

# THE EFFECT OF THE SEVERITY OF THE DUPUYTREN'S CONTRACTURE ON THE FUNCTION OF THE HAND BEFORE AND AFTER SURGERY

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**This study investigated the effect on the power and function of the hand of loss of finger(s) extension, number of fingers involved and the patient's age in Dupuytren's disease and the influence of improvement of finger extension and the patient's age on these variables after surgery. Median values at presentation included total loss of extension 80°, total grip strength 41 kg and DASH score 54. Twelve months postoperatively, the median value of total loss of extension decreased to 10° and the DASH score to 32 (both significant improvements). Grip strength decreased slightly to 40 kg. The severity of the contracture had no significant effect on function but had a significant negative effect on power. The number of fingers involved affected neither function nor power. The age of the patient did not influence function of the hand. However, older patients experienced less functional benefit from surgery. The improvement of finger extension following surgery had significant beneficial effect on function, but no effect on power.**

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Dupuytren's contracture causes deformation of the hand by contracture of, mostly, the ulnar fingers. It seems likely that such a deformity would lead to decrease of the dexterity and the power of the hand, because of difficulties in grasping objects, and that surgery to release finger contractures would improve both power and dexterity. To date, only two studies have examined the functional benefit of surgery for Dupuytren's contracture (Sinha et al., 2002; Skoff, 2004). Both groups of authors noted a significant correlation between the improvement of deformity after surgery and the dexterity of the hand, as assessed by the Sollerman test (Sinha et al., 2002) and by the DASH questionnaire (Skoff, 2004). Sinha et al. (2002) also noted significant correlation between degree of the deformity preoperatively and loss of dexterity of the hand.

This study investigated the effect on the power and function of the hand of loss of finger(s) extension, number of fingers involved and the patient's age in Dupuytren's disease, and the influence of improvement of finger extension and the patient's age on these variables after surgery.

## PATIENTS AND METHODS

Between September 2003 and May 2004, a total of 74 patients with Dupuytren's contracture were enrolled into this study. Twenty patients (27%) failed to attend 12 month follow-up. The data from the remaining 54 patients were analysed. They included 49 men (91%) and 5 women (9%) with a mean age of 60 (range 32–83) years. All patients underwent subtotal fasciectomy of all

contracted fingers. Thirty-seven patients (69%) had surgery to the right hand and 17 (31%) had surgery to the left hand. Nineteen patients had bilateral contractures, but, during this study, had surgery to only one: the more severely affected hand. The previous duration of the disease was a mean of 5 years (range 6 months to 20 years). Three patients (6%) had four fingers involved, 15 (28%) had three fingers involved, 17 (31%) had two fingers involved and 17 (31%) had one finger involved. Two patients had no contracture, but thickening and nodules of the palmar fascia. They were included because of complaints of pain on grasping the objects. No patient had a history of epilepsy or alcohol abuse. Four patients (7%) were diabetics.

Patients were assessed before operation using a standard protocol:

- Loss of extension at each joint of each involved finger was measured with a goniometer and the totals for the three joints summated. A total loss of extension (TLE) of all affected fingers was calculated by adding the extension deficits of all involved fingers.
- The power of the hand was assessed by measurement of grip strength with a Jamar dynamometer (Data-Link Biometrics, Gwent, UK).
- All patients completed the DASH questionnaire to assess the function of the hand. We employed the classical version of the DASH (Hudak et al., 1996) which consists of 30 items, each one rated from 1 to 5 points. The results of the DASH scores in this version range from 30 (normal function) to 150 (total disability).



Operations were performed under brachial block anaesthesia and tourniquet control. All patients underwent a subtotal fasciectomy through palmar and finger zigzag and curved incisions. Patients were discharged on the day after the surgery. Patients were followed up at 1, 3 and 12 months after surgery and the above measurements repeated on each occasion. For the purpose of this study, the preoperative data and that at 12 months were analysed.

The results were statistically verified using Spearman rank correlation and Kruskal–Wallis rank tests. The differences between variables in pre- and post-operative assessments were verified with the Wilcoxon test. A value of  $P < 0.05$  was considered statistically significant.

