Distal Femur Replacements for Oncologic Indications Provide Durable Limb Salvage: A 45-year Single-Institution Experience

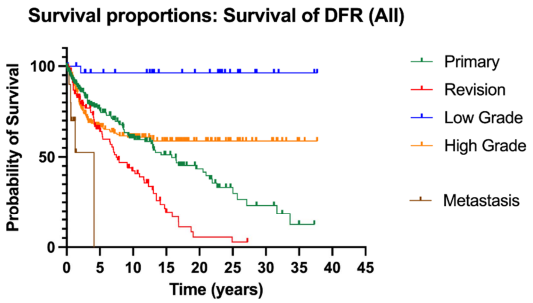
Trevor Lloyd, Autreen Golzar, Christopher D Hamad, Thomas Olson, Min Wook Joo, Michael Fice, Joshua A Mehany, Nicholas M Bernthal

INTRODUCTION: The distal femur is a common site for primary and metastatic bone tumors requiring distal femoral replacement (DFR). With advances in immunotherapy and oncologic care, long-term implant durability is increasingly critical. We present a 45-year, single-institution experience to characterize implant survivorship and failure patterns following DFR.

METHODS: A retrospective database (1980–2023) identified 370 distal femoral replacements (DFRs) for primary or metastatic bone tumors. Tumors were staged using the Enneking system: low-grade (n = 29), high-grade (n = 221), and metastatic (n = 12). Kaplan–Meier methods estimated implant survival, with any revision surgery as the endpoint. Patients without failure were censored at last follow-up or death. Failures were classified according to the Henderson failure mode classification.

RESULTS: Median follow-up was 9 years. The 5-, 10-, and 20-year implant survival rates for primary DFRs were 75.8%, 60.3%, and 52.0%, respectively; for revision DFRs, survival declined to 62.7%, 43.6%, and 19.9%, respectively. A total of 108 implants (29%) were revised. Among primary DFRs (n = 262), the most common failure modes were mechanical failure (12.2%), aseptic loosening (10.7%), and infection (5.7%). In revision DFRs (n = 108), mechanical failure (29.6%) and infection (17.6%) were more frequent. Tumor recurrence was infrequent in both groups (3.8% primary vs. 1.9% revision).

DISCUSSION AND CONCLUSION: DFRs provide a durable limb salvage option and often outlast the recipient patient. Long-term survivors face an increasing risk of late mechanical failure or aseptic loosening, underscoring the need for improved implant longevity and failure prevention strategies.



Complication	Primary (n = 262)	Revision (n = 108)	Total (n = 370)
Soft Tissue Failure (Type 1)	3/262 (1.1%)	2/108 (1.9%)	5/370 (1.4%)
Aseptic Loosening (Type 2)	28/262 (10.7%)	12/108 (11.1%)	40/370 (10.8%)
Mechanical Failure (Type 3)	32/262 (12.2%)	32/108 (29.6%)	64/370 (17.3%)
Infection (Type 4)	15/262 (5.7%)	19/108 (17.6%)	34/370 (9.2%)
Tumor Recurrence (Type 5)	10/262 (3.8%)	2/108 (1.9%)	12/370 (3.2%)