Hand Function and Quality of Life Before and After Fasciectomy for Dupuytren Contracture

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Purpose To describe changes in joint motion, sensibility, and scar pliability and to investigate the patients' expectations, self-reported recovery, and satisfaction with hand function, disability, and quality of life after surgery and hand therapy for Dupuytren disease.

Methods This prospective cohort study collected measurements before surgery and 3, 6, and 12 months after surgery and hand therapy. Ninety patients with total active extension deficits of 60° or more from Dupuytren contracture were included. Outcomes measures were range of motion; sensibility; scar pliability; self-reported outcomes on expectations, recovery, and satisfaction with hand function; Disabilities of the Arm, Shoulder, and Hand scores; safety and social issues of hand function; physical activity habits; and quality of life with the Euroqol.

Results The extension deficit decreased, and there was a transient decrease in active finger flexion during the first year after surgery. Sensibility remained unaffected. Generally, patients with surgery on multiple fingers had worse scar pliability. The majority of the patients had their expectations met, and at 6 months, 32% considered hand function as fully recovered, and 73% were satisfied with their hand function. Fear of hurting the hand and worry about not trusting the hand function were of greatest concern among safety and social issues. The Disability of the Arm, Shoulder, and Hand score and the Euroqol improved over time.

Conclusions After surgery and hand therapy, disability decreased independent of single or multiple operated fingers. The total active finger extension improved enough for the patients to reach a functional range of motion despite an impairment of active finger flexion still present 12 months after treatment. *(J Hand Surg Am. 2014;39(7):1333–1343. Copyright © 2014 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic IV.

Key words Dupuytren contracture, surgical treatment, range of motion, satisfaction, occupational therapy.

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DUPUYTREN DISEASE (DD) IS A benign connective tissue disorder with unknown etiology. It affects the palmar fascia of the hand, leading to progressive finger joint contractures.[1] A common treatment is surgical fasciectomy, but nonsurgical treatment options exist. The treatment does not cure the disease, and recurrence is common.[2,3] Possible adverse effects of surgery are vascular or nerve damage, delayed wound healing, scar problems, infection, swelling, complex regional pain syndrome, and loss of finger flexion.[4–6] Some surgeons recommend postoperative hand therapy,[7–9] and according to clinical experience, recovery after surgery takes in general 3 to 6 months.[8]

Previous research has focused on outcomes related to surgical techniques, decrease of extension deficit, or disease recurrence[3,10−12] and show larger improvement of the extension deficit in the metacarpophalangeal (MCP) joint than in the proximal interphalangeal (PIP) joint.[10] Further, a more severe degree of contracture before surgery or contracture of the PIP joint has been associated with residual contracture after surgery.[10,13,14] Although reduced finger flexion is a potential complication,[4] few studies report the impact of surgery on finger flexion. Descriptions of finger flexion after surgery vary from all patients regaining finger flexion within 2 weeks[15] to flexion deficits present 6 weeks after surgery[16] to no patients achieving restoration of full range of motion (ROM).[17] Benefits in ROM over time have been reported occasionally for isolated joints,[18] and some studies report improvement in hand function after surgery measured by the Sollerman grip function test.[13,19] Few studies report assessment of sensibility before and after surgery,[20] although 1 study using the Semmes-Weinstein monofilaments reported diminished light touch and protective sensation after surgery.[17] Scar contracture is another potential complication after surgery[5,6] and should be distinguished from recurrence, that is, the development of new DD tissue in the operated area.[1] Despite possible drawbacks of surgery, several studies report high overall patient satisfaction or satisfaction with the procedure.[15,17,20−24] After fasciectomy, patients also report improved quality of life.[25]

The aim of our study was to describe changes over time in finger joint motion, sensibility, and scar pliability and to investigate the patients' expectations, self-reported recovery, and satisfaction with hand function, disability, and quality of life after surgery and hand therapy for DD.

We hypothesized that there would be a negative effect of surgery on finger flexion and sensibility and that self-reported recovery of hand function would take 3 to 6 months. We expected the extension deficit of the operated finger to decrease enough to reach a ROM needed for performance of daily activities.

MATERIALS AND METHODS

The study design was a prospective cohort study with routine evaluations at 4 consistent time points: immediately before surgery and at 3, 6, and 12 months after surgery and hand therapy.

Patients

We recruited patients with DD consecutively as they were scheduled for fasciectomy from a center for hand surgery in Sweden. Inclusion criteria were an extension deficit of 60° or more in digits II to V in an

isolated finger joint or as the sum of the extension deficits of the MCP, PIP, and distal interphalangeal (DIP) joints in the affected finger. Of 123 available patients, 19 did not meet the inclusion criteria, and 10 declined participation. Ninety-four patients gave informed consent. We excluded 4 patients owing to incomplete measurements, leaving 90 patients to participate in the study (Fig. 1), 77 of whom attended all follow-ups. Of the 90 patients included in the study, 70 had surgery in 1 finger, 16 had surgery in 2 fingers, and 4 patients had surgery in 3 fingers. Seven patients had contractures only in the MCP joint, 9 patients only in the PIP joint, and 74 in both the MCP and the PIP joint (Table 1). Twenty patients had previous upper extremity disease not located to the hand or finger, for example, neck/shoulder pain (n = 12), fractures (n = 2), osteoarthritis (n = 2), and rheumatic disease (n = 1).

