Incidental Teres Minor Atrophy in Patients Undergoing Arthroscopic Rotator Cuff Repair of the Supraspinatus Occurs Frequently and is Associated with Worse Postoperative Outcomes Without Higher Failure Rates

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INTRODUCTION:
Fatty infiltration and rotator cuff atrophy has been associated with poor clinical outcomes during rotator cuff repairs. Compared to supraspinatus and infraspinatus atrophy there has been minimal research on the effect of teres minor atrophy on surgical outcomes and failure rates in rotator cuff repairs. The purpose of this study was to assess the incidence and outcomes of arthroscopic rotator cuff repairs (ARCR) for partial and full thickness supraspinatus tears in patients with incidentally identified teres minor fatty infiltration.

METHODS:
A consecutive series of 272 shoulders from 256 patients who underwent arthroscopic, double row transosseous equivalent repairs by 3 fellowship trained surgeons with minimum 1 years follow up for partial and full thickness tears of the supraspinatus tendon was reviewed. Revision repairs and concomitant subscapularis repairs were excluded. Preoperative MRI was reviewed to classify teres minor fatty infiltration using the modified Goutallier classification. Preoperative and postoperative range of motion (ROM), strength, visual analog scale (VAS), subjective shoulder value (SSV), Patient-Reported Outcomes Measurement Information System (PROMIS) mental/physical health, American Shoulder and Elbow Surgeons Shoulder Score (ASES), and Brophy shoulder activity scores were collected. Failure defined as a symptomatic retear identified on postoperative MRI or need for revision surgery was also collected. Paired t-tests, Chi-squared, and Fisher's exact tests were utilized for continuous and binary variables, respectively. Statistical significance was set at $p < 0.05$.

RESULTS:
A total of 106 patients met the inclusion criteria with 47 partial and 59 full thickness tears. The average age of 67 and average follow up of 30-months (range 10-92) were included. Incidental teres minor fat infiltration was present in 53% of cases with the following frequencies: 47%-Grade 0, 38%-Grade 1, 14%-Grade 2, 1%-Grade 3, and 0%-Grade 4. For partial tears, postoperative PROMIS mental/physical scores were significantly better in those without teres minor fatty infiltration versus in those with (16.7 vs 14.3, p=0.01; 15.5 vs 13.5, p=0.02), while ROM, strength, and PROs were not statistically significant. For full thickness tears, those without fat infiltration had significantly better PROs on PROMIS physical (16.25 vs 14.07, p=0.01), ASES (83 vs 63, p=0.02), Brophy (8.3 vs 5.2, p=0.02), and SSV (94 vs 83, p=0.046). No other differences in ROM, strength, and PROs were identified.

No differences were identified for retear and revision rates among patients regardless of fatty infiltration (Partial: retear, 7.7% vs 9.5%, p=0.59; revision, 7.7% vs 9.5%, p=0.59. Full: retear, 2.5% vs 1.7%, p=0.27; revision, 12.5% vs 5.7%, p=0.18).

DISCUSSION:
Our study demonstrates that incidentally noted teres minor fatty infiltration occurs in over 50% of patients undergoing arthroscopic rotator cuff repair for full thickness supraspinatus tears and is associated with worse postoperative outcome scores without higher failure rates. Compared to full thickness tears, teres minor atrophy in partial thickness tears showed a lesser effect on outcomes scores with only significantly worse post operative PROMIS mental and physical scores. Identification of these patients preoperatively with strategies to optimize may be necessary to improve outcomes.

SIGNIFICANCE:
Teres minor atrophy in full thickness supraspinatous tears is associated with worse outcomes scores without higher failure rates.

Table 1: Comparison of Minimum 12 Month Outcomes Between Teres Minor Atrophy by Tear Thickness
SSV = Subjective Shoulder Value (0-100); VAS = Visual Analog Score (1-10); ASES = American Shoulder and Elbow Surgeons Score (0-100)

Table 1	Teres Minor Goutallier	PROMIS		ROM		Strength	
		Mental	Physical	FF	ER	Supraspinatus	ER
Partial Tears	0	16.7	15.5	163.2	51.4	4.96	4.96
	1-4	14.3	13.5	161.4	53.3	4.85	5.00
	P values	**0.012**	**0.022**	0.28	0.79	0.10	0.81
Full Thickness	0	16.7	16.25	162.7	53.1	4.87	4.91
	1-4	14.9	14.07	160.8	52.7	4.84	4.97
	P values	0.059	**0.010**	0.29	0.44	0.41	0.81
	Teres Minor Goutallier	PRO				Retear rate	Revision Rate
		ASES	Brophy	SSV (%)	VAS		
Partial Tears	0	60.08	7.71	89.4	1.61	7.7%	7.7%
	1-4	71.16	6.13	90.0	1.21	9.6%	9.5%
	P values	0.86	0.18	0.55	0.30	0.59	0.59
Full Thickness	0	83	8.30	94.0	1.23	25.0%	12.5%
	1-4	63	5.20	83.0	1.81	17.0%	5.7%
	P values	**0.020**	**0.020**	**0.046**	0.82	0.27	0.18