## RESULTS

### Analysis of pre-operative correlations

Table 1 presents pre-operative parameters in relation to the number of fingers involved by disease. There was a statistically significant correlation between the total loss of extension of the involved fingers and loss of power of the hand, assessed by grip strength measurement (Spearman test  $P < 0.05$ ,  $r = -0.34$ ). However, analysis of the effect of the degree of pre-operative total loss of extension of the involved fingers on the function of the hand, as assessed by the DASH score, showed no statistically significant correlation between these variables (Spearman test  $P > 0.05$ ,  $r = 0.26$ ). There was no statistically significant correlation between the number of involved fingers and either the function, as assessed by the DASH score ( $P > 0.63$ ), or the power of the hand, assessed by grip strength measurement ( $P > 0.32$ ), on analysis by the Kruskal–Wallis rank correlation test. There was no statistically significant correlation between the age of the patient and the function of the hand, as assessed by the DASH score ( $P > 0.05$ ,  $r = -0.26$ ), pre-operatively on analysis by the Spearman test. We did not analyse the relationship between the age of the patient and the power of the affected hand.

### Analysis of postoperative correlations

Table 2 presents changes of the parameters analysed at 12 months after surgery. A significant improvement of the extension of the fingers was noted, with a median pre-operative total loss of extension of the involved fingers of  $80^\circ$  improving to  $10^\circ$  at 12 months after surgery (Wilcoxon test,  $P < 0.05$ ). There was a slight, but not significant ( $P > 0.1$ ), weakening of the power of the hand from a grip strength of 41 kg pre-operatively to 40 kg at 12 months after surgery. There was a statistically significant improvement of the function of the hand, with an improvement of the DASH score from 54 to 32 (Wilcoxon test,  $P < 0.05$ ). There was a statistically significant correlation between the age of the patient and the functional improvement, as assessed by the DASH score, 12 months after surgery (Spearman test  $P < 0.05$ ,  $r = -0.30$ ), with older patients reporting only a minor improvement of function as compared to the degree of improvement in younger patients.

## DISCUSSION

In this study, we attempted to answer the question “Does surgery for Dupuytren’s contracture have a significant beneficial effect on function of the hand?”. We evaluated both objective (loss of extension and grip strength) and subjective (DASH questionnaire) parameters before and after surgery. This methodology allowed us to obtain reliable and reproducible data which may be compared to previous studies and is reproducible in other studies.

Similar methodology has only been used in two previous trials. Sinha et al. (2002) analysed the results of surgical treatment of 42 patients with Dupuytren’s contracture. The total degree of the deformity was assessed by total loss of extension, as in our study, and the function of the hand was assessed with the Sollerman test (Sollerman and Ejeskar, 1995) which includes 20 items, each one rating from 0 to 4 points. The results of the Sollerman scores range from 0 (total disability) to 80 (normal function). These authors noted a significant

**Table 1—Pre-operative characteristics of the group, with division into subgroups according to the number of involved fingers**

Number of involved fingers	n	Total loss of finger extension (Degrees)		Total grip strength (kg)		DASH score	
		Median	Range	Median	Range	Median	Range
0 fingers	2	0		49	13–74	44	42–47
1 finger	17	45	10–60	44	12–57	57	30–103
2 fingers	17	75	15–185	43	15–56	49	32–84
3 fingers	15	145	50–310	35	13–52	52	34–99
4 fingers	3	245	180–370	31	28–40	60	45–101
Total	54	80	0–370	41	12–74	54	30–103



**Table 2—Changes of analysed parameters at 12 months follow-up**

<i>Parameter analysed</i>	<i>Changes of analysed parameters at 12 months follow-up</i>			
	<i>Pre-operatively</i>		<i>Assessment at 12 months</i>	
	<i>Median</i>	<i>Range</i>	<i>Median</i>	<i>Range</i>
Total loss of extension <sup>1</sup> (Degrees)	80	0–370	10*	0–300
Grip strength (kg)	41	12–74	40	6–73
DASH score	54	30–103	32*	30–104

\*Statistically significant changes (Wilcoxon test  $P < 0.05$ ).

<sup>1</sup>Total loss of extension of all affected fingers is a sum of the deficits of full extension in all involved fingers.

correlation between the preoperative deformity and loss of hand function. They also noted a statistically significant reduction of the total deformity from 81° pre-operatively to 32° at 6 month follow-up. This correlated with a statistically significant improvement of overall hand function, expressed in the Sollerman score changing from 71 points pre-operatively to 77 points, at 6 month follow-up.

