RESULTS AFTER SURGERY FOR SEVERE DUPUYTREN'S CONTRACTURE: DOES A DYNAMIC EXTENSION SPLINT INFLUENCE OUTCOME?

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Abstract. Seventy-six consecutive patients were operated on for advanced Dupuytren's contracture and the results evaluated after nine months with special reference to the use of a dynamic extension splint. The patients were separated into three groups: those in whom the splint was used according to our guidelines ($n = 15$); those in whom the splint was used, but inadequately ($n = 15$); and those who did not require splinting ($n = 24$). Our results nine months postoperatively were similar to those of other studies in showing that the fifth proximal interphalangeal joint constituted the greatest problem. Comparison of the three groups indicated that splinting the way we used it did not influence the natural course of the disease after operation.

Key words: Dupuytren's contracture, outcome, extension splint.

Operative correction of severe Dupuytren's contracture, particularly of the proximal interphalangeal (PIP) joint has been considered relatively disappointing (5, 14–16), and even in cases with an optimal operative correction of the contracture, it is likely that as much as 50% of the improvement in extension will be lost (8, 11, 16). A number of traction or extension techniques and splinting programmes has been developed to try and improve this, including dynamic splinting (1, 2, 4, 9, 13, 14). These techniques can be used as an adjunct to operation when the contraction deformity is stretched before operation to facilitate the dissection (1, 4, 13). Others use postoperative dynamic extension splinting (2, 14).

The object of this study was to find out if dynamic extension splinting postoperatively has any influence on the outcome in terms of recurrence of the contracture in the PIP joint and the metacarpophalangeal (MP) joints of the little finger.

PATIENTS AND METHODS

Seventy-six consecutive patients with advanced Dupuytren's contracture (two or more rays affected either primarily or recurrent) were operated on during the period September to December 1994. All were treated as day cases (6). Sixty-nine (91%) of the patients were available for follow-up nine months postoperatively. The operation was done using the open palm technique and radical fasciectomy of the affected rays. When needed: palmar capsulectomy of interphalangeal joints ($n = 27$) and in some cases temporary joint fixation with a K-wire ($n = 3$) or other additional surgical procedures i.e. skin graft, extensor tendonplasty, pulley reconstruction ($n = 11$). Postoperatively the patients were seen in the outpatient clinic on the first postoperative day and about five times during the following three weeks.

The dynamic extension splint was indicated when there was a tendency to rapid recurrence or insufficient operative correction with about 25° of residual contracture. The splint was constructed and applied by the hand therapists during the second or third postoperative week. The plastic splint (Fig. 1) was designed individually using a direct imprint of the hand, and the extension force was created by rubber-bands. This device affects both PIP and MP joints. The extension force is about 200 g. The degree of contracture was recorded when the splint was applied. The patients were given standard information and were specifically recommended to use the splint every night for at least six months. At the follow-up nine months postoperatively, the degree of contracture of each joint was recorded and classified as described by McFarlane (12), and the patients answered a questionnaire about the use of the splint.

Our guideline for adequate use of the splint was daily use for at least three months. Use for a shorter period or less often than daily was classified as inadequate use.

We were particularly interested in the fifth PIP joint, because other studies (5, 14–16) including our own have indicated that these joints are problematic,
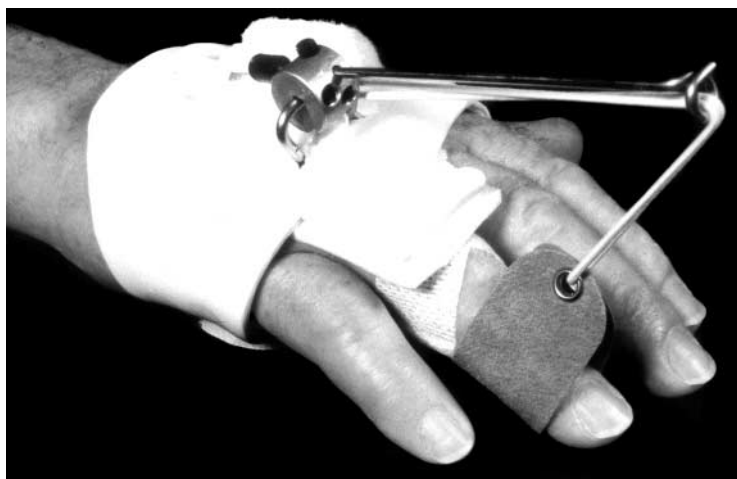
Fig. 1. The dynamic extension splint.

while treatment of MP joint contractures is far more effective.

