Original Article
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Broken Transverse Force Coupling as a Predictor of Poor Prognosis after Lower Trapezius Tendon Transfer

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Background: Lower trapezius transfer (LTT) has emerged as a promising surgical option for irreparable posterosuperior massive rotator cuff tears (PSMRCTs), particularly for restoring external rotation and improving shoulder function. The transverse force couple, formed by the balanced action of the subscapularis anteriorly and the infraspinatus and teres minor posteriorly, is essential for maintaining shoulder stability and kinematics. However, outcomes remain variable, and predictors of suboptimal recovery are not fully understood. The objective of this study was to evaluate clinical and radiologic outcomes following LTT in patients with irreparable PSMRCTs and to identify prognostic factors associated with achieving clinically meaningful improvement.

Methods: This retrospective study included 44 patients who underwent LTT between June 2022 and February 2024. Functional outcomes were assessed at 12 months using visual analog scale, American Shoulder and Elbow Surgeons, Subjective Shoulder Value, University of California at Los Angeles scores, and active range of motion (ROM). Postoperative magnetic resonance imaging was performed at 6 months following surgery to evaluate repair integrity. The primary outcome was Patient Acceptable Symptom State (PASS). Patients were categorized into PASS-Y (yes) or PASS-N (no) groups. Multivariate logistic regression identified independent predictors of PASS failure.

Results: Of 44 patients, 32 (72.7%) achieved PASS. The PASS-Y group demonstrated significantly superior improvements in pain, functional scores, and ROM compared with the PASS-N group. Tear of the transferred tendon was observed in 13.6% (6 / 44) and was significantly more common in the PASS-N group than in the PASS-Y group (33.3% [4 / 12] and 6.3% [2 / 32], respectively; p = 0.039). Subscapularis retear was identified in 18.2% overall and was significantly associated with PASS failure (41.7% vs. 9.4%, p = 0.025). Logistic regression identified tear of the transferred tendon (odds ratio [OR], 2.863; p = 0.017), subscapularis fatty infiltration (OR, 2.751; p = 0.009), and smoking status (OR, 2.501; p = 0.046) as independent risk factors for not achieving PASS.

Conclusions: The most significant finding of this study is that disruption of transverse force coupling—whether due to tear of the transferred graft or failure of the repaired subscapularis tendon—negatively impacts clinical outcomes of LTT. Therefore, careful consideration is warranted in cases with a high risk of subscapularis tendon retear.

Keywords: *Lower trapezius transfer, Rotator cuff tear, Subscapularis, Transverse force couple*

Massive rotator cuff tears (MRCTs), especially those involving the posterosuperior tendons, present significant clinical challenges due to tendon retraction, poor tissue quality, and advanced muscle degeneration.[1-3] In particular, involvement of the external rotators in MRCTs can severely impair essential daily activities such as combing hair or using utensils and can significantly impact patients

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with high functional demands.[4] A range of surgical strategies has been proposed for the management of MRCTs, including partial repair, superior capsular reconstruction (SCR), and tendon transfers.[5] However, due to their inherent limitations, partial repair and SCR alone are often insufficient to fully restore external rotation.[6] Partial repair, despite providing initial pain relief, shows declining functional outcomes at long-term follow-up due to progressive fatty degeneration and continued atrophy of the remaining rotator cuff musculature, often resulting in incomplete functional recovery.[7] Similarly, SCR functions primarily as a static stabilizer that serves as a spacer to prevent humeral head migration but does not actively restore infraspinatus function or external rotation strength.[8]

Among the various surgical options, lower trapezius transfer (LTT) has recently emerged as a clinically and biomechanically favorable technique for irreparable posterosuperior massive rotator cuff tears (PSMRCTs), defined as full-thickness tears involving both the supraspinatus and infraspinatus with a tear size ≥ 3 cm.[9,10] The lower trapezius has a line of pull that closely mimics those of the infraspinatus and teres minor, making it particularly effective in restoring external rotation and dynamic shoulder stability (Fig. 1).[11,12] In combination with an intercalary graft, LTT has shown promising outcomes in terms of pain relief, range of motion (ROM), and patient satisfaction.[13]

