The Effect of Night Extension Orthoses Following Surgical Release of Dupuytren Contracture: A Single-Center, Randomized, Controlled Trial

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Purpose To clarify the efficacy and detrimental effects of orthoses used to maintain finger extension following surgical release of Dupuytren contracture.

Methods We conducted a single-center, randomized, controlled trial to investigate the effect of night extension orthoses on finger range of motion and hand function for 3 months following surgical release of Dupuytren contracture. We also wanted to determine how well finger extension was maintained in the total sample. We randomized 56 patients to receive a night extension orthosis plus hand therapy (n = 26) or hand therapy alone (n = 30). The primary outcome was total active extension of the operated fingers (°). Secondary outcomes were total active flexion of the operated fingers (°), active distal palmar crease (cm), grip strength (kg), and self-reported hand function using the Disabilities of the Arm, Shoulder, and Hand questionnaire (0–100 scale).

Results There were no statistically significant differences between the no-orthosis and orthosis groups for total active extension or for any of the secondary outcomes. Between the first postoperative measure and 3 months after surgery, 62% of little fingers had maintained or improved total active extension.

Conclusions The use of a night extension orthosis in combination with standard hand therapy has no greater effect on maintaining finger extension than hand therapy alone in the 3 months following surgical release of Dupuytren contracture. Our results indicate that the practice of providing every patient with a night extension orthosis following surgical release of Dupuytren contracture may not be justified except for cases in which extension loss occurs after surgery. Our results also challenge clinicians to research ways of maintaining finger extension in a greater number of patients. *(J Hand Surg 2013;38A:1285–1294. Copyright © 2013 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic II.

Key words Dupuytren contracture, hand therapy, orthoses, randomized controlled trial, splints.

Additional material is available online.

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DUPUYTREN DISEASE IS a common disease involving the palmar fascia of the hand. Collagen proliferation within the fascia leads to the development of tight cords and bands that pull the fingers into flexion and, without intervention, results in progressively disabling contractures of the fingers.[1,2] The mainstay of Dupuytren contracture treatment is surgical excision of diseased tissue to release the contracture.[3] Following surgery, failure to maintain finger extension is a well-documented problem, with reports of up to 59% of patients experiencing contracture recurrence.[4–7] The practice of positioning the fingers at night in an extension orthosis for 3 to 6 months has long been advocated to prevent extension loss.[8–11] Orthoses are thought to help in maintaining extension of the fingers during the scar maturation process by preventing scar contraction and helping to correct residual contracture of the finger joints.[8,10] At the inception of this study in 2009, evidence on the effect of orthoses on finger range of motion and function was inconclusive and conflicting.[12]

As part of our center's routine hand therapy, following surgery, we provided all patients with a night extension orthosis, which was worn for 3 months. In 2009, we conducted an unpublished clinical audit of 45 patients who had surgery for Dupuytren contracture. We found that 40% of patients lost an average of 10° of composite finger extension from the first postoperative appointment to 3 months, despite wearing an orthosis over this period. This led us to question whether night extension orthoses did indeed maintain finger extension as traditionally thought. We also had concerns that wearing an orthosis may increase finger stiffness and delay the return of finger flexion and function.

We therefore designed a study with the aim of investigating the effects of night extension orthoses in the 3 months following surgical release of Dupuytren contracture on finger range of motion and hand function. The objectives of our study were to investigate whether the use of a night extension orthosis in addition to hand therapy would result in greater finger extension by 3 months than hand therapy alone and whether orthoses would delay the return of finger flexion, hand function, and grip strength. Furthermore, we wanted to determine how well finger extension was maintained overall in the first 3 postoperative months.

MATERIALS AND METHODS

Our study was a randomized, controlled trial (RCT) that took place at the hand therapy clinic of Counties Manukau District Health Board (CMDHB). This clinic is part of the CMDHB Plastic Reconstructive and Hand Surgery Service, which is one of the 4 regional plastic surgery centers in New Zealand. Participants were recruited from the CMDHB surgical waiting list, and the study took place between September 2010 and December 2011.

Participants were randomly allocated to 1 of 2 treatment groups: night extension orthosis plus standard hand therapy or hand therapy alone. This occurred at the first postoperative hand therapy appointment by the participant selecting a tag from an envelope with group allocation concealed. Patients of all ages and surgery types were included, provided they attended their first postoperative hand therapy appointment within 14 days after surgery. Our exclusion criteria included K-wiring of the proximal interphalangeal joint during surgery or inability to comply with hand therapy. Both groups received a standard hand therapy program delivered by an occupational therapist, physiotherapist, or New Zealand registered hand therapist from our clinic. Owing to the nature of the intervention, there was no blinding of the participant or the treating therapist.

