CASE REPORT

Lancing of a boil leading to severe invasive methicillin-sensitive *Staphylococcus aureus* infection in an adolescentMarsha Medows,^{1,2} Amit Sharma^{1,2}¹Department of Paediatrics, Woodhull Medical and Mental Health Center, Brooklyn, New York, USA²NYU School of Medicine, New York, New York, USA

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SUMMARY

A 10-year-old boy presented to the emergency department with chief symptoms of fever and right leg pain for 3 days. Also of note, he reported that he had a boil on his neck 2 weeks prior to admission. This lesion was lanced by his mother with a hot needle. An X-ray, CT scan and MRI of the right knee showed no evidence of osteomyelitis. He was placed on intravenous vancomycin for empiric treatment. Blood culture grew methicillin-susceptible *Staphylococcus aureus* (MSSA), susceptible to vancomycin and clindamycin. He continued to spike fever with the development of erythema, and swelling of the distal thigh. Repeat MRI of the right knee showed osteomyelitis and subperiosteal abscess in the distal femur shaft with surrounding intramuscular abscesses and pyomyositis. He was taken to the operating room where 50 mL of fluid was drained from the periosteal abscess and a bone biopsy was obtained. Bone marrow culture also grew MSSA, susceptible to clindamycin.

BACKGROUND

Osteomyelitis is one of the severe, invasive bacterial infections observed in children and the leading cause of these infections is *Staphylococcus aureus*.¹ Studies had shown that methicillin-resistant *S aureus* (MRSA) produces more severe complications, including bone infection, compared with methicillin-susceptible *S aureus* (MSSA).²⁻³ However, McCaskill *et al*⁴ found that, in the USA, the incidence of invasive infections associated with MSSA has seen a greater increase than that with MRSA. To our best search of the literature, lancing of a boil leading to acute osteomyelitis with subperiosteal abscess and intramuscular abscesses due to MSSA is very uncommon in a previously healthy adolescent.

CASE PRESENTATION

A previously healthy, 10-year-old boy presented to the paediatrics emergency department (ED) with a chief symptom of fever and right leg pain that began 3 days ago. The pain was described as non-migratory, and had progressively worsened to a point where he could no longer bear weight. One day, prior to the onset of pain, he had a mild, blunt trauma on his right knee. He was evaluated in the paediatrics ED, and discharged home with a diagnosis of a sprain. Also of note, he reported that he had a boil on his neck 2 weeks prior to admission. This lesion was lanced by his mother with a hot needle. There was no other relevant medical,

prenatal or family history. Immunisations were up to date.

The physical examination revealed a healthy appearing child with fever of 39.3°C. The right knee and thigh were tender, and warm with a decreased range of motion.

INVESTIGATIONS

Initial complete blood count showed leucocytosis of $22 \times 10^9/L$, 81% of which were neutrophils. The erythrocyte sedimentation rate (ESR) was 130 mm/h and the C reactive protein (CRP) was 268.97 g/L. Blood culture was subsequently sent. An X-ray, CT scan and MRI (figure 1) of the right knee were obtained and showed no evidence of osteomyelitis. Blood cultures were shown to grow MSSA, susceptible to vancomycin and clindamycin. MRI of the right knee was repeated which confirmed the diagnosis of osteomyelitis. This study revealed a subperiosteal abscess in the distal femur shaft with surrounding intramuscular abscesses and pyomyositis.

TREATMENT

He was started on intravenous vancomycin (40 mg/kg/day, q8 h) for empiric treatment. Later,

Figure 1 MRI of the right thigh: osteomyelitis, subperiosteal abscess, intramuscular abscesses and pyomyositis. Coronal T2-weighted fat-suppressed MRI of both thighs shows medullary bone signal intensity abnormalities involving the right distal femoral shaft, compatible with osteomyelitis. Subperiosteal abscess (green arrow) and the surrounding muscular plane abscess (pyomyositis, red arrow) are also shown.

