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Incidence of Bacterial Contamination in ACL Reconstruction Grafts: Are Gram-negative Bacterial Relevant?

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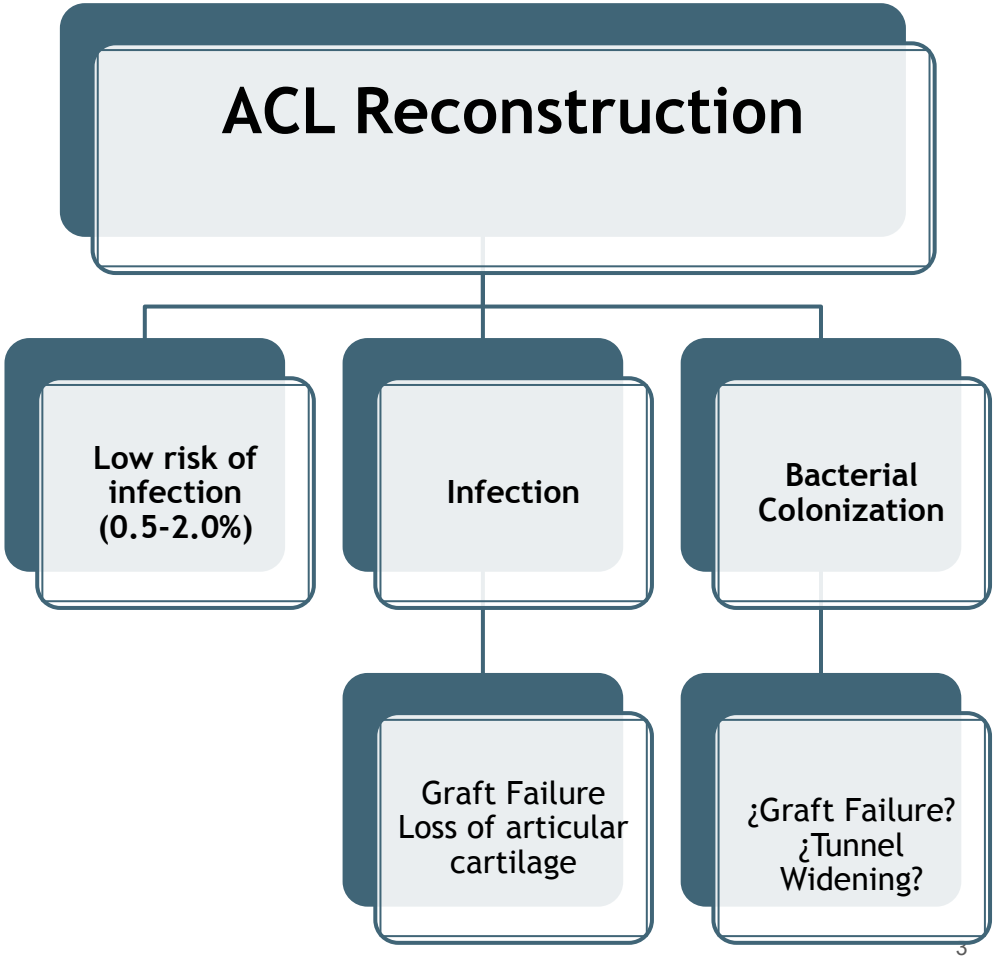
Faculty Disclosure Information

- Nothing to disclose.

Introduction

Recent studies have reported an association between the presence of bacterial DNA **(Bacterial Colonization)** in the anterior cruciate ligament (ACL) graft and clinical outcomes such as graft failure and tunnel widening in patients without clinical infection.



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Burnett et al 2024. Flanigan et al 2019. Gobbi et al 2016.

