Implant Survivorship and Functional Recovery Utilizing a Modern Knee Fusion Nail Spacer for Periprosthetic Joint Infection

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INTRODUCTION: Periprosthetic joint infection (PJI) following Total Knee Arthroplasty (TKA) in the context of bony defects, ligamentous insufficiency, or extensor mechanism disruption poses a complex clinical challenge. A fusion nail spacer (FNS) offers both mechanical stability and local antibiotic delivery. This study aimed to (1) evaluate outcomes of FNS use with respect to TKA reimplantation, infection eradication, and limb salvage, (2) determine implant survivorship using reinfection as an endpoint, and (3) assess complications and functional recovery.

METHODS: We conducted a retrospective cohort study of 64 patients treated with an FNS from 2017–2023. Inclusion criteria included patients with PJI undergoing FNS placement; exclusions were incomplete records or follow-up <3 months. Mean follow-up was 22.4 ± 17.7 months. Primary outcome was implant survivorship; secondary outcomes included reimplantation, reinfection, complications (e.g., VTE, AKI), and functional recovery. Kaplan-Meier analysis estimated survivorship. Univariate Cox regression identified predictors of reinfection.

RESULTS: Limb salvage was achieved in 96.8% of cases; two patients (3.2%) required above-knee amputation. The uninfected bone rate was 81%. Implant survival to TKA reimplantation was 60.3%; 28.6% retained the FNS long-term and 9.5% had unplanned reoperations. Survivorship free from reinfection was 90% at 1, 2, and 3 years. No significant predictors of reinfection were identified ($p > 0.05$). Nail breakage was not observed; nail loosening occurred in 9.4%, and 4.8% experienced femur or tibia fractures. Mean post-reimplantation extension was 3.6° (±9.3, range -5° to 48°) and flexion was 87.6° (±34.1, range 0° to 125°).

DISCUSSION AND CONCLUSION: FNS is a promising option for managing complex PJI after TKA, especially in cases of significant bone loss. It offers durable infection control and supports limb salvage and recovery. While further surgeries may be required, this technique represents a viable limb-sparing strategy.

Figure 1: Fusion Nail Construct (Link Endo-Model Knee Fusion Nail SK, Hamburg, Germany)
Primary outcomes were successful TKA reimplantation, infection eradication, and limb salvage rate. Secondary outcomes included spacer-related complication (periprosthetic fracture, loosening, or mechanical failure), wound complication, VTE, AKI, and reinfection following reimplantation. Final knee ROM was also recorded for those who underwent reimplantation.

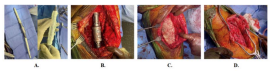

Figure 2: Intraoperative Placement of the Fusion Nail. A. Coated Fusion Nail; B. Fusion Nail Inserted in Knee; C. Cement Inserted in Knee; D. Capsule Closed over Cement.

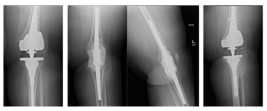

Figure 3: X-Rays demonstrating Fusion Nail Indication, Placement, and Durability. 59-year-old female with fusion nail placed on left one year following primary total knee arthroplasty. Patient underwent reimplantation with a Stage 2 Hinge total knee arthroplasty approximately 6 months after placement of the nail. There were no known complications with the nail. **A.** Preoperative Anteroposterior Weight-Bearing Radiograph; **B.**1-month postoperative of fusion nail placement **1)** anteroposterior and **2)** lateral weight-bearing radiographs; and **C.**1-year postoperative of reimplantation anteroposterior weight-bearing radiograph.

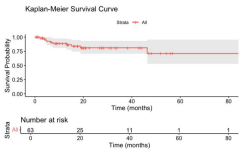

Figure 4: Kaplan-Meier Survivorship Curve and Analysis with Reinfection at any time as the Endpoint.