A Comparison of Methods of Treatment of Pip Joint Contractures in Dupuytren's Disease

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J Hand Surg [Br] 1996 21: 246
DOI: 10.1016/S0266-7681(96)80107-0

A COMPARISON OF METHODS OF TREATMENT OF PIP JOINT CONTRACTURES IN DUPUYTREN'S DISEASE

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An analysis of the different methods of treating residual flexion deformity at the PIP joint level after digital fasciectomy in 75 PIP joints has shown that gentle passive manipulation alone gives better results with fewer complications than more aggressive surgical intervention.
Journal of Hand Surgery (British and European Volume, 1996) 21B: 2: 246–251

PIP joint contracture secondary to Dupuytren's disease is a difficult surgical problem. However, there is little agreement about methods and management of the residual PIP joint contracture when digital fasciectomy fails to achieve full extension.

Release of the volar plate, accessory collateral ligament, check-rein ligaments, arthroplasty and amputation have all been recommended. The importance of central slip attenuation has been highlighted. However there are few studies which compare conservative treatment by manipulation and splintage with more aggressive surgical management. This study compares the different methods of treatment that were used in 75 severely contracted PIP joints.

MATERIALS AND METHODS

A retrospective review was performed of operations for Dupuytren's contracture undertaken in Mount Vernon Hospital between 1980 and 1992 (Table 1). In the hands affected by Dupuytren's disease, 188 PIP joints were involved and 75 of these (40%) required some form of release because of a residual flexion contracture after a release of all the Dupuytren's tissue in the digit.

The patients therefore fell into two broad groups. The first group (113 PIP joints) responded with full correction following digital fasciectomy, and the second group (75 PIP joints) required a PIP joint procedure following digital fasciectomy. There was no significant demographic difference between the two groups (Table 2).

In the group requiring PIP joint procedures the PIP joint contracture had existed twice as long (36 months) and there was a difference of 10.9 years between the average age at onset of Dupuytren's disease and the average age at which a PIP procedure was undertaken (Table 3); 37% of this group had undergone previous surgery with 16% undergoing more than one operation. This group underwent four different methods of treatment for residual PIP joint contracture.

Table 1—201 operations for Dupuytren's contracture at Mount Vernon Hospital between 1980 and 1992 with involvement of 188 PIP joints

	Number of hands	*Number of PIP joints*
Palmar disease or MP contracture	50	0
PIP joint involvement	151	188
Fasciectomy: release PIP contracture	84	113
PIP joint procedure required	67	75

Gentle passive manipulation

Twenty-two fingers underwent only gentle passive manipulation (GPM) of the PIP joint. Very gentle, sustained manipulation of the PIP joint into extension is carried out with the MP joint flexed. The amount of force that is required to do this is only that required to rupture minor periarticular adhesions. It is imperative that excessive force should not be used. Neither the volar plate nor the accessory collateral ligaments should be ruptured. These should be released surgically if the joint does not respond to gentle passive manipulation. The manipulation is sustained for up to two minutes and the majority of patients appear to respond to this form of treatment. Very few seem to require surgical release of the PIP joint (Figs 1 and 2).

Table 2—Difference in demographic features between the two groups of hands with PIP joint involvement

	Fasciectomy alone 84 hands	*PIP joint procedure 67 hands*
Male patient	87%	81%
Northern European	95%	98%
Family history positive	40%	41%
Associated diseases	49%	53%
Ectopic localisations	25%	26%
Both hands involved	82%	78%
Heavy manual occupation	42%	40%
History of trauma	36%	50%

Table 3—Difference in operative details between the two groups of hands with PIP joint involvement

	Fasciectomy alone 84 hands	*PIP joint procedure 67 hands*
Age at onset (years)	51.1	51.1
Age at operation (years)	60.2	62.0
Surgeon PJS	41%	79%
Previous operations	24%	37%
Complications	25%	60%

