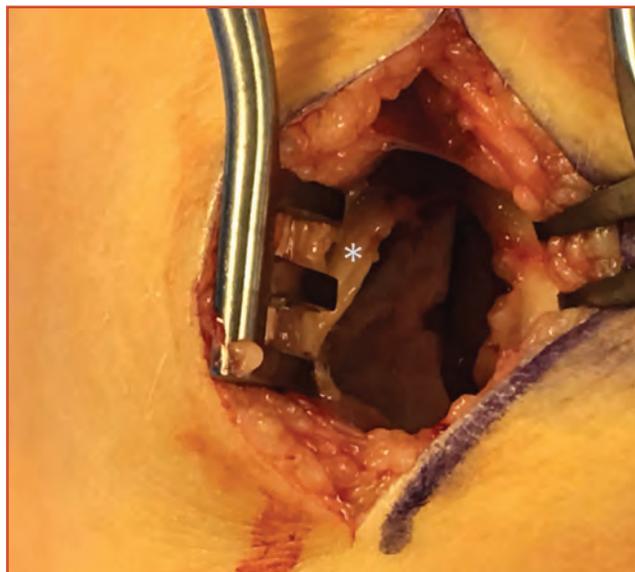


Figure 2. Appearance of the distal radius upon incision, showing a clear collection of pus underneath the periosteum (asterisk).

but lacked pus on incision (Figure 2). After irrigation and debridement, the patient was admitted to the hospital and placed on cefazolin and ceftriaxone. The bacterial culture tested positive for MSSA and the patient's CRP levels decreased to 1.4 nmol/L. Ceftriaxone was discontinued, and the patient switched to continuous infusion of 10 g of nafcillin using the PICC for 6 weeks. At 2 weeks postoperatively, the symptoms resolved in the right forearm and the patient returned to normal activities of daily living. No complications or concern for chronic osteomyelitis were noted at 6, 10, and 18 weeks postoperatively.

DISCUSSION

Subperiosteal abscesses are more common in children and adolescents because the cortical bone is thinner, allowing infection to spread easily from the medullary cavity to the periosteum. Additionally, pus accumulates easily within the subperiosteal space because the periosteum is loosely attached to the underlying bone.^{10,11} In the current case, the subperiosteal abscesses found within the distal radius and ulna necessitated irrigation and debridement to reduce the risk of periosteum rupture and soft-tissue infections.

T1-weighted MRI scans are preferred owing to easy detection of subperiosteal abscesses. The region with abscess-containing pus produces a low signal on T1-weighted images, with a rim of medium-intensity granulation tissue in the periphery.^{11,12}

Treatment of acute osteomyelitis after irrigation and debridement varies. For example, 7 days of parenteral therapy followed by oral antibiotics have been compared to continuous intravenous antibiotic infusion using PICC, showing mixed results. Whereas some studies have reported that use of oral antibiotics are as effective as a PICC, other studies have found greater relapse rates with oral antibiotic treatment.¹³⁻¹⁵

In the current case, use of a PICC helped successfully treat acute osteomyelitis in a 13-year-old boy. Subsequently, a PICC may be a reliable method of treatment in this age group. Patients may recover without complications. Future studies may focus on evaluating the efficacy, ease of compliance, and risk factors associated with intravenous infusion versus oral antibiotic treatment of acute osteomyelitis in pediatric populations.

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