Intervention

The surgical intervention followed a standard protocol of fasciectomy with straight-line incisions, removal of the pathological tissue, and closure with z-plasties. If there was a shortage of skin or bad skin quality, the surgeon used an open palm technique (n = 8). If there was a residual extension deficit of 25° to 30° left in the PIP joint after the fasciectomy, the surgeon removed the volar plate of the PIP joint (n = 9). After surgery, the hand was casted. We used a standard postoperative treatment previously described[26] regardless of the extent of surgery. One week after surgery, the occupational therapist (OT) removed the cast. All patients started active exercises with both isolated joint motions and composite flexion and extension. They received a volar orthosis with the wrist in 10° to 20° extension, the MCP joint in 10° to 20° flexion, and the interphalangeal joints in maximum extension without tensioning the wounds. Beginning 1 week after surgery, the patient used the orthosis 24 hours a day with removal only during exercise. A week later, the patient used the orthosis only at night. Nighttime splinting continued for 3 to 6 months. Ninety-eight percent used their orthosis at 3 months after surgery and 37% were still using it at 6 months. Some patients needed further postoperative hand therapy beyond the therapy described previously (Table 2).

Data collection

Two OTs, not involved in the postoperative treatment, were responsible for measurements at all follow-ups. The same OT followed each patient with the exception of 5 patients living further away from
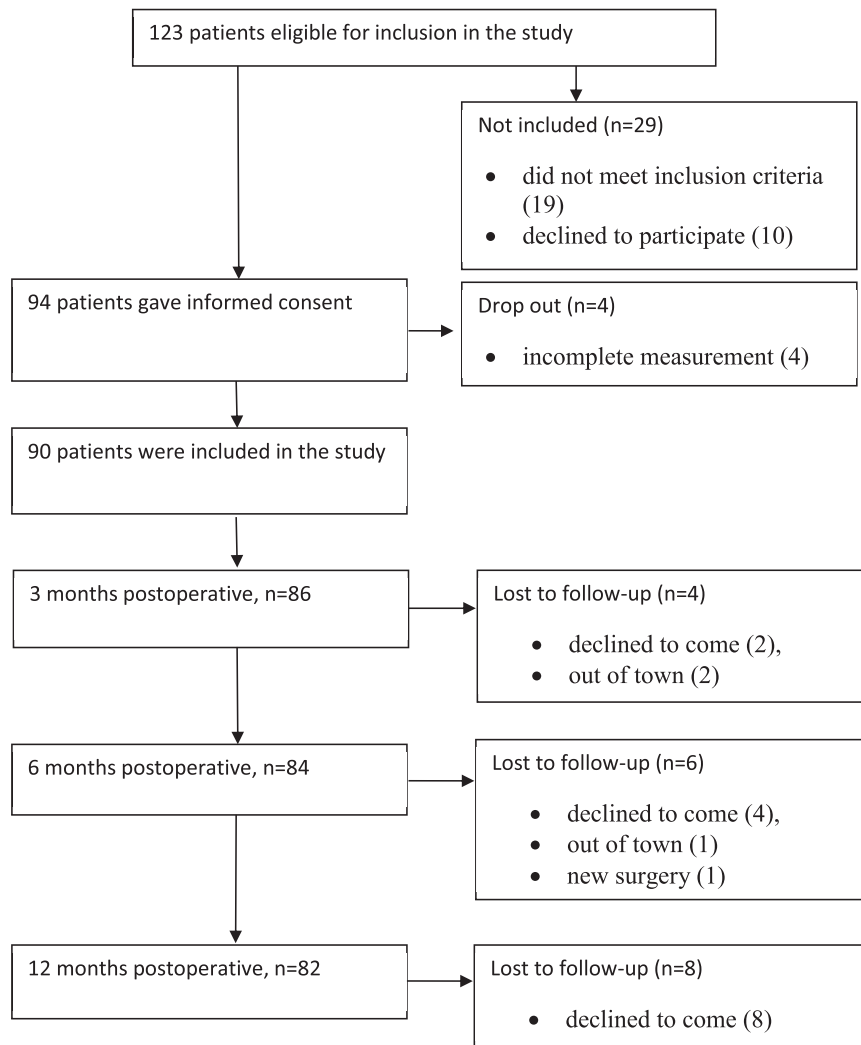
123 patients eligible for inclusion in the study

Not included (n=29)

- did not meet inclusion criteria (19)
- declined to participate (10)

94 patients gave informed consent

Drop out (n=4)

- incomplete measurement (4)

90 patients were included in the study

3 months postoperative, n=86

Lost to follow-up (n=4)

- declined to come (2),
- out of town (2)

6 months postoperative, n=84

Lost to follow-up (n=6)

- declined to come (4),
- out of town (1)
- new surgery (1)

12 months postoperative, n=82

Lost to follow-up (n=8)

- declined to come (8)

FIGURE 1: Flowchart on participants and dropouts in the study. Measurements on all occasions: ROM, sensibility, and self-reported outcomes. Measurement on follow-up occasions: assessment of scar pliability.

the hospital, where local OTs specially trained for the study performed the follow-up measurements.[24] The OTs systematically collected information about postoperative hand therapy given for swelling, pain, ROM, splinting, and scars.

