Bone or metal to reconstruct the proximal humerus? An analysis of functional outcomes, complications and survival between Reverse Allograft Prosthetic Composite and Endoprosthesis

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Introduction:
Proximal humerus bone loss can result from trauma, infection, osteolysis, prior surgery or oncological destruction and is challenging to manage. Reverse allograft prosthetic composite (APC) and endoprostheses, which can comprise hemiarthroplasty or reverse shoulder arthroplasty (RSA) configurations, can both restore stability and function, albeit with a relatively high complication rate. Direct comparisons between the outcomes and complication profiles have been lacking and historically challenging to perform, but are critical to help inform decision making in these complex cases. The purpose of this study was to compare outcomes and complications between reverse-APC and endoprosthesis. We hypothesized reverse-APC would be associated with a higher complication-free survival, while endoprosthesis would be associated with a higher rate of dislocation given inherent lack of soft tissue stability.

Material and Methods:
This was a retrospective comparative multi-surgeon cohort study of consecutive patients undergoing first-time proximal humerus reconstruction with reverse-APC or endoprosthesis, hemiarthroplasty or RSA, for any indication. The primary outcome was complication rate. Secondary outcomes were range of motion, patient reported outcome measures, reoperations and revisions. Minimum follow up was 12 months. Kaplan-Meier survival analysis with log-rank tests were performed.

Results
A total of 44 patients were included: 12 reverse-APC, 22 RSA endoprosthesis, and 10 hemi endoprosthesis, with a mean (and range) follow up of 26 (12-41), 42 (14-87), and 35 (31-39) months respectively. Demographics and comorbidities were similar between groups. Five reverse-APCs (42%) had complications, and all needed reoperation secondary to fracture, hematoma, symptomatic hardware, glenoid component loosening, and recurrent infection. There were no dislocations. Twelve RSA endoprostheses (55%) had complications, including 4 dislocations (18%), 3 of which went on to revision surgery. Ten hemi endoprostheses (100%) had complications, including 5 dislocations (50%), 4 of which went on to revision surgery. The RSA endoprosthesis and hemi endoprosthesis group had a significantly higher rate of dislocation when compared to the reverse-APC group ($p= 0.014$). Complication-free survival at two years was 75% for reverse-APC, which was higher than the RSA endoprosthesis group and hemi endoprosthesis group (45% and 20% respectively; $p= 0.018$). With the deltoid detached in severe proximal humerus bone loss, there was a significantly lower complication-free survival (<0.05). ROM and PROMs were similar between groups.

Conclusions:
Reverse-APC and endoprosthesis both have a high complication rate, although reverse-APC was associated with a higher complication-free survival, and hemi endoprosthesis had a higher dislocation rate. There is a higher risk of complications when the deltoid integrity is compromised.

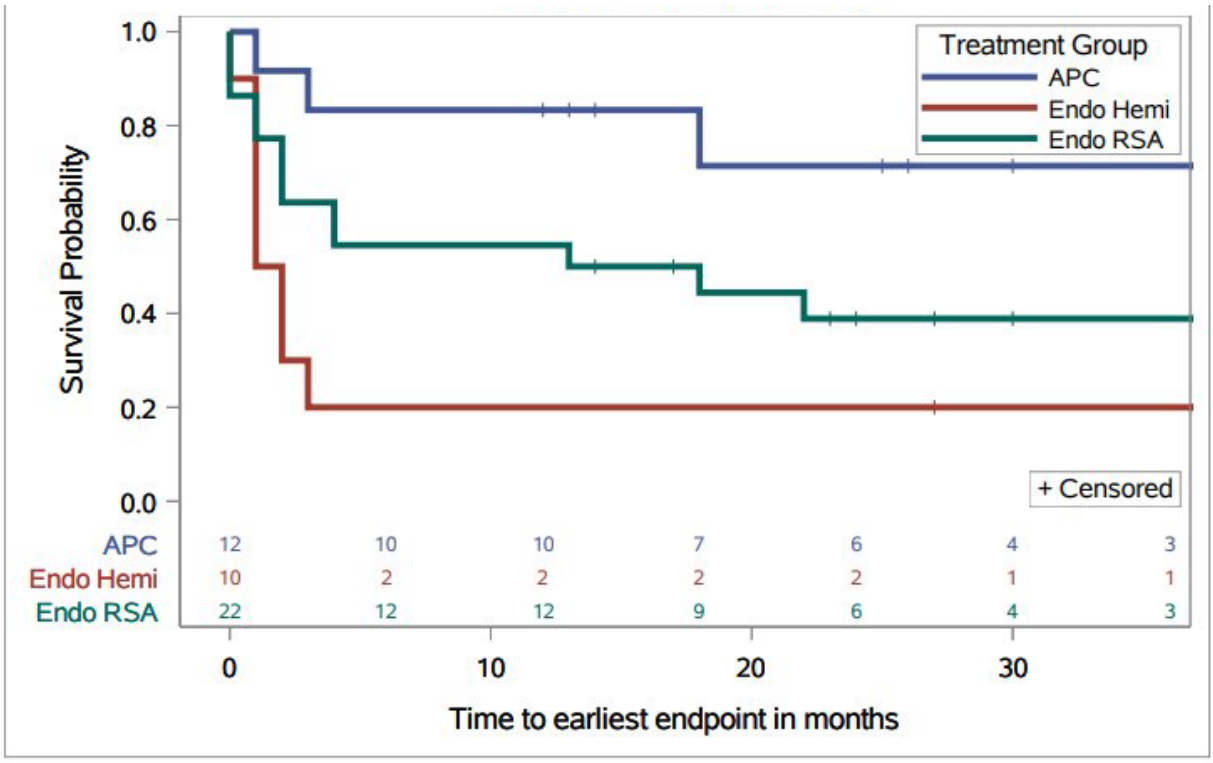

Figure 1: Kaplan-Meier survival curve, with complication of any type as the end point.