Table 1 Comparison of outcome scores pre-operatively and at one-year follow-up

	Pre-Operative									One-Year								
	RSA + Transfer				RSA Only					RSA + Transfer				RSA Only				
	N	Med	Q1	Q3	N	Med	Q1	Q3	P-value†	N	Med	Q1	Q3	N	Med	Q1	Q3	P-value†
DASH Score (0-100)	15	62.5	45.5	79.5	12	53.1	46.0	70.4	**0.3929**	13	18.8	13.4	31.3	8	19.4	12.7	29.1	**0.9423**
ASES (0-100)	12	37.4	26.9	53.2	12	41.4	29.1	51.8	**0.5832**	12	87.6	77.4	92.9	9	80.3	78.3	88.3	**0.4312**
ADLER (0-30)	15	16.0	13.0	22.0	12	17.0	9.0	22.0	**1.0**	13	27.0	26.0	30.0	9	28.0	20.0	30.0	**0.6101**
SST (0-12)	15	3.0	1.0	4.0	12	4.0	2.5	5.0	**0.1665**	13	8.0	7.0	10.0	9	9.0	8.0	11.0	**0.4167**

†Wilcoxon rank-sum test was used for continuous non-normally distributed data to determine statistical significance between groups.
N = sample size, Med = median, Q = quartile

Introduction: Reverse shoulder arthroplasty (RSA) can restore active elevation in a cuff-deficient, pseudoparalytic shoulder. However, RSA alone does not restore active external rotation, which is impaired in patients with teres minor dysfunction. Persistent teres minor dysfunction, following RSA, has been associated with diminished functional outcomes and patient satisfaction, stemming from an inability to control spatial positioning of the arm. To address this concern, latissimus dorsi and teres major tendon transfers have been performed concurrently with RSA to restore both active elevation and external rotation. This is the first prospective, randomized investigation comparing RSA with and without concomitant tendon transfer.

Methods: Twenty-eight eligible patients with concurrent shoulder pseudoparalysis and teres minor dysfunction were randomized into the treatment (RSA with transfer) or comparison (RSA without transfer) group and followed to one year after treatment. The primary outcome measure was the Activities of Daily Living and External Rotation (ADLER) Score. Secondary outcome measures included Disabilities of the Arm, Shoulder and Hand (DASH) Score, American Shoulder and Elbow Surgeons (ASES) Score, and Simple Shoulder Questionnaire (SST).

Results: The gender distribution, body mass index (BMI), and age of the groups were similar. There was no difference in complication rates between the two groups. There was no significant difference in the ADLER, DASH, ASES, or SST between the groups preoperatively or at one-year follow-up. (Table 1)

Conclusion: Based on the ADLER, DASH, ASES, and SST results at one-year, there did not appear to be a difference in functional outcome or satisfaction between patients with concomitant shoulder pseudoparalysis and teres minor dysfunction who underwent RSA with or without LD and TM transfer.

Paper #13 IMPACT OF SCAPULAR NOTCHING ON REVERSE TOTAL SHOULDER ARTHROPLASTY OUTCOMESâ5 YEAR MINIMUM FOLLOW-UP

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Introduction: Scapular notching is a well-documented phenomenon that occurs following reverse total shoulder arthroplasty (rTSA). Its frequency has been reported to occur variably with rates between 7% and 96% within the orthopedic literature. The impact of scapula notching on clinical outcomes is controversial as previous studies have differed in their determination of a significant effect on outcomes. Mallon et al[1] performed a power analysis on previous rTSA outcome studies and determined that four of the five largest rTSA outcome studies that concluded scapular notching did not have an impact on clinical outcomes were underpowered. The purpose of this study was to conduct a sufficient statistically powered analysis to definitively quantify the impact of scapular notching on rTSA clinical outcomes.

