



Risk Factors for Failure After Debridement and Implant Retention in Early Spinal Instrumentation Infection: A Multicenter Cohort Study

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Background

Postoperative spinal instrumentation infection (PSII) is a serious complication of instrumented spinal fusion. For early infections, debridement and implant retention (DAIR) is commonly performed to preserve spinal stability; however, predictors of treatment failure are not well established. The aim of this study was to identify factors associated with treatment failure.

Methods

Study Design: retrospective cohort

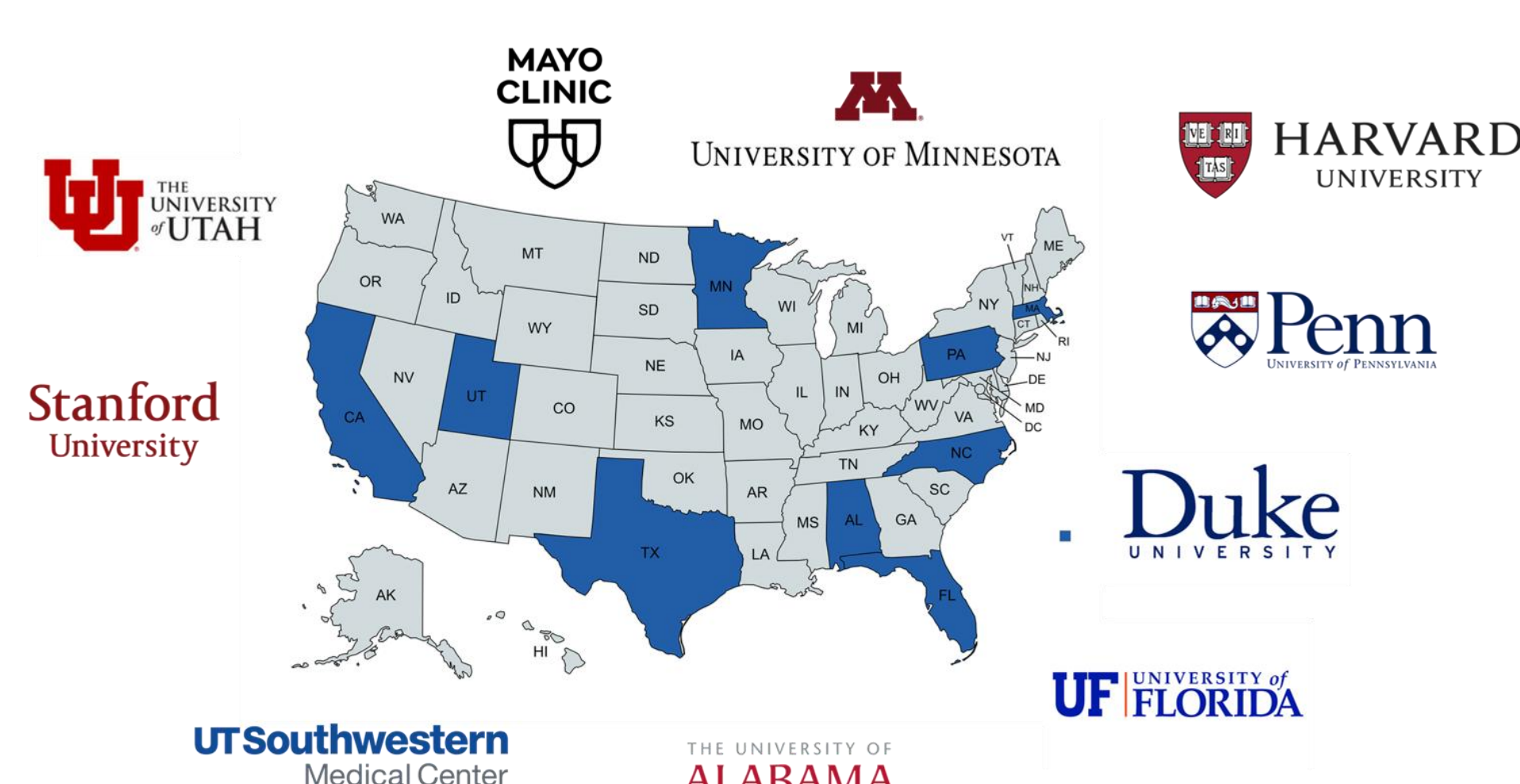
Inclusion criteria: adults with PSII from 10 academic medical centers (figure 1), defined as infection occurring within 90 days of instrumented spinal fusion, who underwent DAIR and received at least 2 weeks of systemic antimicrobial therapy.

Exclusion criteria: spinal instrumentation for infectious or oncologic indications; complete hardware removal.

Primary outcome: treatment failure, defined as return to the operating room, reinfection, or death due to infection.