Outcomes

We assessed active ROM with extension and flexion only. We measured maximum active extension and flexion in the MCP, PIP, and DIP joints according to guidelines (Appendix A, available on the *Journal*'s Web site at www.jhandsurg.org).[27] We summed maximum active extension and flexion for individual joints for each operated finger, giving the total active extension (TAE) deficit and total active flexion (TAF). We calculated total active ROM as the TAF minus the TAE deficit. We noted hyperextension in the DIP joint but converted it to 0° in the analysis

because this could underestimate the TAE deficit. We compared participants' total ROM with 165° total ROM, representing the minimum functional ROM needed for performance of 11 common daily activities and with 290° representing normal ROM.[28]

Sensibility of the fingertip of the operated finger was measured with the Semmes-Weinstein mono-filament[29] with 5 filaments ranging from 1 equaling normal sensibility (2.83 filaments) to 5 equaling deep pressure only (6.65 filaments).

Scar pliability was assessed on all follow-up occasions by visual inspection and palpation of the scar tissue. The scar tissue was graded on a subscale from the Vancouver Scar Scale: 1, normal (normal skin); 2, supple (flexible scar with minimal resistance); 3, yielding (scar giving way to pressure); 4, firm (scar inflexible, not easily moved, resistant to manual pressure); 5, ropes (ropelike tissue that blanches with extension of scar);

TABLE 1. Patient-Reported Background Data, Severity of DD, and Given Intervention for the Study Sample*

		The Whole Group (n = 90) n (%)	Patients With Surgery on 1 Finger (n = 70) n (%)	Patients With Surgery on Multiple Fingers (n = 20) n (%)
Background Data				
Sex	Male (%)	77 (85)	61 (87)	16 (80)
Age	M (SD)	68 (± 9)	68 (± 9)	69 (± 9)
Diabetes	Yes (%)	10 (11)	6 (9)	4 (20)
Smoking	Yes (%)	8 (9)	5 (7)	3 (15)
Heredity	Yes (%)	41 (46)	30 (43)	11 (55)
	No (%)	18 (20)	15 (21)	3 (15)
	Unknown (%)	31 (34)	25 (36)	6 (30)
Previous upper extremity disease(s)	Yes (%)	n = 88 20 (23)	n = 69 13 (19)	n = 19 7 (37)
Severity of DD				
Disease duration[†]	0−5 y (%)	22 (24)	19 (27)	3 (15)
	6−10 y (%)	32 (36)	28 (40)	4 (20)
	11−15 y (%)	17 (19)	12 (17)	5 (25)
	> 15 y (%)	19 (21)	11 (16)	8 (40)
DD[†]	Bilateral (%)	64 (71)	46 (66)	18 (90)
Previous surgery for DD		n = 85	n = 65	n = 20
	No (%)	54 (64)	46 (71)	8 (40)
	Yes, other hand (%)	19 (22)	11 (17)	8 (40)
	Yes, same hand but other finger (%)	3 (3)	2 (3)	1 (5)
	Yes, same hand and finger (%)	9 (11)	6 (9)	3 (15)
Intervention				
Type of surgery	Fasciectomy (%)	73 (81)	60 (85)	13 (65)
	+ Open palm (%)	8 (9)	4 (6)	4 (20)
	+ Volar release (%)	9 (10)	6 (9)	3 (15)
Complications during surgery	Nerve injury (%)	4 (4)	3 (4)	1 (5)
	Blood vessel injury (%)	1 (1)	0	1 (5)
Complications after surgery	CRPS (%)	4 (4)	3 (4)	1 (5)
	Infection (%)	6 (7)	6 (9)	0
Surgery in dominant hand	Yes (%)	49 (54)	40 (57)	9 (45)
Operated fingers		n = 114	n = 70	n = 44
	Index	1 (1)	0 (0)	1 (2)
	Middle	9 (8)	1 (1)	8 (18)
	Ring	34 (30)	15 (21)	19 (43)
	Little	70 (61)	54 (77)	16 (36)

CRPS, complex regional pain syndrome.
*Data are presented as number and proportions (%) of patients or mean and SD for the whole group and for subgroups.
†Significant difference between subgroups, $P < .05$.

and 6, contracture (permanent shortening of scar producing deformity/distortion).[30] The patient extended the fingers during the assessment.

Self-reported outcomes consisted of:
• Expectations about and recovery of hand function (global index): 7-point scale ranging from 1

TABLE 2. Postoperative Treatment, Given in Addition to Standard Protocol, Based on Individual Needs During the First 3 Months*

Type of Problem and Intervention	n (%)
ROM	
Dynamic finger extension splint	2 (2)
Dynamic finger flexion splint	4 (5)
Swelling	
Compression gloves or finger wrapping	26 (30)
Pain	
Transcutaneous electrical nerve stimulation/ acupuncture	5 (6)
Pain medication (diclofenac and paracetamol)	13 (15)
Scarring	
Zinc tape or occlusive materials	10 (12)

*Interventions were directed toward ROM, swelling, pain, or scarring and are presented as numbers and proportions (%) of patients attending 3 months of follow-up (n = 86).