Given its increasing clinical adoption, much of the current literature on LTT predominantly reports favorable outcomes.[14,15] The absolute indication for LTT is generally described as an isolated infraspinatus tear with

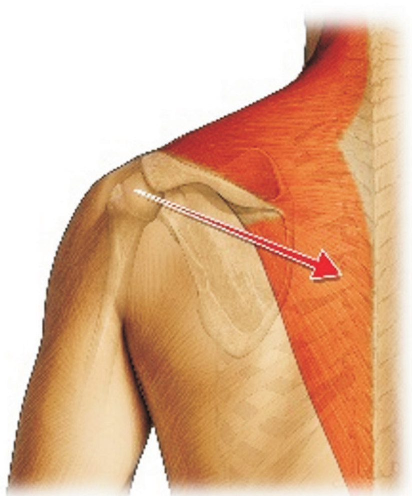

Fig. 1. Schematic diagram showing the line of pull of the lower trapezius (arrow).

advanced fatty infiltration (Goutallier grade ≥ 3), minimal glenohumeral arthritis, and intact remaining rotator cuff muscles.[16] However, isolated infraspinatus deficiencies are relatively uncommon in clinical practice, as tears often involve additional tendons, complicating the clinical scenario.[17] In this context, some patients show limited functional recovery despite technically successful procedures.[18] The factors contributing to these heterogeneous outcomes remain poorly understood.

Therefore, the purpose of this study was to evaluate the clinical and radiologic outcomes of LTT in patients with irreparable PSMRCTs and to investigate which factors are associated with achieving clinically meaningful improvement. We hypothesized that although LTT offers overall functional benefit, specific factors may be predictive of suboptimal outcomes.

METHODS

This study was approved by the Institutional Review Board of Yonsei University College of Medicine (IRB No. 4-2025-0280), and the requirement for informed consent was waived due to the retrospective nature of this study.

This retrospective study analyzed 52 patients who underwent LTT for irreparable MRCT between June 2022 and February 2024. Patients were considered eligible for LTT if: (1) they failed to respond to at least 6 months of conservative management, regardless of prior surgical history, (2) they had an irreparable infraspinatus tear with advanced fatty infiltration (Goutallier grade ≥ 3), (3) they had a reparable subscapularis tear with limited fatty degeneration (Goutallier grade ≤ 3), and (4) they had glenohumeral arthritis of Hamada grade 2 or lower.[19] Patients were excluded from the study if (1) their follow-up duration was less than 12 months, (2) they did not undergo postoperative magnetic resonance imaging (MRI) evaluation, or (3) the case involved a workers' compensation claim. After applying these inclusion and exclusion criteria, a total of 44 patients were enrolled in the study.

Surgical Procedure

All surgical procedures were performed under general anesthesia, with the patient placed in the beach-chair position. Diagnostic arthroscopy was initially performed to assess the reparability of the posterosuperior rotator cuff, specifically the supraspinatus and infraspinatus tendons. Concomitant subscapularis tears were treated based on severity: low-grade tears (Lafosse type II or less) were repaired intra-articularly, whereas high-grade tears (Lafosse type III or more) were repaired via the subacromial space.

Once the irreparability of the supra/infraspinatus was confirmed, the greater tuberosity footprint was prepared using a shaver to remove soft tissue and expose a bleeding bone surface.

To harvest the lower trapezius tendon, a 4- to 6-cm horizontal incision was made approximately 2 cm inferior to the scapular spine, extending laterally from the medial border. After soft-tissue dissection, the lower trapezius tendon was identified running obliquely to the scapular spine and detached from its insertion along the medial third of the scapula. Care was taken to avoid injury to the spinal accessory nerve, which courses anteriorly and approximately 2 cm medial to the scapula. The free tendon end was reinforced with a Krackow stitch using No. 2 nonabsorbable sutures. An Achilles tendon allograft was prepared on the back table, trimmed to match the width of the infraspinatus footprint, and reinforced with Krackow sutures at both ends. A soft-tissue tunnel was created between the infraspinatus and posterior deltoid to allow passage of the graft from the posterior incision into the subacromial space. Traction sutures were retrieved arthroscopically via the anterolateral portal to guide the graft into position.

