

# Intraoperative Wound Bacterial Burden during Total Ankle Arthroplasty: a microbiome analysis

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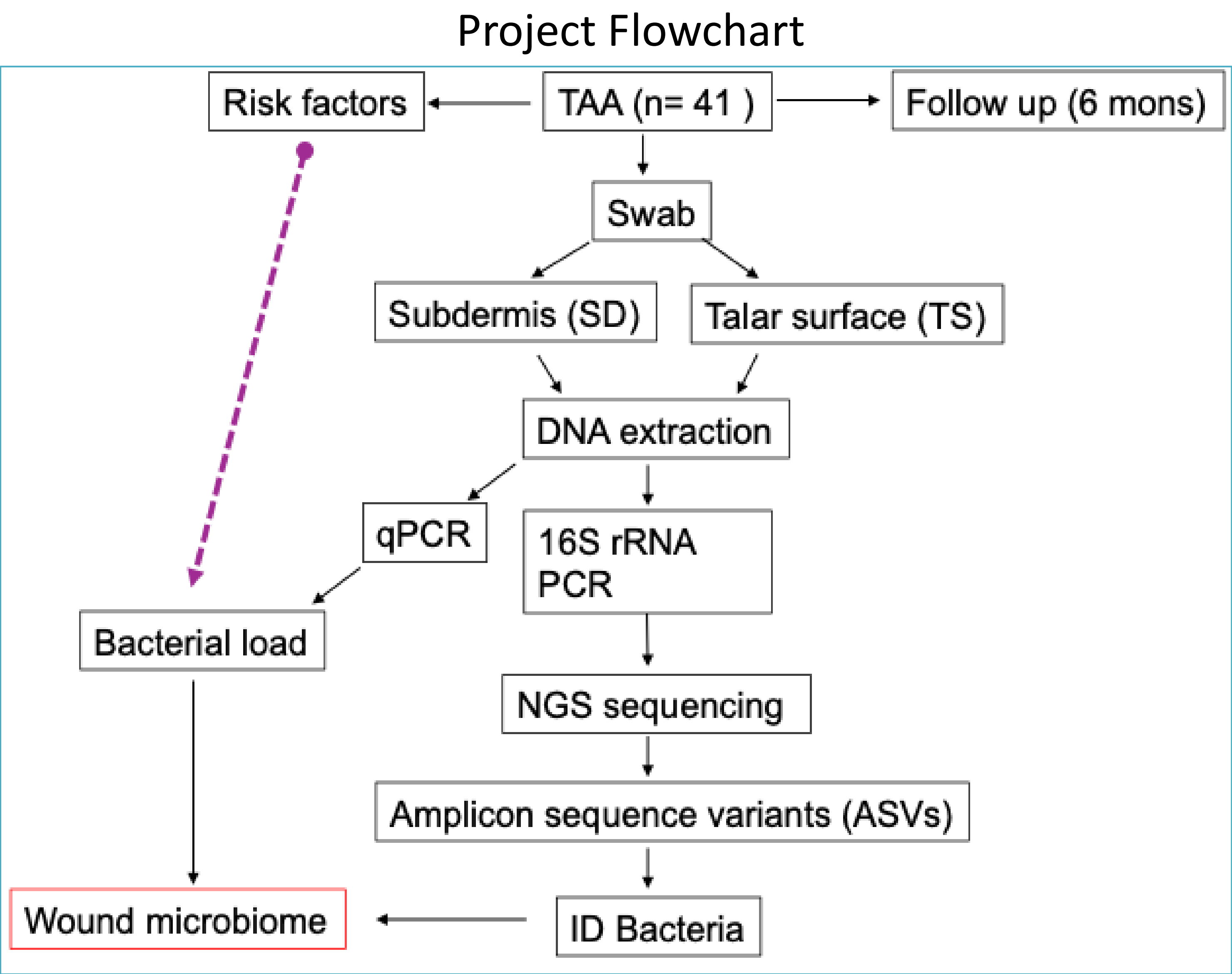
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Total ankle arthroplasty (TAA) marks a milestone of contemporary foot and ankle surgery and is increasingly performed for the treatment of late-stage ankle arthritis. Although periprosthetic joint infection (PJI) accounts for a small portion of TAA complications, it is responsible for up to 80.6% TAA failures. The surgical field bacterial burden during TAA is a critical factor contributing to PJI but has not been fully elucidated.

