# Efficacy of Arthroscopic Assisted Lower Trapezius Tendon Transfer versus Reverse Shoulder Arthroplasty in Patients with Posterosuperior Irreparable Rotator Cuff Tear without Arthritis: Retrospective Propensity Score Matching Study

Chaemoon Lim, Jung Gon Kim, Bo Taek Kim, Chang Hee Baek

INTRODUCTION:
Posterosuperior irreparable rotator cuff tears (PSIRCTs) remain a challenging problem, especially in non-arthritic and active high-demand patients with loss of forward elevation (FE) and external rotation (ER). Although reverse shoulder arthroplasty (RAS) shows good clinical outcome and reliable restoration of range of motion (ROM), the restoration of ER has been limited and ER related to toileting activity has a considerable influence on satisfactory clinical outcome. Recently, arthroscopic assisted lower trapezius tendon transfer (aLTT) has gained attention as a potential treatment for PSIRCTs. Although RSA and aLTT could be selected for active high-demand patients with PSIRCTs, there is no clinical comparative study between RAS and aLTT in PSIRCTs. The purpose of this study was to compare the clinical outcomes and recovery of ER strength between lateralized RSA and aLTT in active high-demand patients with PSIRCTs.
METHODS:
We retrospectively performed a clinical comparative study of patients who underwent RSA or aLTT for PSIRCTs between January 2017 and December 2020. The indications for RSA or aLTT for PSIRCTs were as follows (Fig 1). Using propensity score matching based on demographic variables, 26 patients in each group were included (RSA and aLTT groups) with a minimum 2-year follow-up (Fig 1). After Propensity score matching, there was no significant difference in age, sex, dominant hand and FI grade between two groups. In the surgical procedure, the supraspinatus footprint was prepared, and the two medial row anchors were inserted into the supraspinatus footprint after arthroscopic diagnostic examination. To harvest the lower trapezius (LT) tendon, a skin incision approximately 5 cm in length was made along the scapular spine, extending from its medial border. The LT tendon was identified and carefully released from infraspinatus while ensuring the spinal accessory nerve remained undamaged. The boundary between the LT tendon and the middle trapezius (MT) tendon was identified, and the LT tendon was separated from the MT tendon. A small incision was made in the infraspinatus fascia to provide a pathway for transferring the LT tendon. Then, the Achilles tendon allograft was folded two or three times to achieve a minimum thickness of 6 mm, a width of 2 cm, and a length of 15 cm, serving as an interpositional graft. The interpositional graft was passed through the infraspinatus fascia into the subacromial space. After being placed on the supraspinatus footprint, the graft was fixed using medial-row and lateral-row anchors. To enhance the posterior aspect, the graft was connected to the remaining posterior rotator cuff with a side-to-side suturing technique. Lastly, the interpositional graft was anastomosed to the LT tendon using the Krackow suture method (Fig 2). Clinical outcomes were compared using visual analogue scale (VAS) score, Constant shoulder score, American Shoulder and Elbow Surgeons (ASES) score, University of California Los Angeles (UCLA) shoulder score, activities of daily living requiring active ER (ADLER) and active range of motion (aROM). The strength of ER and IR was evaluated using a hand-held dynamometer. The acromiohumeral distance (AHD) and Hamada classification were assessed in the true AP view with the patient standing.
RESULTS:
Postoperative clinical outcomes were significantly improved in both groups. However, the postoperative ADLER (20.6 ± 4.0 vs. 27.3 ± 3.7, $p < .001$) of aLTT group were significantly better than that of RSA group. Similarly, postoperative ROM was significantly improved in both groups, and the mean postoperative ER at 0˚ of abduction (34.2 ± 13.2 vs. 47.5 ± 11.1, $p = .001$) and ER at 90˚ of abduction (49.6 ± 15.4 vs. 66.5 ± 19.5, $p < .001$) of aLTT group were significantly better than that of RSA group. All patients with preoperative pseudoparalysis in both groups showed improvements. The final follow-up ER strength of aLTT group was significantly better than that of RSA group (16.4 ± 4.0 vs. 24.1 ± 9.1, $p < .001$) (Table I) In aLTT group, no significant decrease of AHD change (preoperatively 9.1 ± 2.2 to postoperatively 8.4 ± 2.3, $p = 0.256$) and no significant progression of cuff tear arthropathy (Hamada grade: preoperatively 1.4 ± 0.5 to postoperatively 1.5 ± 0.5, $p = 0.798$) were observed (Table 2).
DISCUSSION AND CONCLUSION:
Lateralized RSA and aLTT improved overall patient outcomes postoperatively; however, aLTT transfer was superior in clinical scores, notably the ADLER score, ER of aROM, and ER strength in patients with PSIRCTs. Our findings suggest that aLTT could be a first-line joint-preserving treatment option for PSIRCTs patients without arthritis, given the longevity and related adverse events associated with arthroplasty.

