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Title: Lower Cortical Core Thickness and Bone Mineral Density Does Not Lead to Inferior Outcomes After Reverse Shoulder Arthroplasty

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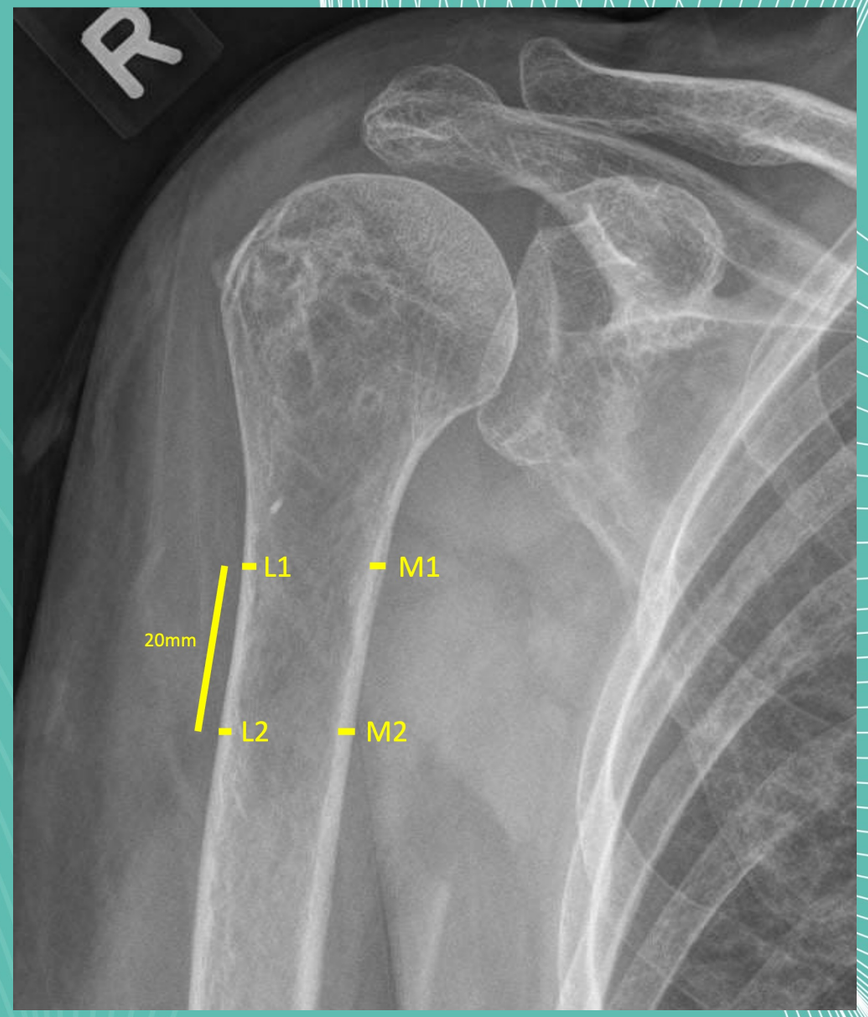
Introduction

- Cortical thickness of the proximal diaphysis in the humerus had been described by Tingart et al to be a reliable measure bone mineral density and quality.

- We seek to examine the influence of pre-operative diaphysis cortical thickness on the post-operative outcomes following reverse shoulder arthroplasty (RSA).

Materials and Methods (1)

- A retrospective study was performed on 65 patients who underwent a reverse shoulder arthroplasty between 2011 and 2019 were included in our study.
- 2 independent reviewers measured the combined cortical thickness (CCT) on shoulder radiographs taken preoperatively.
- These patients were followed up and evaluated post-operatively at 3, 6, 12 and 24 months.



AP radiograph of the shoulder with measurements labelled. The reference point for the proximal measurement was where the lateral and medial cortices of the humerus appeared parallel(L1, M1). The other measurements were taken 20 mm distally (L2, M2). CCT was the mean of the two levels.

