

Improving diagnostics in fracture-related infection: the added value of Reamer–Irrigator–Aspirator intramedullary cultures

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BACKGROUND

Early and accurate pathogen identification is essential to guide surgical and antimicrobial treatment for fracture-related infection (FRI). Particularly in the presence of intramedullary infection, biofilm formation or prior antibiotic exposure, conventional deep tissue cultures (TC) may fail to recover all causative pathogens. The **Reamer-Irrigator-Aspirator** (RIA) system enables sampling of intramedullary material during reaming and may therefore provide complementary microbiological information. This study compared RIA-derived cultures with standard deep TC to determine their additional diagnostic value in patients with suspected FRI.

METHODS

Study design:

Retrospective, single-center cohort study of patients treated with the RIA-system for suspected FRI of the femur or tibia in the period between May 2020 and July 2024.

Treatment protocol:

- Single surgeon performed all surgical procedures
- Microbiological cultures obtained in accordance with standardized guidelines
- For each patiënt, ≥ 3 standard deep TC and ≥ 3 RIA-derived cultures were collected.

Follow-up period: min. 1 year

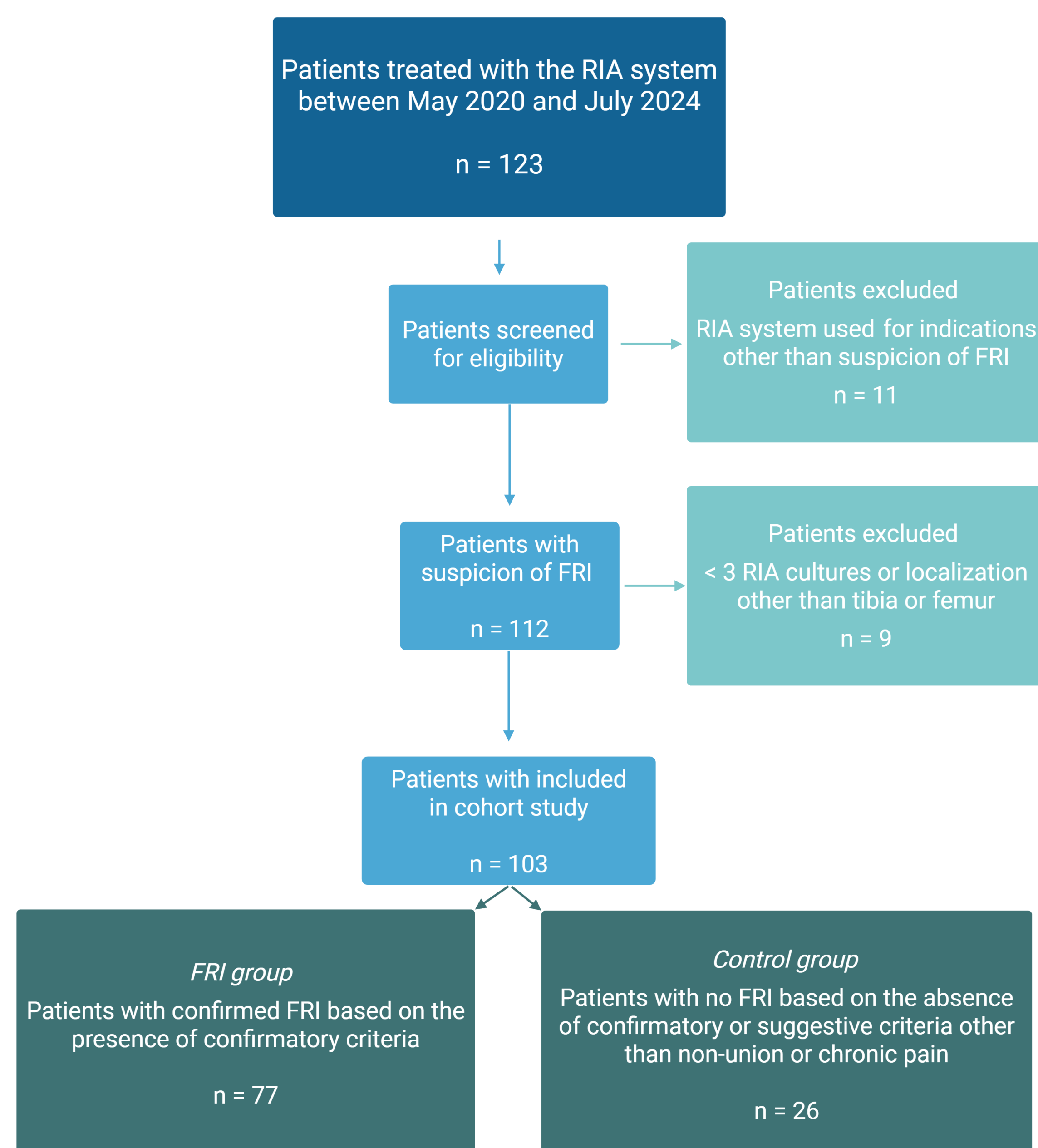
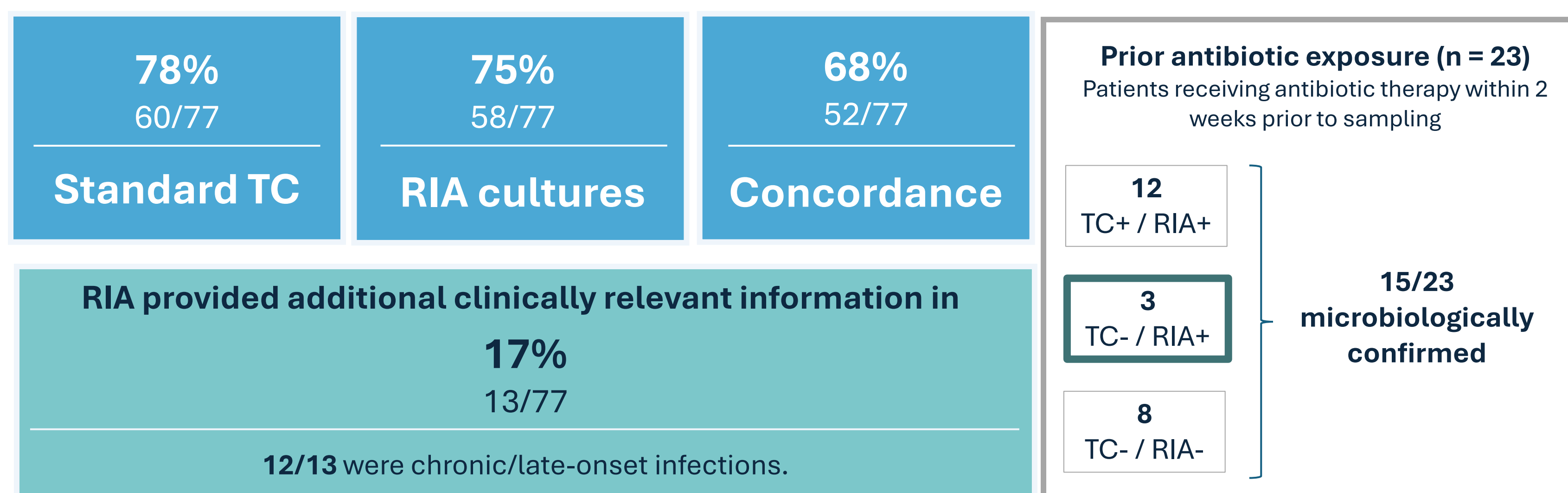


Fig. 1. Study flowchart. In all control patients, all standard TC and RIA cultures were negative and no other suggestive or confirmatory diagnostic signs occurred throughout the follow-up period of 1 year. None of these patients received antibiotics in the 2 weeks prior to sampling. FRI, fracture-related infection; RIA: Reamer-Irrigator-Aspirator.

