

Evaluating Patient Compliance with Woodcast and Thermoplastic Splints After Carpometacarpal Arthroplasty

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INTRODUCTION: Orthopaedic care, especially in hand and upper extremity clinics, generates considerable waste, with standard post-carpometacarpal (CMC) joint arthroplasty treatment often utilizing non-recyclable thermoplastic splints. With growing environmental concerns, this study evaluates whether removable, recyclable woodcasting orthoses can improve patient comfort and compliance while reducing waste and environmental impact. The study investigates and compares woodcasting (WC) versus thermoplast (TP) splinting in regard to patient preference and amount of waste produced in patients that underwent CMC joint arthroplasty.

METHODS: This is a prospective, non-blinded clinical study involving patients undergoing CMC arthroplasty surgeons (AH, MD) at a single institution between 2024 and 2025. Prior to surgery, all participants completed the Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH) questionnaire to establish a baseline for comparison throughout the study. Patients returned for follow-up at two weeks postoperatively to receive their assigned type of immobilizer (woodcast or thermoplast). During the six-week follow-up, they completed patient satisfaction and compliance surveys and were invited to provide additional comments regarding their splint. The satisfaction survey comprised three questions, each scored from 1 (no satisfaction at all) to 5 (extremely satisfied), for a maximum total score of 15. The compliance survey included four questions, also scored from 1 (not at all) to 5 (all the time), for a maximum total score of 20.

RESULTS SECTION: A total of 26 patients participated in the study with 13 patients in each group. The TP group demonstrated greater splint compliance than the WC group ($p = 0.046$). The WC group experienced more splint-related complications ($p = 0.050$). Splint satisfaction ($p = 0.203$) and overall patient satisfaction ($p = 0.127$) were comparable between groups. The WC group generated significantly

DISCUSSION:

We found greater compliance and fewer complications with TP splints compared to WC, though patient satisfaction and functional outcomes were similar. WC splints produced 85% less plastic waste, highlighting their potential environmental advantage. Reported bulkiness and discomfort with WC splints may reflect fabrication differences, as TP splints were made by occupational therapists and WC by technicians, underscoring the role of specialized expertise in optimizing outcomes. Despite these limitations, both splints provided equivalent functional recovery (QuickDASH, PRWE, VAS), and WC splints offer a sustainable alternative when access to occupational therapists or TP splints is limited. While splint fabrication accounts for a small portion of overall surgical waste, even modest reductions align with broader efforts to reduce healthcare's environmental impact. Future studies should standardize fabrication methods to better compare materials and refine WC use. Conclusion: TP splints demonstrated higher compliance and fewer complications, but WC splints achieved comparable functional outcomes while substantially reducing waste. WC splints may therefore be considered a practical, sustainable alternative, particularly in resource-limited settings.

SIGNIFICANCE/CLINICAL RELEVANCE: (1-2 sentences): The project highlights the need to reduce waste generated in orthopaedic outpatient rehabilitation, emphasizing sustainability as an important goal for future care. Clinically, patients demonstrated greater compliance with thermoplastic splints, suggesting that improved manufacturing of woodcast splints—or fabrication by specialized occupational therapists—will be necessary to optimize their use.

IMAGES AND TABLES: Images and tables will appear at the end of the abstract and must be sized to fit within the abstract. Three images and/or tables are allowed per abstract.



Table 2. Primary outcomes of patients who were in the woodcast group vs. thermoplast group

	Overall (n=26)	Woodcast (n=13)	Thermoplast (n=13)	p-Value
Length of Follow-Up (days)	45 ± 6	46 ± 6	44 ± 6	0.165
Splint Compliance	4.33 ± 1.03	3.88 ± 1.25	4.70 ± 0.68	0.042*
Splint Satisfaction	7.28 ± 1.78	6.88 ± 2.23	7.60 ± 1.35	0.203
Splint Complications	2.22 ± 1.22	2.75 ± 1.28	1.80 ± 1.03	0.048*
Patient Satisfaction	12.28 ± 2.35	13.00 ± 1.93	11.70 ± 2.58	0.127
Waste (g)	12.01 ± 11.29	3.14 ± 1.38	20.88 ± 9.64	<0.001*

Values represent means ± standard deviations and means (proportions).
* indicates statistical significance at an *a priori* significance level of 0.05.

Splint Compliance: Scale 1-5; Higher Scores Indicate Greater Compliance
Splint Satisfaction: Scale 1-10; Higher Scores Indicate Greater Satisfaction
Splint Complications: Scale 1-5; Higher Scores Indicate More Issues
Patient Satisfaction: Scale 1-20; Higher Scores Indicate Greater Satisfaction

Table 3. Tertiary outcomes of patients who were in the woodcast group vs. thermoplast group

	Overall (n=26)	Woodcast (n=13)	Thermoplast (n=13)	p-Value
QuickDASH				
Baseline	56.03 ± 18.07	56.12 ± 17.09	55.94 ± 19.69	0.491
Final	42.13 ± 18.26	40.91 ± 20.35	43.36 ± 16.66	0.370
Delta	13.90 ± 17.60	15.21 ± 12.32	12.59 ± 22.12	0.356
VAS				
Baseline	6 ± 2	7 ± 2	6 ± 2	0.215
Final	3 ± 2	3 ± 2	3 ± 2	0.375
Delta	3 ± 2	3 ± 2	3 ± 2	0.380
PRWE Pain				
Baseline	33.33 ± 10.06	34.13 ± 11.94	32.66 ± 8.69	0.372
Final	20.87 ± 10.46	18.44 ± 11.74	22.89 ± 9.30	0.166
Delta	13.53 ± 9.82	15.89 ± 11.12	11.73 ± 8.66	0.180
PRWE Function				
Baseline	29.08 ± 11.85	30.21 ± 13.82	28.14 ± 10.47	0.347
Final	18.44 ± 11.43	17.18 ± 13.77	19.59 ± 9.36	0.321
Delta	11.48 ± 10.85	13.03 ± 9.82	10.19 ± 11.90	0.277
PRWE Total				
Baseline	62.41 ± 21.39	64.34 ± 25.29	60.80 ± 18.55	0.355
Final	38.47 ± 21.50	35.62 ± 24.88	40.84 ± 19.04	0.292
Delta	23.94 ± 18.57	28.72 ± 19.36	19.96 ± 17.71	0.141

Values represent means ± standard deviations and means (proportions).
* indicates statistical significance at an *a priori* significance level of 0.05.

Abbreviations-
QuickDASH: Quick Disabilities of Arm, Shoulder, and Hand (11 Questions, scored 0-100. Higher scores indicate greater disability)
VAS: Visual Analogue Scale (Likert Scale from 1 (no pain) to 10 (most severe pain))
PRWE: Patient-Rated Wrist Evaluation: Consists of two categories—Pain and Function—each scored 0-50, for a total of 0-100. Higher scores indicate greater disability.