Materials and Methods (2)

- Functional outcomes were assessed with the Constant shoulder score (CSS), University of California at Los Angeles Shoulder rating scale (UCLASS), Oxford shoulder score (OSS), Visual Analogue Scale (VAS), Satisfaction score (SAT) and range of motion of forward flexion (ROM-FF) and abduction (ROM-ABD).

- Statistical analysis was performed by dividing the patients into 2 groups based on their CCT: a higher CCT group (>3.8mm) and a lower CCT group (<3.8 mm).

Results (1)

- There were 58 patients in the lower CCT group and 7 patients in the higher CCT group.

- The mean CCT in our patient cohort was 2.85 + 0.68mm.

Results (2)

- There was no statistically significant difference in outcomes between the groups at 2 years follow-up for the CSS (P = 0.929), OSS (P = 0.429), UCLASS (P = 0.802), ROM-FF (P = 0.841), ROM-ABD (P = 0.633), VAS (P = 0.477), and SAT (P = 0.801).

- Differences at shorter time intervals were not significant either.

Outcome Measurement	CCT <3.8	CCT >= 3.8	Comparison (P Value)
Postoperative Constant shoulder score			
3 months	38 (16)	41 (13)	0.619
6 months	53 (17)	48 (14)	0.320
12 months	59 (17)	56 (10)	0.416
24 months	62 (15)	62 (14)	0.929
Postoperative Oxford shoulder score			
3 months	29 (13)	33 (7)	0.343
6 months	22 (12)	23 (9)	0.634
12 months	19 (10)	17 (4)	0.782
24 months	18 (9)	16 (8)	0.429
Postoperative UCLA shoulder rating scale			
3 months	21 (6)	22 (2)	0.898
6 months	24 (7)	26 (7)	0.736
12 months	27 (6)	30 (3)	0.369
24 months	28 (6)	28 (8)	0.802

Functional Outcome Scores Based on CCT

Postoperative forward flexion			
3 months	89.1 (30.4)	89.4 (32.1)	1.000
6 months	110.6 (25.5)	109.5 (40.3)	0.477
12 months	115.7 (23.4)	115.8 (20.9)	1.000
24 months	119.9 (25.3)	125.6 (21.7)	0.841
Postoperative abduction			
3 months	75.3 (26.9)	80.6 (38.2)	0.744
6 months	98 (26.7)	90.5 (23.3)	0.394
12 months	106.7 (21.3)	107.4 (18.4)	0.911
24 months	109.3 (27)	117 (22.8)	0.633
Postoperative VAS score			
3 months	2.9 (3)	2.8 (2.6)	0.979
6 months	2.3 (3.1)	2.2 (2.5)	0.898
12 months	2.1 (2.8)	1.3 (2.2)	0.634
24 months	1.4 (2.4)	2 (3.1)	0.477
Postoperative SAT score			
3 months	2.8 (1.1)	3.4 (0.5)	0.162
6 months	2.6 (1.1)	3 (0.6)	0.213
12 months	2.5 (1.2)	3.2 (0.8)	0.081
24 months	2.5 (1.2)	2.6 (1.1)	0.801

Discussion (1)

- In our study, we found that outcome scores of patients with low and high CCTs after RSA were similar.
- RSA complications such as peri-prosthetic or scapular fractures, instability and notching have been previously described in literature; these events will subsequently negatively impact outcome score
- There were no fracture complications within our study cohort, and only one reported case of instability leading to dislocation. The low complication rate in our patients - which we had expected to be higher in the lower CCT group due to their poor bone mineral density - could have led to comparable outcomes with the high CCT group.

Discussion (2)

- It is possible that factors other than bone mineral density play a more significant role in causing some of these complications.
- Scapular notching is largely due to surgical technique and implant factors.
- For prosthesis instability, joint compressive forces through soft tissue tension, prosthesis socket depth and glenosphere size, are the main critical biomechanical predictors.

Conclusion

To the best of our knowledge, this would be the first study investigating the effect of pre-operative proximal humerus diaphysis cortical thickness, on RSA outcomes.

Our study shows lower CCT does not correlate with poorer functional outcomes post-RSA.

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