

# Structural and Clinical Outcomes After Superior Capsule Reconstruction Using an at least 6-mm thick Fascia Lata Autograft Including the Intermuscular Septum: A Multi-institutional Study

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## INTRODUCTION:

Superior capsule reconstruction (SCR) is a viable treatment option for irreparable rotator cuff tears. However, graft tear rate is highly variable in the previous studies and impact of graft tears on clinical outcomes after arthroscopic SCR remains controversial. We aimed to investigate the graft tear rate, timing of graft tear, and the impact of graft tears on clinical outcomes after arthroscopic SCR using an at least 6-mm thick fascia lata autograft including the intermuscular septum.

**METHODS:** This retrospective multi-institutional study included 154 patients (79 women and 75 men; mean age, 69.9 years; age range, 49–87 years) with irreparable rotator cuff tears who underwent arthroscopic SCR using an at least 6-mm thick fascia lata autograft including the intermuscular septum and completed a minimum 2-year follow-up. Postoperative graft integrity was evaluated by magnetic resonance imaging (MRI) examinations performed at 3, 6, 12, and 24 months after surgery. The presence of a full-thickness defect within the graft was diagnosed as a graft tear. In contrast, a graft without a full-thickness defect was diagnosed as a healed graft. We compared the following data between patients with and without graft tears: 1) baseline characteristics, 2) visual analog scale (VAS) pain score, 3) Japanese Orthopedic Association (JOA) score, 4) American Shoulder and Elbow Surgeons (ASES) shoulder score, and 5) active range of motion (ROM) preoperatively and at the final follow-up (mean, 35.1 months; range, 24–86 months). For the statistical analyses, the paired t-test was used to compare the preoperative and postoperative clinical outcome measures. The unpaired t-test was used to compare the clinical outcomes between patients with healed grafts and those with graft tears. Fisher's exact test was used to compare categorical variables between the two groups. Furthermore, multivariate logistic regression analysis was performed to identify the independent risk factors for graft tears.

**RESULTS:** The overall graft tear rate was 11.7% (18 of 154 patients). Of 18 graft tears, 14 (77.8%) occurred within 6 months after SCR. Two additional graft tears were diagnosed at 12 months postoperatively and another two at 24 months after SCR (Figure 1). We found no significant differences between the healed and graft tear groups in terms of age, sex, arm dominance, preoperative Hamada grade, Goutallier classification of the supraspinatus and teres minor, status and treatment of subscapularis and long head of the biceps, and graft thickness used for SCR (Table 1). However, there was a significant difference in preoperative acromiohumeral distance (AHD), Goutallier classification of the subscapularis and infraspinatus, and RCT size (anterior-posterior direction) between the healed and graft tear groups. Multivariate logistic regression analysis revealed that the Goutallier classification of the subscapularis was an independent risk factor for graft tear (odds ratio 2.29, 95% confidence interval 1.34–3.89,  $P=0.0013$ ) (Table 2). The VAS, ASES, and JOA scores improved significantly after SCR in both patients with and without graft tears (all  $P<0.0001$ ) (Table 3). However, the patients with graft tears showed significantly inferior postoperative VAS, JOA, and ASES scores than those without graft tears (all  $P<0.01$ ).

## DISCUSSION AND CONCLUSION:

The overall graft tear rate (11.7%) after arthroscopic SCR using an at least 6-mm thick fascia lata autograft including the intermuscular septum was lower relatively to previous studies. The majority of graft tears (77.8%) occurred within 6 months after SCR. Significant pain relief and improvement of shoulder functions were achieved after surgery in both patients with and without graft tears. However, graft healing was associated with more favorable clinical outcomes after SCR.

