

Editorial Commentary: Predictors of Best Outcomes After Latissimus Dorsi Transfer for Irreparable Rotator Cuff Tear



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Abstract: The management of patients with massive posterosuperior rotator cuff tears without glenohumeral arthritis remains a challenge to arthroscopic surgeons. A wide variety of treatment options have been described, including latissimus dorsi tendon transfer (LDTT) and lower trapezius tendon transfer. These tendon transfers have been utilized to rebalance the glenohumeral force couple for patients with massive or irreparable posterosuperior rotator cuff tears. Proponents of the latissimus dorsi tendon transfer have touted several theoretical advantages, including improvement of the shoulder fulcrum, optimization of the deltoid function, improved humeral head depression, and restoration of shoulder motion. Currently accepted contra-indications to LDTT include glenohumeral arthritis, irreparable subscapularis tear, axillary nerve palsy and/or deltoid insufficiency. However, few studies have investigated the ideal patient selection for LDTT, particularly as it relates to clinically significant outcomes. Recent literature suggests a high rate of complications and re-tear following LDTT, and studies suggest that older age, previous surgery, true pseuoparalysis, lower low pre-operative acromiohumeral interval (AHI) or AHI reversibility negatively impact results. Ultimately, candidates for tendon transfer should be carefully stratified according to their modifiable and non-modifiable risk factors, and surgeons should understand how pre-operative patient characteristics may affect the treatment options available for this unique patient population. In the setting of supraspinatus and infraspinatus deficiency, we prefer to utilize the lower trapezius tendon transfer, given its more predictable handling characteristics, ease of harvest, and greater function consistency compared to LDTT.

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Despite various treatment options, the management of massive rotator cuff tears in patients without glenohumeral osteoarthritis remains a challenge to orthopaedic surgeons. With a wide variety of different treatment options described, including partial repair, subacromial spacer, superior capsular reconstruction, and tendon transfers; there is no clear consensus on which treatment is superior in the current literature.^{1,2} Several tendon transfers, including latissimus dorsi tendon transfer (LDTT) or lower trapezius tendon transfer, have been utilized with the aim of rebalancing the glenohumeral force couple in patients with massive or irreparable posterosuperior

rotator cuff tears.³ Proponents of the latissimus dorsi tendon transfer have touted several theoretical advantages, including improvement of the shoulder fulcrum, optimization of the deltoid function, improved humeral head depression, and restoration of forward elevation and external rotation.^{4,5} Despite favorable outcomes following latissimus tendon transfer, the ideal candidate for this treatment has yet to be determined.^{4,6}

The current body of literature has attempted to examine patient factors influencing functional outcomes following LDTT with mixed success. Reported patient factors affecting patient-reported outcomes include patient age,⁴ sex,⁷ previous surgery,^{8,9} acromiohumeral distance,^{9,10} rotator cuff fatty infiltration,⁹ pseudoparalysis,¹¹ and/or critical shoulder angle (CSA).¹² However, the existing literature is comprised of conflicting studies with inconsistent outcome parameters. Given the extensive clinical heterogeneity in the currently available literature, a recent systematic review by Longo *et al.* concluded that it is not possible to

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establish clear recommendations for the use of LDTT in patients with massive rotator cuff tears.¹³

Furthermore, recent literature has highlighted the high risk of failure associated with LDTT. Kany *et al* demonstrated a 18.3% complication rate and 38% rupture rate with LDTT, which was associated with significantly worse clinical outcomes.¹⁴ Additionally, the biomechanics and efficacy of LDTT compared with alternative tendon transfers, such as lower trapezius transfer, have been hotly debated. The lower trapezius tendon transfer has been shown to have a more anatomic vector of pull, in phase activation pattern, and excursion similar to the infraspinatus, thereby providing a mechanical advantage.¹⁵ Recent biomechanical and clinical studies have demonstrated improved external rotation and greater improvement in pain and function with lower trapezius transfer compared to LDTT in patients with massive posterosuperior rotator cuff tears.^{15,16} Moreover, Elhasan *et al* demonstrated the improved function and patient reported outcomes following lower trapezius transfer in patients with subscapularis insufficiency and/or pseudoparalysis, which has not been shown for LDTT.¹⁷ Some might call the latissimus dorsi tendon transfer a dying art, particularly with the emergence and widespread adoption of the lower trapezius tendon transfer.