Fixation to the humerus was achieved using a double-row suture bridge technique. The medial anchors were placed on the medial side of the infraspinatus footprint, and the lateral anchors were positioned just posterior to the bicipital groove, securing the graft to the greater tuberosity. With the shoulder positioned in approximately 30°–60° abduction and maximal external rotation, the scapular end of the graft was attached to the mobilized lower trapezius tendon using a Pulvertaft weave technique and additional interrupted sutures. Intraoperative assessments of graft tension and shoulder mobility were performed arthroscopically and through the posterior incision. Standard wound closure and postoperative dressing were applied (Fig. 2).

Postoperative Rehabilitation

For the first 6 weeks postoperatively, patients wore a sling maintaining 30° abduction and external rotation, and no exercise was allowed. Beginning 6 weeks after surgery, patients were instructed to perform self-assisted passive ROM exercises, such as forward flexion in the supine position and table sliding, after bathing or using a hot pack. Active-assisted ROM exercises were initiated 8 weeks postoperatively, and isotonic strengthening exercises using elastic bands were started at 3 months. Return to previous sports activities was permitted gradually after 6 months.

Functional and Radiological Assessments

Functional outcomes were assessed using a visual analog scale (VAS) for pain (0 indicating no pain and 10 indicating the worst), the Subjective Shoulder Value (SSV; reported as a percentage comparing the affected shoulder with the contralateral side), the American Shoulder and Elbow Surgeons (ASES) score, and the University of California at Los Angeles (UCLA) shoulder score. Active ROM was measured in forward flexion (in the scapular plane), external rotation (with elbow at the side), and internal rotation. To assess external rotation strength, the test was per-

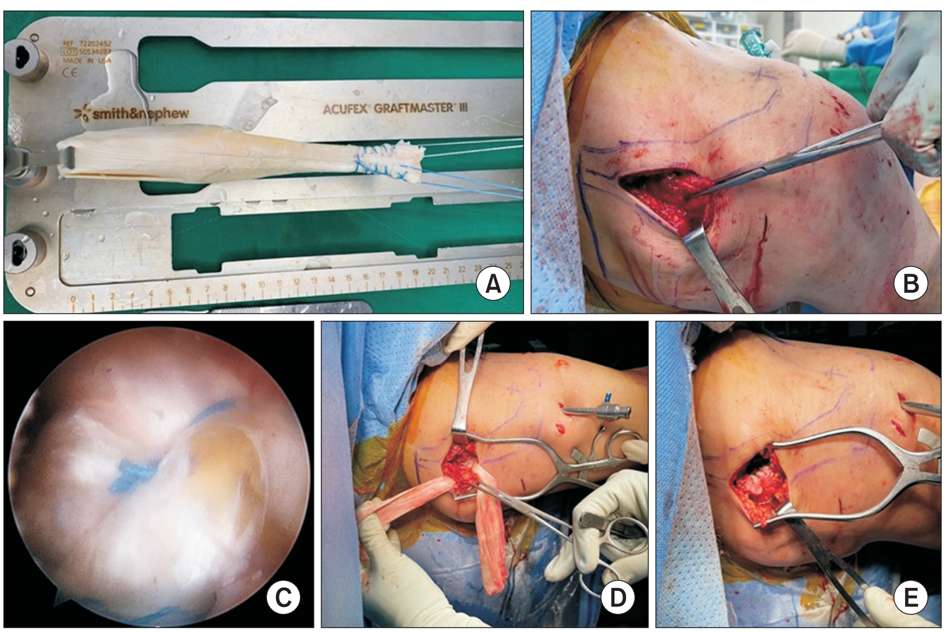

Fig. 2. Arthroscopy-assisted lower trapezius transfer surgical technique. (A) Achilles tendon allograft preparation with Krackow suture reinforcement technique. (B) Harvesting of the lower trapezius tendon. (C) Arthroscopic fixation of the Achilles tendon allograft to the greater tuberosity footprint using a doublerow suture bridge technique. (D) Pulvertaft weave technique used to attach the scapular end of the graft to the mobilized lower trapezius tendon. (E) Final construct after completion of the lower trapezius transfer, showing the tensioned graft secured to the lower trapezius tendon.

formed with the patient's arm positioned at their side. The patient was instructed to push externally against resistance applied by the examiner's hand, and the generated force was measured. Muscle strength was graded on a scale from 0 to 5, corresponding to no contraction, trace contraction, poor, fair, good, and normal strength, respectively. Internal rotation was evaluated according to the highest spinal level reached by the patient's thumb, converted to numerical values (T1–T12 = 1–12, L1–L5 = 13–17, sacrum = 18) for statistical analysis. All measurements and scores were obtained by an independent examiner blinded to the preoperative data and group assignments.