The study was approved by the our local ethics Northern X Regional committee in August 2010 (NTX/10/07/070). Informed, written consent was gained from all participants. The main ethical consideration was the risk of participants in the no-orthosis group losing finger extension. A clause was developed based on the Jerosch-Herold et al[13] protocol, whereby participants in the no-orthosis group would be provided with an orthosis if they lost extension greater than 20° in a proximal interphalangeal (PIP) joint or 30° in a metacarpophalangeal (MCP) joint compared to the first postoperative measurement.

The primary outcome was total active extension (TAE) of the operated fingers, which was a sum of active MCP, PIP, and distal interphalangeal joint extension in degrees. Secondary outcomes were total active flexion (TAF) of the operated fingers (MCP + PIP + distal interphalangeal joint flexion); composite finger flexion measured in centimeters from the distal palmar crease to the nail fold of the finger and recorded as active distal palmar crease; grip strength as measured with a Jamar dynamometer; and hand function as measured by the self-reported Disabilities of the Arm, Shoulder, and Hand questionnaire. Range of motion measurements were for operated fingers only.

We used a standard finger goniometer according to the procedure described by the American Society of Hand Therapists.[14] The goniometer was placed on the dorsum of the finger, with the finger in composite extension or flexion, respectively. To minimize inter-

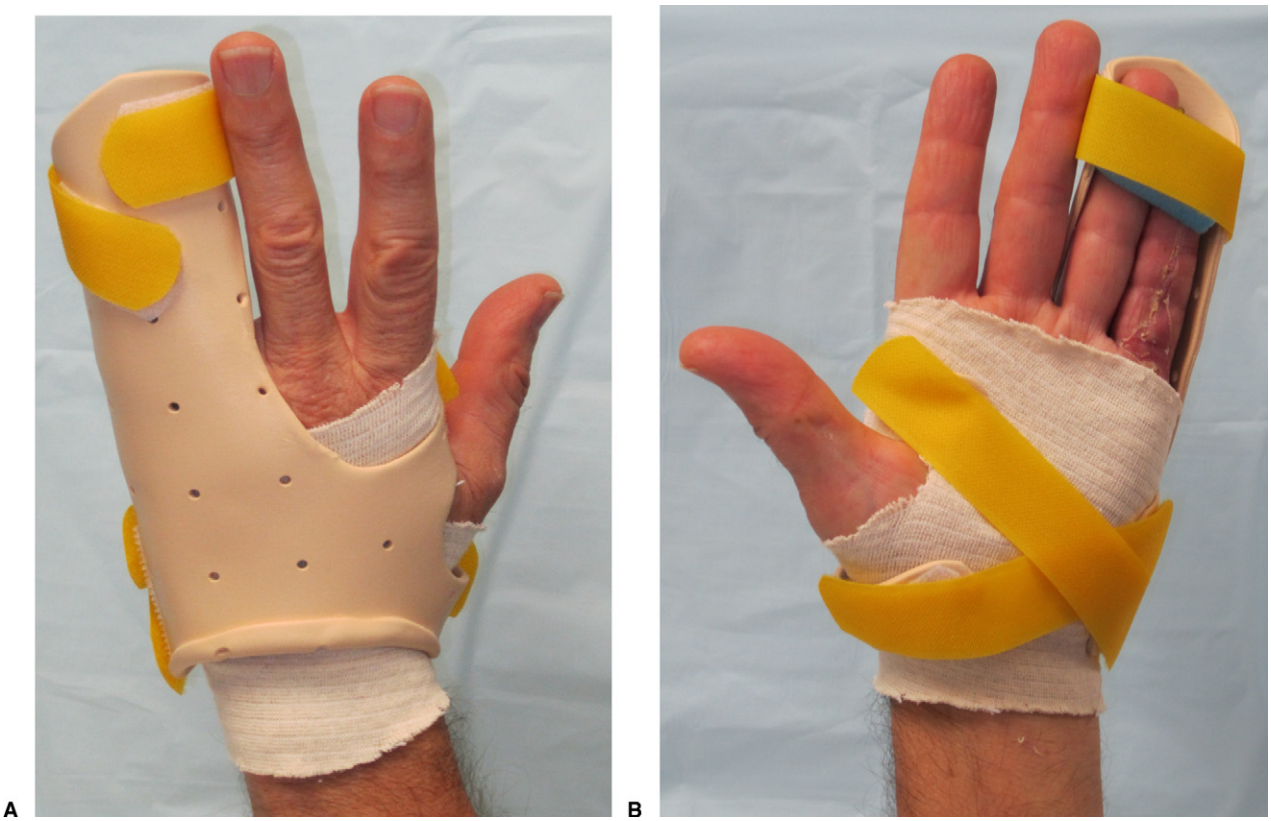

FIGURE 1: Thermoplastic finger extension orthosis—**A** dorsal and **B** volar view.

rater error, 1 therapist took nearly all of the measurements. When she was unavailable, 2 other therapists, trained by the first to measure uniformly, filled in. Measures were taken before surgery, at the first postoperative hand therapy visit, at 6 weeks, and at 3 months. Orthosis adherence was measured by a patient diary and was calculated as a percentage of the total number of nights that the orthosis was worn over 3 months.

