



Shoulder Pain after a Wasp Sting in a 2-Year-Old

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Presentation

A 2-year-old girl presents to the Emergency Department (ED) with a 36-hour history of redness to the left shoulder and left shoulder pain. Mother reports that a day prior, the daycare staff reported that patient was less playful and acting more irritable. Patient has a history of recurrent ear infections and mother was concerned about another ear infection and had gone to the pediatrician where she had been diagnosed with an otitis media and prescribed Cefdinir. She developed a fever 24 hours prior to presentation and was restless, crying and refusing to move her left shoulder.

Mother reports that patient was stung by a wasp 10 days prior. Her past medical history is significant only for the recurrent ear infections and she is up to date on her immunizations.

Physical examination reveals an alert, crying but easily consoled toddler. Vital signs show a temperature of 37.8°C (100°F), heart rate of 146 beats/min, respiratory rate 26 breaths/min, blood pressure 98/67 mmHg and oxygen saturations 100% in room air. There is mild erythema measuring about 1cm by 3cm over the left shoulder but no swelling noted. She cries in pain with abduction, adduction and rotation of the left shoulder. There is no swelling over the clavicular area and no tenderness on palpation. Elbow and wrist examination are normal and are neurovascular intact. Old wasp stings are noted to both arms and wrists. Her tympanic membranes are erythematous and show purulence. The remainder of the physical examination findings are normal.



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In the ED, initial laboratory studies reveal a White Blood Cell (WBC) count of 20980/ μL ($20.98 \times 10^9/\text{L}$) with a neutrophil predominance, C-reactive protein (CRP) level of 12 mg/L (114.28 nmol/L), and Erythrocyte Sedimentation Rate (ESR) is 28 mm/hr. Her chemistry panel is normal. Left humerus and left shoulder radiograph are performed and are normal. Ultrasound of the left shoulder is obtained to check for joint effusion and is negative for joint effusion. With persistence of left shoulder pain, elevated WBC with a left shift and mildly increased inflammatory markers, she is admitted to the hospital and further testing reveals the diagnosis.

Discussion

The patient was started on clindamycin although radiographs were normal which can be seen in early osteomyelitis. She received parenteral ketorolac for pain control. She continued to be febrile with a maximum recorded temperature of 39.4°C (103°F) while on admission and continued with pain and resistance to any movement of the left shoulder. Differential diagnosis included cellulitis, septic arthritis, osteomyelitis, and less likely transient synovitis. Orthopedic surgery was consulted and Magnetic Resonance Imaging (MRI) was obtained on the second day of admission because of persistent symptoms. MRI showed left shoulder joint effusion and mild synovitis with significant surrounding myositis. There was no evidence of osteomyelitis. Based on the imaging appearance alone, septic arthritis could not be excluded. Blood culture did not grow any organism after 5 days.

The condition

Septic Arthritis (SA) is defined as infection of the joint space and can be caused by bacteria, viruses, mycobacteria and fungi. Bacterial joint infections are the most common etiology of SA. In the United States, the estimated incidence is approximately 3 - 4 per 100,000 children. Children younger than five years are affected most frequently. It can affect any major joint with the hip and knee joints most frequently involved. SA is spread via hematogenous means, direct inoculation, or extension of a contiguous focus of infection. Hematogenous spread is said to account for most cases of bacterial arthritis. Approximately two-thirds of infections are caused by *Staphylococcus* species, followed by gram negative bacilli and streptococci. *Kingella kingae*, a gram-negative coccobacillus, is increasingly becoming a common pathogen in the younger age group (two to three years). Patients classically presents with acute onset of fever and joint pain. Swelling may or may not be present with limited range of motion of the affected joint. Other symptoms include malaise, poor appetite, and irritability especially in the younger infant. A high index of suspicion for SA should be maintained in all children with acute onset of fever and joint pain such as limping or limited movement even in the absence of other associated symptoms. Laboratory findings in SA include elevated inflammatory markers (CRP, ESR) and elevated peripheral WBC. Elevated inflammatory markers have more negative than positive predictive value for SA. Blood cultures are positive in approximately 40 percent of cases. Additionally, joint/synovial fluid studies (WBC count, Gram stain, and culture) are important in the diagnosis of SA specifically synovial fluid WBC count of $>50,000$ cells/ μL with neutrophil predominance. Culture of a bacterial pathogen from the synovial fluid confirms the diagnosis of SA. Kocher criteria can help to differentiate between septic arthritis and transient synovitis in a case of non-traumatic