At 12 months postoperatively, patient-reported outcomes were collected electronically, including the Patient Acceptable Symptom State (PASS), which was assessed with a binary (yes/no) question: "Are you satisfied with the surgery given your current pain level, function, and daily life?" A "yes" response was classified as PASS-Y (satisfied) and a "no" response as PASS-N (unsatisfied).

For radiological evaluations, all patients underwent initial imaging with true anteroposterior and axial radiographs, as well as MRI to confirm eligibility for LTT. At 6 months postoperatively, magnetic resonance arthrography (3.0-T MR imaging unit, MAGNETOM Tim Trio; Siemens) was performed to evaluate graft healing and the integrity of the repaired rotator cuff.

Statistical Analysis

All statistical analyses were performed using IBM SPSS software version 27.0 (IBM Corp.). A paired *t*-test and Mann-Whitney *U*-test were used to compare continuous variables, and categorical variables were analyzed using the chi-square test or Fisher's exact test, as appropriate. To identify factors associated with PASS, stepwise logistic regression analysis was performed using PASS status as the dependent variable and demographic characteristics and radiologic findings as the independent variables. Receiver operating characteristic (ROC) curve analysis and area under the curve (AUC) measurements were used to determine the optimal threshold values of each outcome measure for predicting PASS by identifying the cutoff score that provided the highest combined sensitivity and specificity.

To evaluate whether the sample size was sufficient, a post-hoc power analysis was conducted based on the observed effect size. A total of 42 patients were determined to provide at least 80% statistical power, with a type I error rate of 5% and a type II error rate of 20%, to detect differences in the incidence of significant associated factors between the groups. A significance level of $p < 0.05$ was used with a 95% CI.

RESULTS

A total of 32 patients (72.7%) responded to the anchor question with a PASS-Y, and 12 patients (27.3%) responded with a PASS-N. The ROC curve for the ASES score was analyzed based on this PASS reference using a sensitivity- and specificity-based approach. The AUCs of the ROC curves were 0.83 for the ASES score and 0.81 for the UCLA score, with optimal cutoff values of 58.0 (sensitivity, 0.78; specificity, 0.86) and 21.0 (sensitivity, 0.74; specificity, 0.81), respectively.

Baseline demographic and clinical characteristics revealed no significant differences between the PASS-Y and PASS-N groups, except for a significantly greater degree of subscapularis muscle fatty infiltration observed in the PASS-N group ($p < 0.001$) (Table 1). Preoperative clinical scores, including VAS, SSV, ASES, and UCLA scores, and ROM, demonstrated no significant differences between the PASS-Y and PASS-N groups. However, at the 1-year postoperative evaluation, the PASS-Y group exhibited significantly superior outcomes across all parameters. The external rotation lag sign was observed in 18 patients (56.3%) in the PASS-Y group and 6 patients (50.0%) in the PASS-N group preoperatively, and external rotation power was measured at 2.0 ± 1.0 and 1.8 ± 1.1, respectively. Postoperatively, reversal of the external rotation lag sign was noted in all patients with preoperative lag in the PASS-Y group and all but 3 patients in the PASS-N group (p = 0.012). External rotation power improved to 3.8 ± 0.4 in the PASS-Y group and to 3.1 ± 1.2 in the PASS-N group, with a statistically significant difference between the groups (p = 0.005) (Table 2).