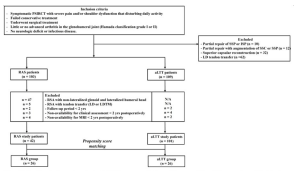


**Figure. 1.** Flowchart showing patient selection. PASECT, posterosuperior irreparable rotator cuff tear; SSP, supraspinatus; ISP, infraspinatus; LD, latissimus dorsi; RSA, reverse shoulder arthroplasty; aLTT, arthroscopic assisted lower trapezius tendon; LDTM, latissimus dorsi and teres major; MRI, magnetic resonance image.

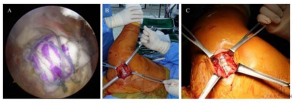


**Figure 2.** Arthroscopic image and intraoperative photograph of the interpositional bridging graft fixation. The interpositional bridging graft was attached to the supraspinatus footprint (A). Anastomosis between interpositional bridging graft and lower trapezius tendon (LTT) was carried out in the shoulder position of maximal external rotation and 60° abduction for physiologic tensioning (B). The interpositional bridging graft was anastomosed along the inferior margin of the LTT using the Krakow method (C).

**Table I.** Comparisons in clinical outcomes between the two surgical groups

| Variables | RSA Group | aLTT Group | *p* |
|---|---|---|---|
| VAS score | | | |
| Preoperative | 4.7 ± 0.9 | 4.4 ± 1.4 | 0.551 |
| Postoperative | 1.7 ± 0.6 | 1.5 ± 0.8 | 0.233 |
| *p* | < 0.001 | < 0.001 | |
| Constant score | | | |
| Preoperative | 43.0 ± 7.5 | 49.7 ± 13.3 | 0.065 |
| Postoperative | 70.0 ± 4.6 | 72.4 ± 12.1 | 0.049 |
| *p* | < 0.001 | < 0.001 | |
| ASES score | | | |
| Preoperative | 46.4 ± 6.6 | 49.8 ± 12.6 | 0.260 |
| Postoperative | 76.2 ± 6.0 | 79.1 ± 12.6 | 0.178 |
| *p* | < 0.001 | < 0.001 | |
| UCLA | | | |
| Preoperative | 14.8 ± 5.1 | 14.7 ± 5.4 | 0.912 |
| Postoperative | 24.3 ± 4.8 | 25.5 ± 4.1 | 0.496 |
| *p* | < 0.001 | < 0.001 | |
| ADLER | | | |
| Preoperative | 16.7 ± 5.8 | 17.6 ± 6.1 | 0.463 |
| Postoperative | 20.6 ± 4.0 | 27.3 ± 3.7 | < 0.001 |
| *p* | 0.001 | < 0.001 | |
| Active FE, ° | | | |
| Preoperative | 113.8 ± 34.7 | 110.0 ± 30.7 | 0.468 |
| Postoperative | 150.4 ± 21.4 | 154.2 ± 20.0 | 0.531 |
| *p* | < 0.001 | < 0.001 | |
| ABD, ° | | | |
| Preoperative | 87.3 ± 38.7 | 88.3 ± 29.8 | 0.103 |
| Postoperative | 138.8 ± 24.7 | 131.2 ± 27.3 | 0.081 |
| *p* | 0.001 | < 0.001 | |
| ER at 0° of abduction, ° | | | |
| Preoperative | 25.2 ± 12.7 | 22.7 ± 15.4 | 0.539 |
| Postoperative | 34.2 ± 13.2 | 47.5 ± 11.1 | 0.001 |
| *p* | 0.005 | < 0.001 | |
| ER at 90° of abduction, ° | | | |
| Preoperative | 39.2 ± 19.7 | 40.0 ± 19.5 | 0.638 |
| Postoperative | 49.6 ± 15.4 | 66.5 ± 19.5 | < 0.001 |
| *p* | 0.032 | 0.034 | |
| IR at back | | | |
| Preoperative | 5.6 ± 2.0 | 6.1 ± 1.7 | 0.104 |
| Postoperative | 6.3 ± 1.4 | 6.6 ± 1.4 | 0.609 |
| *p* | 0.056 | 0.256 | |
| Pseudoparesis, n (%) | | | |
| Preoperative | 4 (15.4) | 2 (7.7) | 0.530 |
| Postoperative | 0 (0.0) | 0 (0.0) | |
| *p* | 0.027 | 0.014 | |
| Strength, N | | | |
| IR at side | 23.4 ± 8.7 | 25.6 ± 8.1 | 0.384 |
| ER at side | 16.4 ± 4.0 | 24.1 ± 9.1 | <0.001 |

**Table II.** Radiologic outcome of arthroscopic lower trapezius tendon transfer group

| Outcomes | Preoperative (mean ± SD) | Postoperative (mean ± SD) | *p* |
|---|---|---|---|
| AHD (mm) | 9.1 ± 2.2 | 8.4 ± 2.3 | 0.256 |
| Hamada grade | 1.4 ± 0.5 | 1.3 ± 0.5 | 0.798 |

*Significant p-value is < 0.05; SD, standard deviation; AHD, acromiohumeral distance