

Predictive Value of Prosthesis Sonication on Survival of Debridement Antibiotics and Implant Retention for the Treatment of Periprosthetic Joint Infection

Nicholas P Drain MD¹, Sydney Scanlon MS², Gabrielle Alba BS², Jayanth Kashyap BS²,
Malcolm Dombrowski MD¹, Frank Johannes Plate MD PhD¹, Michael J O’Malley MD¹, Brian Klatt MD¹, Alan E Wilson MD¹

¹ Department of Orthopaedic Surgery, University of Pittsburgh Medical Center, Pittsburgh, PA; ² University of Pittsburgh School of Medicine, Pittsburgh, PA

INTRODUCTION

- Acute periprosthetic joint infection (PJI) is often treated with debridement antibiotics and implant retention (DAIR)
- DAIR continues to have a relatively high failure rate¹
- Various risk factors correlate with DAIR failure:
 - postoperative laboratory studies and bacterial burden^{2,3}
- The use of colony forming units (CFU) from sonication of prostheses has been shown to correlate with the diagnosis of PJI and serves as an adjunct in identifying PJI⁴
- Literature investigating the use of CFU in predicting failure following DAIR is lacking

OBJECTIVE

- ❖ To identify a CFU value derived from sonication culture which is predictive of DAIR failure for the treatment of PJI

METHODS

- 89 DAIR procedures performed at a multicenter single institution between 2016-2025 with sonication cultures obtained were included for analysis
- PJI diagnosis was established using MSIS 2018 consensus criteria
- Exclusion Criteria:
 - septic revisions
 - septic revisions not treated with DAIR
 - inadequate workup to determine MSIS criteria
 - absent CFU values within electronic medical records (EMR)
 - sonication of antibiotic spacers
- Patients were stratified into cohorts based on CFU values:
 - 0-50 CFU
 - 51-100 CFU
 - >100 CFU
- Failure was defined as requiring revision arthroplasty related to PJI or infection-related death within two years of surgery
- Kruskal-Wallis and Fisher's Exact tests were used for analyses between cohorts
- Receiver operating characteristic (ROC) analysis identified a CFU threshold predictive of failure
- Failure-free survival was compared using Kaplan-Meier analysis

RESULTS

- No significant differences in baseline characteristics (Table 1)
- Twenty-two (25%) patients failed treatment
- ROC analysis revealed a CFU threshold 64 as most predictive of treatment failure
 - AUC 0.60; Youden 23.27; sensitivity 59.09%; specificity 64.18%
- Kaplan Meier analysis revealed a trend of higher failure-free survival with lower CFU values (p = 0.17)

Baseline Characteristics	Low CFU (0-50)	Medium CFU (51-100)	High CFU (>100)	p-value
Age at operation (years) [mean (SD)]	69.9 (9.9)	71.3 (7.4)	66.3 (9.0)	0.3
Sex - female [n (%)]	27 (54%)	4 (50%)	13 (42%)	0.56
BMI (kg/m^2) [mean (SD)]	33.8 (7.3)	31.1 (6.6)	32.6 (7.2)	0.51
ASA grade [mean (SD)]	3 (0.49)	3.1 (0.64)	2.8 (0.48)	0.33
Anesthesia type - spinal [n (%)]	17 (34%)	0 (0%)	6 (19%)	0.13
Length of surgery (minutes) [mean (SD)]	72.5 (27.4)	80.4 (48.7)	85.7 (30.1)	0.07
Laterality - right [n (%)]	27 (54%)	4 (50%)	14 (45%)	0.74
Follow up length (months) [mean (SD)]	26.2 (25.4)	21.0 (17.4)	31.4 (31.6)	0.72

Table 1. Baseline characteristics between cohorts defined by colony forming unit values derived from sonication of prosthesis. BMI: body mass index, ASA: American Society of Anesthesiologists, SD: standard deviation.

