



Prevalence of Intra-operative Tissue Cultures in Posterior Pediatric Spinal Deformity Surgery

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Background



Neuromuscular Scoliosis

- Prevalence of deep surgical site infection (SSI) varies from 1-14%.
- Neuromuscular conditions, particularly with fusion and instrumentation to the pelvis such as Spina Bifida, have one of the highest risks of infection.
- The most common bacterial causes of infection are normal skin flora such as *Propionibacterium acnes*, *Staphylococcus epidermidis*, and *Staphylococcus aureus*.
- Increased risks for children developing postoperative deep (SSI) include past medical problems, fusions to the pelvis, and longer duration of surgery.
- Little is known about intra-operative contamination of the surgical site and its role in postoperative deep surgical site infection.



Hypothesis

- We sought to determine if children with neuromuscular scoliosis with fusion to the pelvis, and thus longer duration of surgery, have higher intra-operative culture positive rates than children receiving surgery for adolescent idiopathic scoliosis.

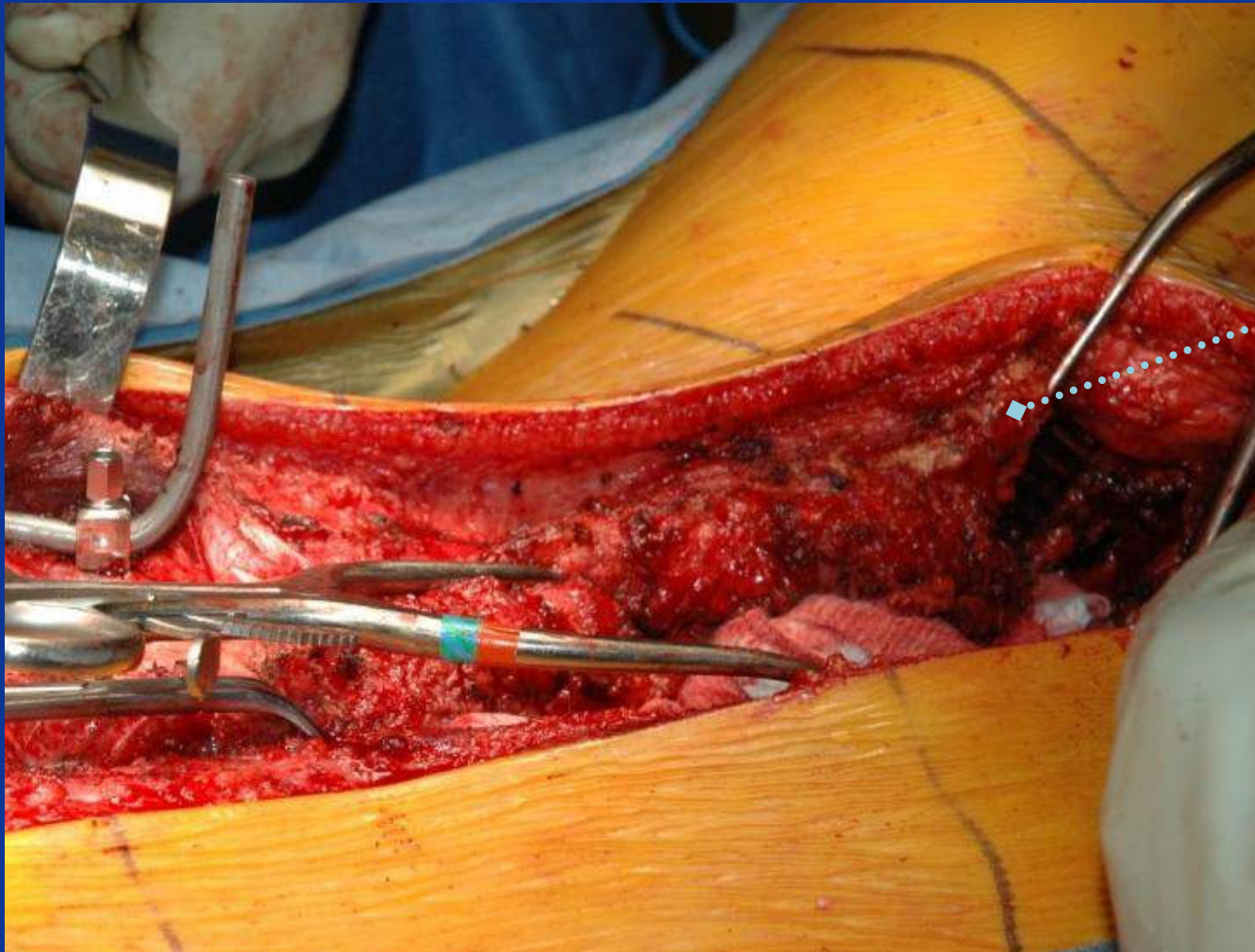


Methods

- **Study Design:** Retrospective , single center study
- **Inclusion Criteria :** Patients who underwent posterior spinal deformity surgery between January 2009 and December 2010 and had a pre-closure tissue culture from debrided paraspinal muscle
- **Study Groups:** Two patient groups;
 - Culture Positive Group
 - Culture Negative Group
- **Data:** Risk factors analyzed included type of scoliosis, instrumentation to the pelvis, duration of surgery, adequacy of prophylactic antibiotics, estimated blood loss, transfusion of blood products, associated medical conditions, BMI, bone mineral density (a surrogate for nutrition), sex, age at surgery, and laboratory data.
