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ORIGINAL ARTICLE

Assessing glenosphere position: superior approach versus deltopectoral for reverse shoulder arthroplasty

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Background: The anterosuperior (AS) approach for reverse total shoulder arthroplasty (RTSA) has been reported as a risk factor for baseplate malposition because of potential difficulty in glenoid exposure. The objective of this study was to compare glenoid baseplate position between the AS and deltopectoral (DP) approaches in relation to the surgeon's experience and to evaluate the effect of placement on clinical outcomes.

Methods: There were 109 shoulders that underwent RTSA for cuff tear arthropathy or osteoarthritis with cuff tearing by a single surgeon. The AS approach was used in 87 shoulders. Clinical, radiographic, and functional outcomes were assessed for all patients with a minimum of 2 years of follow-up. Initial post-operative radiographs of all 109 shoulders were assessed for baseplate positioning.

Results: The mean change in glenoid inclination was 3.0° inferior with the AS approach and 2.5° inferior with the DP approach ($P = .68$). Pain scores ($P = .14$), range of motion, and American Shoulder and Elbow Surgeons scores ($P = .16$) improved in both groups, without a difference between approach. Scapular notching was noted in 68.5% of AS shoulders and 72.4% of DP shoulders ($P = .78$). Over time, there was a trend to place the glenoid baseplate more caudal with less inferior tilt.

Discussion and conclusion: Both approaches produce similar baseplate position, clinical outcomes, and rates of scapular notching when they are used for RTSA. Attempts to inferiorize the glenoid baseplate through the AS approach may increase the risk of superior inclination.

Level of evidence: Level III; Retrospective Cohort Design; Treatment Study

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Keywords: Shoulder arthroplasty; superior approach; deltopectoral; cuff tear arthropathy; notching; reverse; malposition

Reverse total shoulder arthroplasty (RTSA) is a common open procedure performed for rotator cuff tear arthropathy, osteoarthritis with concurrent rotator cuff tearing, proximal humerus malunions, and revision arthroplasty.^{3,17} The 2 most common approaches are the anterosuperior (AS) and deltopectoral (DP).¹⁰ The DP approach uses an extensile internervous plane. In 1993, Mackenzie described the AS approach, which provides *en face* exposure of the glenoid,

Approval for this study was provided by the Mayo Clinic Institutional Review Board: 16-005559.

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preserves the subscapularis tendon insertion, and may decrease risk of dislocation.^{12,15} The AS approach requires splitting of the anterior and middle heads of the deltoid. This places the axillary nerve at risk at the distal aspect of the exposure. Trauma to the nerve and potential disruption off the deltoid origin of the acromion from retraction may lead to postoperative deltoid dysfunction and affect patient outcomes.¹⁵ Another potential disadvantage of the AS approach is glenoid baseplate malposition and subsequent scapular notching and implant loosening.¹¹

The primary objective of this study was to assess the effect of the AS approach on glenoid baseplate position in comparison to the DP approach using a single surgeon's experience. Secondary outcomes included clinical outcomes, radiographic notching, loosening, and reoperation. Last, we analyzed the learning curve associated with the AS approach.

Materials and methods

A retrospective review was performed. The senior author (S.P.S.) performed 109 primary RTSAs for cuff tear arthropathy or osteoarthritis with a rotator cuff tear. Arthroplasties performed for proximal humerus malunions, acute proximal humerus fracture, locked dislocation, humeral head avascular necrosis, and revisions were excluded. The AS approach was used in 87 shoulders and the DP approach in 22 shoulders. The senior author's preferred approach for RTSA is the AS approach. In cases with a previous DP approach contralaterally or the possibility of performing an anatomic total shoulder, a DP approach is used. For the DP approach, the subscapularis was managed with a tenotomy in 15 shoulders and an osteotomy in 3, and it was torn in 4. The subscapularis was repaired with multiple interrupted nonabsorbable figure-of-8 sutures in all cases of tenotomy. Postoperative radiographs did not demonstrate any evidence of nonunion in the case of the 3 osteotomies.

