Can Video-Assisted Therapy Replace In-Person Occupational Therapy After Carpometacarpal Arthroplasty? A Noninferiority Study

Patrick C Barrett[1], Darren Theodore Hackley, Christopher Robert Deneault, Cesar J Bravo[2], Peter J. Apel[3]
[1]Department of Orthopaedic Surgery, [2]Carilion Clinic Orthopaedics, [3]Department of Orthopaedic Surgery, Carilion Clinic Institute for Orthopaedics & Neurosciences

INTRODUCTION: Carpometacarpal (CMC) arthroplasty is a common procedure in the United States. The current postoperative standard-of-care involves in-person visits with an occupational therapist, which can be burdensome to complete. Video-assisted therapy is an alternative option which allows patients to complete the entirety of their postoperative rehabilitation at home. The effectiveness of a video-assisted therapy program for hand surgery has not been studied in a prospective clinical trial. The purpose of this study is to evaluate the effectiveness of a video-assisted therapy program compared to in-person occupational therapy after CMC arthroplasty. We hypothesize that patient-reported outcome measures for upper extremity function and pain, as well as strength and range-of-motion in patients completing a video-assisted therapy program will be noninferior to the standard-of-care, in-person occupational therapy.

METHODS: Patients 18 years of age or older undergoing primary CMC arthroplasty (CPT: 25447) who have access to a smartphone, tablet, or computer with a 5.5 inch or larger screen were included in this study. Patients were randomized into one of two groups. The in-person therapy group completed all their postoperative therapy at an occupational therapy office. The video-assisted therapy group completed their postoperative therapy at home, with the use of pre-recorded videos. Both groups began therapy at four weeks postoperative and concluded at 10 weeks. The primary outcome measure is the change in Patient-Reported Outcomes Measurement Information System® (PROMIS) upper extremity and pain interferences scores at three months. Secondary outcome measures include range of motion (ROM) and grip/pinch strength changes from preoperative to three months, as well as change in PROMIS upper-extremity and pain interferences scores at one year. We developed an assessment to determine technology literacy that all patients completed preoperatively.

RESULTS:

One-hundred one patients met inclusion/exclusion criteria and 49 enrolled. Thirty-four patients completed the three-month follow-up visit. At the three-month follow-up, patients in the in-person therapy group show greater improvements in PROMIS upper extremity (10.0 vs 4.4, $p = 0.03$) but not PROMIS pain interference scores (11.8 vs 8.3, $p = 0.25$) (**Table 1**). There was no difference in ROM and grip/pinch strength. With subgroup analysis, patients in the video-assisted therapy group with technological literacy scores greater than one half standard deviation above the mean showed greater improvement in PROMIS upper extremity than the rest of the group (14.2 versus 1.8, $p = 0.004$) as well as more improvement in PROMIS pain interference (17.8 versus 5.8, $p = 0.032$) (**Table 2**). Over the course of their postoperative care, patients in the video-assisted therapy group saved on average 213 minutes and 147 miles in commutes.

DISCUSSION AND CONCLUSION: In-person therapy may provide a modest short-term improvement in function compared to video-assisted therapy after CMC arthroplasty. However, for those with high technological literacy, video-assisted therapy outperformed in-person therapy. The time and cost savings are substantial for video-assisted therapy and these savings should be weighed against the modest benefit. For patients with high technological literacy, video-assisted therapy should be utilized over in-person therapy.

Table 1. Results for in-person therapy and video-assisted therapy groups at preoperative visit (pre-op) versus three months postoperative visit (post-op). Improvement column equals post-op minus pre-op. Positive improvement values indicate a gain in function for that category. ±PROMIS pain interference calculated as preoperative minus postoperative, as higher scores indicate more pain interference. *Statistical significance between groups, improvement column ($p<0.05$). lbs., pounds; SD, standard deviation; PROMIS, Patient-Reported Outcomes Measurement Information System®.

	In-Person Therapy			*Video-Assisted Therapy*		
	Pre-op	*Post-op*	*Improvement (SD)*	*Pre-op*	*Post-op*	*Improvement (SD)*
Grip strength (lbs)	36.3	46.4	10.1 (18.7)	40.8	41.1	0.3 (17.2)
Key pinch (lbs)	3.1	3.7	0.6 (3.2)	4.9	3	-1.9 (4.0)
3-Finger pinch (lbs)	2.3	3.1	0.8 (2.8)	4	2.5	-1.5 (4.1)
Palmar abduction (°)	43.5	49.9	6.3 (13.9)	44.6	47.4	2.8 (10.8)
Radial abduction (°)	41.9	52.5	10.6 (14.5)	46.6	50.8	4.2 (13.8)
PROMIS upper extremity*	30.1	40.1	10.0 (5.5)	32	36.4	4.4 (8.3)
PROMIS pain interference±	65.4	53.6	11.8 (7.1)	64.9	56.6	8.3 (10.1)

Table 2. Results for the video-assisted therapy group stratified by high tech literacy (one half standard deviation above the mean on technological literacy assessment) versus remainder of group. *P*-values indicate differences in improvements between the two groups. Op, operative; SD, standard deviation; (PROMIS), Patient-Reported Outcomes Measurement Information System®.

	Video-Assisted Therapy						
	High tech literacy (n=4)			*Rest of group (n=15)*			
	Pre-op	*Post-op*	*Improvement (SD)*	*Pre-op*	*Post-op*	*Improvement (SD)*	*P*
PROMIS upper extremity	32.1	46.4	14.2 (4.2)	31.9	33.7	1.8 (7.0)	0.004
PROMIS pain interference	66.1	48.4	17.8 (9.1)	64.6	58.8	5.8 (9.1)	0.032