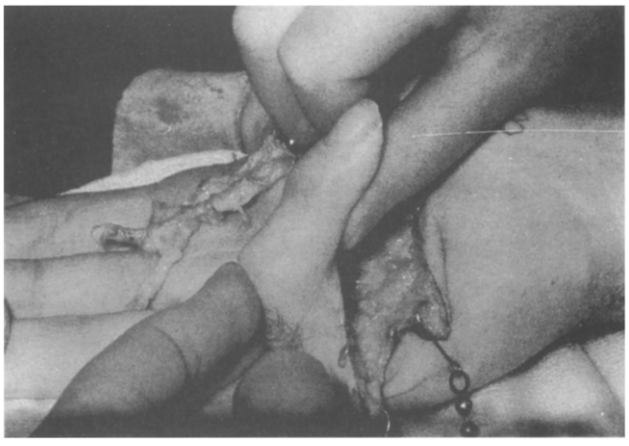

Fig 1 Gentle passive manipulation (GPM) of a residual PIP joint contracture of 50°; the MP joint is flexed and the PIP joint gently but firmly extended.

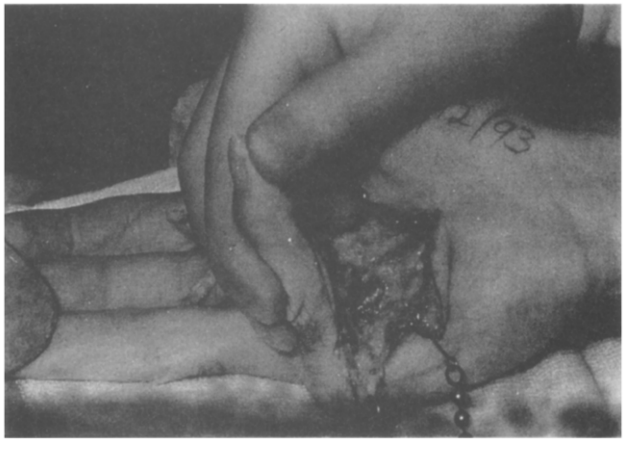

Fig 2 Full extension is achieved after sustaining GPM for 1 minute.

Surgical release of the PIP joint

Thirty-one patients underwent PIP joint surgery. This involved release of accessory collateral ligaments, volar plate, flexor tendon sheath, check rein ligaments or lateral bands as indicated. In this group seven joints had failed to respond to GPM alone and the remaining 24 patients had immediate surgical release without manipulation.

PIP joint release and extensor tendon repair

A further ten patients who had PIP joint surgery then underwent extensor tendon repair using an extensor loop technique and the repair was protected with a Kirschner wire.

No further PIP treatment

Seven patients were felt to be unsuitable for any form of surgical treatment other than amputation, and in five other patients nothing further was done after surgical release of the Dupuytren's cords.

Tables 4, 5 and 6 give an indication of the overall severity of Dupuytren's disease in the different groups. In most cases the palm and two or more fingers were affected (Table 4) and in all groups the fifth PIP joint required most frequently extensive release (Table 5). The preoperative joint angles of the MP and PIP joints in the different groups are shown in Table 6. 80% of the operative procedures in both the GPM alone group and in the less group that underwent PIP joint surgery as well as all of the patients who underwent extensor tendon repair and K-wire fixation were operated on by the same surgeon. It can be seen from Figure 3 that at the beginning of the study, 1980–1986, the surgical

Table 5—Involved fingers

PIP joint procedure	*Little*	*Ring*	*Middle*	*Index*
Manipulation ($n=22$)	16	3	2	1
PIP joint surgery ($n=31$)	20	9	2	
Extensor tendon repair ($n=10$)	8	2		
Amputation ($n=7$)	6	1		
Nothing done ($n=5$)	5			

Table 6—Preoperative MP and PIP joint angles in the different groups of PIP treatment

PIP joint procedure	*MP joint*	*PIP joint*
Manipulation ($n=22$)	51	88
PIP joint surgery ($n=31$)	52	75
Extensor tendon repair ($n=10$)	45	84
Amputation ($n=7$)	55	93
Nothing done ($n=5$)	45	87