The mean age at surgery was 73.0 years (range, 50-90 years). The cohort included 46 men (42%) and 63 women (58%). The dominant extremity was involved in 69 (63%) shoulders. Mean body mass index was 29.0 kg/m² (range, 16.8-47.1) in the AS group and 31.2 kg/m² (range, 21.5-40.7) in the DP group ($P = .10$). A minimum of 2-year radiographic follow-up was available for 65 shoulders (54 AS, 11 DP) with a mean of 3.4 years (range, 2-10.3 years). A minimum of 2-year clinical follow-up was available for 78 shoulders (66 AS, 12 DP) with a mean of 3.7 years (range, 2-9.9 years). Initial postoperative radiographs of all 109 shoulders were assessed for glenoid baseplate positioning. Clinical, radiographic, and functional outcomes were assessed for patients at a minimum of 2-year follow-up (Table I).

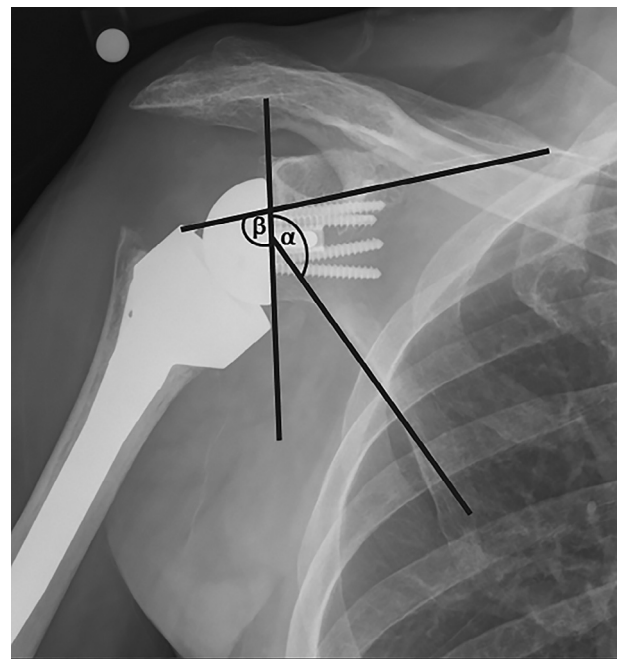


Figure 1 Definition of α and β angles used to assess change in inclination.^{4,13} For preoperative radiographs, the vertical line represented the native glenoid face.

Preoperative, initial postoperative, and final radiographs were reviewed. Glenoid baseplate inclination was assessed on the basis of the difference between the preoperative and immediate postoperative radiograph α angles as described by Bufquin et al⁴ and β angles as described by Maurer et al (Fig. 1).¹³ The latter has been reported to be more reliable and less susceptible to scapular positioning. On preoperative radiographs, the vertical axis for both measurement techniques was the native face of the glenoid; on the postoperative radiograph, the baseplate was used. Glenoid baseplate position was also assessed using the scapular neck angle (SNA), the prosthesis-SNA (PSNA), and the peg-glenoid rim distance (PGRD) based on the technique previously described by Simovitch et al.¹⁸ Scapular notching was graded 0-4 according to the classification of Sirveaux et al.¹⁹ Glenoid and humeral implant loosening was graded as previously described.²⁰

Preoperative glenoid wear demonstrated a B2 glenoid in 8.3% of the DP group and 6.8% of the AS group. Moderate or severe humeral head subluxation was noted on 67% of preoperative radiographs.

Clinical outcomes included pain scores, range of motion, and American Shoulder and Elbow Surgeons (ASES) scores.¹⁴ Pain scores

Table I Mean clinical and radiographic follow-up based on surgical approach for those with minimum follow-up of 2 years

Mean clinical follow-up			Mean radiographic follow-up		
AS (n = 66)	DP (n = 12)	P value	AS (n = 54)	DP (n = 11)	P value
3.9 y (range, 2-9.9 y)	2.8 y (range, 2-5 y)	.17	3.7 y (range, 2-10.3 y)	2.4 y (range, 2-3.6 y)	.08

AS, anterosuperior approach; DP, deltopectoral approach.
Statistical significance was considered for $P < .05$.

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