

Background

Surgical indications for bone debridement in children with acute hematogenous osteomyelitis (AHO) remain poorly defined, resulting in substantial practice variation and the potential for overtreatment. Although illness severity is strongly associated with clinical outcomes, existing severity scoring systems require several days to calculate and are therefore unavailable at the time of initial surgical decision-making. The Accelerated Severity of Illness Score (ACCEL-SIS) provides objective severity stratification within approximately 20 hours of presentation, allowing early assessment of disease severity during the period when surgical decisions are typically made. We hypothesized that the effect of major bone debridement would differ according to illness severity. We sought to determine whether early severity stratification using ACCEL-SIS can guide surgical decision-making and improve outcomes in children with AHO.

Methods

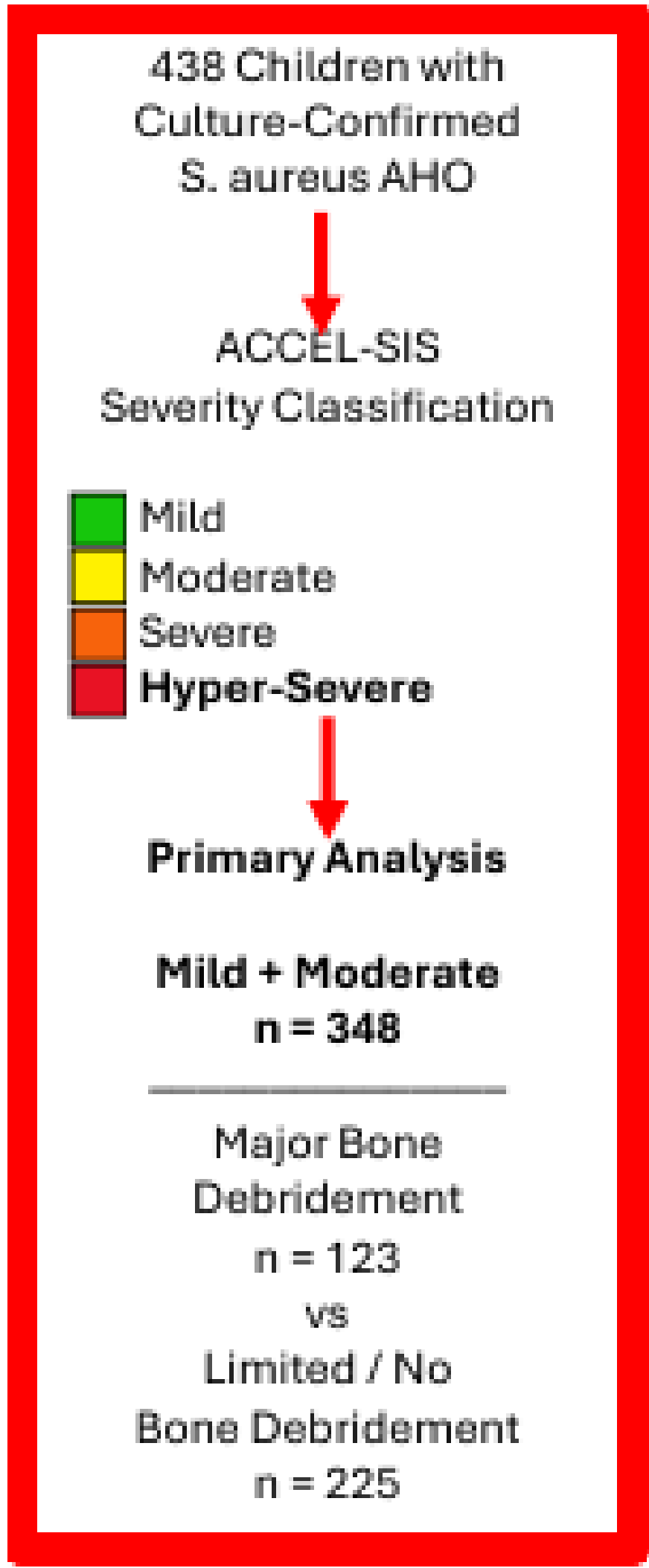
A retrospective cohort study was performed of 438 children with culture-confirmed *Staphylococcus aureus* acute hematogenous osteomyelitis (AHO). Illness severity was prospectively stratified using the Accelerated Severity of Illness Score (ACCEL-SIS) into four categories (Mild, Moderate, Severe, and Hyper-Severe) based on objective clinical and laboratory variables available within approximately 20 hours of presentation.