Regarding structural integrity, the overall tear rate of the LTT was 13.6% (6 / 44), with most cases presenting as inter-substance tears around the humeral attachment site (Fig. 3). Tear of the transferred tendon was significantly more frequent in the PASS-N group compared with the PASS-Y group, occurring in 33.3% (4 / 12) and 6.3% (2 / 32) of patients, respectively (p = 0.039). In addition, retear of the subscapularis tendon was more prevalent in the PASS-N group than in the PASS-Y group, with rates of 41.7% (5 / 12) and 9.4% (3 / 32), respectively (p = 0.025). In the multivariable logistic regression analysis, tear of the transferred tendon, subscapularis fatty infiltration, and smoking status were identified as independent risk factors negatively associated with achieving PASS, with odds ratios (ORs) of 2.863 (p = 0.017), 2.751 (p = 0.009), and 2.501 (p = 0.046), respectively (Table 3).

Table 1. Baseline Comparison between PASS-Y and PASS-N Groups

Variable	PASS-Y (n = 32)	PASS-N (n = 12)	*p*-value
Age (yr)	65.3 ± 6.1	63.1 ± 7.3	0.326
Sex (%)			0.901
Male	14 (43.8)	5 (41.7)	
Female	18 (56.3)	7 (58.3)	
Side (%)			0.304
Dominant	26 (81.3)	8 (66.7)	
Non-dominant	6 (18.8)	4 (33.3)	
Duration of symptoms (mo)	15.6 ± 11.1	18.8 ± 17.5	0.470
Diabetes mellitus (%)	7 (21.9)	3 (25.0)	0.826
Hypercholesterolemia (%)	5 (15.6)	4 (33.3)	0.195
Smoking (%)	6 (18.8)	4 (33.3)	0.304
Employment status (%)			0.933
Sedentary	27 (84.4)	10 (83.3)	
Manual work	5 (15.6)	2 (16.7)	
Revision (%)	10 (31.3)	6 (50)	0.250
Pseudoparalysis (%)	8 (25.0)	5 (41.7)	0.281
External rotation lag (%)	18 (56.3)	6 (50.0)	0.711
Glenohumeral arthritis (%)*			0.603
I	29 (90.6)	10 (83.3)	
II	3 (9.4)	2 (16.7)	
Tear size of subscapularis (%)†			0.378
I	16 (50.0)	3 (25.0)	
II	4 (12.5)	2 (16.7)	
III	12 (37.5)	7 (58.3)	
Grade of fatty infiltration (%)‡			
Supraspinatus			0.270
2	2 (6.3)	0	
3	12 (37.5)	2 (16.7)	
4	18 (56.3)	10 (83.3)	
Infraspinatus			0.176
3	18 (56.3)	4 (33.3)	
4	14 (43.8)	8 (66.7)	

Table 1. Continued

Variable	PASS-Y (n = 32)	PASS-N (n = 12)	*p*-value
Subscapularis			< 0.001
1	10 (31.3)	2 (16.7)	
2	20 (62.5)	3 (25.0)	
3	2 (6.3)	7 (58.3)	
Teres minor			0.874
1	5 (15.6)	3 (25.0)	
2	10 (31.3)	4 (33.3)	
3	11 (34.4)	3 (25.0)	
4	6 (18.8)	2 (16.7)	

Values are presented as mean ± standard deviation or number (%). Patients were categorized into PASS-Y (yes) or PASS-N (no) groups.
PASS: Patient Acceptable Symptom State.
*Stage of glenohumeral arthritis was classified according to the Hamada classification. †Tear size was assessed arthroscopically according to the Lafosse classification. ‡Grade of fatty infiltration was determined based on magnetic resonance imaging findings using the Goutallier classification.