- **Lab Culture:** Paraspinal muscle was routinely debrided before the final irrigation and incision closure and a small sample was sent to the microbiology laboratory for aerobic and anaerobic cultures.
 - A positive culture represented a bacterial contamination



Paraspinal Debridement



Debrided tissue
source of cultures



Acne Grading Scale



SEVERE



MODERATE



MILD



NONE

- The prevalence of *P. acnes*, which has a documented role in deep surgical site infections in spine surgery, was correlated with the presence of back acne .
- The photos of each patient received an acne severity grading, blinded to the results of the patient's bacteria cultures.
 - Severe back acne as greater than 10 visible pustules,
 - Moderate back acne as 5-10 pustules,
 - Mild back acne as less than 5 pustules.



Results

TABLE 1. Comparison of Culture Negative and Culture Positive Study Groups

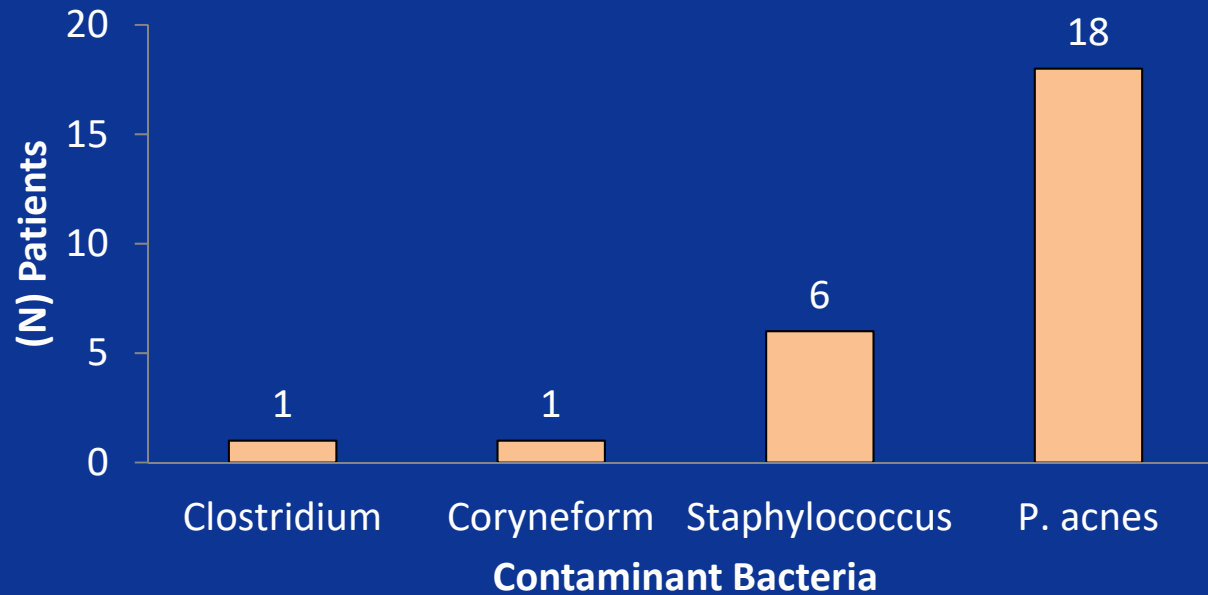
Characteristic	Culture Negative (n = 88)	Culture Positive (n = 26)
Average Age (Years)	11.8	13.6
Fusion to Pelvis	11	8
Length of Surgery greater than 6 hours	38	18
Average Estimated Blood Loss (cc)	1216	1457
Number with Blood Transfusions	64	24
Presence of Back Acne	30	20
Early Deep Surgical Site Infection	0	3

- 114 children were identified to have posterior spinal deformity surgery.
- 26 (23%) patients had positive intra-operative cultures, while 88 (77%) were culture negative.
- Of the 26 with positive cultures, 3 (2.6%) developed an early surgical site infection.
- Idiopathic scoliosis consisted 45% of the population while neuromuscular scoliosis comprised of 31%
- 19 patients underwent fusion to the pelvis (17%) of which 17 had neuromuscular etiology while the other 2 had syndromal spinal deformity.
- Fifty patients (44%) showed evidence of back acne.