Table 4—The distribution of Dupuytren's disease over the hand. In most groups at least two rays were affected

PIP joint procedure	*Palm and two or more fingers*	*Palm and one finger*	*One finger*
Manipulation ($n=22$)	14	6	2
PIP joint surgery ($n=31$)	19	10	2
Extensor tendon repair ($n=10$)	5	5	
Amputation ($n=7$)	6	1	
Nothing done ($n=5$)	1	3	1

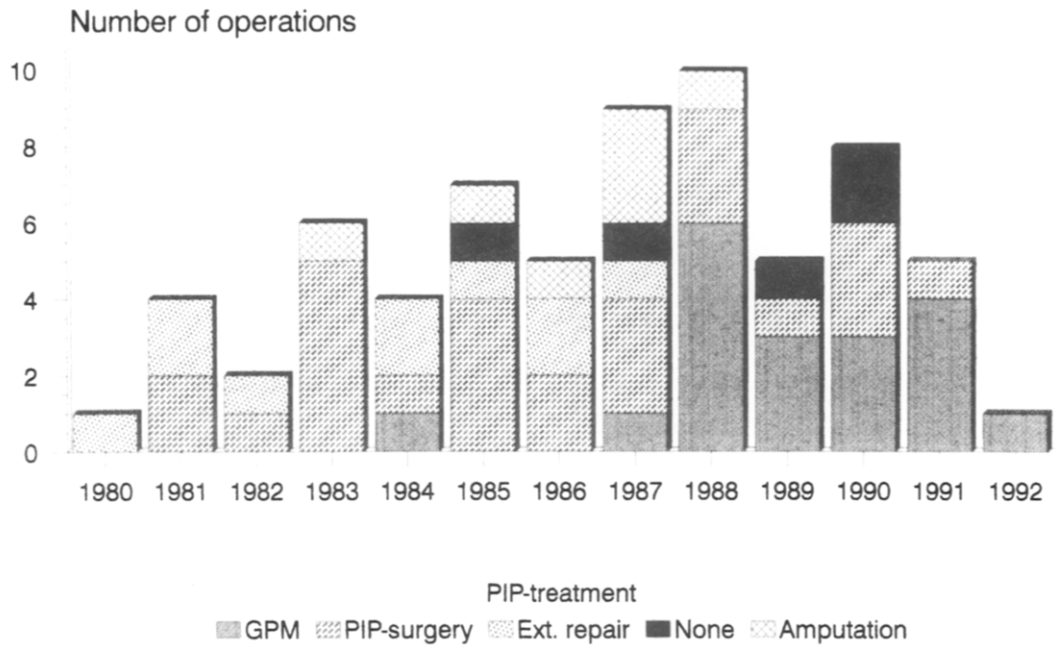

Fig 3 Surgical approach to the PIP joint changing from aggressive to more conservative management from 1986 onwards.

approach was more aggressive and that from 1986 onwards a more conservative approach was pursued.

RESULTS

Out of 188 PIP joints, 113 joint contractures were released by fasciectomy alone and 75 joints required some form of PIP joint procedure. The pre- and postoperative joint angles were documented and averaged (Table 7, Fig 4).

In the group where nothing further was done after fasciectomy, there was a change between the pre- and postoperative joint angles. The postoperative angle represents the residual flexion contracture which was not pursued following resection of the Dupuytren's tissue.

In the GPM group the joints were straightened by manipulation alone and had the most severe preoperative joint contractures (average 87.5°) with the best results (84% improvement). The patients who underwent PIP surgery had less severe contractures with less satisfactory final results. Those who underwent extensor tendon repair with K-wire fixation had the least satisfactory results of all; we no longer use this method of treatment for dealing with central slip attenuation, but limit the treatment to GPM and appropriate postoperative splintage. A statistical analysis of the results was undertaken using the Mann–Whitney test. When applying this test to the manipulation and PIP joint surgery group, $P = 0.043$.

Table 8 shows that when the seven failures of passive stretching within the PIP surgery group were excluded the difference between the PIP surgery (64% improvement) and GPM group (84% improvement) is even more emphasized.