FIGURE 2: **A** TAE deficit in the whole finger at different time points, significantly reduced at 3 months (F [1, 75] = 506.70, $P < .001$). **B** Active extension deficit of isolated finger joints (MCP, PIP, and DIP) at different time points. Number of patients at each time point: before surgery (n = 90), 3 months (n = 86), 6 months (n = 84), and 12 months after surgery (n = 82). F, value for the contrast analysis (degrees of freedom). Data presented as mean degrees and 95% confidence intervals (CI).

equaling fully recovered to 7 equaling much worse.[31]

- Satisfaction with current hand function (global index): 7-point scale ranging from 1 equaling delighted to 7 equaling terrible.[32]
- The Disabilities of the Arm, Shoulder, and Hand Questionnaire (DASH), Swedish version: 30-item disability/symptoms scale giving a score ranging from 0 equaling no disability to 100 equaling severest disability.[33,34]
- Safety and social issues regarding hand function (Appendix B, available on the *Journal*'s Web site at www.jhandsurg.org):
  1. Worry about not trusting the hand function
  2. Need to take special precautions owing to hand function
  3. Fear of hurting the hand
  4. Concern about the appearance of the hand
  5. Avoiding use of the hand in social contexts

Response options ranged from 1 equaling to a large degree to 10 equaling not at all.

- Present physical activity habits: 6-point scale ranging from 1 equaling hardly any physical activity to 6 equaling hard exercise several times a week.[35]
- The Euroqol (EQ-5D), Swedish version: a descriptive profile of 5 areas that is converted into a summary index ranging from 1 equaling full health to −0.594 equaling worst imaginable health state and a vertical visual analog scale (VAS) where overall health is rated 100, best imaginable health state, and 0, worst imaginable health state.[36]
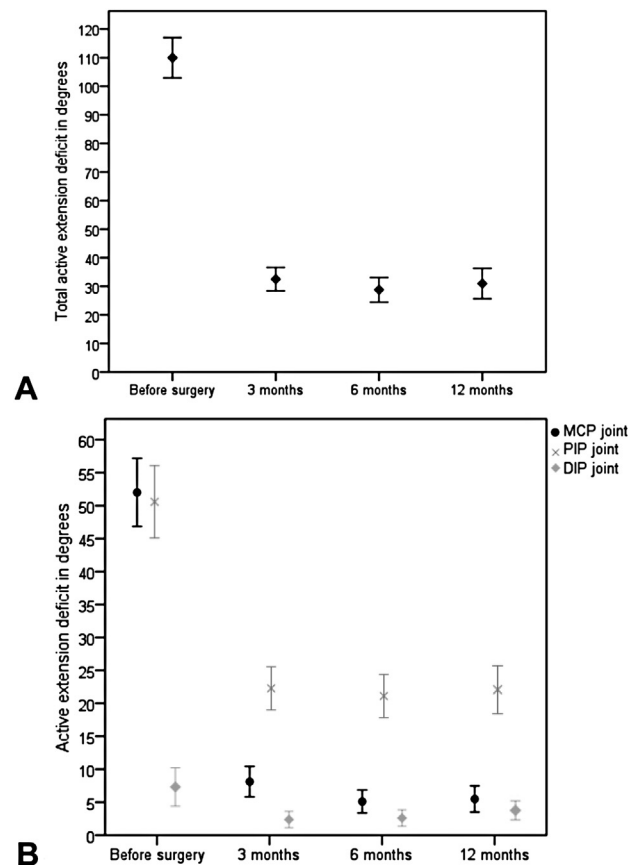
Statistical analysis

We estimated the necessary sample size to 58 patients based on a change of 15° in extension deficit with an SD of 30° and a power of 90%. Based on the results of finger flexion with a change of 10° and SD 23°, the power of the study exceeded 90%. To handle multiple observations in the analysis, we divided the patients into 2 subgroups consisting of patients with surgery on 1 finger and surgery on multiple (2 or 3) fingers.[37,38] For patients with surgery on multiple fingers, we calculated an average for ROM and sensibility outcomes.[37] We performed the analysis on the whole group and on subgroups. We used descriptive statistics for demographic data and sample characteristics, and Fisher exact and *t*-tests for identifying differences between subgroups regarding sample characteristics. We summed and averaged rating of safety issues (questions 1–3) and social issues (questions 4–5) before surgery
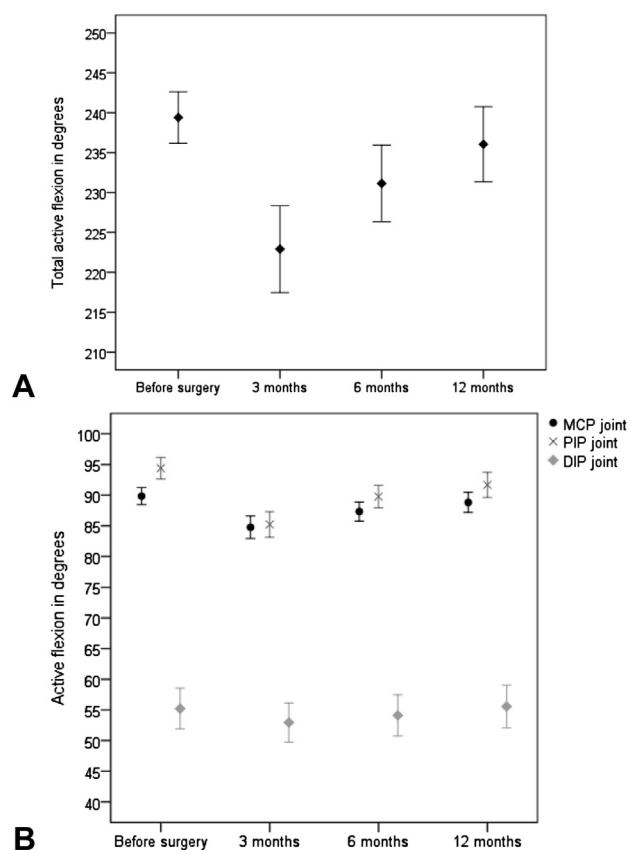
FIGURE 3: A TAF in the whole finger at different time points, significantly impaired at 3 months (F [1, 75] = 32.74, $P < .001$) and at 12 months (F [1, 75] = 5.33, $P = .024$) compared with before surgery. **B** Maximum active flexion of isolated finger joints (MCP, PIP, and DIP) at different time points. PIP joint flexion still impaired at 12 months (F [1, 76] = 4.99, $P = .028$). Number of patients at each time point: before surgery (n = 90), 3 months (n = 86), 6 months (n = 84), and 12 months after surgery (n = 82). F, value for the contrast analysis (degrees of freedom). Data presented as mean degrees and 95% CI.