Participants in the orthosis group received a thermoplastic orthosis that was custom-fabricated by a therapist at the first postoperative appointment. The orthosis was molded on the dorsum of the hand holding the operated fingers in maximal comfortable extension without placing undue tension on the wound (Fig. 1). The participants were instructed to apply the orthosis overnight and remove it during the daytime. After wound healing occurred, the orthosis was adjusted to apply greater extension force to the operated fingers if the therapist deemed this necessary. Both groups received standard hand therapy, which included any or all of the following treatments: active tendon gliding range of motion exercises, education, wound care, edema management, scar management, graded return to usual daily activities, passive stretch with or without heat to increase finger extension and/or flexion, intermittent use of daytime finger-based dynamic PIP joint extension orthoses, and grip strengthening.

Statistical analysis

A power analysis was undertaken based on our 2009 audit of a cohort of patients who all received orthoses following surgical release of Dupuytren contracture and of whom 75% had surgery on the little finger. The mean little finger extension at 3 months was 23° (SD, 16). The same standard deviation was assumed for groups receiving and not receiving an orthosis in our study. Allowing for a 10% dropout, we established that a minimum of 21 participants would be required in an orthosis group and 21 in a no-orthosis group to detect a clinically significant difference of 20° (taking the known measurement error of 5° for each joint into account)[15] at a .05 significance level with 90% power. It was estimated that up to 25% of participants may lose substantial extension after surgery and would need to be provided with an orthosis. This would be known only after randomization. It was therefore determined that 28 participants would be recruited to the no-orthosis group to account for any group allocation swapping.

The distribution of participants' characteristics and preoperative clinical measurements between groups

was analyzed using descriptive statistics, as recommended by the most recent Consolidated Standards of Reporting Trials statement for reporting of parallel group RCTs.[16] A 2-sample *t*-test or Mann Whitney U test was used to assess whether there were significant differences in finger range of motion, grip strength, and hand function between the 2 treatment groups at each visit after surgery.

A mixed-effect, repeated-measure analysis of variance was applied to assess whether there were significant differences in the main outcomes between groups from the first postoperative visit to 3 months and was adjusted for preoperative measurements and clinical factors (age, sex, type of surgery, dominance, skin graft). Mixed-effect, repeated-measure analyses were used to account for the dependency in the outcome data from multiple postoperative visits, where random intercept of each patient was used in the models).[17,18] Treatment allocation and clinical factors were treated as mixed effects in the model. The interactions between visit and treatment were also evaluated in the mixed effect model. The analysis of TAE was performed for each finger separately because we wanted to determine whether wearing an orthosis may have differing effects on different fingers.

The primary analysis was based on the intention-to-treat principle, whereby participants were analyzed according to the group to which they were randomly allocated. No imputations were applied in the analysis. A secondary per-protocol analysis was performed based on the treatment that participants actually received. For the orthosis group, this included those with compliance greater than 50% and those participants from the no-orthosis group who subsequently met the threshold for an orthosis.

All tests were 2-tailed, and the statistical significance level was set at .05.

RESULTS

The flow of patients through the study is presented in Figure 2. Three participants from the no-orthosis group met the threshold of extension loss and were subsequently provided with an orthosis. Participant baseline demographics, clinical characteristics, and preoperative measurements are presented in Tables 1 and 2. The groups had similar measurements before surgery and demonstrated a relatively equal spread of characteristics. All range of motion outcomes are related to the fingers that had surgery.

Table 3 presents the finger range of motion results from the primary analysis. The difference in the means was adjusted for preoperative measurements and clinical factors and averaged across the 3 postoperative visits. The results from this mixed effect model showed no statistically significant differences in little finger TAE ($P = .07$), TAF ($P = .08$), or in range of motion of the ring or middle fingers.

The results from the unadjusted analysis showed that, for the 43 (77%) fingers that had little finger surgery, there was no statistically significant difference in TAE at 3 months (Fig. 3) or for TAE of the other operated fingers. There were also no statistically significant differences for finger flexion measures of any of the fingers. Unadjusted mean differences in range of motion for all 3 postoperative visits can be found in Appendix A (available on the *Journal's* Web site at www.jhandsurg.org).

The results of grip strength and hand function from the adjusted analysis are presented in Table 4. There was no statistically significant difference between the groups for these outcomes.

Unadjusted mean differences for the 6-week and 3-month postoperative visits can be found in Appendix B (available on the *Journal's* Web site at www.jhandsurg.org). There were no statistically significant differences for grip strength or hand function at either of the visits.