RESULTS

Diagnostic added value of RIA cultures



In the 12 cases where standard TC provided additional clinically relevant information, 7/12 were chronic/late-onset infections.

87%

67/77

Combined microbiological confirmation

Microbiology

Combined RIA and deep TC microbiologically confirmed FRI in 67/77 patients (87%). Of these, 47 (70%) were monomicrobial and 20 (30%) polymicrobial. Coagulase-negative staphylococci were the predominant pathogens in both groups, while Gram-negative bacteria were particularly frequent in polymicrobial infections (Fig. 2).

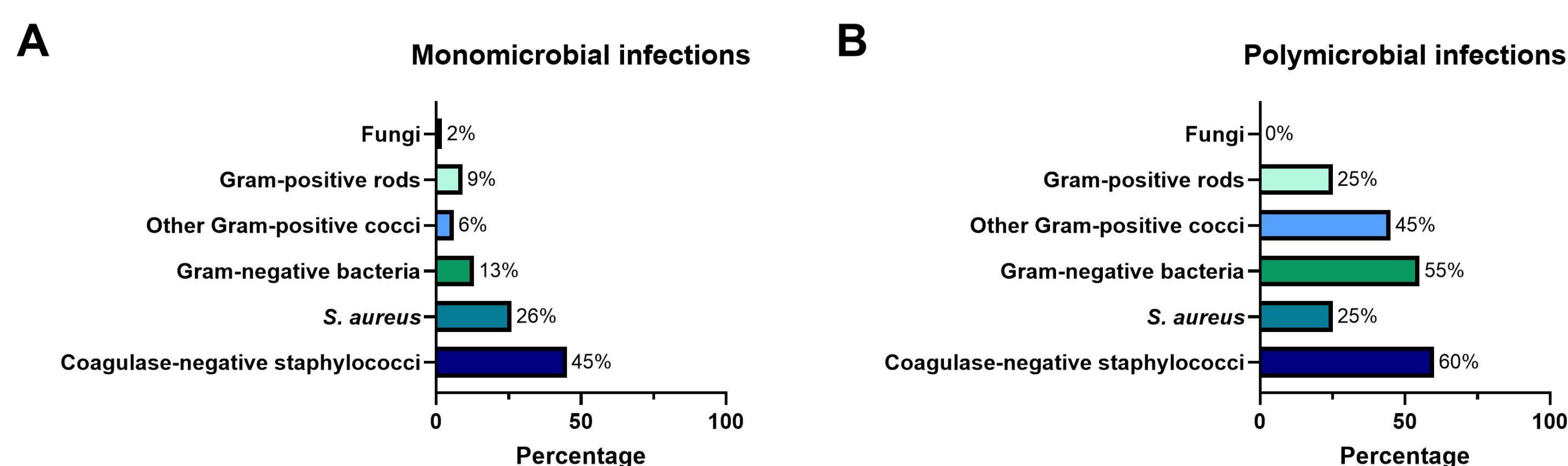


Fig. 2. Microbiological profile of culture-positive FRI (n = 67). **(A)** Distribution of pathogens in monomicrobial infections (n = 47). Percentages represent the proportion of infection caused by each microorganism. **(B)** Distribution of pathogens in polymicrobial infections (n = 20). Percentages represent the proportion of infection in which the respective microorganism was identified. Percentages may exceed 100% due to the presence of multiple organisms per case.

CONCLUSIONS

- RIA-derived intramedullary cultures may serve as a **useful adjunct** to standard deep TC in FRI, providing additional clinically relevant microbiological information.
- Their added value appears particularly relevant in **chronic/late-onset infections**.
- Given the cost of the RIA system, its use for diagnostic sampling should be considered selectively, particularly when RIA is already clinically indicated.