FIGURE 4: Total active ROM in the whole finger at different time points. Number of patients at each time point: before surgery (n = 90), 3 months (n = 86), 6 months (n = 84), and 12 months after surgery (n = 82). Data presented as mean degrees and 95% CI.

The regional ethical review board in Linköping, Sweden, approved the study.

RESULTS

ROM, sensibility, scar pliability

Figures 2 to 4 show ROM outcomes. The TAE deficit reduction was significant at 3 months and remained stable over time. Total finger flexion was significantly impaired at 3 months and was still slightly impaired at 12 months compared with before surgery. At 12 months, flexion in the MCP joint had recovered but PIP joint flexion still was slightly impaired. Number of operated fingers did not affect ROM outcome, that is, ROM did not differ between subgroups, and the course of change over time in ROM was similar for both groups. Eighty-seven percent of the patients reached a functional ROM ($\geq 165°$) at 12 months, whereas no patient reached normal ROM ($\geq 290°$). Sensibility was unchanged over time and did not differ between subgroups (Fig. 5). Patients with surgery on multiple fingers had an increased risk of having worse scar pliability (firm, ropes, or contracture) (Table 3).

Expectations, recovery, and satisfaction with hand function

No difference was seen between expectations from before surgery and self-reported recovery at 12 months ($P = .077$). Self-reported recovery of hand function improved until 6 months ($P < .001$) with no further changes to 12 months (Table 3). The subgroups did not differ in expectations, recovery, or satisfaction with hand function.

and compared them with Wilcoxon signed rank test. For ROM, the DASH, and EQ-5D, we used a 1-way full-factorial repeated measures analysis of variance with surgery on 1 or multiple fingers as a between-subjects factor (Appendix C, available on the *Journal*'s Web site at www.jhandsurg.org). In addition, we performed a single-contrast analysis using the preoperative measure as a reference. For nonparametric variables, we used the Friedman test and Wilcoxon signed rank test with Bonferroni correction for identifying differences between follow-up occasions and the Kruskal Wallis Test for analysis of differences between subgroups. We calculated the relative risk (risk-ratio) for having scar pliability rated as firm, ropes, or contracture depending on the number of operated fingers. We considered a P of .05 or less as significant.
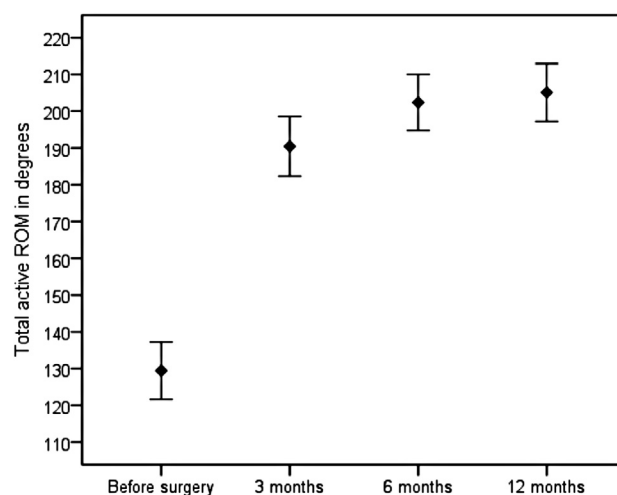
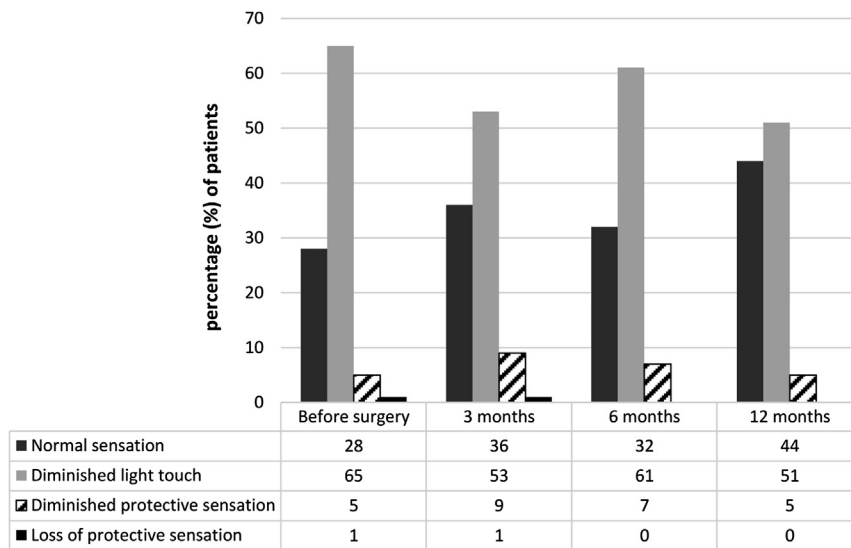|	Before surgery	3 months	6 months	12 months
■ Normal sensation	28	36	32	44
■ Diminished light touch	65	53	61	51
▨ Diminished protective sensation	5	9	7	5
■ Loss of protective sensation	1	1	0	0

FIGURE 5: Outcomes on sensibility measured with Semmes-Weinstein monofilament for the whole group at different time points (n = 7) (P = .056). Data presented as proportions (percentage) of patients with normal sensation, diminished light touch, diminished protective sensation, or loss of protective sensation.

