

## ABSTRACT 11339

### SURGICAL FAILURE AND DISEASE PROGRESSION IN A NEW ERA OF METASTATIC SKELETAL DISEASE

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**Background:** Improvements in primary disease treatments and the use of adjuvant skeletal therapies have substantially altered postoperative survival rates for patients with skeletal metastases. Although literature exists on postoperative complications and survival following surgical stabilization of symptomatic bone metastases, the role of procedure choice, adjuvant antiresorptive medication, and tumor origin in altering risk of postoperative radiographic disease progression and implant failure has yet to be fully explored in this new era of improved survivorship.

**Questions/Purposes:** The purpose of this study is to assess risk factors associated with (1) failure of surgical stabilization, (2) radiographic disease progression, and (3) survival following operative treatment of metastatic bone disease of the extremities in patients living at least six months with a treated skeletal lesion.

**Patients and Methods:** Retrospective review included 89 extremity metastatic bone lesions treated surgically in 77 patients. To be included, patients must have been evaluated between 2004 and 2014, be >18 years of age, and have at least six months of radiographic imaging of an operatively treated skeletal lesion. Variables assessed included patient age and gender, lesion location, size, histology, and quality. Surgical variables included procedure type, cement use, indication, and time to surgery from diagnosis. Adjuvant treatment variables included post-surgical bisphosphonate and denosumab use, and radiotherapy timing. Mirels score was assigned at earliest radiograph, and disease progression was assessed on follow-up imaging at three month intervals based on criteria described by Harada, H. et al (2010). Postoperative failure was defined as implant loosening, development of new impending or completed fracture, or periprosthetic infection. Association of explanatory variables with surgical failure was assessed using Fisher exact test for categorical variables and the t-test for continuous variables. Cox proportional hazards models were used to assess association with time to first evidence of radiographic disease progression, and time between subsequent episodes of progression. Survival was also evaluated with cox regression models. Mean mirels score was  $8 \pm 1.4$ . Primary tumor origin was commonly kidney (29.2%), myeloma (28.0%), breast (11.2%), and lymphoma (8.9%). Procedures included resection with endoprosthetic replacement (39.3%), intramedullary nail fixation (41.5%), plate fixation (12.3%), pinning (3.3%), and cementation alone (3.3%); cement was utilized in 44.4% of fixation procedures.

**Results:** Overall surgical failure rate was 16.8%; endoprosthetic failure rate was 8.8%, compared with 22.2% for fixation procedures. Surgical failure was significantly associated with tumor type ( $p=0.02$ ) and mirels score ( $p=0.015$ ). Renal cell carcinoma had the highest rate of failure (30.77%), and significantly higher odds of failure than round cell tumors ( $p=0.007$ , OR 0.23, 95% CI 0.07-0.67). Procedure ( $p=0.066$ ), lesion location ( $p=0.059$ ), and gender ( $p=0.072$ ) were trending but did not reach significance. Radiographic disease progression was observed in 43.8% (39/89) of lesions. Cox models demonstrated that male gender (HR=2.77; 95% CI 1.45-5.24) was significantly associated with disease progression, while denosumab compared with bisphosphonate use (HR=2.26; 95% CI 0.91 – 5.62), increased time to surgery (0.085), and femoral compared with humeral lesions ( $p=0.084$ ) were trending towards significance. Furthermore, use of systemic antiresorptive medication significantly decreased risk of death (HR 0.50; 95% CI 0.28 – 0.90).

**Conclusions:** Certain patients are likely to progress despite multimodal therapy for their at-risk skeletal lesions. Renal cell carcinoma and femoral lesions should be considered for resection and endoprosthetic reconstruction over prophylactic fixation, given a higher likelihood of disease progression and surgical failure in patient with this risk factors. Postoperative antiresorptive therapy should be utilized when indicated, given a lower likelihood of disease progression and strong association with overall survival.

Level of Evidence: Level III