The mixed model analysis was also conducted to determine any confounding effect of baseline measurements, sex, age, surgery type, hand dominance, and skin graft on operated finger measurements. There were no effects observed, except for a small number of participants who had dermofasciectomy (n = 6, 11% of total sample) and who showed significantly poorer little finger TAF ($P = .006$) than those who had fasciectomy. Of the 43 that had little finger surgery, 30 had surgery only on the little finger, and 13 had surgery on multiple fingers. A separate analysis showed that there was no significant association between the number of fingers operated and little finger TAE ($P = .37$) or active distal palmar crease ($P = .15$).

Of the orthosis group and those who met the criteria for an orthosis, 28 of 29 (97%) of participants who were provided an orthosis wore the orthosis more than 50% of the recommended time.

Our secondary per-protocol analysis revealed a similar result to the primary analysis, with no statistically significant difference for any outcomes in the adjusted means between groups. For little finger TAE, the adjusted mean difference was −10° (standard error, 5.7; $P = .09$). For little finger TAF, the difference was 12° (standard error, 7.7; $P = .13$).

The data were also evaluated to identify the overall number of little fingers that maintained extension between the first and final postoperative measures (Fig. 4). Per joint,

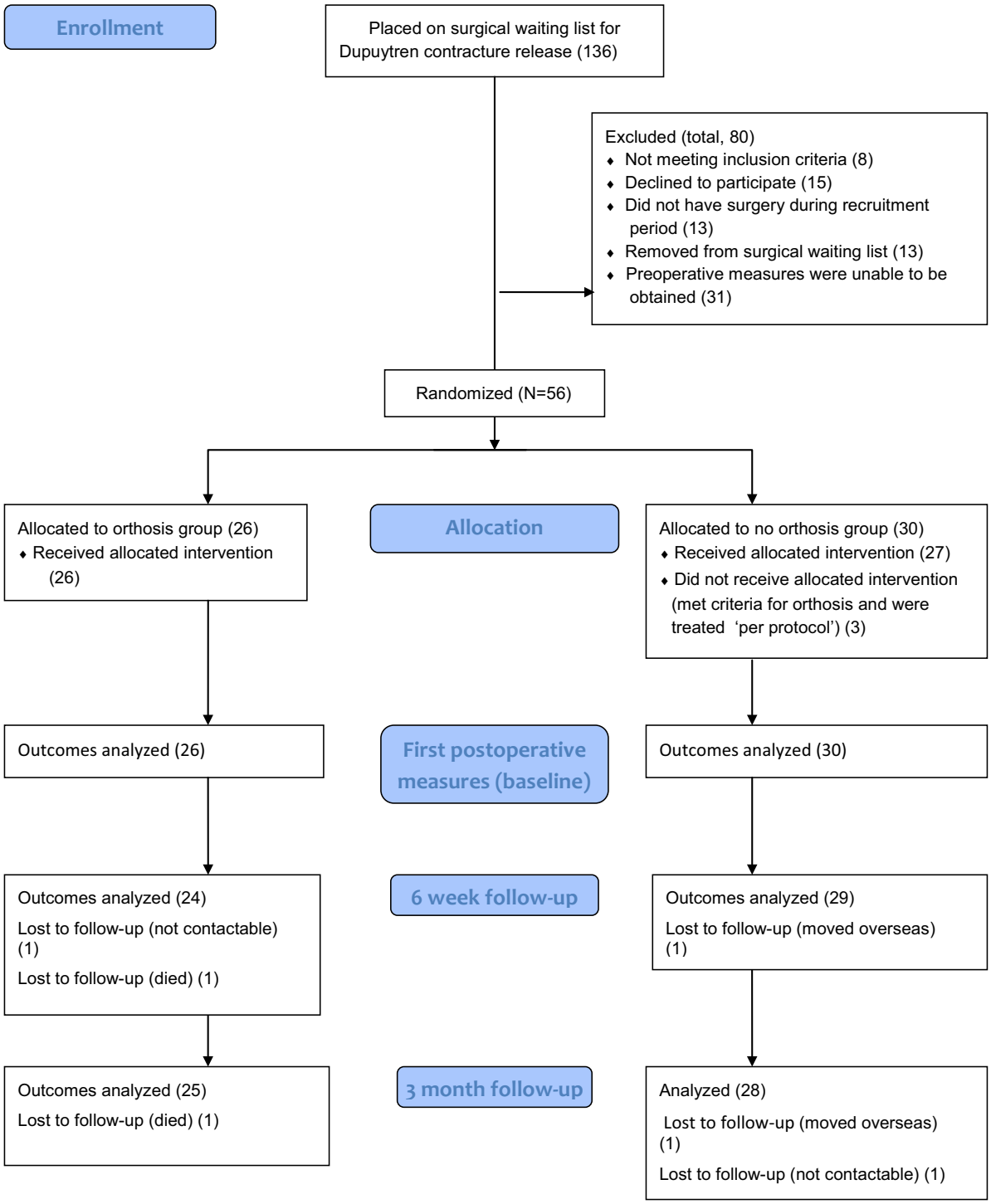

FIGURE 2: Flowchart of study.