When preoperative joint angles of less than 60° are excluded from the study the manipulation and PIP joint

Table 7—Pre- and postoperative measurements for the 113 PIP joints which were released after fasciectomy alone and the 75 joints which required some form of PIP joint procedure. Separate results are given for the different methods of treatment

	Number of PIP joints	*Preoperative joint angles (degrees)*	*Postoperative joint angles (degrees)*	*Percentage improvement*
Fasciectomy alone	113	54.3	11.8	78%
PIP joint procedure required	75	80.5	21.3	74%
type of PIP joint procedure:				
Manipulation	22	87.5	13.9	84%
PIP joint surgery	31	74.5	24.1	68%
Extensor tendon repair	10	83.5	39.5	53%
Amputation	7	92.9	–	–
Nothing done	5	87.0	32.5	63%

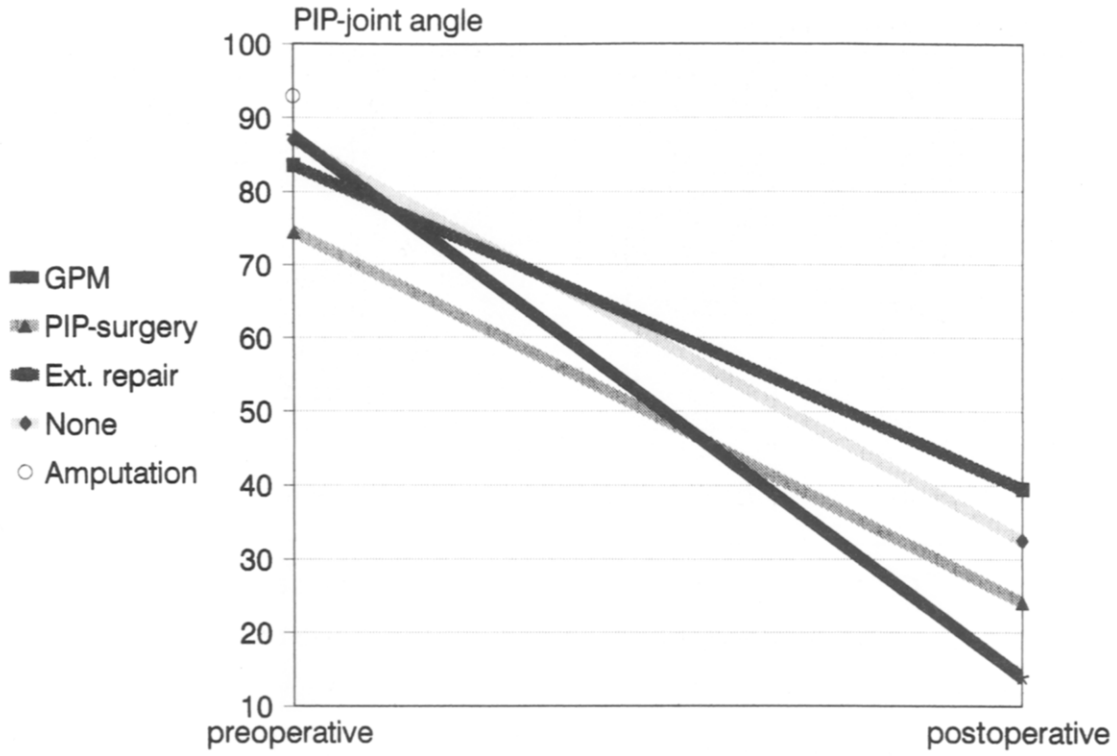

Fig 4 Graphic illustration of the pre- and postoperative PIP joint angles after the four different methods of PIP joint treatment.