painful hip in a child. Components of the Kocher criteria are: [1] Walking or weight bearing inability, [2] Fever $>38.5^\circ\text{C}$ (101.3°F), [3] ESR > 40 mm/hr and [4-7] WBC $>12,000$ cells/ μL . A point is awarded for the presence of each criteria and is associated with a likelihood of the child having septic arthritis. The likelihood of a child with 0 of the Kocher criteria having septic arthritis is 0.2%. This percentage increases with each additional point up to 99% likelihood at 4 points. Plain radiographs are usually negative in SA. Ultrasonography is helpful in detecting joint fluid, but the presence/absence of fluid is not specific for joint infection as was the case in this patient. MRI is extremely sensitive for the early detection of joint fluid however; it is not as readily available as ultrasonography; younger children may require sedation and this can delay the diagnosis. It is important to note that a diagnosis of probable SA can be made even if blood culture or synovial fluid culture do not isolate a bacterial pathogen if other diagnoses are excluded and if the patient has characteristic clinical, laboratory and radiographic features.

Treatment

The mainstay of treatment for SA is joint drainage and antimicrobial therapy. Joint drainage can be accomplished through arthrotomy, arthroscopy, or needle aspiration. Antibiotics that cover for common pathogens should be instituted promptly. It is recommended that initial antibiotics be given parenterally when treating SA. The antibiotic of choice will usually depend on the severity of illness, local prevalence of community-associated methicillin resistant staphylococcal aureus (CA-MRSA), the susceptibility of CA-MRSA isolates to clindamycin, and suspicion for other pathogens. Antibiotic options include cefazolin, clindamycin, nafcillin/oxacillin, and vancomycin. Recommended duration of treatment is usually for at least two to three weeks while monitoring clinical improvement. Clinical improvement (decreased fever curve, improved joint pain, swelling, erythema, and range of motion) as well as improved inflammatory markers decreased peripheral WBC count, ESR and/or CRP) is typically expected within three to five days after instituting treatment.

Patient course

On receipt of MRI results, patient was taken to the operating room by the orthopedic surgery team, where she had left shoulder aspiration, left shoulder open irrigation and debridement.

Cloudy fluid was identified at the gleno-humeral joint and two milliliters of frankly purulent fluid was aspirated. The gleno-humeral joint was then irrigated with normal saline. Joint aspirate was sent for cell count, gram stain, aerobic, anaerobic, and fungal cultures. Synovial fluid aspirate showed 79,500 cells/ μL with neutrophil predominance at 96.7%. Gram stain showed moderate WBC but no organisms were seen and no there was no growth on culture. She was continued on parenteral clindamycin and she continued to show clinical improvement with fever resolving. She was discharged home on hospital day 5 and had much improved range of motion of left shoulder by time of discharge. Her CRP improved from 12 mg/L (114.28 nmol/L to

11 mg/L (104.76 nmol/L) and WBC improved to 6700/ μL ($6.7 \times 10^9/\text{L}$) at time of discharge. She was transitioned to oral Clindamycin for a total of 3 weeks course. At her outpatient follow up with orthopedic surgery a week after discharge, she was using her left arm without any difficulty.



Lessons for the clinician

1. Have a high index of suspicion for septic arthritis in a patient without an obvious source of infection when there is persistent abnormal physical finding or elevated inflammatory markers suggesting a pathological process even in the absence of joint effusion on ultrasound or negative radiographs.
2. Upper extremity joint infections are less common than lower extremity infections so a normal ultrasound result for joint effusion may not be enough to make the diagnosis. Consider further imaging like MRI and orthopedic consult early.
3. Though hematogenous spread is still the most common source of infection in the toddler, with the advent of immunizations, it has become less likely. Always look for other sources of infection as a possible etiology in these patients for example, direct inoculations like insect stings/bites.
4. Early diagnosis and treatment are associated with improved outcome.

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