29 of 40 (73%) MCP joints maintained or improved extension (mean, 6°; range, 0° to 38°) compared with 21 of 40 (53%) of the PIP joints (mean, 7°; range, 0° to 22°). Mean extension loss in the MCP was 15° (range, 4° to 36°) and in the PIP was 15° (range, 1° to 56°).

A subgroup analysis was conducted to determine any preferential effect of orthoses on MCP or PIP joints. Inclusion criterion was little finger MCP or PIP joints that had a preoperative contracture. Improvement in extension from preoperative to 3 months after surgery was compared between joints and groups (Table 5). The study was not sufficiently powered for hypothesis testing to be conducted on these data.

TABLE 1. Baseline Characteristics

	No Orthosis (n = 30)	Orthosis (n = 26)
Age		
Mean (SD)	67 (9)	68 (8)
Sex		
Ratio M:F	23:7	22:4
Ethnicity		
New Zealand European	23 (77%)	18 (69%)
Other European	6 (20%)	7 (27%)
Fijian	0 (0%)	1 (4%)
Indian	1 (3%)	0 (0%)
Operated hand		
L	18 (60%)	12 (46%)
R	12 (40%)	14 (54%)
Operated digits		
Little fingers	22 (73%)	21 (81%)
Ring fingers	11 (37%)	11 (42%)
Middle fingers	5 (17%)	8 (31%)
No. of operated digits		
1	22 (73%)	17 (65%)
2	8 (27%)	5 (19%)
3	0 (0%)	4 (15%)
Dominance		
L	5 (18%)	0 (0%)
R	23 (82%)	26 (100%)
Surgery type		
Dermofasciectomy	3 (10%)	3 (12%)
Fasciectomy	27 (90%)	23 (88%)
Disease recurrence		
Primary surgery	26 (87%)	24 (92%)
Revision surgery	4 (13%)	2 (8%)
Skin graft		
Full-thickness skin graft	4 (13%)	3 (12%)

TABLE 2. Preoperative Measures (Mean and SD)

	No Orthosis (n = 30)	Orthosis (n = 26)
Little finger (no.)	22	21
TAE (°)	92 (44)	80 (30)
TAF (°)	233 (25)	242 (15)
ADPC (cm)	1 (1)	1 (1)
Ring finger (no.)	11	11
TAE	64 (30)	73 (42)
TAF	241 (16)	230 (11)
ADPC	1 (1)	2 (1)
Middle finger (no.)	5	8
TAE	71 (15)	59 (24)
TAF	248 (18)	242 (11)
ADPC	1 (1)	2 (< 1)
Grip strength, L	32 (11)	31 (8)
Grip strength, R	33 (14)	31 (10)
DASH	13 (14)	14 (12)

ADPC, active distal palmar crease; DASH, Disabilities of the Arm, Shoulder, and Hand questionnaire; TAE, total active extension; TAF, total active flexion.

DISCUSSION

We investigated the effects of night extension orthoses over the 3 months following surgical release of Dupuytren contracture on finger range of motion and function. Our analyses showed no statistically significant differences for any of the outcomes measured.

With respect to finger extension, our results demonstrated that a night extension orthosis, in combination with standard hand therapy, had no greater effect on maintaining finger extension than hand therapy alone. Our results support 2 recent RCTs,[19,20] and together, these results challenge long-held assumptions regarding the efficacy of orthoses. Several factors may contribute to the lack of effect observed. First, our results suggest that the addition of passive extension force as applied by a night orthosis is no more effective at preventing scar contracture than hand therapy and normal use of the hand. This may be attributable to the effects of active motion in promoting normal remodeling of scar tissue[21,22] and strengthening of the finger extensors that may offset the forces of scar contraction.

Second, it is possible that 3 months of night use may be insufficient to influence the newly forming scar. Previous studies demonstrated that contracture resolution is directly proportional to the total orthosis dosage.[23–25] Although these studies were not directly examining the effect of orthoses on scar formation, they do demonstrate that short, tight tissues often require prolonged orthosis use to effect change in tissue length. However, in 2 recent RCTs that did use orthoses for longer periods of time than our study, greater extension was not reported in the orthosis groups.[19,20]

Another consideration is the contribution of PIP motion to total finger extension deficit. Restoring PIP joint extension is generally considered more challenging than MCP joint extension. Although inferences must be made with caution, our subgroup analysis suggested a greater propensity for improvement in the MCP joint than the PIP joint, regardless of extension orthoses.