TABLE 3.   Outcomes on Rating of Scar Pliability (Firm, Ropes, or Contracture); Patients Reaching a Functional ROM; and Self-Reported Outcomes on Expectations, Recovery, and Satisfaction With Hand Function for Patients Attending All Follow-Ups (n = 77)*

	Before Surgery	3 Mo	6 Mo	12 Mo
Scar pliability rated as firm, ropes, or contractures				
1 operated finger (n = 57), %		28	18	5
Multiple operated fingers (n = 20), %		50	40	25
Risk ratio, 95% CI		1.78	2.28[†]	4.75[†]
		0.97−3.26	1.05−4.96	1.25−18.1
Functional ROM (n = 77)				
Patients reaching ≥ 165° ROM, %	20	81	84	87
Expectations before surgery (n = 74)				
Expect hand function to be "fully recovered," %	43			
Expect hand function to be "much better," %	51			
Self-reported recovery of hand function (n = 74)				
Hand function "fully recovered," %		18	32	37
Hand function "much better," %		60	60	50
Satisfaction with present hand function (n = 75)				
"Delighted" or "pleased" with current hand function, %	4	65[‡]	73[§]	81

*Data are presented as proportions (%) and for scar pliability as risk ratio and 95% CI.
†Significant increased risk of worse scar pliability for patients with surgery on several fingers, P < .05.
‡Significant difference compared with before surgery, P ≤ .05.
§Significant difference compared with 3-month follow-up, P < .05.

Disability and quality of life

Patients with multiple operated fingers had significantly higher DASH scores before surgery and on all follow-up occasions with no interaction effect in change over time between the DASH and number of operated fingers (Fig. 6). There was no interaction effect between number of operated fingers and the EQVAS whereas the EQ-5D index showed temporarily lower scores at 3 and 6 months for patients with surgery on multiple fingers (Table 4).
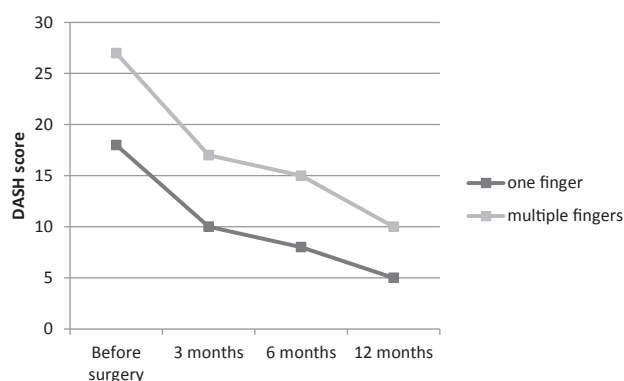
FIGURE 6: Outcomes on DASH score for subgroups consisting of patients with 1 operated finger (n = 53) and multiple operated fingers (n = 17) (P < .05). Data presented as mean DASH score. Rating scale: 0 = no disability; 100 = severest disability.

Before surgery, safety issues of hand function were a significantly larger problem than social issues but ratings on all 5 questions improved over time (Fig. 7). Before surgery, patients scheduled for surgery on multiple fingers had significantly worse scores on "need to take special precautions due to hand function" and "fear of hurting the hand" (P ≤ .029); at 12 months, this was still the case on "need to take special precautions due to hand function" (P = .028). Physical activity habits were unchanged over time (P = .074) with the majority performing light or moderate physical exercise.

DISCUSSION

The present study showed that the TAE deficit decreased after fasciectomy and hand therapy and recovery of finger flexion continued for at least 12 months with the PIP joint recovering more slowly. The majority of the patients had their expectations for recovery of hand function met and were satisfied with their hand function at 12 months. At that time, the majority of the patients had reached a functional but not normal ROM. Fear of hurting the hand and worry about not trusting the hand function were of greater concern than other safety or social issues. The DASH and EQVAS improved over time, and the scores at 12 months were close to those in the general population.

The improvement in TAE deficit during the first year after surgery and hand therapy was in line with previous research.[10] The present study confirmed our assumption of a negative effect on active finger flexion. We did not measure passive ROM, which could have helped to differentiate between contracture and motion lag. However, from the patients' view, the compromised function is what matters

regardless of its cause.[12] At 12 months, the majority had regained sufficient flexion to allow a functional ROM, that is, exceeding 165°. Reaching full ROM might not be a reasonable goal after surgery; instead, the overall goal should be to reach a level of improvement that allows for acceptable hand function. An important feature of hand function is the combination of strength, stability, sensibility, and ROM.[39] We did not assess strength or restrictions in abduction/adduction due to difficulties with baseline measurement associated with severe contractures.