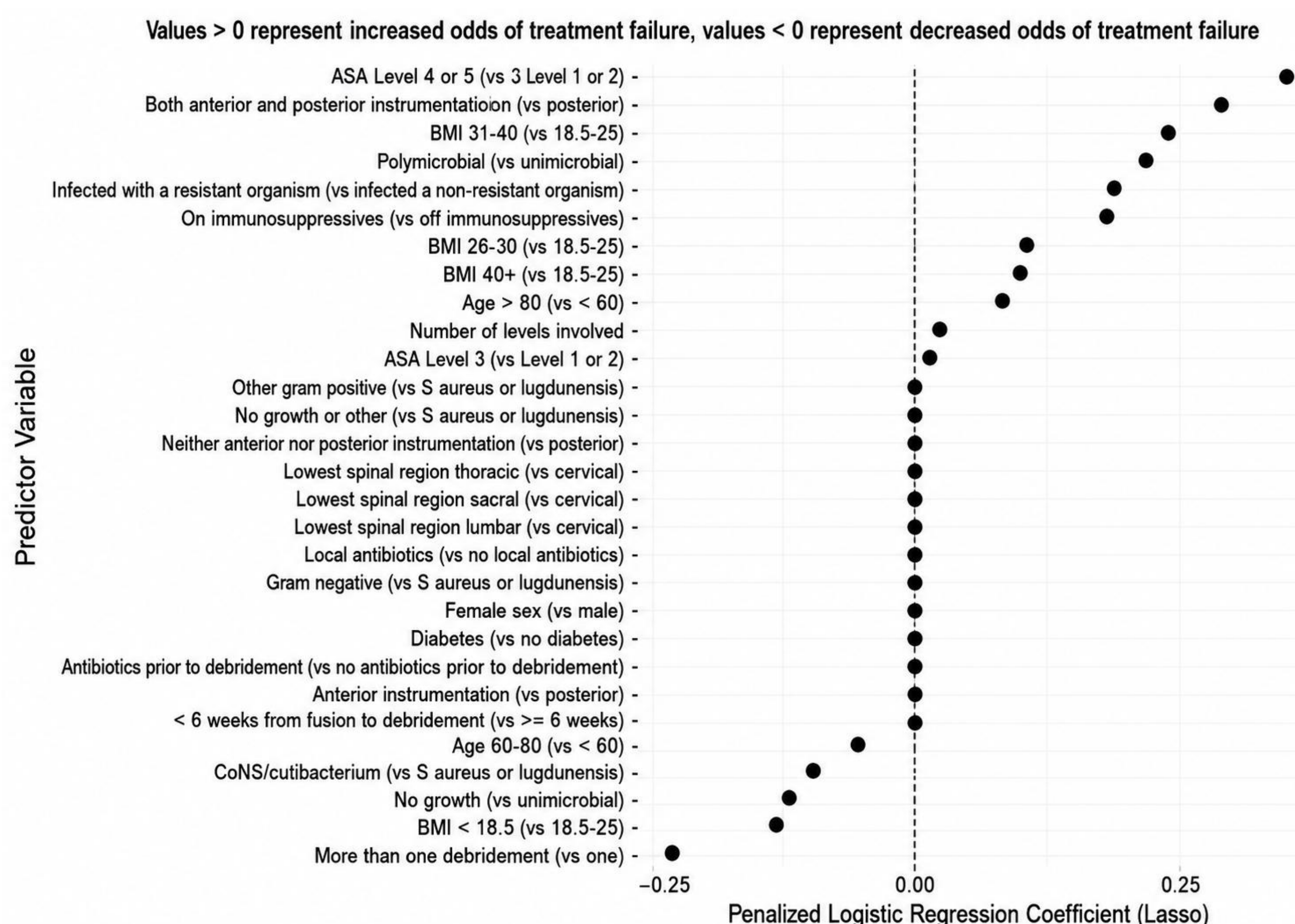
Analysis: The cumulative incidence of failure was estimated. Factors associated with failure were evaluated using a Least Absolute Shrinkage and Selection Operator penalized Cox proportional hazards model.

Figure 1: Participating medical centers



Results

Figure 2: Forest Plot of Penalized Logistic Regression Coefficients for Treatment Failure



Cohort: 559 patients met inclusion criteria; the mean age was 64.3 years and 50.3% were female. At one year, the cumulative incidence of treatment failure was 19.7% (95% CI, 16.5–23.2).

Factors associated with an **increased hazard of failure:**

- greater number of spinal levels involved
- lumbar-level involvement
- combined anterior and posterior instrumentation
- polymicrobial infection
- infection with resistant organisms
- body mass index (BMI) >25
- immunosuppressive medications

Factors associated with a **decreased hazard of failure:**

- >1 debridement
- infections with no growth
- infections caused by coagulase-negative staphylococci or *Cutibacterium* species.
- BMI <18.5 kg/m²
- American Society of Anesthesiologists (ASA) class <IV

Conclusion

Approximately one in five patients experienced treatment failure within one year. Failure was associated with host characteristics, surgical complexity, and microbiologic factors. These findings provide clinically relevant predictors of DAIR failure and may inform patient selection, counseling, and future efforts to improve early SII outcomes.

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