Methods: 247 patients who underwent rTSA utilizing the Equinoxe (Exactech, Gainesville, FL) rTSA system for a diagnosis of either cuff tear arthropathy or osteoarthritis in the setting of a rotator cuff tear and had greater than 5-years follow up were evaluated. Revision cases and fracture rTSA were excluded. Outcome metrics evaluated included the Simple Shoulder Test (SST), University of California Los Angeles (UCLA), American Shoulder and Elbow Surgeons (ASES), Shoulder Pain and Disability Index (SPADI) and Constant scores. Active abduction, flexion, external and internal rotation were also measured. The study patients were stratified according to the presence or absence of scapular notching at latest follow up. A two-tailed, unpaired t-test was utilized to compare the preoperative and postoperative outcomes as well as the pre- to post- operative improvements between the notching and no notching cohorts. A value of $P < .5$ was considered significant.

Results: The 247 patients were evaluated at a minimum of 5 year and an average follow-up of 7.3 ± 1.3 years. Stratification of the patients according to the presence of inferior scapular notching at latest follow-up revealed that 39 (16%) patients had notching and 208 (84%) patients did not. Of the patients with scapular notching the average grade of notching according to the Nerot classification was 1.7 ± 0.8 (eighteen grade 1, fourteen grade 2, seven grade 3). Comparison of preoperative outcome scores and range of motion between the notching and no notching cohorts failed to demonstrate

Table 1 Post-operative outcomes stratified according to notching. Active internal rotation (IR) is reported as a scaled number. Active flexion, abduction and external rotation (ER) are reported as degrees

	SST	Constant	ASES	UCLA	SPADI	Flexion	Abduction	IR	ER
No notching	9.6 ± 2.8	66.2 ± 14.6	79.9 ± 20.1	29.4 ± 6	26.5 ± 27.7	131 ± 28	114 ± 28	4.5 ± 1.7	32 ± 20
Notching	8.1 ± 3.7	56.3 ± 17.7	68.2 ± 26.8	25.1 ± 7.8	41.1 ± 39.6	118 ± 38	96 ± 31	4.5 ± 1.9	30 ± 20
P-value	**.0047**	**.0002**	**.0018**	**.0001**	**.0074**	**.0131**	**<.0001**	.9951	.6111

Table 2 Pre- to post- operative improvement stratified according to notching

	SST	Constant	ASES	UCLA	SPADI	Flexion	Abduction	IR	ER
No notching	6.1 ± 3.3	31.2 ± 16.6	44.1 ± 20.5	15.4 ± 6.5	55.8 ± 6.5	34 ± 45	31 ± 40	1.4 ± 2.2	14 ± 25
Notching	5.2 ± 3.7	23.4 ± 15.4	34.2 ± 27.2	34.2 ± 27.2	44.6 ± 36.8	24 ± 42	40 ± 38	1.1 ± 2	14 ± 24
P-value	.2261	**.0422**	.0501	**.0238**	.0919	.3674	.1706	.4930	.930

a statistically significant difference in any of the outcome measures. However, at latest follow-up rTSA patients with scapula notching had significantly worse outcome scores according to all 5 metrics as well as forward flexion and abduction (Table 1). Evaluation of the pre- to post- operative improvement also demonstrated statistically significant differences in clinical outcomes between the notching and no notching cohorts as depicted in Table 2.

Discussion and Conclusion: This study identifies a 16% notching rate after a minimum of five years follow up. Based on our analysis, inferior scapular notching is associated with a statistically significant degradation of clinical outcomes and range of motion compared to patients with an absence of scapular notching. Based on this, it is advisable to limit the risk of inferior scapular notching through patient selection, technique variation and implant choice.

Reference

1. Mollon B, Mahure SA, Roche CP, Zuckerman JD. Impact of scapular notching on clinical outcomes after reverse total shoulder arthroplasty: an analysis of 476 shoulders. J Shoulder Elbow Surg 2017;26:1253-61. http://dx.doi.org/10.1016/j.jse.2016.11.043

Paper #14 CHARACTERISTICS OF PATIENTS WHO RATE THEIR SUBJECTIVE SATISFACTION AS UNCHANGED OR WORSE AFTER REVERSE TOTAL SHOULDER ARTHROPLASTY

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Introduction: Patient reported outcome measures are an important determinant of surgical results as objective measures of function may not correlate with patient satisfaction. The prevalence of reverse total shoulder arthroplasty (rTSA) has increased over the past several years and for many surgeons now represents a majority of arthroplasty cases. It is important to understand who is at risk for unsatisfactory outcomes after rTSA so that surgeons can appropriately counsel patients as part of a shared decision-making process. The purpose of this study was to compare characteristics of patients who reported to be unchanged or worse to those who reported to be better or much better after rTSA.

