

Distal Femoral Replacement for Neoplastic Conditions with Comparable Outcomes to Non-Neoplastic Indications

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INTRODUCTION: Reconstructing significant loss of bone in the distal femur poses a significant challenge for orthopedic surgeons. While distal femoral replacement (DFR) is a common solution after tumor removal, it is less commonly used for non-neoplastic conditions. DFRs are associated with a high rate of complications, especially dislocation and infection, and are generally considered a last resort for limb salvage. Previous studies have examined the use of DFRs for non-neoplastic indications (NNI), but they have not compared outcomes across different patient indications. The objective of this study was to evaluate the incidence of complications in DFR procedures and to better understand the varying risk profiles among indications.

METHODS: Utilizing our mega prosthesis database, we identified all distal femur replacements performed at our institution from 1999-2021. Surgeries were grouped by tumor involvement as well indication for DFR (metastasis, primary tumor, benign tumor, failed arthroplasty, or trauma: peri-implant fractures, fractures not amenable to primary fixation). Patient demographics and clinical outcomes were collected and compared with a focus on complications including infection, revisions, and implant survival.

RESULTS: Of the 221 patients included in this study, 39% received a DFR for primary or metastatic sarcoma (n=82), 29% for trauma (n=62), 13% for revision arthroplasty (n=28), 11% for metastatic carcinoma (n=23), and 8% for benign tumor of bone (n=16). The average length of follow-up for all indications was 4.07 years, with the longest average follow-up being for primary or metastatic sarcoma (5.54 years). For all indications, the average rate of readmission within 30 days was 9% (19/221). The highest rates of readmission within 30 days were 13% for metastatic carcinoma (3/23), 10% for primary or metastatic sarcoma (8/82), 8% for trauma (5/62) and 11% for metastasis (20/182).

For all indications, the average rate for any superficial wound problem within 30 days was 16% (16/221), with the most common superficial wound problem being wound dehiscence at 2% (5/221). An indication of arthroplasty was associated with the highest rate of superficial wound problems at 14% (4/28). For all indications, the average rate of reoperation for any cause was 30% (63/221), with the most common reason for first reoperation being deep infection at 7% (15/221). Arthroplasty was associated with the highest rate of reoperation for any cause at 36% (10/28), while metastasis had the highest rate of surgery for deep infection at 13% (3/23) followed by trauma 10% (6/62).

For all indications, the average time to first reoperation was 2.08 years. The longest time to reoperation was for benign tumor of bone at 2.2 years, while the shortest time to reoperation was for metastasis at 1.5 years. For all indications, the average number of reoperations was 2.27 reoperations. Arthroplasty was associated with the highest number of reoperations, with an average of 2.7 reoperations. Benign tumor of bone was associated with the lowest number of reoperations, with an average of 1.0 reoperations per patient.

The overall rate of aseptic loosening in this cohort was 4% (9/221). The highest rates of aseptic loosening were 8% for trauma (5/62) and 7% for arthroplasty (2/28). The overall rate of amputation in this cohort was 8% (16/221). The highest rates of amputation were 10% for primary sarcoma (8/82), 8% for trauma (6/62), and 7% for arthroplasty (2/28). In this cohort, the overall rate of implant failure requiring implant removal was 16% (32/331). The highest rate of implant failure requiring implant removal was 18% for arthroplasty (5/28) and sarcoma (15/82).

There were no significant differences between NNI and NI indications with regards to 30-day readmission (9% vs 9%, p=1.00), superficial wounds problems (7% vs 9%, p=0.6), rate of revision surgery (27% vs 33%, p=0.36), amputation rate (7% vs 8%, p=1.0) or implant removal (16% vs 16%, p=1.0). There was a significantly increased rate of aseptic loosening amongst NNI compared to NI (8% vs 2%, p=0.039).

DISCUSSION: These results demonstrate that outcomes and complications of reconstruction with DFR vary based on the indication for surgery and demonstrate that neoplastic patients counterintuitively fair as well as their non-neoplastic counterparts, across several outcome measures namely readmission, revision surgery, infection, amputation, or implant removal.

SIGNIFICANCE/CLINICAL RELEVANCE: Outcomes of reconstruction surgery using DFR differ depending on the surgical indication. Surprisingly, neoplastic patients have similar results to non-neoplastic patients.