

Reduced Stem Engagement in the Non-Violated Femoral Diaphysis is a Predictor of Aseptic Loosening After Cemented Distal Femoral Replacement

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INTRODUCTION: Aseptic loosening is a common failure mode following distal femoral replacement (DFR) for revision total knee arthroplasty (rTKA). While secure stem fixation is intuitively linked to longevity, no quantitative threshold for native diaphyseal engagement exists. This study aimed to evaluate a large cohort of DFRs at a high-volume tertiary center, assessing whether native diaphyseal engagement serves as a predictor of fixation failure.

METHODS: This retrospective cohort study identified 105 patients who underwent DFR between 2016 and 2021, with a minimum two-year follow-up. Inclusion required adequate imaging parameters and quality for radiographic analysis. Standardized anteroposterior radiographs were analysed using a PACS-based digital measurement tools; diaphyseal engagement was calculated as the stem length occupying the native intramedullary canal divided by the total stem length. Implants were categorised as <62% or ≥62% engagement, based on cohort mean. Aseptic loosening was defined by progressive radiolucent lines, stem migration, or re-operation for loosening. Chi-square tested the association between engagement and loosening.

RESULTS: Of the 105 patients identified, 100 met the inclusion criteria of adequate imaging for radiographic analysis (mean age 73; 63% female). Aseptic loosening was observed in 15 implants (15%). Among these, 12 of 15 implants (80%) had native diaphyseal engagement <62%, compared to 3 of 85 implants (3%) in the non-loosening group. The difference in loosening rates between engagement groups was statistically significant, with a higher rate of aseptic loosening observed in DFR cemented stems with <62% of the stem length in non-violated diaphyseal bone ($p = 0.003$).

DISCUSSION AND CONCLUSION: Preoperative templating for DFR should include ≥62% of the stem length in non-violated femoral diaphysis to reduce the risk of aseptic femoral failure. Prospective studies with longer follow-up are warranted to validate this benchmark and to assess whether greater engagement improves stability.

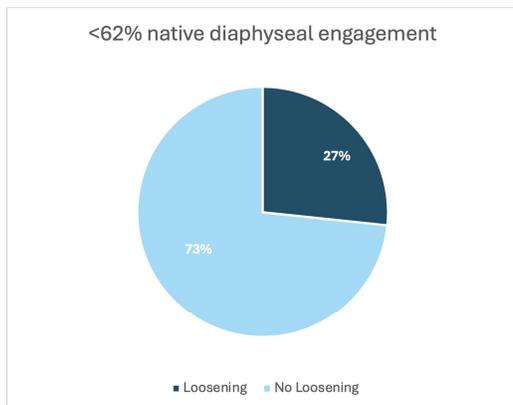


Figure 1: Aseptic loosening rates in implants with <62% native diaphyseal engagement.

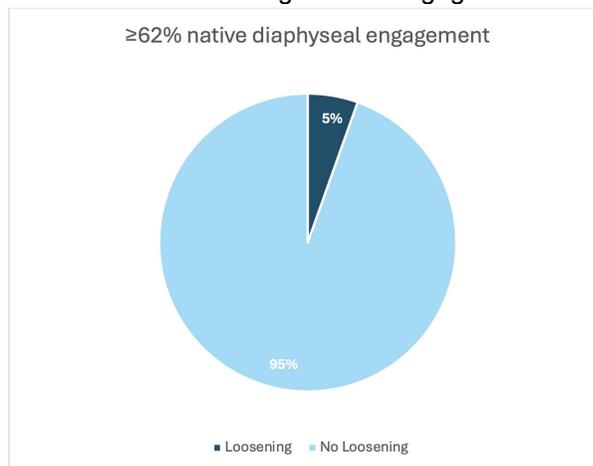


Figure 2: Aseptic loosening rates in implants with ≥62% native diaphyseal engagement.