Table 2. Functional Outcomes of PASS-Y and PASS-N Groups

	Variable	PASS-Y (n = 32)	PASS-N (n = 12)	*p*-value
Preoperative	VAS score	6.8 ± 1.8	7.3 ± 1.9	0.465
	SSV score	32.8 ± 15.7	30.8 ± 13.8	0.687
	ASES score	37.3 ± 16.1	29.5 ± 16.7	0.182
	UCLA score	13.8 ± 3.9	12.2 ± 3.9	0.228
	Forward flexion	118.8 ± 24.2	107.5 ± 30.2	0.263
	External rotation	28.6 ± 11.5	26.6 ± 11.9	0.621
	Internal rotation	12.9 ± 2.0	13.6 ± 1.6	0.279
	External rotation power	2.0 ± 1.0	1.8 ± 1.1	0.545
1-Year follow-up	VAS score	1.4 ± 0.8	3.3 ± 0.8	< 0.001
	SSV score	82.3 ± 9.1	65.0 ± 8.0	< 0.001
	ASES score	72.2 ± 7.3	44.5 ± 4.3	< 0.001
	UCLA score	26.2 ± 4.1	17.2 ± 6.1	< 0.001
	Forward flexion	135.6 ± 9.1	120.2 ± 10.0	0.048
	External rotation	49.5 ± 6.0	36.7 ± 10.6	< 0.001
	Internal rotation	10.6 ± 2.0	12.1 ± 1.7	0.023
	External rotation power	3.8 ± 0.4	3.1 ± 1.2	0.005

Values are presented as mean ± standard deviation. Patients were categorized into PASS-Y (yes) or PASS-N (no) groups.
PASS: Patient Acceptable Symptom State, VAS: visual analog scale, SSV: Subjective Shoulder Value, ASES: American Shoulder and Elbow Surgeons, UCLA: University of California at Los Angeles.

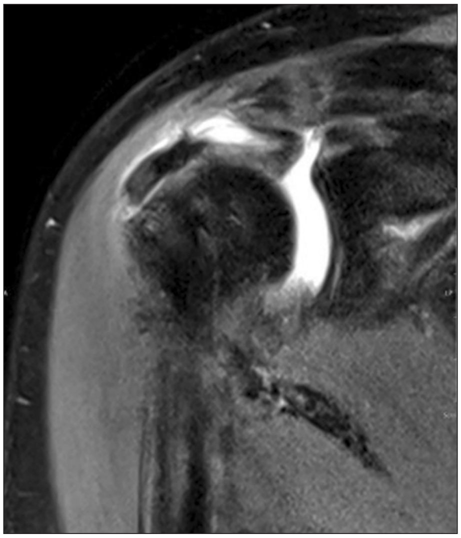

Fig. 3. Coronal T2-weighted magnetic resonance imaging showing a tear of the transferred tendon following lower trapezius tendon transfer.

DISCUSSION

The most significant finding of this study is that disruption of transverse force coupling—whether due to tear of the transferred graft or failure of the repaired subscapularis tendon—negatively impacts clinical outcomes. The overall tear rate of the transferred graft was 13.6%, and subscapularis retear occurred in 18.2% of the entire cohort. In the context of LTT, the transferred lower trapezius graft serves to restore the posterior component of this force couple by replacing the deficient infraspinatus and teres minor functions. When either the transferred graft tears or the subscapularis retears, the biomechanical equilibrium essential for glenohumeral stability is lost, which explains why patients with structural failure in either component demonstrated significantly inferior functional outcomes. Furthermore, multivariate logistic regression analysis of the entire cohort identified tear of the LTT, advanced fatty infiltration of the subscapularis, and smoking status as independent risk factors associated with poor clinical outcomes.

The overall positive outcomes observed in this study align with previous reports highlighting the biomechanical and clinical advantages of LTT.[8] Notably, Baek et al. recently reported favorable midterm outcomes of arthroscopically assisted LTT for irreparable PSMRCTs, demonstrating significant improvements in pain relief and patient-reported outcomes, with no cases of tendon retear or progression of glenohumeral arthritis.[20,21] Our findings further support the effectiveness of LTT in improving pain, function, and ROM, particularly in patients who maintain the structural integrity of the transferred construct. However, in our study, the overall tear rate of the LTT was 13.6%, with a significantly higher incidence observed in patients who failed to achieve a PASS. These findings suggest that although LTT provides substantial functional benefits, maintaining graft integrity is crucial for optimizing clinical outcomes.