Objective

Describe the incidence bacterial colonization and bacteria type at the genus level in ACL reconstruction surgery

Hypothesis

Bacterial colonization of the graft is frequent in patients undergoing ACL reconstruction, and Gram-negative bacteria represent a significant proportion of the organisms

Study design

- Descriptive study in a single center between 2019-2022
- We included patients aged ≥ 18 years old who underwent ACL reconstruction with hamstring autograft.
- We analyzed 3 samples from each patient:
  - **M1** a segment of the tendon after the harvest.
  - **M2** a segment of the tendon after the fixation.
  - **M3** a saline receptacle on the instrument table (Control).
- Bacteria were detected using 16S rRNA gene next-generation sequencing.

M1

M2

M3

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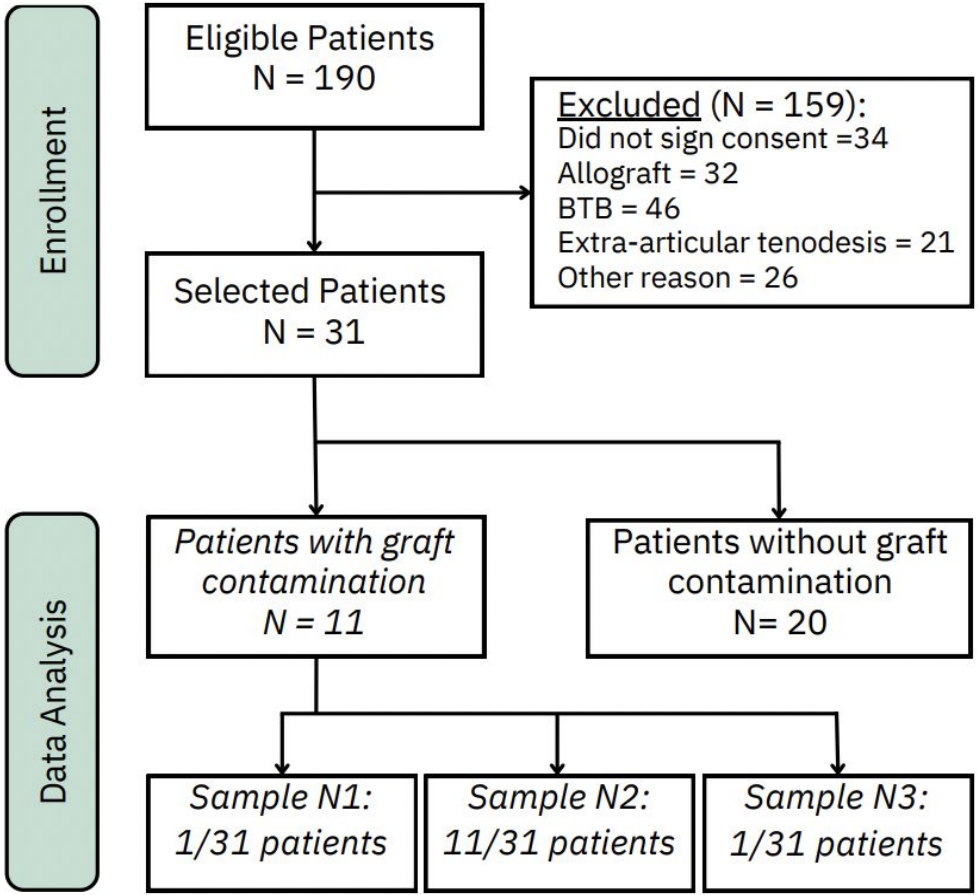


