

Scapular Morphometrics Predict Safe Zones and Optimal Screw Placement in Reverse Shoulder Arthroplasty: A Cadaveric Study

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INTRODUCTION:

Reverse total shoulder arthroplasty (rTSA) is a well-established treatment for glenohumeral joint arthritis. Glenoid baseplate fixation using peripheral screws can injure the suprascapular nerve (SSN). Current purported safe zone definitions do not account for anatomical variations and may still place SSN at risk. This study assessed if scapular morphometrics predict safe zones, and investigated optimal screw placement in rTSA.

METHODS:

Twenty cadaveric shoulders were dissected. The superior safe zone (distance from supraglenoid tubercle to SSN at suprascapular notch) and posterior safe zone (distance from mid-posterior glenoid rim to SSN at spinoglenoid notch) were measured. Scapular morphometrics (height, width, spine length) were recorded. Baseplates were fixed by screw insertion at standard superior (11, 12, or 1 o'clock) and posterior (8, 9, or 10 o'clock) positions. Screw lengths were determined based on glenoid depth. Cortical breach and SSN proximity were recorded. Linear regression evaluated correlations between scapular morphometrics and safe zones.

RESULTS:

The superior safe zone (mean 29.5 ± 4.8 mm) significantly correlated with scapular morphometrics ($r=0.78-0.86$; $p<0.0001$), enabling patient-specific prediction of SSN proximity. All superior screws remained intraosseous and outside the SSN path. The posterior safe zone (mean 18.9 ± 5.6 mm) showed no correlation. Posterior screws breached the cortex in 50% of specimens, at all tested positions (8–10 o'clock). Breached scapulae were morphometrically smaller than non-breached scapulae (unpaired t -test; $p=0.027$). There was no significant difference in SSN risk between the three baseplate screw configurations.

DISCUSSION AND CONCLUSION: Scapular morphometrics reliably predict superior, but not posterior, safe zones. Smaller scapulae carry higher risk of posterior breach in rTSA (50%), suggesting caution in posterior screw selection. Common baseplate configurations display no significant difference in SSN risk, suggesting screw position should be guided by bone stock, not SSN risk. Preoperative assessment of scapular morphometry may inform patient-specific safe zones and screw selection, reducing rTSA complications.