One of the key findings of this study was the critical impact of subscapularis integrity on clinical outcomes following LTT. Restoration of the transverse force couple between the subscapularis and the posterior cuff is essential for balanced shoulder kinematics.[22] Early on, Burkhart emphasized the importance of restoring the transverse force couple, reporting satisfactory outcomes even in MRCTs when acceptable force coupling reconstruction was achieved despite incomplete repair.[7] This was supported by several studies that demonstrated the preservation of subscapularis integrity and compensatory teres minor function was associated with improved outcomes in the non-operative management of irreparable RCTs.[23,24] Thus, disruption of this force couple, as observed in patients with subscapularis retear, likely compromises the biomechanical advantage provided by LTT, leading to inferior functional recovery. This underscores that successful outcomes after LTT depend not only on restoring the external rotator but also on preserving the anterior stabilizers of the shoulder.

In addition to structural factors, patient-related factors such as smoking were identified as independent predictors of poor outcomes in our multivariate regression analysis. These findings warrant attention given the well-established detrimental effects of smoking on tendon-to-bone healing. Galatz et al. demonstrated that nicotine exposure significantly delays rotator cuff healing in animal models, showing decreased collagen organization and inferior biomechanical properties.[25] Similarly, Justan et al. reported that smoking negatively affected postoperative outcomes in patients with tendon grafts.[26] More relevant to our use of allograft, Chan and Yau[27] reported that smokers undergoing anterior cruciate ligament reconstruction with allograft had significantly higher graft rupture rates and poorer graft maturation on postoperative MRI compared to non-smokers (12.8% vs. 4.6%, $p = 0.0498$). The negative impact may be even more pronounced in allograft incorporation, which requires robust vascular ingrowth and cellular repopulation, both processes compromised by nicotine-induced vasoconstriction.

This study has several limitations. First, its retrospective design introduces inherent risks of selection and reporting biases, which may affect the internal validity

Table 3. Regression Analysis of PASS Achievement Associated with Retear after Lower Trapezius Transfer

Variable	Univariable analysis	*p*-value	Multivariable analysis	*p*-value
Age	0.946 (0.849–1.055)	0.320	0.954 (0.795–1.146)	0.616
Sex				
Male	Reference		Reference	
Female	1.089 (0.284–4.173)	0.901	1.023 (0.285–3.670)	0.972
Side				
Dominant	Reference		Reference	
Non-dominant	2.167 (0.487–9.641)	0.310	0.983 (0.777–1.242)	0.883
Duration of symptoms	1.018 (0.970–1.069)	0.463	1.000 (0.936–1.069)	0.992
Diabetes mellitus	1.190 (0.252–5.622)	0.826	1.086 (0.871–1.354)	0.464
Hypercholesterolemia	2.700 (0.583–12.511)	0.204	1.541 (0.586–4.054)	0.381
Smoking				
Non-smoker	Reference		Reference	
Smoker	2.167 (0.487–9.641)	0.310	2.501 (1.017–6.153)	0.046
Employment intensity				
Sedentary	Reference		Reference	
Manual work	1.080 (0.180–6.489)	0.933	1.399 (0.487–4.013)	0.533
Glenohumeral arthritis	1.933 (0.281–13.295)	0.503	1.026 (0.230–4.570)	0.444
Transferred tendon retear				
Intact	Reference		Reference	
Retear	4.127 (1.158–14.564)	0.035	2.863 (1.362–6.694)	0.017
Fatty infiltration				
Supraspinatus	2.558 (0.633–8.578)	0.062	1.380 (0.488–3.901)	0.107
Infraspinatus	3.619 (0.811–16.151)	0.092	2.573 (0.748–8.854)	0.134
Subscapularis	3.912 (1.196–12.797)	0.024	2.751 (1.283–5.901)	0.009
Teres minor	1.057 (0.552–2.023)	0.867	1.030 (0.328–3.233)	0.959

Values are presented as odds ratio (95% CI).
PASS: Patient Acceptable Symptom State.

of the findings. Second, the small sample size may limit the generalization of the results and reduce the statistical power to detect additional significant predictors. Finally, although PASS was used as the primary outcome measure, potential confounders such as rehabilitation compliance, socioeconomic status, and psychological factors were not systematically assessed and may have influenced patient-reported outcomes.

In conclusion, maintaining transverse force coupling integrity is critical for successful outcomes after LTT. Surgeons should carefully evaluate subscapularis quality preoperatively, as high-grade fatty infiltration and smoking status predict poor outcomes. In patients at high risk for subscapularis retear, alternative treatment strategies may be warranted.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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