Lower Trapezius Tendon Transfer versus Reverse Shoulder Arthroplasty for Massive Irreparable Rotator Cuff Tears: An *in-vivo* Scapulohumeral Rhythm Dynamic Radiography study

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INTRODUCTION: Reverse shoulder arthroplasty (RSA) and lower trapezius tendon (LTT) transfer are both accepted treatment options for massive irreparable rotator cuff tears (MIRCTs) without glenohumeral arthritis, however clinical superiority of one remains uncertain. Although the RSA is an excellent reconstructive option, it is hypothesized that preserving the joint, inferiorizing the humeral head and restoring in-line active external rotation with a LTT transfer may better normalize shoulder biomechanics. However, this has historically been difficult to assess. Digital Dynamic Radiography (DDR) provides a novel way to examine shoulder improvement following surgical intervention by measuring scapulohumeral rhythm (SHR), the ratio of glenohumeral and scapulothoracic contributions for shoulder motion. The purpose of this study was to compare SHR between LTT transfer and RSA in the setting of non-arthritic MIRCT with the use of DDR.

METHODS: DDR was performed on 71 shoulders, comprised of 42 RSA and 29 LTT shoulders, secondary to non-arthritic MIRCT – the diagnosis for which was validated by the senior surgeon. Shoulders with arthritic MIRCT, <6 months postoperative DDR, prior surgery, and patients <18 years old were excluded. Manual measurements of the angle between the humerus and the midline and the lateral border of the scapula and midline were taken by two readers at 0°, 30°, 60°, and 90° of shoulder abduction, and the ratio of these measurements formed the SHR. A paired subgroup analysis was performed on 7 RSA and 7 LTT shoulders with both pre- and postoperative DDR to evaluate for precise changes in SHR. Data was compared using descriptive statistics, and inter-rater reliability of the manual measurements was assessed with intra-class correlations.

RESULTS: Total number of measurements was 680. Mean total range-of-motion (ROM) SHR (0°-90°) for the RSA and LTT cohorts were significantly different (p<0.05) at 2.08 and 2.81, respectively. Subgroup analysis of the RSA cohort showed a non-significant improvement in mean total ROM SHR from 1.91 to 2.07 following surgical intervention. The LTT subgroup's mean total ROM SHR significantly improved from 1.97 to 2.58 (p<0.05) following surgical intervention. Compared to the mean total SHR of 1.94 for the 14 preoperative MIRCT shoulders, SHR showed significant improvements in the LTT cohort, but not the RSA cohort, 2.81 (p<0.05) and 2.08 respectively.

DISCUSSION AND CONCLUSION: While both RSA and LTT procedures produced SHRs within the range of a normal shoulder, LTT demonstrated superior restoration of SHR by establishing a higher glenohumeral contribution as compared to scapulothoracic. Future studies should focus on direct paired comparisons between pre and postoperative DDRs to limit confounding.



n in patient with aLTTT (Top) and RSA (Bottom) at 0° (A,D) ic-assisted lower trapezius tendon transfer, RSA; reverse

3.5			
3			•
2.5 BHS			
2	Ŧ	2	
1.5			
1	MIRCT	RSA	LTT





hiskers (not bar chart) for RSA (preop and postop), LTT (preop and postop) – previous "Barplot of subgroup mparing mean preoperative and postoperative SHR for RSA and LTT cohorts. The LTT cohort had a significant SHR following suprical intervention (ncd IX').