Rates of Early Recovery Following Thumb Carpometacarpal Arthroplasty: Comparing Ligament Reconstruction and Tendon Interposition, Abductor Pollicis Longus Suspensionplasty, and Suture Button Suspensionplasty

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INTRODUCTION: Many surgical procedures are utilized for the treatment of thumb carpometacarpal (CMC) arthritis, including trapeziectomy with ligament reconstruction and tendon interposition (LRTI), abductor pollicis longus suspensionplasty (APLS), and suture button suspensionplasty (SBS). While long-term outcomes seem to be equivalent, it remains unclear whether a specific method produces faster recovery and more rapid return to function though earlier mobilization with SBS has been a reported advantage. The purpose of this study is to evaluate early clinical outcomes in patients undergoing thumb CMC arthroplasty stratified by treatment method.

METHODS: This study was conducted using a registry of patients undergoing thumb CMC arthroplasty using LRTI, APLS, or SBS. Patients were grouped by technique for comparison. Patient reported outcomes were measured using PROMIS Upper Extremity, Pain Interference, and Pain Intensity scores determined pre-operatively and again at 2 weeks, 1 month, 3 months, 6 months, and 1 year post-operatively. Regression analysis was used to determine factors associated with early clinical outcomes.

RESULTS:

A total of 150 out of 201 patients met inclusion criteria for this study. Univariate regression demonstrated no difference between thumb CMC arthroplasty technique and achievement of minimal clinically important difference (MCID) during follow-up or ΔPROMIS scores at 1-month and 3-months postoperatively. Stepwise multivariate regression analysis similarly demonstrated that operative technique did not contribute significantly to postoperative outcomes. Higher baseline PROMIS Upper Extremity scores and performance of concomitant thumb metacarpophalangeal joint (MCP) procedures were associated with lower odds of achieving MCID during follow-up ($p<0.001$). Additionally, higher baseline PROMIS Upper Extremity scores were associated with lower ΔPROMIS Upper Extremity scores at both 1-month and 3-months postoperatively ($p<0.001$). However, lower baseline PROMIS Pain Intensity and PROMIS Pain Interference scores were associated with greater improvements at 1-month and 3-months postoperatively ($p<0.001$).

DISCUSSION AND CONCLUSION:

Our results suggest that there is no significant difference in early postoperative outcomes between thumb CMC arthroplasty performed via the LRTI, APLS, or SBS techniques.Patients undergoing concomitant MCP procedures were less likely to reach thresholds for clinically relevant changes in functional scores after surgery, likely reflecting the consequences of treating more advanced disease. Those with worse pain at baseline showed more pronounced improvements relating to this pain after surgery, however those with superior baseline upper extremity function did not improve as much as those starting with more debilitating disease.

Table 1. Demographic and Intra-Operative Characteristics

	LRTI	APLS	SBS	P Value*	Total
Age					
(mean ± standard deviation)	63.7 ± 10.2	58.6 ± 7.6	59.7 ± 12.9	0.004	61.8 ± 10.3
BMI					
(mean ± standard deviation)	27.1 ± 5.7	27.3 ± 4.7	27.9 ± 5.8	0.835	27.3 ± 5.5
ASA Classification					
(n = grade 1, 2, 3, 4)	10, 73, 8, 0	6, 28, 3, 0	1, 20, 1, 0	0.728	17, 121, 12, 0
Race					
(n, % Caucasian)	80, 87.9%	34, 91.9%	20, 90.9%	0.928	134, 89.3%
Smoking Status					
(n, % current smoker)	4, 4.4%	1, 2.7%	4, 18.2%	0.045	9, 6.0%
Gender					
(n, % female)	60, 65.9%	28, 75.7%	15, 68.2%	0.575	103, 68.7%
Laterality					
(n, % right)	44, 48.4%	17, 45.9%	12, 54.5%	0.559	73, 48.7%
Procedure Time					
(mean ± standard deviation)	57.7 ± 12.5	80.5 ± 15.3	78.3 ± 22.3	0.815	66.3 ± 18.4
Concomitant TFR					
(n, % of total)	7, 7.7%	1, 2.7%	3, 13.6%	0.256	11, 7.3%
Concomitant MCP					
(n, % of total)	32, 35.2%	25, 67.6%	4, 18.2%	<0.001	61, 40.7%

LRTI: ligament reconstruction and tendon interposition; APLS: abductor pollicis longus suspensionplasty; SBS: suture button suspensionplasty; TFR: trigger finger release; MCP: thumb metacarpophalangeal joint procedure
*Continuous variables analyzed with one-way ANOVA or Kruskal-Wallis rank-sum test based on distribution, categorical variables assessed with either Fisher exact or Chi Square test based on sample size

Table 2: Stepwise Regression Analysis of ΔPROMIS Measures

Analysis	Timepoint	Variable	Coefficient*	P-value	95% CI Lower	95% CI Upper
ΔPROMIS Pain Intensity	1 Month	Baseline PROMIS Pain Intensity Score	-0.72	**<0.001**	-0.99	-0.58
		Age	-0.09	0.132	-0.21	0.03
	3 Months	Baseline PROMIS Pain Intensity Score	-0.88	**<0.001**	-1.09	-0.68
ΔPROMIS Pain Interference	1 Month	Baseline PROMIS Pain Interference Score	-0.57	**<0.001**	-0.73	-0.40
	3 Months	Baseline PROMIS Pain Interference Score	-0.62	**<0.001**	-0.83	-0.40
ΔPROMIS Upper Extremity	1 Month	Baseline PROMIS UE Score	-0.75	**<0.001**	-0.93	-0.57
	3 Months	Baseline PROMIS UE Score	-0.60	**<0.001**	-0.80	-0.41
PROMIS Upper Extremity MCID	12 Months**	Concomitant TFR	0.29	0.295	0.01	2.18
		Concomitant MCP Procedure	0.22	**0.007**	0.07	0.62
		Concomitant TFR and MCP Procedures	3.05	0.570	0.06	172.56
		Baseline PROMIS UE Score	0.80	**<0.001**	0.71	0.88

TFR: trigger finger release, MCP: thumb metacarpophalangeal joint
PROMIS Pain Intensity, Pain Interference, and Upper Extremity models analyzed as stepwise multivariate linear regression models. PROMIS Upper Extremity MCID model analyzed as stepwise multivariate binary logistic regression model.
*PROMIS Upper Extremity MCID coefficient presented as odds ratio.
**Refers to MCID achievement at any point up to 12 months.