However, perhaps the LDTT is not “dead” after all, and only our patient selection criteria need a “lifeline.” In “Pseudoparalysis and Acromioclavicular Interval Reversibility Are the Most Important Factors Affecting the Achievement of Patient-Acceptable Symptom State After Arthroscopic-Assisted Latissimus Dorsi Tendon Transfer,” Okutan and Gul are to be applauded for utilizing patient-centered outcomes to determine predictors of patient satisfaction following LDTT.¹⁸ In this investigation, patients who underwent LDTT were followed and factors such as age, sex, previous surgery, acromioclavicular interval (AHI) reversibility, fatty infiltration grade, presence of pseudoparalysis, CSA, and shoulder abduction moment index were collected. Utilizing “patient acceptable symptom state” (PASS), the authors sought determine the PASS values for American Shoulder and Elbow Surgeons (ASES) score and the Constant-Murley (CM) score, as well as to identify potential patient factors affecting the achievement of PASS. Ultimately, the authors demonstrated statistically significant improvement in both the ASES and CM scores following LDTT with the PASS values for the ASES and CM scores were 62.4 and 52.5, respectively. Of the 42 patients included in the study, an astounding 30 patients (71.4%) achieved PASS. Older age, presence of pseudoparalysis, previous surgery, lower preoperative AHI, and lower AHI reversibility were all patient factors significantly associated with worse patient satisfaction. Following further statistical analysis, pseudoparalysis and AHI reversibility were

found to be independent prognostic factors affecting the achievement of PASS after arthroscopic-assisted LDTT. At minimum 1-year follow-up, 10 patients (23%) were found to have a secondary LDTT rupture, and 6 patients were symptomatic and dissatisfied, 4 of which required revision to reverse total shoulder arthroplasty. The authors concluded that LDTT resulted in satisfactory results in patient with massive rotator cuff tears, however pre-operative pseudoparalysis and lack of AHI reversibility are important prognostic factors that reduced the odds of achieving PASS.

While the superior treatment option for patients with massive posterosuperior rotator cuff tears remains unclear, Okutan and Gul’s study has provided further insight into the appropriate patient selection criteria specifically for latissimus dorsi tendon transfer. Prior to existing data, the current consensus in the literature posited that contra-indications to LDTT included an irreparable subscapularis tear, axillary nerve palsy, and/or deltoid insufficiency.¹⁹ However, the results of Okutan and Gul highlight two further potential contra-indications, true pseudoparalysis and AHI reversibility less than 4 mm, based on their negative effects on patient satisfaction after LDTT. To this end, Okutan and Gul’s paper provides new insight into appropriate patient selection criteria for LDTT and helps orthopaedic surgeons counsel their patients on the appropriate surgical intervention based on each patient’s unique symptomatology.

Despite the small sample size and retrospective nature of this study, Okutan and Gul provide a step in the right direction for assessing clinically meaningful patient-specific factors following LDTT. While further studies with larger cohorts and longer follow up are necessary to support the findings as definitive conclusions, these results provide an excellent starting point for further clarifying the indications and success rates for LDTT, both in the native shoulder and with concomitant reverse shoulder arthroplasty (RSA).^{20,21} In the setting of supraspinatus and infraspinatus deficiency, we prefer to utilize the lower trapezius tendon transfer, given its more predictable handling characteristics, ease of harvest, and greater function consistency. Future research evaluating the comparative outcomes of LDTT and lower trapezius transfer are warranted. Lastly, we should continue to scrutinize the role of patient-specific factors on patients with massive posterior superior rotator cuff tears, both with and without glenohumeral osteoarthritis, in order to better individualize care and equip our colleagues with the tools to appropriately counsel and treat their patients.

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