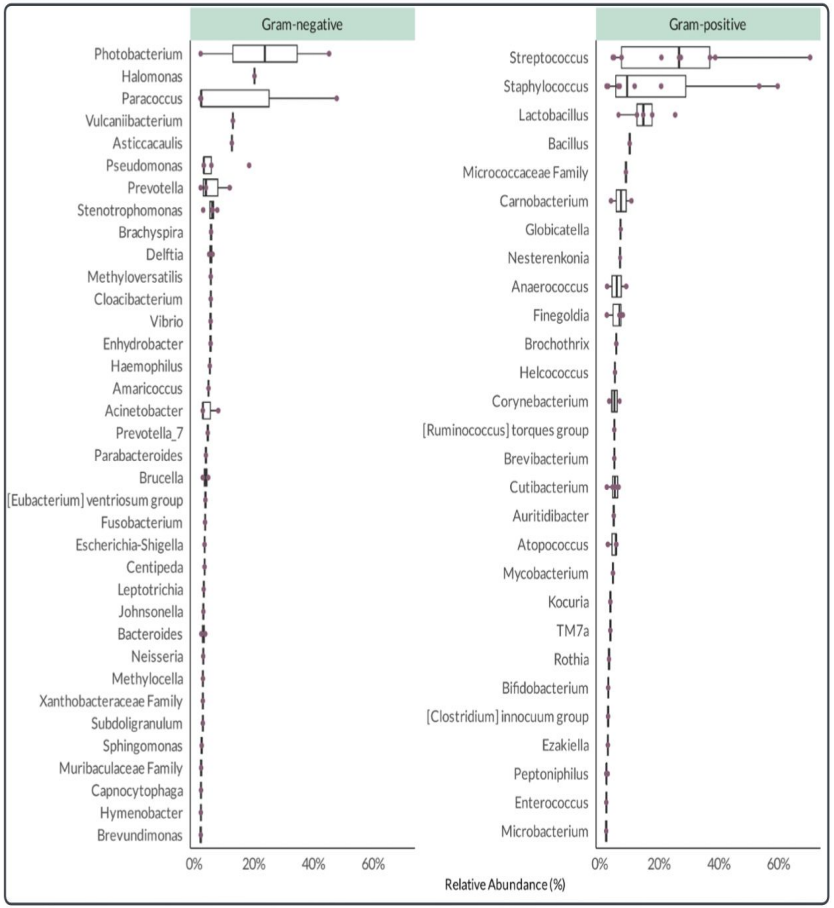
BTB= Bone-Tendon-Bone surgical technique. N1= Sample obtained during the harvest. N2= Sample obtained following tibial fixation. N3= Control sample

Results

- Bacteria colonization was present in **35.4%** of the samples

- **M2** samples contained 47 types of **Gram-negative** bacteria, with a mean of **6.8 bacterial types** per sample and a **relative abundance of 3.97%** per bacterium. The most frequent bacteria was ***Pseudomonas*** (5/11 samples)

- **M2** samples contained 33 types of **Gram-positive** bacteria, with a mean of **6 bacterial types** per sample and a **relative abundance of 9.62%** per bacterium. The most frequent bacteria was ***Streptococcus*** (8/11 samples)



Relative abundance at the Genus level of the M2 samples. The most abundant group in the Gram-Negative samples was Photobacterium. Overall, most of the organisms found to be prevalent in the samples (present in most of them) and in high abundance, are Gram-Positive, including Streptococcus, Staphylococcus and Lactobacillus.

Discussion

Bacterial Colonization

In this study bacterial colonization was observed in **35.4%** of the grafts, with significant prevalence of **Gram-Negative**.

Flanigan et al. found bacterial colonization in **87%** of grafts from ACL **revision surgeries**.

Strategies for Prevention

Current practice: Vancomycin covers Gram-positive

Challenges: Gram-negative are not being covered. Should we consider dual prophylactic antibiotic in high risk cases?

Surgical Recommendation

Most bacterial colonization detected after graft handling **(M2)**. We might improve:

- Exposure time
- Graft handling
- Gloves changing frequency

Limitations

Small sample size (n = 31)

Single centre study

Molecular detection may overestimate colonization

Flanigan et al 2019.

Conclusion

The study identified a 35% incidence of bacterial contamination.

Both Gram-negative bacteria (GNB) and Gram-positive bacteria (GPB) were frequently observed.

The presence of bacterial DNA was associated with the duration of graft exposure and the extent of manipulation (M2 sample).

References

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