Results

Bacteria Isolated From Surgical Site



- *P. acnes* (69%) was the most common contaminant
 - All *P. acnes* cases were found in adolescents 11 years or older ($P = 0.02$).
 - Back acne was associated with all *P. acnes* contaminations ($P < 0.0001$).
- *Staphylococcus sp.* was the second most prevalent contaminant followed by *Clostridium* and *Coryneform* bacteria.
 - These three organisms were independent of age or back acne.



Results

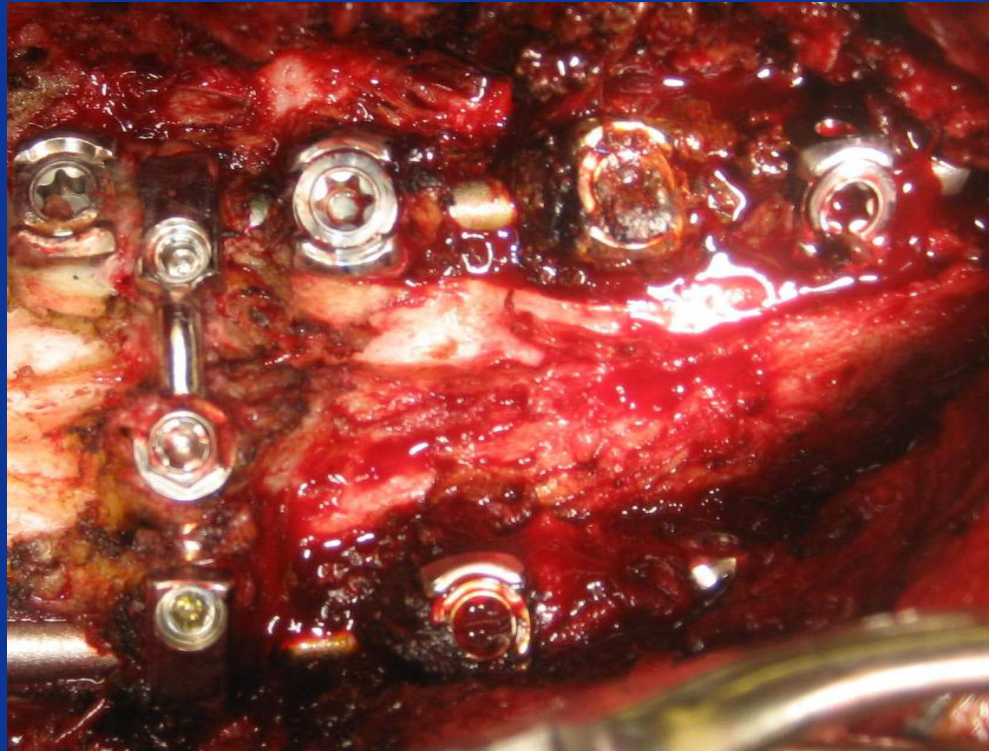
Risk Factor	Odds Ratio	95% Confidence Interval	Relative Risk	P Value
NM Fusion to Pelvis	3.9	1.3 - 11.5	3	0.02
Age > or = 12 years	3.8	1.3 - 11.0	1.5	0.01
Length of Surgery > 6 Hr	2.9	1.1 - 7.5	1.6	0.02

NM Indicates Neuromuscular ; >, Greater than; and =, Equal to

- Three major risk factors correlated with risk of positive intra-operative cultures
- Neuromuscular scoliosis with fusion to the pelvis was the most significant risk factor.
 - In the culture positive group, all cases of fusion to the pelvis (8) were in neuromuscular patients.
- Length of surgery greater than 6 hours, often seen in longer fusions or fusions to the pelvis, was also significant
 - Eighteen (70%) cases in the culture positive group had a length of surgery greater than six hours compared to thirty eight (43%) in the culture negative group.
- Adolescents 12 years or older were also correlated with greater risk of intra-operative positive cultures.



Infections



Staphylococcus sp Infection

- Three patients, all with neuromuscular scoliosis instrumented to the pelvis, developed an early surgical site infection with *Methicillin Susceptible Staphylococcus aureus*.
- These three patients all had positive intraoperative cultures ($P=0.01$).
- Intraoperative cultures had grown *P.acnes* in one patient and *Staphylococcus sp.* in the other two.



Discussion

- With a 23% prevalence, risk factors for bacterial contamination include
 - Neuromuscular patients fused to the pelvis
 - Children older than 11 years
 - surgery duration greater than 6 hours
- Back acne is a preventable risk factor for *P. acnes* seeding.
- Intra-operative bacterial contamination indicates a need to consider type of surgery and patient age to determine prophylactic antibiotics and other modalities to prevent infection.
- New methods that we have implemented
 - Consult with dermatology for adolescent patients with back acne
 - Pre-operative antimicrobial wash with topical ChoraPrep®
 - Strict timing of prophylactic preoperative antibiotics



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