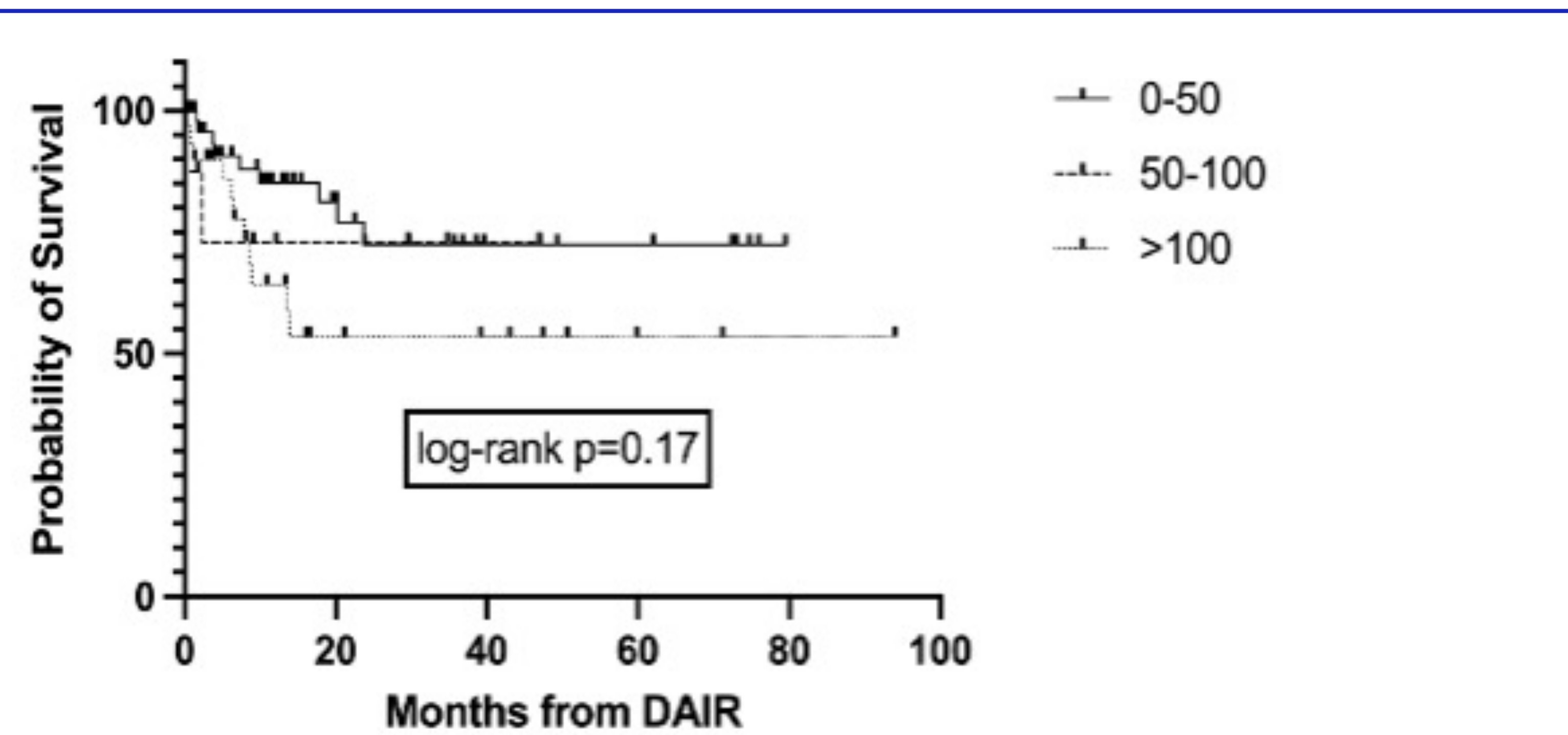


Figure 1. Kaplan-Meier curve demonstrating differences between CFU-based cohorts in failure-free survival following DAIR.

CONCLUSIONS

- This study highlights the association between CFU values derived from sonication culture and treatment failure following DAIR for PJI
- A threshold of 64 CFU was identified as predictive of failure
 - AUC of 0.60 reflects limited discriminative ability
 - CFU alone is unlikely to predict failure. Consider other variables.
- The use of CFU values may strengthen orthopaedic surgeons’ ability to predict treatment failure and adjust treatment accordingly
- Future studies with higher power are needed to determine whether a threshold of CFU can be used to predict DAIR failure
 - Consider regression analysis controlling for age, BMI, comorbidities, microbial virulence, length of surgery

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