TABLE 3. Range of Motion from Mixed Effect Model Averaged Across Postoperative Visits (Intention to Treat)

	Difference, No-Orthosis vs Orthosis Groups	Standard Error	Lower of 95% Confidence Interval	Upper of 95% Confidence Interval	*P* Value
Little finger TAE (°)	−10	5.3	−20	< 1	.07
Little finger TAF (°)	13	7.4	−2	27	.08
Little finger ADPC (cm)	0	0.3	−1	< 1	.44
Ring finger TAE	1	6.3	−12	13	.92
Ring finger TAF	12	11.3	−10	34	.29
Ring finger ADPC	> −1	0.6	−1	1	.71
Middle finger TAE	−10	7.2	−24	7	.23
Middle finger TAF	5	9.3	−14	23	.63
Middle finger ADPC	< 1	0.7	−1	1	.95

Data presented are least square means (adjusted by covariates).
ADPC, active distal palmar crease; TAE, total active extension; TAF, total active flexion.

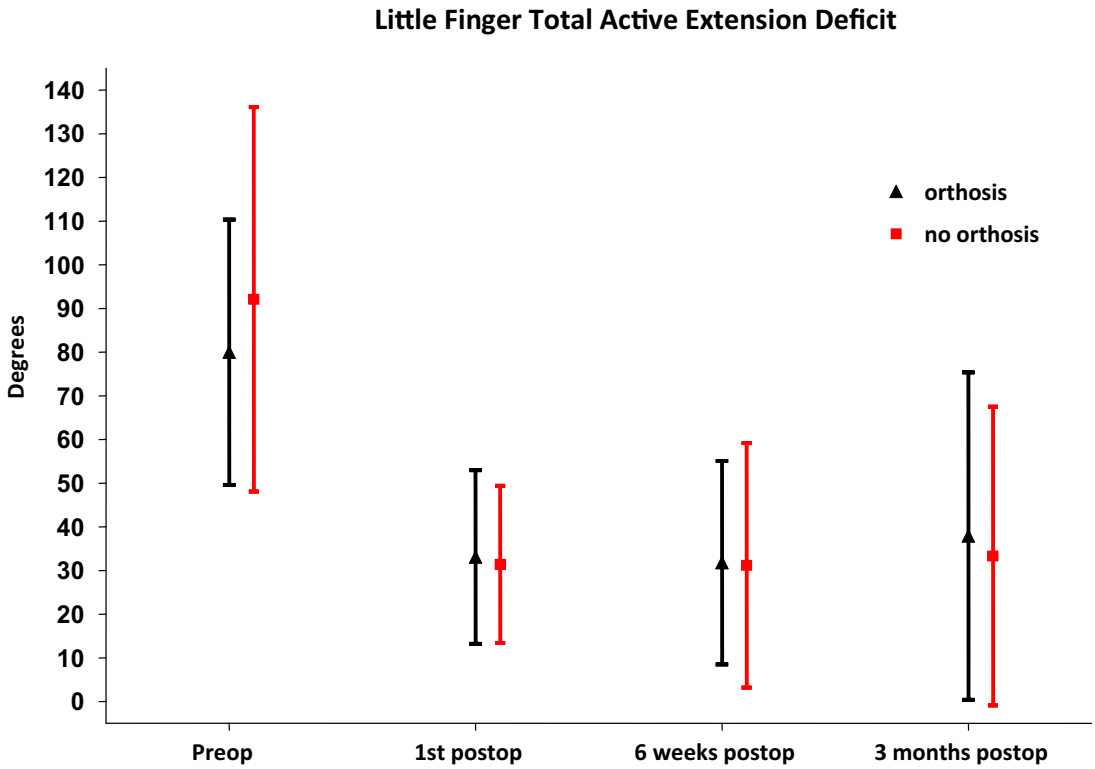

FIGURE 3: Comparison of little finger TAE between groups at each visit; unadjusted means and 95% confidence intervals.

Contracture of the PIP joint is a biomechanically complex problem, with alterations to the anatomy and physiology of the tissues resulting from long-term flexion forces. One of the primary sequelae is attenuation of the central slip,[26,27] resulting in inefficiency of the extensor mechanism. Where this has occurred, night extension orthoses are unlikely to result in shortening of the central slip and correction of this problem.