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blood cultures were shown to grow MSSA, susceptible to vancomycin and clindamycin. He continued to spike fever with the development of erythema, and swelling of the distal thigh. Paediatric infectious disease was consulted and recommended to change antibiotics to intravenous clindamycin (40 mg/kg/day, q6 h) and cefazolin (85 mg/kg/day, q6 h).

MRI of the right knee was repeated which confirmed the diagnosis of osteomyelitis. This study revealed a subperiosteal abscess in the distal femur shaft with surrounding intramuscular abscesses and pyomyositis. He was taken to the operating room where 50 mL of fluid was drained from the periosteal abscess and a bone biopsy was obtained. Pathology confirmed the diagnosis of acute osteomyelitis. Bone marrow culture also grew MSSA, susceptible to clindamycin. A peripherally inserted central catheter line was then placed for long-term antibiotic use. Fever spikes, erythema, oedema and inflammatory marker levels (CRP, ESR and white cell count) gradually improved. During the treatment, three blood cultures and a synovial culture were performed and determined to be negative. He received inpatient physical therapy which allowed him to ambulate again. He received 3 weeks of intravenous antibiotics as an inpatient and was discharged with 1 week of oral clindamycin (30 mg/kg/day, q6 h).

DISCUSSION

Osteomyelitis is one of the more common invasive bacterial infections in children leading to hospitalisation and prolonged antibiotic administration. Most cases of osteomyelitis in children arise haematogenously, occurring characteristically in the metaphysis of long bones such as femur, tibia and humerus.¹ Among children, haematogenous osteomyelitis occurs more often in those who are younger. At least one-quarter of patients are younger than 2 years of age, and more than one-half are younger than 5 years of age.^{5–6} The exact pathophysiology of haematogenous osteomyelitis is unclear. It has been postulated that in newborns the thin cortex, loosely applied periosteum and nutrient metaphyseal capillaries, which perforate the epiphyseal growth plate, lead to the spread of infection to the subperiosteal space which breaks through the thin metaphyseal cortex into the surrounding soft tissue. As the skeleton matures, the metaphyseal cortex becomes thicker with a dense, fibrous periosteum. Thus, the infection is more contained and rarely spreads to the soft tissues of the extremity in children and adolescents.⁷

In our case, an adolescent male had bacteraemia secondary to lancing of a boil by needle. This has led to haematogenous spread causing severe complications like intramuscular abscess formation.

The role of trauma in the pathogenesis of osteomyelitis in children remains unclear.⁸ Some suggest trauma can lead to occlusion of the slow-flowing sinusoidal vessels, creating a nidus for infection. In our case, the history of mild blunt trauma may have facilitated the involvement of femur bone.

By far the most common bacterial pathogen causing osteomyelitis in children, regardless of age, is *S aureus*.¹ Severe, life-threatening infections in adolescents are more frequently

associated with MRSA.² Panton-Valentine leukocidin (PVL), an exotoxin produced by some colonies of *S aureus*, is associated with complications such as myositis, pyomyositis and intraosseous or subperiosteal abscesses.⁹ Martínez-Aguilar *et al*¹⁰ found that 87% of MRSA strains and 24% MSSA strains have the genes which encode for PVL ($p < 0.001$). In our case, MSSA was the causative agent of severe complications seen in an adolescent boy, but we did not determine the PVL status of it. McCaskill *et al* found that the incidence of invasive infections, such as osteomyelitis and pyomyositis, due to MSSA is increasing compared with MRSA, in the USA (8.5% vs 4%, $p < 0.01$, respectively).²

In summary, manipulation like lancing of a boil can lead to haematogenous spread of MSSA with severe complications.

Learning points

- ▶ Lancing of a boil can lead to severe complications such as osteomyelitis, subperiosteal abscess and intramuscular abscess.
- ▶ Although osteomyelitis caused by haematogenous spread is more common in infants and preschool-aged children, adolescents can have haematogenous spread leading to severe complications from methicillin-susceptible *Staphylococcus aureus*.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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