Do Patient Outcomes Differ following Distal Femoral Replacement Performed for Trauma versus Arthroplasty? A Systematic Review and Meta-Analysis

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INTRODUCTION: Distal femoral replacement (DFR) involves resecting the distal portion of the femur and replacing it with an endoprosthesis. Indications for DFR include notable bone loss or instability following primary and revision total knee arthroplasty, native and periprosthetic distal femoral fractures, and osteosarcoma. While previous studies have evaluated patient outcomes following DFR, no meta-analysis has compared patient outcomes between trauma and arthroplasty indications. The purpose of this study was to conduct a systematic review and meta-analysis comparing outcomes for patients who underwent DFR for either trauma (native or periprosthetic fracture) or arthroplasty (bone loss or hardware failure) indications.

METHODS: A search of PubMed, Ovid MEDLINE, and Ovid Embase databases was performed with the specified terms distal femoral replacement, total knee arthroplasty, distal femoral fracture, and periprosthetic fractures, with no specific time frame for publication date. Publications were in English, full-text, and screened by two individuals. A total of 183 publications were screened; 151 publications were excluded due to duplication, oncologic indication, or absence of discussion of patient outcomes, leaving 32 studies. Patient outcomes measured included: patient survival 90 days postoperation, patient survival until last follow up, implant survival at 90 days, 1 year, and 2 years, postoperative infection, overall reoperation rate, reoperation for fracture, reoperation for aseptic loosening, and readmission to hospital. Statistical analysis was performed with a Pearson's Chi-squared test of independence (alpha of 0.05) to determine the relationship between DFR indication (trauma or arthroplasty) and patient outcome.

RESULTS: A total of 2,397 patients were included across these studies: 2,190 (91.4%) of the patients underwent DFR for trauma, while 207 (8.6%) patients underwent DFR for arthroplasty. There was a statistically significant difference between the arthroplasty and trauma indications for patient survival until last follow-up ($p<0.001$), 90-day implant survival ($p<0.001$), 1-year implant survival ($p<0.001$), 2-year implant survival ($p<0.001$), postoperative infection ($p<0.001$), hospital readmission ($p<0.001$), reoperation overall ($p<0.001$), and reoperation for aseptic loosening ($p=0.002$) (Table 1). Additionally, the odds of postoperative infection, hospital readmission, reoperation overall, and reoperation for aseptic loosening were 0.41 (95% confidence interval [CI] =0.26-0.65, $p<0.001$), 0.26 (95% confidence interval [CI] =0.14-0.46, $p<0.001$), 0.31 (95% confidence interval [CI] =0.22-0.44, $p<.001$), and 0.43 (95% confidence interval [CI] =0.25-0.73, $p=0.001$) times lower, respectively, for the DFR trauma indication than the arthroplasty indication. There was no statistically significant difference in the odds of both survival until last follow up (OR=1.51, 95% confidence interval [CI] =0.92-2.47, $p=0.10$) and 2-year implant survival (OR=1.74, 95% confidence interval [CI] =0.68-4.44, $p=0.24$) when comparing the trauma indication to the arthroplasty indication.

DISCUSSION AND CONCLUSION:

In this meta-analysis, patients who underwent DFR for arthroplasty were more likely to experience postoperative infection, hospital readmission, overall reoperation, and reoperation for aseptic loosening than patients who underwent DFR for trauma. Arthroplasty patients are more likely to have undergone several revision surgeries or experienced past periprosthetic joint infection, potentially increasing their likelihood of complications following DFR. Given the smaller sample of patients in the arthroplasty indication group, additional studies are necessary to evaluate patient outcomes following DFR for arthroplasty. Ultimately, our results suggest that when counseling patients on the outcomes of DFR, the indication for surgery should be considered.