Table 8—Pre- and postoperative results when the seven failures of passive stretching were excluded from the PIP surgery group

	Preoperative joint angles	*Postoperative joint angles*	*% improvement*
all $n=31$	74.5	24.1	67.6%
PIP surgery $n=24$	72.3	26.1	63.9%
PIP surgery after GPM $n=7$	75.8	16.7	78.0%

groups are virtually equally balanced, and $P=0.026$. This statistical analysis shows that manipulation only is a more successful method of treatment of the PIP joint than any form of surgical correction. It should be noted that the criterion for a successful outcome that has been used in this statistical test was any operation where there was more than a 90% improvement in the PIP joint contracture.

The complication rate varied from one group to another. When looking at the overall group of 188 PIP joints, in 113 joints where there was no residual PIP joint contracture after digital fasciectomy, the complication rate was 25%. However when further treatment of the PIP joint was necessary ($n=75$) the complication rate rose to an average of 60%. It is clear from Figure 5 that the complication rate was smallest in the GPM group undergoing manipulation alone, and was not significantly higher than in the group where no PIP procedures were necessary.

The recurrence rates for the different groups are shown (Table 9) but the difference between the GPM and surgical groups may not be significant because of the different length of follow-up.

DISCUSSION

In the first half of this century the most common approach to the severely contracted PIP joint was ampu-

Table 9—Difference in recurrence rates for each method of treatment of the PIP joint

PIP joint procedure	*Recurrence rate*	*Average period of follow up (years)*
Manipulation ($n=22$)	25%	2.3
PIP joint surgery ($n=31$)	33%	5.1
Extensor tendon repair ($n=10$)	60%	3.7
Amputation ($n=7$)	25%	4.9
Nothing done ($n=5$)	67%	1.7

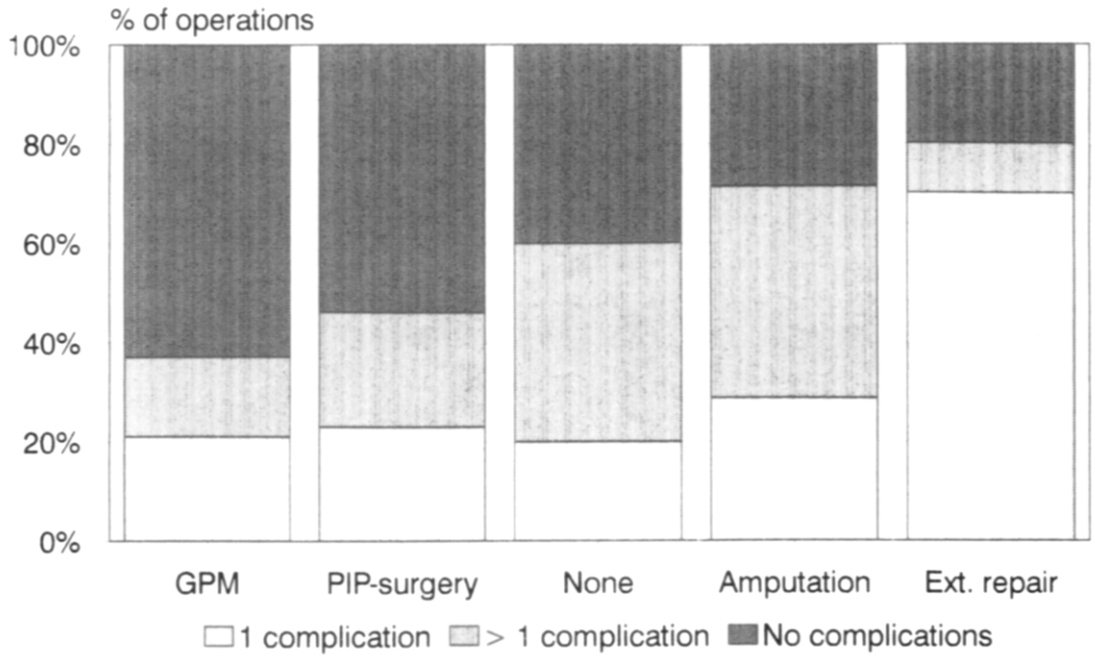

Fig 5 Complication rates, showing more complications in the groups with more aggressive PIP joint surgery.