We assumed that there would be a negative effect on sensibility,[17] but the present study did not confirm this. The proportion of patients with diminished protective sensation was lower than previously reported data.[17,40] Before surgery and at 12 months, the majority of the patients had diminished light touch, which might not have a functional impact and can be unnoticed by the individual.[29] Further, the ability to detect monofilament 2.83 (normal sensibility) may be lost owing to aging.[40]

To determine whether the patient reached an acceptable level of hand function, it is important to look beyond traditional measures of hand function (eg, ROM, sensation) and to include the patient's perspective. In the present study, a majority of the patients rated their hand function as much better or fully recovered at 6 months. Although not all patients had regained finger flexion at that time, we found no further improvement in self-reported recovery of hand function after 6 months. Previous research has associated satisfaction with fulfillment of expectations,[41] and in the present study, most patients had their expectations fulfilled. However, the patients with previous experience of hand surgery might have an a priori understanding that influenced their expectations and satisfaction. Patients can also have other influencing previous experiences (eg, through others or Internet). This was not investigated specifically because it was beyond the scope of the present study. The questions regarding safety and social issues of hand function represent emotional aspects, and the effect showed in this study with reduced fear or worry about using the hand is an important aspect of attaining an acceptable hand function.

When multiple digits are involved, natatory cords commonly influence the adjacent digit. This can be 1 explanation for the higher DASH scores among patients with surgery on multiple fingers. The DASH scores showed a parallel decrease between patients with surgery on 1 or multiple fingers, where the latter reached the level of a clinical important change.[42,43] Patients with surgery on 1 finger had low baseline

TABLE 4. Outcomes on Disability (DASH Score) and Quality of Life (EQ-5D) for Patients Attending All Follow-Up Occasions*

	Preoperative	3 Mo	6 Mo	12 Mo
DASH score (n = 70)	20 (17−23)	12 (9−15)[†]	9 (7−12)[†]	7 (5−8)[†]
1 operated finger (n = 53)	18 (15−22)[‡]	10 (6−13)[‡]	8 (5−10)[‡]	5 (3−8)[‡]
Multiple operated fingers (n = 17)	27 (21−33)	17 (11−23)	15 (10−20)	10 (6−14)
EQ-5D index (n = 68)	0.82 (0.79−0.85)	0.88 (0.84−0.91)	0.87 (0.84−0.90)	0.91 (0.88−0.95)
1 operated finger (n = 52)	0.81 (0.78−0.85)	0.89 (0.85−0.94)	0.89 (0.85−0.92)	0.93 (0.89−0.97)[‡]
Multiple operated fingers (n = 16)	0.85 (0.79−0.91)	0.82 (0.75−0.90)	0.82 (0.76−0.88)	0.85 (0.78−0.92)
EQVAS (n = 67)	80 (76−83)	80 (76−84)	83 (79−87)	84 (80−88)[†]

Rating scales: DASH score, 0 = no disability; 100 = severest disability. EQ-5D index, 1 = full health; −0.594 = worst imaginable health state. EQVAS, 100 = best imaginable health state; 0 = worst imaginable health state.
*The DASH score, EQ-5D index, and EQVAS are presented as mean (95% CI).
†Significant difference compared with before surgery, $P < .05$.
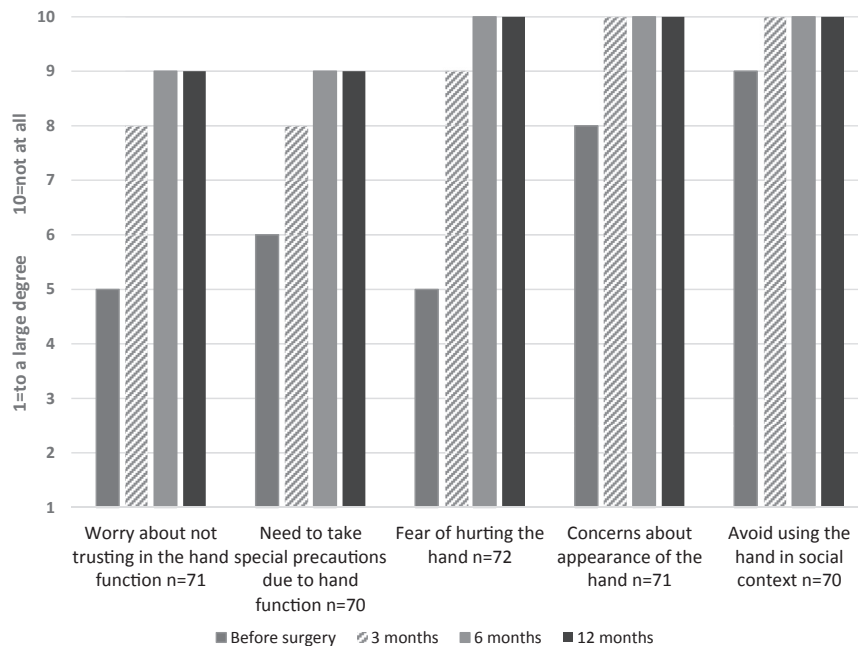‡Significant difference between subgroups, $P < .05$.