## Materials and Methodes

With IRB approval, a total of 41 patients who underwent TAA were enrolled.

|              | Variable               | Response       | N=41        |
|--------------|------------------------|----------------|-------------|
| Demographic  | Age                    | Mean (range)   | 63 (34-83)  |
|              | Female                 | Yes            | 21 (50%)    |
|              | Diagnosis              | Osteoarthritis | 41 (100%)   |
| Clinical     | Laterality             | Left           | 14 (34%)    |
|              | BMI                    | Mean (SD)      | 29.0 (5.26) |
|              | Prior ankle surgery    | No             | 22 (54%)    |
| Risk factors |                        | Yes            | 19 (46%)    |
|              | Prior arthroplasty     | No             | 41 (100%)   |
|              | Smoking                | Current        | 3 (6%)      |
|              |                        | Former         | 7 (17%)     |
|              |                        | Never          | 31 (76%)    |
|              | Immunosuppressive drug | No             | 31 (76%)    |
|              |                        | Yes            | 10 (24%)    |
|              | Diabetes               | No             | 34 (83%)    |
|              |                        | Yes            | 7 (17%)     |
|              | Malignancy             | No             | 33 (80%)    |
|              |                        | Yes            | 8 (20%)     |
|              | CKD                    | No             | 40 (98%)    |
|              |                        | Yes            | 1 (2%)      |
|              | ASA score              | Mean (SD)      | 2.1 (0.56)  |
|              | Procedure time         | Mean (SD)      | 3.5 (1.07)  |
|              | Mayo score             | Mean (SD)      | 1.7 (3.2)   |



**Conclusion**

Next-generation sequencing enables in-depth analysis of the bacterial burden in surgical wound during TAA. Its technological advances allow detection of bacteria at very low biomass levels. As a result, this study had a much higher bacterial positivity rate than those using conventional bacterial cultures, which are limited by the specific growth conditions required by different bacterial species. Although most of the bacteria identified in the surgical wound are low pathogenicity, the findings justify wound irrigation with bactericidal agents during TAA procedures.

## Results

A total of 72 out of 82 swabs (87.8%) were qualified for sequencing.