Skoff (2004) reported the results of treatment of 30 patients by two different methods, viz. the open palm technique and the “synthesis” technique. This method consisted in selective fasciectomy followed by closure of the wound in the finger using a radially based full-thickness skin flap advanced distally. The defect at the base of the finger was left open for 4 days, and then was covered by full-thickness skin graft. The degree of the deformity was assessed for individual joints and the function of the hand was assessed using the DASH questionnaire. This author noted a significant reduction of the mean contracture of the metacarpophalangeal joints from 50°/57° (method one/method two) pre-operatively to 0° at 3.5 years and the proximal interphalangeal joints from 40°/58° (method one/method two) pre-operatively to 6°/10° at 3.5 years. This correction of the deformity of the fingers correlated with improvement in function of the hand, as expressed in DASH scores, which decreased from a mean of 37 points pre-operatively to a mean of 30 points at 3.5 years.

Contrary to the findings of Sinha et al. (2002), our study failed to show that the overall function of the hand, as assessed subjectively by the DASH score system, is affected significantly by the degree of total loss of extension of the affected fingers. These authors reported significant negative correlation between severity of the pre-operative deformity and dexterity of the hand, as measured by the Sollerman score, and concluded that a greater degree of deformity is associated with poorer function of the hand. In our opinion, as progression of the contracture is relatively slow, patients may adapt to their deformity and experience little subjective feeling of functional worsening of hand function. However, there was an improvement in function of the hand 12 months after surgery, which is presumed to be associated with the

improvement of the extension of the fingers as a result of surgery. Our results are, broadly, in agreement with those of Sinha et al. (2002) in respect of the effectiveness of surgery in improving hand function subjectively.

In our study, the power of the hand was reduced significantly as the degree of total loss of extension of the affected fingers increased. This was as expected, because patients with more severe deformity, largely of the ulnar fingers, would be expected to experience more difficulties in grasping objects with the affected hand. We would have expected this to be reversed by surgical correction of the deformity, but median value of grip strength was slightly worse 12 months after surgery. This can be explained by the effect of extensor tethering, which affects most of these patients significantly in the first few months (Kulkarni et al., 2006). Many do not have full roll-up of both the operated fingers and the adjacent fingers, even at 12 months.

An analysis of the effect of the number of fingers involved by Dupuytren’s contracture and the power and function of the hand failed to display any correlation between these parameters. This was not because patients with more involved fingers had less deformity in each affected finger, as the mean value of total lack of extension per finger was 66°, 44°, 37° and 45°, respectively, with four, three, two and one finger involvement. This finding suggests that patients with Dupuytren’s contracture experience similar limitations of function of the hand in daily living, regardless of the number of involved fingers.

The age of the patient’s hand had no influence on the subjective assessment of the function of the hand pre-operatively, but, at 1 year after surgery, older patients experienced less improvement in the function of the hand than younger persons. This finding is difficult to explain and has not been noted previously in the literature. This may reflect the poor response of the older hand to surgery. If so, it would point to the need for use of smaller operations, such as fasciotomy or segmental fasciectomy, in the older patient. Unfortunately, we did not analyse the relationship between age of the patient and power of the hand.

In conclusion, our study showed that severity of the contracture before surgery had no effect on function of



the hand but affected the power of the hand significantly. Surgery had a significant beneficial effect on function of the hand, as assessed subjectively by the DASH system. It is assumed that this effect on hand function is due to the increase of extension of the fingers achieved by surgery. However, it did not increase the power of the hand. The number of fingers involved before surgery affected neither hand function nor power. The age of the patients did not influence subjective assessment of the function of the hand before surgery. Older patients experienced less functional benefit from this operation than younger patients.

## References

- Hudak PL, Amadio PC, Bombardier C, Upper Extremity Collaborative Group (1996). Development of an upper extremity outcome measure: the DASH (disabilities of the arm, shoulder and hand). *American Journal of Industrial Medicine*, 29: 602–608.
- Kulkarni M, Harris SB, Elliot D (2006). The significance of extensor tendon tethering and dorsal joint capsule tightening after injury to the hand. *Journal of Hand Surgery*, 31B: 52–60.
- Sinha R, Cresswell TR, Mason R, Chakrabarti I (2002). Functional benefit of Dupuytren's surgery. *Journal of Hand Surgery*, 27B: 378–381.
- Skoff HD (2004). The surgical treatment of Dupuytren's contracture: a synthesis of techniques. *Plastic and Reconstructive Surgery*, 113: 540–544.
- Sollerman C, Ejeskar A (1995). Sollerman hand function test. *Scandinavian Journal of Plastic Reconstructive Hand Surgery*, 29: 167–176.

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