FIGURE 7: Outcomes on safety and social issues of hand function for patients attending all follow-ups ($P < .001$). Data presented as median scores for the whole group. Rating scale: 1 = to a large degree; 10 = not at all.

scores that were within the range of the normal value of DASH score,[44] indicating that the DASH is not sensitive enough because a ceiling effect occurs and it might underestimate their disability. The EQVAS improved over time, but the levels of the EQVAS and index were consistently high and in line with values in the general Swedish population.[45]

Our study had several limitations. There was diversity in the study sample due to the inclusion criteria. An extension deficit of a single PIP joint might adversely influence hand function differently than the same cumulative amount of contracture in

3 joints.[19] Further, we did not consider severity or location of the preoperative contracture, and having contracture only in the MCP joint might lead to faster recovery or a better outcome. Likewise, we could not make conclusion about how release of the volar plate of the PIP joint influenced the outcome. Although Misra et al[46] showed no impact of PIP joint release on the outcome, these patients might have had a worse prognosis. The present study did not have enough power for considering these aspects in the analysis. The use of the scar pliability subscale was another potential weakness owing to the subjective assessment

of the scar.[47,48] It could be difficult to differentiate between contractures associated with wound healing versus residual/progression of the disease. To increase reliability, the rating scale had a short statement giving guidance, and the rating OTs discussed the rating scale before the study started. We created the questions about safety and social issues, and although they have not been used before, they cover aspects shown to be important for patients with DD.[49]

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APPENDIX A. Outcomes in ROM for Patients Attending All Follow-Up Occasions (n = 77), Presented as Mean Degrees (m), SD, and 95% CI

	Before Surgery	3 Mo	6 Mo	12 Mo
MCP* extension, m (SD), 95% CI	51 (25) 45−57	7 (9)* 5−9	5 (8)* 3−7	5 (9)* 3−7
PIP* extension, m (SD), 95% CI	52 (25) 46−57	22 (15)* 19−25	21 (16)* 18−25	22 (18)* 17−26
DIP* extension, m (SD), 95% CI	8 (14) 4−11	2 (7)* 1−4	2 (7)* 1−4	4 (8)* 2−6
TAE deficit, m (SD), 95% CI	110 (31) 103−117	31 (19)* 27−36	29 (20)* 25−34	30 (24)* 25−36
MCP flexion, m (SD), 95% CI	90 (7) 88−91	84 (8)* 82−86	87 (7)* 86−89	89 (8) 87−91
PIP flexion, m (SD), 95% CI	94 (8) 92−96	85 (10)* 83−87	89 (9)* 87−91	92 (10)* 90−94
DIP flexion, m (SD), 95% CI	56 (14) 53−59	53 (15) 49−56	54 (16) 50−57	55 (16) 51−58
TAF, m (SD), 95% CI	240 (15) 236−243	222 (26)* 216−228	230 (23)* 225−235	235 (22)* 230−240
Total ROM, m (SD), 95% CI	129 (34) 122−137	190 (38)* 182−199	201 (36)* 193−210	205 (36)* 197−213

*Significant differences compared with preoperative, $P \leq .05$.

APPENDIX B. Outcomes on Safety and Social Issues for Patients Attending All Follow-Up Occasions, Presented as Median (md) and Interquartile Range (Iqr)

	Preoperative	3 Mo	6 Mo	12 Mo
Worry about not trusting the hand function, md (Iqr), (n = 71)	5 (3−7)	8 (6−10)*	9 (8−10)*	9 (7−10)*
Need to take special precautions due to hand function, md (Iqr), (n = 70)	6 (4−8)	8 (5−10)*	9 (8−10)*	9 (7−10)*
Fear of hurting the hand, md (Iqr), (n = 72)	5 (4−8)	9 (7−10)*	10 (8−10)*	10 (8−10)*
Concerns about the appearance of the hand, md (Iqr), (n = 71)	8 (5−9)	10 (10−10)*	10 (10−10)*	10 (10−10)*
Avoidance of using of the hand in social contexts, md (Iqr), (n = 70)	9 (5−10)	10 (10−10)*	10 (10−10)*	10 (10−10)*

Rating scale: 1 = to a large degree; 10 = not at all.
  *Significant difference compared with before surgery, $P < .05$.

APPENDIX C. **Model Summary of the Main Effect of Repeated Measures Analysis of Variance and Interaction Effect Between Number of Operated Fingers and Change From Before Surgery to Each Follow-Up Occasion in ROM Outcomes (n = 77), DASH (n = 70), EQVAS (n = 67) and EQ-5D Index (n = 68)**

	df 1*	df2*	F	P	Partial $\eta^{2\dagger}$
TAE deficit	1.58	118.51	425.26	.000	.850
Interaction effect of number of operated fingers	1.58	118.51	1.51	.227	.020
MCP extension	1.20	91.23	258.35	.000	.773
PIP extension	1.39	105.37	144.48	.000	.655
DIP extension	1.71	129.87	12.90	.000	.145
TAF	1.89	141.85	22.54	.000	.231
Interaction effect of number of operated fingers	1.89	141.85	1.20	.302	.016
MCP flexion	2.01	152.68	22.34	.000	.227
PIP flexion	2.06	156.55	39.76	.000	.343
DIP flexion	1.92	145.70	2.05	.134	.026
Total ROM	1.75	131.06	170.58	.000	.695
Interaction effect of number of operated fingers	1.75	131.06	0.312	.703	.004
DASH	2.16	146.89	32.75	.000	.325
Interaction effect of number of operated fingers	2.16	146.89	0.66	.531	.010
EQ-5D index	2.72	179.69	2.45	.071	.036
Interaction effect of number of operated fingers	2.72	179.69	2.81	.046	.041
EQVAS	2.53	164.49	3.44	.024	.050
Interaction effect of number of operated fingers	2.53	164.49	0.16	.897	.002

*Degrees of freedom with Greenhouse-Geisser correction.
†Partial η^2, effect size ranging from minimum = 0 to maximum = 1.