Key-Pinch Strength Requirements for Pinch Activities in the Post-operative Carpometacarpal Arthroplasty Patient

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INTRODUCTION:

Restoration of functional motion and strength are essential for a carpometacarpal (CMC) arthroplasty to be successful, yet no minimum clinically important difference (MCID) or threshold for a functional key-pinch strength have been defined. An innovative hand therapy assessment tool for seven key-pinch tasks was used to assess functional recovery and determine baseline key-pinch strength requirements for activities of daily living (ADLs) for patients recovering from a CMC arthroplasty.

METHODS:

This study was conducted under IRB approval. Consecutive female patients who underwent CMC arthroplasty by the senior author were referred to hand therapy at the six-week post-operative visit to begin strengthening. The hand therapist collected three key-pinch strength readings (baseline pinch gauge with a 30 lb. capacity) and a QuickDASH score and assessed seven key-pinch tasks (Figure 1) weekly. A one-half standard deviation calculation was performed to determine the MCID for key pinch. The mean difference between key pinch for those able and those unable to complete tasks was reported, tying pinch strength to functional completion of ADLs. A functional key-pinch strength, the average of the three lowest pinch strengths needed to successfully complete a task, was reported for each task. RESULTS:

Sixty-two female thumbs were assessed post-operatively. The MCID for key-pinch strength was 0.82 lbs. Of the tasks, manipulating a zipper required the least force, 4 lbs, and only four patients were unable to complete the task (Table 1). Opening a jar required the most force, 7.3 lbs. Overall, the average mean-difference between those able to complete all seven tasks and those unable to complete them was 2.4 lbs. QuickDASH scores correlated with significantly poorer pinch function in all activities except manipulating a zipper.

DISCUSSION AND CONCLUSION:

Pinch strength is essential to completing ADLs. An MCID of 0.82 lbs identifies that even small changes in pinch strength can have significant clinical impact. An average key-pinch mean difference of 2.4 lbs indicates that small changes in pinch strength do have functional implications for patients. Achieving and maintaining a pinch strength of 7.3 lbs will allow a patient to perform all seven ADLs defined in this study.

References:

1. Smaby N, Johanson ME, Baker B, Kenney DE, Murray WM, Hentz VR. Identification of key pinch forces required to complete functional tasks. *J Rehabil Res Dev.* 2004;41(2):215-223. doi:10.1682/JRRD.2004.02.0215



Table 1: Pinch Strength to Complete Activities of Daily Living

Task	Patients Able to Complete Task			Patients Unable to Complete Task			Comparison			
	N	Key Pinch (lbs)	QuickDASH	N	Key Pinch (lbs)	QuickDASH	p-value for Pinch Strength	p-value for Quick DASH	Key Pinch Mean Difference (lbs)	Functiona Pinch Strength (lbs)
Clip Fingernail	21	8.2 ± 1.8	16.2 ± 14.9	41	6.2 ± 1.9	34.2 ±19.1	0.001	0.003	2.0	7.2
Zipper	58	7.0 ± 2.0	28.4 ± 19.0	4	3.2 ± 1.0	44.1 ±25.1	0.006	0.200	3.8	4.0
Water bottle	32	7.9 ± 1.9	23.0 ± 17.6	30	5.7±1.9	35.2 ±19.8	<0.001	0.024	2.2	7.0
ATM	53	7.6 ± 2.0	27.1 ±17.7	9	4.4 ± 1.2	46.0 ±25.7	< 0.001	0.043	3.2	6.1
Plug	51	7.4 ± 1.8	24.5 ± 17.1	11	4.4 ± 1.7	46.3 ±18.6	< 0.001	0.004	3.0	6.0
Gas Cap	43	7.4 ± 1.7	22.0 ±15.3	19	5.6 ± 2.3	41.6 ±20.2	0.002	0.002	1.8	6.9
Open Jar	52	8.0 ± 2.2	19.7±14.7	10	6.6 ± 2.0	31.4 ±20.0	0.049	0.043	1.4	7.3
Average	44	7.6	23.0	18	5.2	39.8		-	2.4	6.4