Methods: Data was derived from a prospective registry of patients who underwent primary rTSA with a minimum 2-year follow-up. The same implant was used in all cases (Equinoxe, Exactech, Inc.). This registry collects information on demographics, diagnosis, comorbidities, implant information, preoperative pain and function and postoperative pain and function. Patients are also asked to rate their subjective satisfaction from which patients were divided into 2 groups: those who rated themselves as worse or unchanged (Unimproved Group, UG) and those who rated themselves as better or much better (Improved Group, IG). Groups were compared for differences using a 2-tailed t-test with significant set at $P < .05$.

Results: There were 851 patients overall including 768 (90%) in IG and 83 (10%) in UG. There were no differences in age, gender, ethnicity or BMI between groups. Patients in IG were more likely to report no comorbidities (43% vs 25%, $P = .001$), while those in UG were more likely to report a history of coronary artery disease (22% vs 10%, $P = .03$) and diabetes (17% vs 10%, $P = .04$). Patients in IG were more likely to have a diagnosis of osteoarthritis (56% VS 41%, $P = .03$). Patients in UG were more likely to have rheumatoid arthritis (10% vs 3%, $P = .03$). There were no differences between groups for diagnoses of rotator cuff tear or cuff tear arthropathy. Patients in UG were significantly more like to have undergone prior surgery (42% vs 24%, $P = .0001$). There were no differences in any implant configuration between groups. Patients in UG were much more likely to report residual moderate to severe pain (48% vs 6%, $P < .001$) and 25% of patients in UG reported pain that was unchanged or worse after rTSA. Outcome scores were significantly worse for all measures for patients in the UG.

Discussion: This study demonstrates that up to 10% of patients rate themselves as unchanged or worse after surgery. These patients are more likely to have had prior surgery and more likely to have certain comorbidities. Patients with a diagnosis of osteoarthritis are more likely to rate themselves as better. While subjective function scores and abduction did not differ between groups preoperatively, those in UG did have significantly lower scores on all other preoperative measures. Interestingly, while outcomes were significantly worse for all measures in WG, there was improvement in all measures despite patients subjectively being worse or unchanged (Table 1).

Paper #15 PRIMARY REVERSE SHOULDER ARTHROPLASTY USING CONTEMPORARY IMPLANTS IS ASSOCIATED WITH VERY LOW REOPERATION RATES

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Introduction: The early results of reverse shoulder arthroplasty (RSA) were influenced to some extent by the use of first generation implants as well as surgeons' learning curves, resulting in relatively high reoperation rates. As experience has been gained with the procedure and new implants have been introduced, reasons for reoperation and complication rates may have changed. The purpose of this study was to quantify the burden and identify the indications for reoperation after primary RSA using contemporary implants and techniques.

Methods: A retrospective review of 1,649 primary RSAs implanted consecutively during a 7-year period (2009-2015) at a single institution was conducted. Study dates were chosen to minimize learning curve associated bias and to have a minimum follow-up of 2 years. All arthroplasties were performed by five fellowship trained shoulder

Table 1

	UG Preop	IG Preop	*P*	UG Postop	IG Postop	*P*
Abduction	66 + 31	70 + 33	NS	91 + 31	114 + 27	.0001
Forward Elevation	79 + 35	88 + 38	NS	109 + 36	141 + 24	.0001
External Rotation	11 + 20	16 + 22	.02	26 +20	35 + 17	.0001
Pain Score	6.7 + 2.2	5.8 + 2.2	.003	4.1 + 3.0	0.9 + 1.7	.0001
Function Score	3.4 + 2.1	3.7 + 2.0	NS	5.5 + 2.8	8.2 + 1.7	.0001
SST	2.7 + 2.4	3.6 + 2.7	.003	6.1 + 3.8	10.3 + 2.2	.0001
ASES	31 + 15	37 + 15	.001	54 + 27	85 + 15	.0001