Finally, the relative effect of night extension orthoses on MCP compared to PIP joints should be taken into account. It is possible that the orthosis design we used was not optimal for acting on the PIP joint. Two previous RCTs,[19,20] which also showed no difference in finger extension at 3 months, used designs similar to those in our study. Biomechanically, this may not be the most advan-

TABLE 4. Grip Strength and Hand Function From Mixed-Effect Model Averaged Across Postoperative Visits (Intention to Treat)

	Difference, No-Orthosis vs Orthosis Groups	Standard Error	Lower of 95% Confidence Interval	Upper of 95% Confidence Interval	*P* Value
Grip strength, L (kg)	3	2	−2	7	.22
Grip strength, R (kg)	3	2	−1	6	.10
DASH (0–100)	−1	2	−5	3	.59

Data presented are least square means (adjusted by covariates).
DASH, Disabilities of the Arm, Shoulder, and Hand questionnaire.

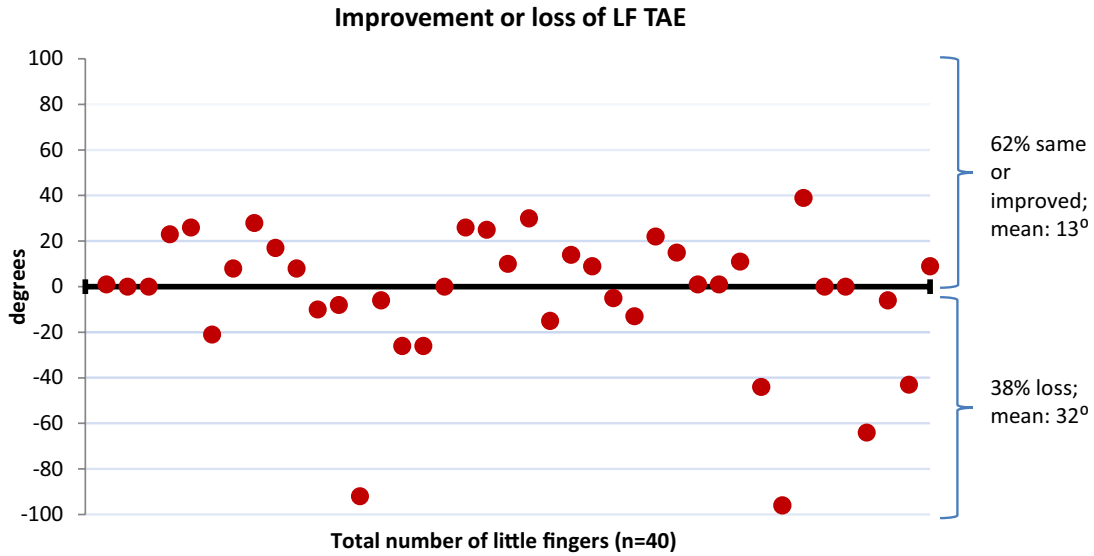

FIGURE 4: Difference in total active extension (°) between the first postoperative visit and 3 months across all little fingers.

TABLE 5. Improvement in Little Finger Extension (°) Before Surgery to 3 Months: MCP and PIP in Both Groups

	No.	Preoperative	No.	3 mo	Difference
MCP					
No orthosis	16	58 (20)	15	10 (20)	−50 (95% CI, −39, −60)
Orthosis	16	46 (23)	15	15 (13)	−34 (95% CI, −25, −43)
PIP					
No orthosis	21	37 (26)	19	24 (21)	−18 (95% CI, −11, −26)
Orthosis	20	37 (20)	19	22 (18)	−14 (95% CI, −6, −21)

Data presented are unadjusted means (SD).

tageous position for an extension force on the PIP joint. A 1992 study[28] demonstrated improved PIP joint extension with the use of a dynamic orthosis with the MCP joint positioned in 70° of flexion and the PIP joint in complete extension. Such alternative designs could be considered in future.

Our secondary aim was to determine any detrimental effects of orthoses. Previous authors suggested that

orthoses may cause stiffness, pain, and slow recovery of function following Dupuytren surgery.[5,12,29] We hypothesized that, although orthoses were only worn at night, this may be sufficient to adversely affect finger flexion and hand function. Our findings, which are similar to those of Jerosch-Herold et al[20] and Kemler et al,[19] demonstrate that wearing orthoses at night did not have a significantly detrimental effect on finger flexion or hand function.

Finally, our study aimed to determine how well finger extension was maintained after surgery. We observed that more than a third of all little fingers lost some extension. With respect to individual joints, we found that almost half of the PIP joints lost some extension, compared with just over a quarter of the MCP joints. Caution must be applied when interpreting these observations because they are unadjusted means from a small sample. Our results, however, allow for comparison with future studies and enable clinicians to inform patients about likely outcomes of finger extension. They also challenge clinicians to research strategies to maintain or improve finger extension in more patients, particularly in the PIP joint.