Changes in extension from the time that the splint was delivered (second to third week postoperatively) to the nine-month follow-up were classified in five groups:

Same = change of 10° or less during the stated period; increase of 10° to 40° in the contracture; increase of more than 40° in the contracture; reduction of 10° to 40° in the contracture; and reduction of more than 40° in the contracture.

Changes of less than 10° were considered as possible measurement inaccuracy.

This outcome classification was correlated with the three groups: adequate use of the splint, inadequate use of the splint, and no splint.

Statistics

The significance of differences was assessed by the non-parametric Mann-Whitney *U*-test, and probabilities of less than 0.05 were accepted as significant.

RESULTS

Tables I and II show the nine months follow-up after operation for advanced Dupuytren's contracture in the primary and recurrent groups. Tables III and IV show the progress of the fifth PIP joint during the period under study (three weeks to nine months postoperatively) for the primary and the recurrent groups. Tables V and VI show the progress of the fifth MP joint.

Table VII shows the correlation between the use of the splint and the outcome as regards the fifth PIP and MP joints for the total series (nine months compared with two to three weeks postoperatively). There were no significant difference between the three groups, but the tendency was that joints were managed better without a splint.

DISCUSSION

As mentioned by Honner et al. (10) the clinical description of Dupuytren's contracture is complex because the condition may involve five

Table I. *Results of operation for advanced primary Dupuytren's contracture of the fifth, fourth, and third fingers, 9 months compared with preoperatively*

Data are expressed as number of patients.

Finger	MP joint ($n = 88$)			PIP joints ($n = 82$)		
	Perfect*	Improved	Same/worse	Perfect*	Improved	Same/worse
Third	6	4	0	12	0	1
Fourth	34	3	1	13	14	4
Fifth	30	8	2	8	26	4

* No residual contracture.

Table II. *Results of operation for advanced recurrent Dupuytren's contracture of the fifth, fourth, and third fingers, 9 months compared with preoperatively*

Data are expressed as number of patients.

Finger	MP joint (n = 23)			PIP joints (n = 25)		
	Perfect*	Improved	Same/worse	Perfect*	Improved	Same/worse
Third	2	0	0	0	2	1
Fourth	5	0	4	4	4	1
Fifth	8	2	2	0	10	3

* No residual contracture.

Table III. *Evolution of contracture of PIP joint of the fifth finger (mean (SD)°) in primary Dupuytren's contracture*

Time of measurement	No splint (n = 19)	Use of splint	
		Adequate (n = 11)	Not adequate (n = 7)
Preoperatively	63	56	76
At the end of the operation	5	4	15
Postoperatively:			
3 weeks	12	26	31
9 months	23	46	44

Table IV. *Evolution of contracture of PIP joint of the fifth finger (mean (SD)°) in recurrent Dupuytren's contracture*

Time of measurement	No splint (n = 4)	Use of splint	
		Adequate (n = 3)	Not adequate (n = 8)
Preoperatively	70	65	89
At the end of the operation	1	15	27
Postoperatively:			
3 weeks	4	19	42
9 months	17	41	65

Table V. *Evolution of contracture of MP joint of the fifth finger (mean (SD)°) in primary Dupuytren's contracture*

Time of measurement	No splint (n = 19)	Use of splint	
		Adequate (n = 11)	Not adequate (n = 7)
Preoperatively	50	55	56
At the end of the operation	0	1	3
Postoperatively:			
3 weeks	0	5	8
9 months	3	20	8

Table VI. *Evolution of contracture of MP joint of the fifth finger (mean (SD)°) in recurrent Dupuytren's contracture*

| | | Use of splint | |
Time of measurement	No splint (n = 4)	Adequate (n = 3)	Not adequate (n = 8)
Preoperatively	23	50	48
At the end of the operation	0	17	0
Postoperatively:			
3 weeks	0	40	14
9 months	0	50	17

digits in each hand, each with several joints liable to contract. Consequently, assessment of the results after operation is both complex and difficult. A number of authors have developed classification systems (3, 10, 12, 17). Other use percentage improvement over time (14). In the present study we used two different systems; we first applied the McFarlane system which describes relief of contracture in each joint/finger, to present the overall results for the primary and recurrent groups. His study (12) included about 1200 patients, and we consider his figures to be an acceptable standard. It should, however, be emphasised that we did not include simple cases in our series, but our results still correspond with McFarlane's. It should also be mentioned that the patients in the present study were evaluated nine months after operation, which could be classed as relatively early. However, the study by Rives et al. (14) showed that patients seem to achieve a steady state as early as six to nine months after operation.

