Outcomes of Arthroscopic-assisted Middle Trapezius Tendon Transfer for Isolated Irreparable Supraspinatus Tendon Tears

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INTRODUCTION:

Isolated irreparable supraspinatus tendon tears (IISTTs) have a low prevalence but are associated with incapacitating pain and loss of function. However, there are limited treatment options for IISTTs, especially in non-arthritic young and high-demand elderly patients. Various joint-preserving treatments such as partial repair, interpositional tendon grafting, superior capsular reconstruction (SCR), biceps rerouting, and use of subacromial spacer have been proposed. Tendon transfer have been considered a reliable treatment option for irreparable rotator cuff tears in young and high-demand elderly patients without arthritic changes. Various tendon transfer options around the shoulder, such as the pectoralis major and minor, and latissimus dorsi, have been developed. In recent decade, trapezius tendon transfer has also been introduced for managing irreparable rotator cuff tears. Middle trapezius tendon (MTT) transfer has recently emerged as an alternative and feasible transfer option for patients with IISTT. MTT transfer were characterized with transferring the middle trapezius from its medial half of the scapular spine to the supraspinatus (SSP) footprint using an interpositional graft (Fig 1), which could reconstruct the SSP tendon biomechanically (mimicking the SSP tendon vector) and contribute to the biological subacromial spacer effect. Hence, MTT transfer provides the combined effects of dynamic joint-centering stability and static spacers in the glenohumeral joint. However, to our knowledge, there have been no clinical studies on MTT transfer. This study aimed to evaluate clinical and radiological short-term outcomes of arthroscopic-assisted MTT (aMTT) transfer using fascia lata autograft in patients with IISTT. We hypothesized that patients with IISTT treated with aMTT transfer using fascia lata autograft would exhibit pain relief and significant improvements in clinical and radiological outcomes.

METHODS:

This retrospective study included patients who underwent aMTT transfer using fascia lata autograft for IISTTs. The indications for aMTT for IISTT were as follows: (1) failed conservative treatment and presence of incapacitating pain that hindered daily activities; (2) SSP tendon tear with poor muscle quality (Goutallier classification grade of 4) and severe retraction (Patte classification grade of 3) on both magnetic resonance imaging (MRI) and intraoperative diagnostic arthroscopic findings); (3) intact or reparable other cuff tendons (subscapularis, infraspinatus, and teres minor tendons); and (4) little to no arthritic change (Hamada grade of 2 or less). Surgical procedure described in Fig. 2. Clinical outcomes, including pain visual analog scale (VAS), Constant, American Shoulder and Elbow Society (ASES), University of California Los Angeles (UCLA) shoulder scores and active range of motion (aROM), were assessed. Radiographic analyses included the acromiohumeral distance (AHD), Hamada grade, and transferred tendon integrity at the final follow-up.

RESULTS:

Twenty-two patients (mean age: 63.3±6.8 years; mean follow-up period: 28.9±4.9 months) met the study criteria (Table 1). The mean VAS, Constant, ASES, and UCLA scores improved postoperatively at the final follow-up ($p<.001$). The mean aROMs for forward flexion and abduction were significantly increased postoperatively. No significant changes of AHD ($p=.105$) and Hamada grade ($p=0.815$) were observed postoperatively. (Table 2.) There was no re-tear at the anastomosis site between interpositional fascia lata autograft and middle trapezius tendon, and at the mid-substance of the fascia lata autograft (Fig. 3). However, one patient had graft re-tear at the SSP footprint attachment on the greater tuberosity on MRI at the final follow-up.

DISCUSSION AND CONCLUSION:

In this minimum 2-year follow-up clinical and radiologic study of the novel aMTT transfer using fascia lata autograft, we found significant improvement in pain relief, clinical scores, and active forward flexion and abduction. There was no progression of cuff tear arthropathy at the final follow-up. Therefore, aMTT transfer characterized by a combination of dynamic joint-centering and static spacing effects could be a promising treatment option for IISTTs in relatively young and active patients. However, further multicenter and long-term trials are needed to verify its effectiveness.