tation. As instruments and techniques have advanced, surgeons have increasingly tried to salvage severely contracted digits using techniques such as arthrodesis and osteotomy. Eicher and Moberg (1970) and Moberg (1973) suggested several ways of treatment of Dupuytren's disease to avoid amputation, using arthrodesis or wedge osteotomy for difficult PIP joints. Arthrodesis results in a stable and painless joint and places the finger in a more functional position but has the disadvantage of stiffness, a problem on the ulnar border of the hand. Wedge osteotomy gives a more functional position and maintains some movement. Haimovici (1978) used Swanson replacement arthroplasty, giving good cosmetic results and a range of motion of more than 60° in 73% of his cases (41 PIP joints and three MP joints). The disadvantages of this technique were the complicated surgical procedure and prolonged postoperative treatment.

Tonkin et al (1985a and b) reviewed 154 operations in which the average PIP joint contracture preoperatively was 42° and the percentage improvement in extension was 41%. In this series 14 amputations were performed.

With improving anatomical knowledge, specific attempts have been made to release the various contracted structures around the PIP joint.

Curtis (1954; 1970) recommended excision of a portion of the flexor tendon sheath and release of the retinacular ligaments. When necessary this was followed by excision of the volar plate and release of the accessory collateral ligaments, followed by K-wire fixation for 1 week.

Watson et al (1979) reviewed 115 cases with fixed PIP joint contractures of which 52 were caused by Dupuytren's disease, and achieved full intraoperative extension by release of the check-rein ligaments alone in nearly all cases. They concluded that the check-rein ligaments are the critical factors in restricted PIP joint extension but did not mention the preoperative severity of the disease, and it may be that they were dealing with early stages of Dupuytren's disease.

In an anatomical study Andrew (1991) studied seven PIP joints in amputated digits, severely affected by Dupuytren's disease. He attempted a release of various structures that might have been responsible for the joint contracture. No improvement was noted with excision of skin, neurovascular bundle, Dupuytren's cords, oblique retinacular ligaments or transverse division of the flexor sheath at the level of the PIP joint. Division of the check rein ligaments produced at maximum a 5° improvement. The most effective procedure was release of the accessory collateral ligaments with 5/7 (71%) producing full extension. Release of the proximal attachment of the central part of the volar plate produced full extension in the remaining digits.

Our study shows that there is a statistically significant difference in results between manipulation and surgical treatment of the PIP joint.

It must be understood that the manipulation that is undertaken is a gentle, passive stretching. This type of manipulation merely ruptures periarticular adhesions. If one accepts MacFarlane's concept (1974) of the primary abnormality being contracture of the fascia and all the secondary deformities in Dupuytren's due to either periarticular adhesions or secondary effects on the surrounding structures, this form of manipulation will deal with any such secondary adhesions. It should not, under

any circumstances, be undertaken in such a fashion as to rupture the volar plate. Such force would only lead to bleeding, haematoma and further scar formation and scar contracture.

Our standard approach to the PIP joint is firstly to do a limited fasciectomy. If after release of all the Dupuytren's tissue in the digit we are then faced with a residual flexion contracture, we would attempt GPM as described previously. Next we would release the accessory collateral ligaments and remanipulate. According to Andrew 70% of digits should release by this manoeuvre.

Finally, we would divide the central part of the volar plate, if all the other procedures had produced no results. Andrew claims that this would deal with the remaining 30% of patients.

At whatever stage we have been able to produce full passive extension of the PIP joint, we then perform a central slip tenodesis test (Smith and Ross, 1994) to ascertain whether or not there is central slip attenuation (Smith and Breed, 1994). If there is, then the PIP joint should be immobilized in a static splint for 3 weeks, then mobilised for a further 3 weeks in a Capener splint. Failure to do this will lead to immediate recurrence of the flexion deformity due to absence of extensor tone. At the same time as the central slip test we would undertake a lateral band test, passively flexing the DIP joint while the PIP joint is maintained in full extension. If the lateral bands are tight, a surgical release or a Fowler's tenotomy may be necessary.

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Accepted: 18 October 1994
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