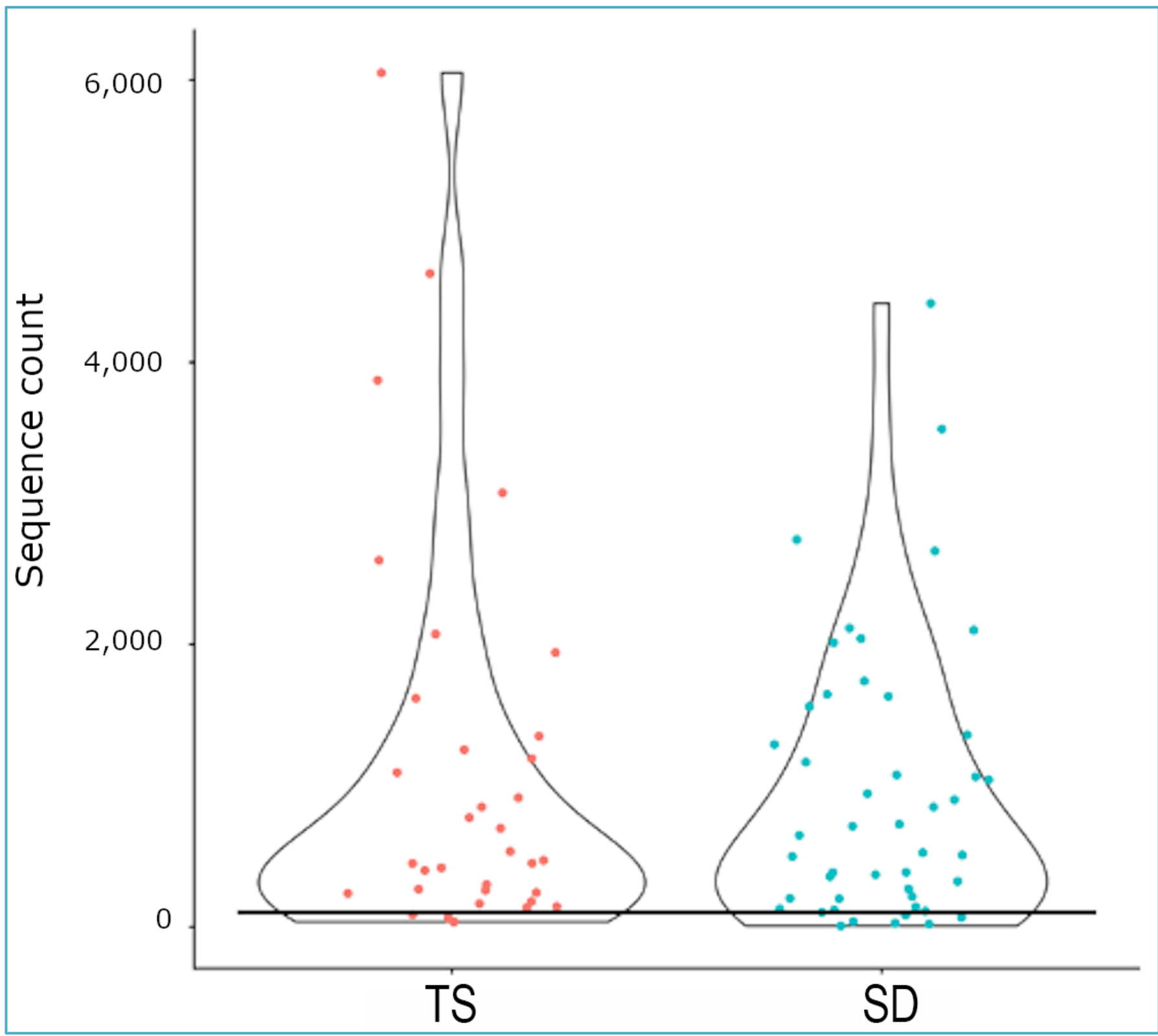
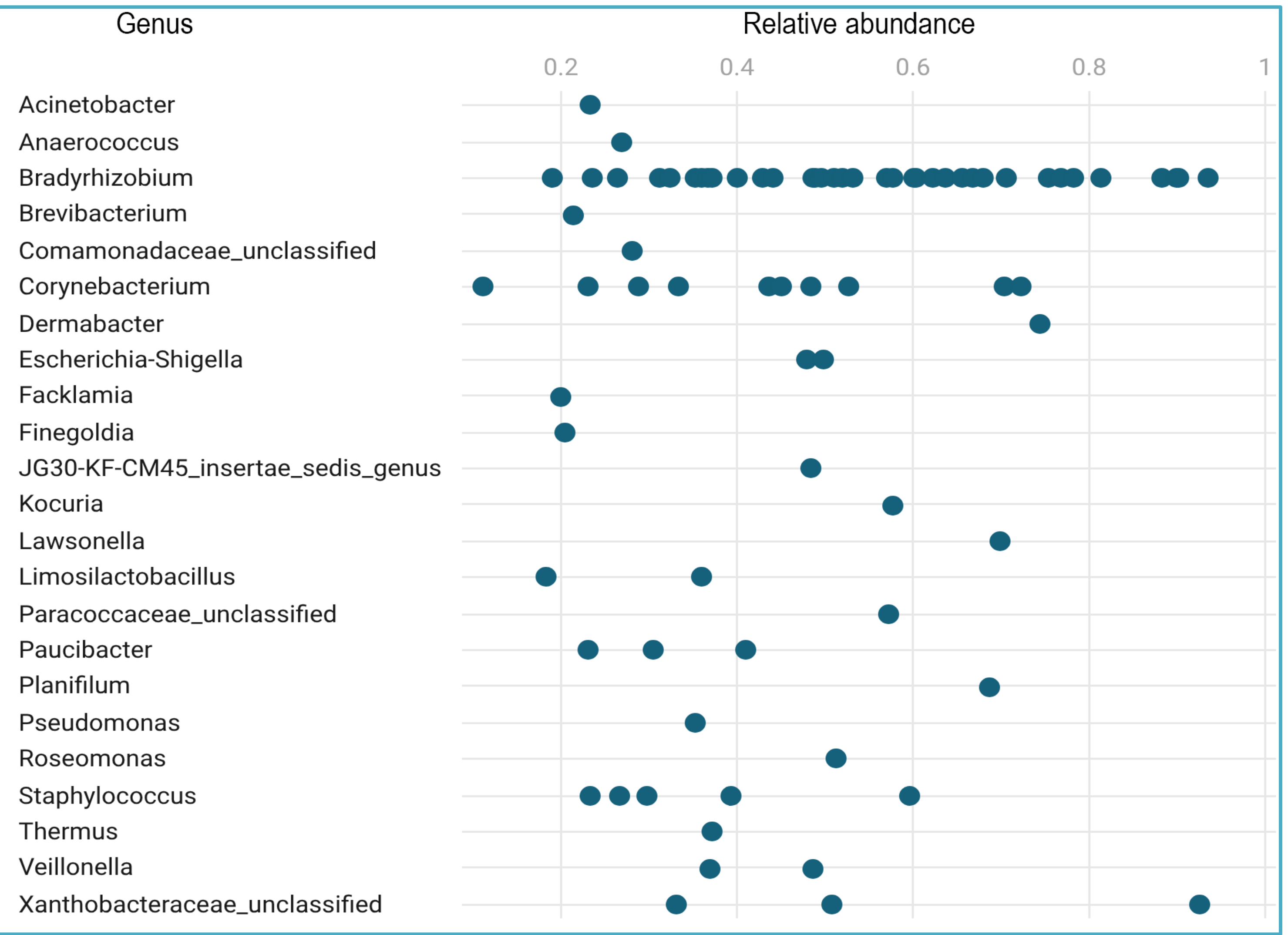