Our study had a number of limitations. First, the study was conducted in a single center, which could limit its general application. We considered, however, that our participants' demographics and the treatment they received are internationally comparable. The sample of 56 may be considered underpowered and raises the possibility of a type II error. Our power analysis was based on our clinical audit, as no standard deviation from an RCT was available at the time. The lack of intraoperative measures may be considered a weakness because we were unable to compare postoperative finger extension with surgical correction. We considered that the value of intraoperative measurement also has limitations because it is attained under anesthesia and may vary substantially from postoperative extension. We suggest that using early postoperative measures as a baseline may be a more pragmatic way of evaluating how well extension is maintained after surgery. Lack of homogeneity in our sample with respect to surgery type may also be considered a limitation because we included patients who had fasciectomy, dermofasciectomy and skin grafting.

The results of our study add to existing evidence that night extension orthoses do not maintain extension any better than hand therapy alone following surgical release of Dupuytren contracture. Our study reports on the operated fingers separately and suggests that such orthoses do not have a preferential effect on extension in any of the fingers. We evaluated the efficacy of orthoses during wound healing and early scar formation and showed a lack of effect during this early postoperative period. We suggest that the practice of providing every patient with a night extension orthosis may not be justified, particularly considering the extra cost and inconvenience. Therapists and surgeons will continue to have concerns about patients who lose extension after surgery or when the risk for extension loss is considered to be high. In these cases, orthoses may still be required to manage extension loss. Future research could focus on establishing indicators for selective use of orthoses, evaluating the effects of different orthosis designs, and identifying interventions that would increase the rate of maintaining extension, particularly at the PIP joint, in a greater number of fingers.

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APPENDIX A. Comparison of Range of Motion Between Groups at Each Postoperative Visit (Intention to Treat)

Data Presented Are Unadjusted Means (SD)	No Orthosis	Orthosis	Difference	*P* Value
1st Postoperative Visit (Mean, 7 d; Range, 1–14 d)				
	n = 22	n = 21		
LF TAE (°)	31 (18)	33 (20)	−2 (19)	.77
LF TAF (°)	125 (33)	115 (32)	11 (33)	.29
LF ADPC (cm)	5 (2)	6 (1)	0 (1)	.72
	n = 11	n = 11		
RF TAE	38 (10)	34 (25)	3 (19)	.71
RF TAF	127 (31)	125 (36)	3 (33)	.85
RF ADPC	6 (2)	6 (2)	< 1 (2)	.84
	n = 5	n = 8		
MF TAE	34 (18)	36 (12)	−3 (15)	.75
MF TAF	121 (22)	136 (25)	−15 (24)	.29
MF ADPC	8 (< 1)	6 (1)	1 (1)	.03
6 wk				
	n = 21	n = 19		
LF TAE	31 (28)	32 (23)	−1 (26)	.94
LF TAF	222 (20)	207 (35)	15 (28)	.11
LF ADPC	2 (1)	2 (1)	0 (1)	.46
	n = 11	n = 10		
RF TAE	31 (22)	33 (15)	−2 (19)	.84
RF TAF	225 (24)	198 (36)	27 (31)	.05
RF ADPC	2 (1)	3 (2)	−1 (2)	.39
	n = 5	n = 7		
MF TAE	29 (19)	33 (23)	−4 (21)	.78
MF TAF	231 (22)	215 (20)	16 (21)	.21
MF ADPC	2 (1)	3 (< 1)	−1 (< 1)	.40
3 mo				
	n = 20	n = 20		
LF TAE	33 (34)	38 (38)	−5 (36)	.68
LF TAF	229 (22)	220 (35)	10 (29)	.68
LF ADPC	2 (< 1)	2 (1)	0 (1)	.49
	n = 11	n = 11		
RF TAE	24 (24)	28 (22)	−5 (23)	.63
RF TAF	232 (18)	208 (36)	24 (29)	.07
RF ADPC	2 (1)	3 (2)	−1 (1)	.20
	n = 5	n = 7		
MF TAE	30 (36)	26 (18)	4 (26)	.80
MF TAF	245 (16)	216 (28)	29 (24)	.07
MF ADPC	1 (< 1)	2 (2)	−1 (1)	.13

ADPC, active distal palmar crease; LF, little finger; MF, middle finger; RF, ring finger; TAE, total active extension; TAF, total active flexion.

APPENDIX B. Comparison of Grip Strength and Hand Function Between Groups at Each Postoperative Visit (Intention to Treat)

Data Presented Are Unadjusted Means (SD)	No Orthosis	Orthosis	Difference	I Value
6 wk	n = 29	n = 24		
Grip strength, L (kg)	27 (13)	24 (12)	4 (13)	.31
Grip strength, R (kg)	30 (11)	27 (13)	3 (12)	.30
DASH (0–100)	12 (9)	16 (11)	−4 (10)	.16
3 mo	n = 28	n = 25		
Grip strength, L (kg)	30 (13)	25 (11)	4 (12)	.19
Grip strength, R (kg)	33 (13)	27 (12)	6 (12)	.11
DASH (0–100)	11 (16)	10 (9)	1 (13)	.75