

# Two Year Outcomes of Modular Segmental Megaprosthesis for Revision Shoulder Arthroplasty with Severe Proximal Humerus Bone Loss

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**INTRODUCTION:** Severe proximal humerus bone loss presents a significant challenge in revision reverse total shoulder arthroplasty (rTSA), particularly when residual bone stock precludes the use of standard implants. The Modular Segmental Megaprosthesis (MSM) offers a customizable, off-the-shelf solution designed to address this complexity, yet its use in non-oncologic shoulder revisions is sparsely reported. This study evaluates the functional outcomes, pain relief, and survivorship of MSM in patients undergoing revision rTSA for severe proximal humerus bone loss.

**METHODS:** A retrospective review of 28 patients who underwent revision rTSA using a modular segmental megaprosthesis between 2014 and 2022 was conducted. All patients had a minimum of two-year follow-up (mean: 2.8 years, range: 2.0–3.5). Inclusion criteria were failed shoulder arthroplasty with inadequate proximal humerus bone stock. Preoperative and postoperative assessments included range of motion (ROM), visual analog scale (VAS) for pain, American Shoulder and Elbow Surgeons (ASES) score, Constant-Murley score, and the Simple Shoulder Test (SST). Implant survivorship was evaluated using the Kaplan-Meier method, and functional outcomes were analyzed using the Wilcoxon signed-rank test.

## RESULTS:

The study included 28 patients (7 males, 21 females) with a mean age of 76 years (range: 60–91). Indications for revision included periprosthetic fracture (n=15), aseptic loosening (n=10), intraosseous cyst (n=1), second-stage reimplantation post-infection (n=1), and benign bone tumor (n=1). At final follow-up, implant survivorship was 85.7%, with 24 of 28 patients demonstrating well-fixed components without radiographic loosening. Four patients required revision surgery: three due to humeral loosening (two cemented, one press-fit) and one due to a periprosthetic fracture that ultimately necessitated conversion to a total humerus replacement. No patients with intercalary segments required revision.

Functional outcomes improved significantly post-operatively. Mean Constant score increased from 12.9 to 69.6 (p=0.008), ASES score from 7.4 to 77.2 (p=0.008), and Simple Shoulder Test score from 11.1% to 68.1% (p=0.008). Pain levels improved markedly, with VAS scores decreasing from a preoperative mean of 7.1 to 2.4 (p=0.001). ROM also improved in all measured directions except internal rotation. Forward elevation improved from 46° to 102° (p=0.004), abduction from 33° to 92° (p=0.002), and external rotation from 13° to 31° (p=0.036). Although internal rotation did not reach statistical significance, qualitative clinical assessment indicated functional gains in most patients.

**DISCUSSION AND CONCLUSION:** Modular segmental megaprosthesis demonstrates strong mid-term survivorship and improvements in pain, function, and mobility following revision rTSA. With a 2-year implant survival rate of 85.7% and significant gains in standardized outcome scores, MSM offers a viable salvage option when traditional implants are not feasible. Given its modularity, intraoperative flexibility, and avoidance of donor graft complications, MSM provides a useful alternative to allograft prosthetic composites and custom implants.

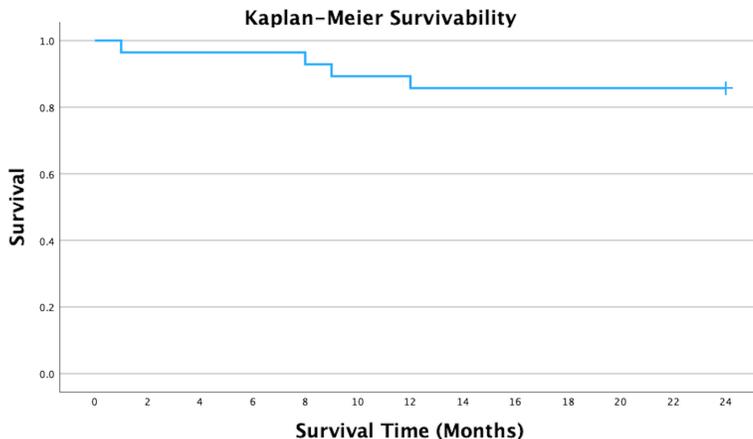


Figure 1: Kaplan-Meier curve demonstrating implant survival in patients who received a proximal humerus megaprosthesis using a modular segmental revision system. At 24 months, 86% of implants were still in place without loosening.