The primary analysis focused on children with Mild or Moderate illness (n = 348), comparing those managed with major bone debridement (n = 123) to those treated with limited or no bone debridement (n = 225). Primary outcomes included length of stay (LOS), total antibiotic duration, and pathologic fracture.

Staphylococcus aureus Acute Hematogenous Osteomyelitis: Severity of Illness Scoring System			Illness Severity Categories	
Immediate and Accelerated Severity of Illness Scores	Points	Time to determination post hospital admission median hours (IQR)	ACCEL-SIS	Score range per category
ACCEL-SIS (maximum score = 18.7)		35 (23-44)		
Culture Results (Van+MRSA, Sae+MRSA)	3	20 (1-47)	MILD	0 – 10.34
Septic Arthritis	4.5	35 (10-38)	MODERATE	10.35 – 14.74
Platelet Counts* (≥10% decline in platelet count)	1.2	0 (0-15)	SEVERE	14.75 – 15.88
Immed-SIS (maximum score = 25.6)		as trigger (median 6 hours)	HYPER-SEVERE	15.89 and up
Tachypnea*	3.9	as trigger	IMMED-SIS	Score range per category
Tachypnea*	6		MILD	0 – 4.39
CRP level (mg/dL) ≥ 17.2	4.5		MODERATE	4.40 – 10.19
Ratio (%) of WBC initial ≥ 9.8	4.6		SEVERE	10.20 – 15.68
Initial Anemia Hb initial (g/dL) ≤ 10.4	8		HYPER-SEVERE	15.69 and up

Abbreviations: dL, deciliter; Hb, hemoglobin; tachypnea stage, RQR, odds ratio; OR, Severity of Illness Score; SIS, white blood cell count; WBC. The ACCEL-SIS is an additive combination of the Immed-SIS and the points of three additional variables, as shown. The Immed-SIS is the additive combination of the scores of five variables, as shown.

Immed-SIS and its categories are a preliminary assessment score and corresponding categorization that are subsequently reassessed at the time of ACCEL-SIS determination. In most cases, ACCEL-SIS categorization should stay the same as that of Immed-SIS or change to an adjacent category.



Results

Among children with Mild and Moderate illness (n = 348), major bone debridement (n = 123) was associated with less favorable outcomes across all measured domains compared with limited or no bone debridement (n = 225).

- Longer hospital length of stay: 7.0 vs 5.9 days (p = 0.008)
- Longer antibiotic duration: 56.5 vs 41.0 days (p < 0.001)
- Pathologic fracture: 10.6% vs 1.3% (p = 0.00025)

Discussion

The effect of major bone debridement was highly dependent on illness severity. Among children with Mild and Moderate AHO, major bone debridement was associated with longer hospitalization, prolonged antibiotic therapy, and an approximately 8-fold increase in pathologic fracture. Routine metaphyseal bone debridement may expose lower-severity children to unnecessary iatrogenic morbidity without measurable clinical benefit. These findings should not be interpreted as discouraging aggressive surgical management in children with Severe and Hyper-Severe illness. Rather, they support a severity-stratified surgical strategy in which the extent of operative intervention is matched to disease severity.

Conclusions

Early severity stratification using ACCEL-SIS provides an objective, clinically actionable framework for surgical decision-making in pediatric AHO. Routine major bone debridement was associated with worse outcomes, including markedly increased pathologic fracture risk, in children with Mild and Moderate illness. Major bone debridement remains important for appropriately selected children with Severe and Hyper-Severe disease. These findings support a shift from diagnosis-based to severity-based surgical decision-making.

KEY FINDING

Major bone debridement increased pathologic fracture risk approximately eight-fold.