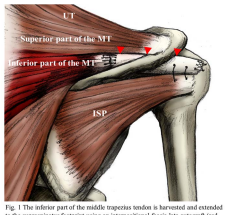

Fig. 1 The inferior part of the middle trapezius tendon is harvested and extended to the supraspinatus footprint using an interpositional fascia lata autograft (red arrowhead), which allows a line of pull that mimics that of the supraspinatus tendon, and provides the biologic spacer effect on the acromial undersurface. UT, upper trapezius; MT, middle trapezius; ISP; infraspinatus muscle.

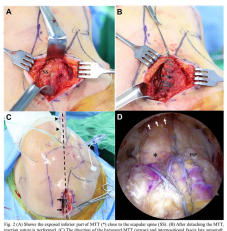

Fig. 2 (A) Shows the exposed inferior part of MTT (*) close to the scapular spine (SS). (B) After detaching the MTT, traction suture is performed. (C) The direction of the harvested MTT (arrow) and interpolyhedral fascia lata autograft (arrow head) are in line with those of the supraspinatus muscle (black dotted line). (D) Arthroscopic view from the lateral portal showing side-to-side suturing between the fascia lata autograft (*) and infraspinatus with no mechanical blockage with clear space between the graft and the acromial undersurface (arrow).

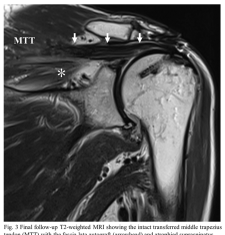

Fig. 3 Final follow-up T2-weighted MRI showing the intact transferred middle trapezius tendon (MTT) with the fascia lata autograft (arrowhead) and atrophied supraspinatus muscle (*) and demonstrating that the line of pull and the height of the MTT with the fascia lata autograft closely approximate those of the native supraspinatus.

Table 1. Demographic and clinical characteristics of study subjects

Variable	Value
Age (years), mean ± SD	63.3 ± 6.8 (51-74)
Female, n (%)	8 (36.4)
BMI (kg/m2), mean + SD	24.1 + 2.3
Arm dominance, n (%)	21 (95.5)
DM, n (%)	6 (27.3)
HTN, n (%)	7 (31.8)
Previous SSP repair, n (%)	3 (13.6)
Bateush grade, n	
- Grade 1	21 (95.5)
- Grade 2	1 (4.5)
SSC fatty infiltration grade, n (%)	
- Grade1	20 (91.0)
- Grade 2	2 (9.0)
SSP fatty infiltration grade, n (%)	
- Grade 3	0
- Grade 4	22 (100)
TM fatty infiltration grade, n (%)	
- Grade 1	22 (100)
- Grade 2	0
ISP fatty infiltration grade, n (%)	
- Grade 1	7 (31.8)
- Grade 2	15 (68.2)
SSC repair during surgery, n (%)	2 (9)
ISP repair during surgery, n (%)	4 (18)
Biceps tenotomy	3 (13)
Biceps tenodesis	5 (23)
Mean follow-up period, months (range)	28.9 ± 4.9 (24-44)

BMI, body mass index; SSC, subscapularis; SSP, supraspinatus; ISP, infraspinatus; SD, standard deviation; DM, diabetes mellitus; HTN, hypertension

Table 2. Preoperative assessment and postoperative clinical and radiological outcomes

Parameter	Preoperatively	Postoperatively	*P-value*
VAS score	4.2 ± 1.5	1.8 ± 0.4	**<.001***
Constant shoulder score	52.1 ± 11.3	70.1 ± 9.7	**<.001***
ASES score	56.3 ± 12.1	87.4 ± 8.5	**<.001***
UCLA shoulder score	17.5 ± 5.9	23.9 ± 1.6	**<.001***
Active ROM			
- Forward flexion	138 ± 38	159 ± 9.6	**0.010***
- Abduction	123 ± 36	143 ± 19.1	**0.045***
- ER at 90° abduction	74 ± 17	79 ± 16.6	0.185
- ER at 0° abduction	51 ± 15	48 ± 11	0.455
- IR at back†	7.4 ± 1.8	7.3 ± 1.6	0.357
AHD (mm)	9.2 ± 1.7	9.7 ± 1.5	0.105
Hamada grade	1.1 + 0.3	1.0 + 0.2	0.815

*Significant *p*-value is below 0.05; VAS, visual analog scale; UCLA, University of California Los Angeles; ASES, American Shoulder and Elbow Surgeon.