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Microbiology of Acute Hematogenous Osteomyelitis in Hospitalized Children

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Background

Acute hematogenous osteomyelitis affects 1 in 5,000 children the in the U.S. and *Staphylococcus aureus* is by far the most common bacterial cause[1]. Mainstays of treatment include appropriate antibiotic regiments and surgical drainage. But, antibiotic usage has become more challenging due to growing antibiotic resistance[2]. At our institution, clindamycin is used empirically for osteomyelitis, despite increasing clindamycin-resistance over the years.

Objective

The goal of this study was to describe microbiologic results and antibiotic resistance patterns in children hospitalized with acute hematogenous osteomyelitis.

Methods

Study design: Retrospective Cohort Study
Study sites: Children's National Hospital, Washington D.C.
Study population: Children < 21y hospitalized between 1/1/2010 - 5/31/2019 diagnosed with acute osteomyelitis based on ICD codes. We excluded patients with recent orthopedic surgery, hardware infection, penetrating trauma, chronic osteomyelitis or with an underlying immunocompromising condition. We performed chart review to collect data on location of infection; blood, synovial fluid, or surgical site cultures; and culture results and susceptibilities.

Definitions: Variables were defined as follows:
- **Infection Location:** Locations recorded based on MRI findings or reported location
- **Cultures**: Cultures included were taken from sterile sites within one week of diagnosis. Susceptibility recorded based on respective culture results. Ambiguous cultures labeled "Eswab" were considered to be cultures from surgical procedures if they were performed the same day as surgery.
- **Empiric therapy**: Antibiotic prescribed for the first 48 hours after suspected diagnosis

Data Analysis:
Descriptive statistics were used to describe patient characteristics and clinical outcomes, using mean (standard deviation) or median (IQR) for continuous and frequency percentages) for categorical variables.

Results

Among the 565 encounters for osteomyelitis,162 encounters were included. Of the encounters excluded, 141 did not have a final diagnosis of osteomyelitis, 118 were repeat encounters for the same episode of osteomyelitis, and 100 were diagnosed with chronic osteomyelitis.

Table 1. Baseline Characteristics

Characteristic	N=162
Age, median (IQR)	8.3 yrs (3.3-12.1)
Infection location*, n (%)	
Lower extremity	105 (64.8)
Upper extremity	31 (19.1)
Pelvis	14 (8.6)
Spine	7 (4.3)
Scapula	4 (2.5)
Rib	1 (0.6)
Mandible	1 (0.6)

*1 patient with multisite infection (upper & lower extremity)

Table 2. Antibiotic susceptibility among culture results positive for *S. aureus*

Positive Culture Any Source	N (%)	Clindamycin Susceptibility, N (%)
Total S. aureus	79	69 (87%)
MSSA	60 (76%)	51 (85%)
MRSA	19 (24%)	18 (95%)

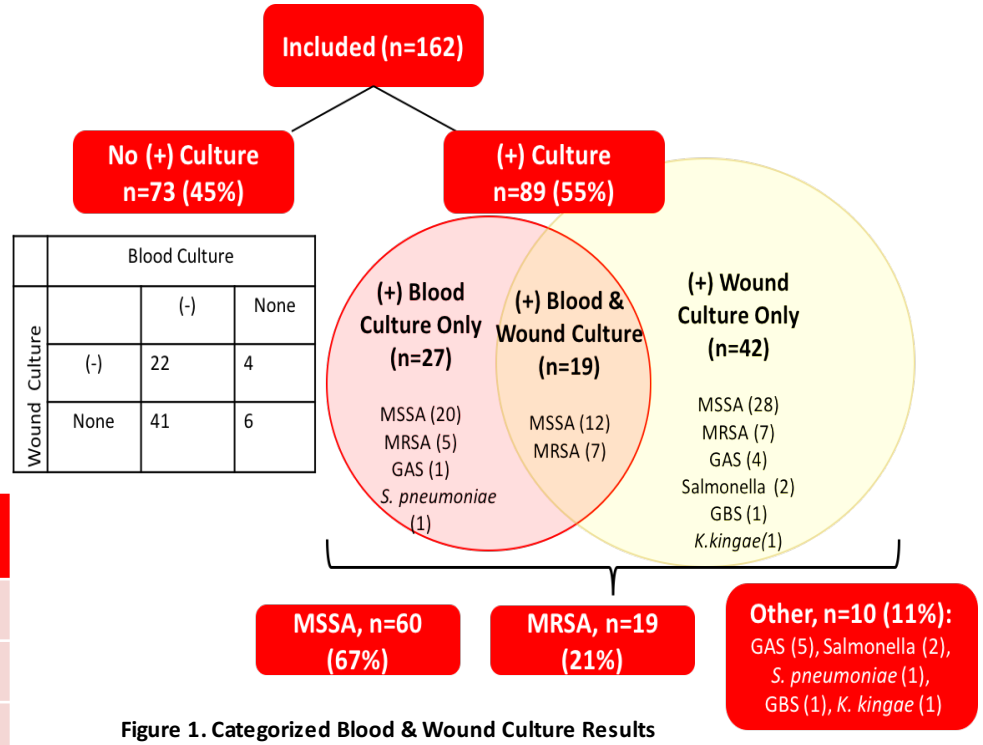

Figure 1. Categorized Blood & Wound Culture Results

Conclusion

The most common sites for osteomyelitis are upper and lower extremities. Almost half of all children with acute hematogenous osteomyelitis did not have any microbiologic data to guide antibiotic usage. *S. aureus* was the most common (88%) isolate among culture positive cases, with more MSSA (76%) than MRSA (24%). The culture positivity rate was higher for surgical specimens (70%) than from blood cultures (42%). Non-*S. aureus* isolates grew more frequently from surgical specimen cultures than from blood cultures. Among *S. aureus* osteomyelitis, clindamycin resistance was more commonly seen in MSSA than in MRSA osteomyelitis.

References

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