

PAPER 24

Title: Indications and longevity of endoprosthetic reconstructions for patients with metastatic bone disease

Authors: Kendal JK^{1,2}, Hamad C¹, Abbott AG², Greig D¹, Peterson NV¹, Wessel LE¹, Puloski SKT², Monument MJ², Bernthal NB¹

1. Department of Orthopaedic Surgery, University of California, Los Angeles, Santa Monica, CA, USA
2. Section of Orthopaedic Surgery, Department of Surgery, University of Calgary, Calgary, AB, Canada

Background: Malignant osseous destruction secondary to metastatic bone disease (MBD) significantly impacts patient mobility and quality of life. Surgical intervention is indicated for patients with realized or impending pathologic fractures. Surgical techniques are tailored to both the patient and bony involvement, with more aggressive surgical resection and endoprosthetic reconstruction (EPR) indicated for patients with more favourable survival or with few metastatic deposits. As therapeutic advances for MBD patients continue to develop, a critical evaluation of indications, outcomes, and complications of EPR performed for MBD is indicated.

Questions/Purposes: The purpose of this study was to review indications, outcomes, and complications of EPR performed for patients with MBD.

Methods: We performed a retrospective multi-institutional database review of patients undergoing primary and revision cemented EPR for extremity MBD between 1990 and 2022 at the University of California, Los Angeles, and the University of Calgary. Demographic data included age, sex, primary tumor type and location. Surgical data included EPR type, indication for EPR, and implant survival. Patient survival was calculated using the Kaplan Meier statistic. Failure modes were categorized by Henderson's classification system.

Results: A total of 113 patients were included with a median age of 61.5 (IQR: 49.2-72.5), and 58 (51.3%) were female. Median follow-up was 22.4 months (95% CI 16.7-34.4) and median patient survival was 28 months (95% CI 18.3-48.4). The 3 most common primaries were renal cell (31/113, 27.4%), breast (26/113, 23.0%), and lung (16/113, 14.2%). Patients with MBD underwent EPR for 3 indications: actualized pathologic fracture (58/113, 51.3%), impending pathologic fracture (31/113, 27.4%), and failed surgical fixation (24/113, 21.2%). The most common EPR was proximal femur replacement (PFR; 41/113, 36.3%), followed by proximal humerus replacement (PHR; 40/113, 35.4%), distal femur replacement (DFR; 21/113, 18.6%), distal humerus replacement (DHR; 7/113, 6.2%), and total femur replacement (TFR; 4/113, 3.5%). Four reverse total shoulder EPRs were performed. Implant survival data was available all patients, the one-year implant survival rate was 81.8% (95% CI 78.2-92.6). Henderson type 1 failure was the most common (50%, 6/12) followed by type 2 (33.3%, 4/12), type 3 (16.7%, 2/12) and type 4 (16.7%, 2/12). Two implants failed in >1 Henderson mode. When stratified by anatomic location, 2/40 PHRs, 3/41 PFRs, 3/21 DFRs, 2/7 DHRs, and 2/4 TFRs failed. Of the 24 patients undergoing EPR for failed previous MBD fixation, 4 were for failed hip hemiarthroplasty, 10 for failed IMN (8 femur and 2 humerus), and 10 for failed ORIF (4 femur, 6 humerus).

Conclusions: In a multi-center cohort of MBD patients, EPRs were done most frequently for renal cell carcinoma, and patients with a relatively favourable survival (28 months in this cohort). Soft tissue failures were the most common failure mode. EPR was indicated for failed previous fixation in 21% of cases, emphasizing the importance of predictive survival modeling to optimize surgical decision making. When utilized for the appropriate indication, EPR is a reliable surgical option for patients with MBD.