Figure 1 Graph demonstrating the cumulative number of patients with graft tears after arthroscopic SCR over time

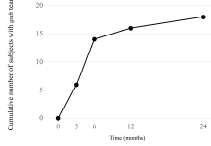


Table 1 Baseline characteristics of patients according to presence or absence of graft tear

	Healed	Graft tear	P-values
Age, years	60.9 ± 8.8	70.1 ± 7.3	0.02
Male/Female	140/2	11/7	0.32
Dominant/non dominant	30/47	14/4	0.43
Hemiparesis involvement			0.17
Grade 1	17(27.7%)	1(5.6%)	
Grade 2	54(39.7%)	9(50.0%)	
Grade 3	43(31.0%)	7(38.9%)	
Grade 4	2(1.5%)	1(5.6%)	
Acromioclavicular distance, mm	43.9 ± 2.3	33.3 ± 1.5	0.000*
Crossflex classification			
Subscapularis	0.0 ± 0.0	2.1 ± 1.3	<0.001*
Supraspinatus	3.4 ± 0.7	3.0 ± 1.8	0.22
Infraspinatus	2.1 ± 1.2	2.8 ± 1.3	0.03*
Teres minor	0.4 ± 0.8	0.7 ± 1.3	0.23
Sum of Subscapularis			0.72
Intact	92(69.9%)	11(61.1%)	
Partial tear	18(19.3%)	2(11.1%)	
Complete tear	27(19.8%)	9(57.8%)	
Treatment of Subscapularis			0.13
Preservation	107(78.7%)	13(72.2%)	
Repair	28(19.9%)	3(16.7%)	
Irreparable	3(2.3%)	2(11.1%)	
Sum of LHB			0.97
Intact	15(25.7%)	1(5.6%)	
Partial rupture	65(47.8%)	10(55.6%)	
Discontinuity	19(7.8%)	0(0.0%)	
Complete rupture	20(19.1%)	7(38.9%)	
Treatment of LHB			0.19
Preservation	96(72.1%)	11(61.1%)	
Tensioning	25(7.5%)	0(0.0%)	
Tendonous	7(2.2%)	0(0.0%)	
No LHB	24(19.1%)	7(38.9%)	
RCT size			
AP, mm	3.2 ± 0.8	3.7 ± 0.8	0.02*
ML, mm	3.8 ± 0.5	3.8 ± 0.5	0.79
Graft thickness			
Horizontal, mm	8.2 ± 1.5	8.3 ± 1.1	0.81
Oblique, mm	7.4 ± 1.5	7.3 ± 1.5	0.78

Values are presented as mean ± standard deviation. \*P < 0.05  
LHB, long head of biceps; RCT, rotator cuff tear; AP, anterior-posterior direction; ML, medial-lateral direction

Table 2 Logistic regression analysis showing variables affecting graft tears

	Univariate logistic regression analysis			Multivariate logistic regression analysis		
	Crude OR	95% CI	P-value	Adjusted OR	95% CI	P-value
Acromioclavicular distance, mm	0.05	0.02-0.10	<0.001*	0.76	0.36-1.67	0.51
Grade of rotator cuff tear	1.01	1.00-1.02	<0.001*	1.01	1.00-1.02	<0.001*
Grade of rotator cuff tear	1.01	1.00-1.02	<0.001*	1.01	1.00-1.02	<0.001*
RCT size (AP), mm	1.00	1.00-1.00	<0.001*	1.00	1.00-1.00	<0.001*

RCT, rotator cuff tear; AP, anterior-posterior; OR, odds ratio; CI, confidence interval; EP, subscapularis; ML, medial-lateral

\*P < 0.05

Table 3 Preoperative and postoperative shoulder scores

	Healed	Graft tear	P-values (Healed vs. Graft tear)
VAS pain score			
Preoperative	5.7 ± 2.4	6.1 ± 2.4	0.56
Postoperative	0.5 ± 2.0	1.9 ± 2.4	0.007*
P-value (preoperative vs. postoperative)	<0.0001*	<0.0001*	
ASES score			
Preoperative	40.4 ± 19.3	39.5 ± 18.0	0.84
Postoperative	93.1 ± 8.1	75.2 ± 19.8	<0.0001*
P-value (preoperative vs. postoperative)	<0.0001*	<0.0001*	
JOA score			
Preoperative	54.3 ± 14.1	51.4 ± 14.7	0.42
Postoperative	92.3 ± 6.8	77.4 ± 18.2	<0.0001*
P-value (preoperative vs. postoperative)	<0.0001*	<0.0001*	

Values are presented as mean ± standard deviation.

VAS, Visual Analog Scale; ASES, American Shoulder and Elbow Surgeons; JOA, Japanese

Orthopaedic Association

\*P < 0.05