The other system used in the present study was constructed by us to assess the development of the contractures in one finger—the fifth finger—for a specific period, which was from three weeks to nine months postoperatively.

The use of splinting in Dupuytrens's contracture is controversial. The study by Brandes et al. (4) leaves no doubt that the palmar fascia reacts to external extension forces with formation of new tissue and reorientation of all tissue components by myofibroblasts. It was particular interesting for us to note that the persistence of myofibroblasts after elongation justified the supposition that the fascia will be reduced in length again after relief of the extension force. Messina and Messina (13) found that the

Table VII. *Relation between use of the splint and postoperative evolution of contracture in the PIP and MP joints of the fifth finger at 9 months compared with 3 weeks postoperatively*

Data are expressed as number of patients.

| | MP joint | | | PIP joint | | |
Contracture	Adequate splinting (n = 14)	Inadequate splinting (n = 15)	No splint (n = 23)	Adequate splinting (n = 15)	Inadequate splinting (n = 15)	No splint (n = 24)
Same (within 10°)	8	9	19	3	5	11
Increased:						
10°–40°	2	3	3	10	7	9
<40°	3	1	0	2	2	2
Decreased:						
10°–40°	1	0	1	0	1	2
<40°	0	2	0	0	0	0

contracture recurred within 10 days in about 60% of the patients treated.

Beard and Trail (2) used a "S" Quattro (7) for postoperative extension for two weeks followed by a simple (night) extension splint for six months. They reported improvement of the initial correction in 17 of 18 fingers. Meanwhile significant recurrence occurred in eight within one year, and only five maintained improved function.

Rives et al. (14) found that six months of dynamic extension splinting could actually influence the outcome: a mean improvement of 44% in the PIP joint was noted in patients who complied with the postoperative dynamic extension splinting programme, compared with a 25% improvement in a non-compliant group. There were no general guidelines to indicate for how long or how regularly the patients must use a postoperative splint to ensure a proper result, and we know from daily practice that the use of a splint is often inconvenient for patients. In our series a dynamic extension splint was used in about half the cases. The longitudinal studies (preoperatively, operatively, and three weeks and nine months postoperatively) of the fifth PIP and MP joints have shown with a few exceptions that there is an important reduction of contracture peroperatively for both joints. The immediate surgical result and what happens during the early postoperative period (one to three weeks) seem to have an important influence on the final result. We found that the splint did not alter the rate of recurrence during the following nine months; on the contrary, it could even have encouraged the tendency to recurrence in the primary MP joints.

The hypothesis raised from these longitudinal studies (that dynamic extension splinting does not lower the rate of recurrence) is confirmed from the figures in Table VII. However, there was no significant difference between the groups. The postulate that splinting does not influence the rate of recurrence has to be discussed; it could be that the group who used the splint adequately did so because their disease was more aggressive. However, we do not know what would have happened if they had not used the splint as they did. Another explanation could be that the external extension force generated by the splint actually stimulated neoformation and reorientation of the tissue components by myofibroblasts as mentioned previously (4). We also have to consider whether the splint was applied too late at two to three weeks after operation. The open palm technique often makes it difficult to use the splint. Finally we have to consider if our rehabilitation/splinting programme was too lax. Rives et al. (14) found that an intensive and demanding rehabilitation and splinting programme including strict compliance improved results after release of the PIP joint.

Apart from the results concerning the use of the splint, Table VII shows that 48% of the PIP joints operated on (independent of the use of the splint) became between 10° and 40° worse and about 11% became more than 40° worse during the period from two to three weeks postoperatively to nine months follow-up. The MP joints as expected gave better results.

We conclude that we have not found any convincing indication that use of a dynamic extension splint (as constructed and used in our department) influences the natural postoperative course of the disease. To find out more about the use of splinting after operation for Dupuytren's contracture, we will design a prospective randomised study. However, it is important to stress that complete surgical release of contractures has an important influence on the final results, and splinting cannot be substituted for good technique.

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