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Deltoid Reflection During Reverse Shoulder Arthroplasty – Is It A Viable Technique?
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Background

Deltoid integrity is a crucial element that predicts functional outcome of reverse shoulder arthroplasty (RSA). However, excessive retraction of the deltoid muscle during surgery may result in structural damage and functional compromise of the muscle. We utilise a proximal deltoid reflection technique during shoulder arthroplasty, which preserves deltoid integrity and enhances surgical exposure for component implantation. However, it is unclear if this technique may have a detrimental effect on the functional outcomes of patients following reverse shoulder arthroplasty.

The purpose of this comparative study is to investigate the outcomes of patients following reverse shoulder arthroplasty between those who undergo a deltoid reflection technique and a conventional deltopectoral approach.

Results

Demographics
In total, 37 patients (13 Women : 24 Men) were included in the study, with a mean post-operative follow-up of 16 months (SD 6, R : 12-31 months). In terms of occupation, 11% were manual workers, 22% were office workers and the remaining patients were in retirement. The average BMI for the entire group was 29.34 kg/m^2 (SD 5.84, R 18.26 - 44.98), with all patients in this group being non-smokers. 10% of patients in our study were diabetic, while 3% of patients reported a previous cerebrovascular event. The average Charlson Comorbidity Index was 2.70 (SD 2.16, R 0-9). The Walch classification was applied to our cohort of patients, with 33% patients demonstrating Type A2 glenoids, 39% had B1 glenoids, 22% had B2 glenoids and 6% having Type C glenoids. All patients had a proven diagnosis of cuff arthropathy demonstrated on MRI (3 Tesla Wide Bore MRI scanner) and CT imaging. At final follow-up, no patients in the study group had underwent revision surgery. No patients were lost to follow-up. (Table 1 summarises demographic data for each group.)

Outcomes
Analysis of shoulder outcome scores (Oxford Shoulder Scores) demonstrated an overall improvement from 21.2 to 34.4 (p<0.001). However, measurement of the primary outcome (OSS scores) at final follow-up, revealed no significant difference between the conventional group versus the deltoid reflection group (p=0.91). Multivariate regression analysis with OSS scores at final follow-up taken as the dependent variable, demonstrated that this outcome did not change after controlling for age, gender, BMI, co-morbidities and occupation.
Comparison of the average VAS pain scores demonstrated a significant improvement from 58.91 (pre-op) to 12.5 (post-op) (p<0.001). Analysis of VAS pain scores revealed a difference between the conventional (VAS =4) and the deltoid reflection group (VAS=19) (p<0.005). However, there was no significant difference between satisfaction rate between both groups (p=0.45), nor was there any significant different between active forward flexion (p=0.35) and active abduction (p=0.58) on review at final follow-up. All deltoid repairs examined by an independent musculoskeletal radiologist under ultrasound imaging at 12 months demonstrated intact repairs. There was no difference in reported complications between either group. The outcome scores and post-operative range of motion is summarised in Table 2.

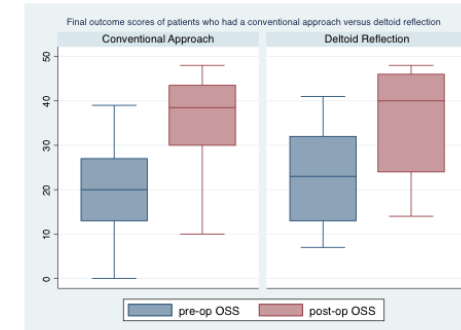| Variable	Conventional Group	Deltoid Reflection Group
Gender	9 Men : 10 Women	15 Men : 3 Women
Age	72 years (SD 7, R: 61-84)	67 years (SD5, R 56-78)
BMI	29.78 kg/m^2 (SD 4.58, R 21.91-38.95)	28.89 kg/m^2 (SD 7.03, R 18.26- 44.98)
Post-op Follow-up	16 months (SD 5, 12-29)	16 months (SD 6, 12-31)
Occupation	Manual 10% / Office 32% / Retired 58%	Manual 11% / Office 11% / Retired 78%
Charlson Comorbidity Index	2.42 (SD 1.74, R=1 -7)	3.00 (SD 2.54, R=0 -9)

Table 1 : Demographic of patients as per conventional and deltoid reflection groups.
* The values are given as the mean. The standard deviation with the range are in parentheses.

Variable		Conventional Group (n=19)		Deltoid Reflection Group (n=18)	P value
Oxford Shoulder Score	Pre-op	19.87 (SD 11, 0-39)	Pre-op	22.62 (SD 11, 7-41)	p=0.483 (NS)
	Post-op	35.67 (SD 11, 10- 48)	Post –op	36.11 (SD 10, 14-48)	p=0.913 (NS)
VAS	Pre-op	56.33 (SD 21, 15-81)	Pre-op	54.38 (SD 23, 10-80)	p=0.806 (NS)
	Post-op	4.17 (SD 10, 0-30)	Post-op	19.23 (SD 20, 0-70)	p=0.028 (S)
Range of motion		Forward Flexion 135° / Abduction 130° / External rotation 30° / Internal rotation T11		Forward flexion 116° / Abduction 116° / External rotation 27° / Internal rotation L1	

Table 2 : Outcome scores and post-operative range of motion for both groups.
* The values are given as the mean. The standard deviation with the range are in parentheses.

Methods

We investigated shoulder function in a cohort of 37 patients; of which 18 patients underwent a deltoid reflection approach (DR group) versus a cohort of 19 patients undergoing a conventional deltopectoral approach (conventional group) for reverse shoulder arthroplasties. Patients were assessed pre-operatively and post-operatively using the Oxford Shoulder Score (OSS) and ultrasound imaging to assess the integrity of the deltoid musculature post-operatively.

Graph 1 : OSS scores at final follow-up between conventional group and deltoid reflection group.

Conclusion

The goal of this study was to assess the effect of a deltoid reflection technique on reverse shoulder arthroplasty patients compared to a conventional deltopectoral approach. We observed no difference in functional outcome scores at final follow-up when controlled against the variables of age, gender, patient co-morbidities, body mass index or occupation. We believe this is a safe viable approach that may be employed during reverse shoulder arthroplasty particularly when facing challenging cases in acquiring adequate exposure.