Fig on the left: Count distribution of amplicon sequence variants (ASVs) of TS and SD swabs. Subsequent alpha diversity analysis examining the richness and evenness of ASVs showed no significant difference between the SD and TS swabs.

In each swab, the relative abundance of individual bacterial genus was calculated. The most abundant were 23 bacterial genera. The most prevalent genus was *Bradyrhizobium*, which was the most abundant in 34 swabs.



In the only PJI case of this cohort, intraoperative microbiome and infected wound bacterial cultures were in high concordance.

|                      | Pre-TAA           | During TAA                                                                              | Post-TAA                                                  |
|----------------------|-------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Risk Factor          | 7 Ankle Surgeries |                                                                                         |                                                           |
| Diagnosis            | Posttraumatic OA  |                                                                                         | PJI (4 weeks)                                             |
| Wound microbial data |                   | <i>Staphylococcus</i><br>SD: most abundant (34%)<br>TS: 2nd most abundant (20%)         | <i>Staphylococcus aureus</i> (culture, 4 weeks)           |
|                      |                   | <i>Corynebacterium</i><br>SD: second most abundant (23%)<br>TS: 3rd most abundant (18%) | <i>Corynebacterium striatum</i> group (culture, 12 weeks) |
|                      |                   |                                                                                         |                                                           |
| Treatment            |                   | Cefazolin; Povidone-iodine                                                              | Wound I&D; implantation of antibiotic beads               |

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