

Multiplanar Analysis of Proximal Humerus Anatomy of Patients with Rotator Cuff Arthropathy and Relevance to Reverse Shoulder Press-Fit Stems

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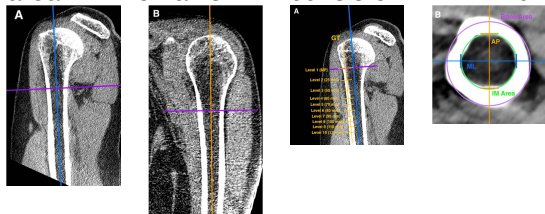
INTRODUCTION: Short stems have become increasingly popular in reverse shoulder arthroplasty (RSA) due to their ability to preserve bone stock for revision surgery. However, short stems may be more at risk for malalignment or loosening, and commercially available stems have varied designs. The purpose of this study was to perform a multiplanar analysis of the proximal humerus anatomy in patients with a diagnosis of rotator cuff arthropathy to better define canal geometry and identify differences based on sex.

METHODS:

A retrospective review was performed of a consecutive series of patients undergoing RSA for rotator cuff arthropathy (RCA). A total of 117 patients were identified with preoperative CT scans. Proximal humerus measures were undertaken following multiplanar reconstruction of the CT scans. Measured parameters included the following: transition point (TP), anteroposterior (AP) and mediolateral (ML) distances, intramedullary (IM) and bone diameter, and cortical thickness. The TP was defined as the distance from the periosteal border of the greater tuberosity to the level of the IM canal where the endosteal borders became parallel. Measurements were started at the metaphysis, then proceeded 25 mm and 50 mm distal to the metaphysis followed by 10 mm increments thereafter. Each level was compared to the level above with t-tests in the overall cohort and separately by sex. Height was correlated to ML-AP difference and IM diameter with Pearson's correlation coefficient. Potential stem sizes that extended 50, 60, 70, and 80 millimeters (mm) from the metaphysis were analyzed to record the percentage of patients in whom the stem would reach past the TP.

RESULTS: The mean transition point for all patients was 55.6 ± 7.4 mm (37.5 – 78.4) from the greater tuberosity (GT), 53.3 ± 6.6 mm (37.5 – 67.0) in females and 58.1 ± 7.5 mm (41.9 – 78.4) in males. ML and AP distances, and IM diameter became consistent at level 3 (mean 83 mm distal to the GT) in the overall cohort and in both sexes. Height positively correlated with IM diameter. Males had significantly larger IM diameters compared to females at all levels. Cortical thickness remained relatively consistent throughout the proximal humerus. A stem length of 70 mm would extend past the TP in 98% of patients.

DISCUSSION AND CONCLUSION: Humeral implants in reverse shoulder arthroplasty with a stem of at least 70 mm in length would extend distally past the transition point in the majority of cases regardless of sex. At this point, the canal's area remains consistent which would facilitate diaphyseal fixation if required.



Level	TP (mm)	AP (mm)	ML (mm)	IM Dia (mm)	Cortical Thk (mm)
Metaphysis	55.6	45.2	38.1	18.5	1.2
25 mm	58.1	46.8	39.5	19.2	1.2
50 mm	60.5	48.1	40.8	19.8	1.2
75 mm	62.8	49.5	42.1	20.5	1.2
100 mm	65.1	50.8	43.5	21.2	1.2
125 mm	67.5	52.1	44.8	21.8	1.2
150 mm	69.8	53.5	46.1	22.5	1.2
175 mm	72.1	54.8	47.5	23.2	1.2
200 mm	74.5	56.1	48.8	23.8	1.2
225 mm	76.8	57.5	50.1	24.5	1.2
250 mm	79.1	58.8	51.5	25.2	1.2