Safety and Effectiveness of Percutaneous Needle Fasciotomy for Dupuytren's Disease in the Palm

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Abstract

Purpose Percutaneous needle fasciotomy is performed in the authors' department to treat Dupuytren's contracture at metacarpophalangeal joints. This study aimed to establish its safety and efficacy, compared with standard fasciectomy.

Materials and Methods All patients who had this procedure performed over the study period were sent the validated British Society for Surgery of the Hand (BSSH) postal questionnaire assessing surgical outcome. Hand function and disability were assessed using the Patient Evaluation Measure (PEM).

Results Statistically significant improvement was achieved in Dupuytren's contracture at the mean follow-up of 15 months (SD $\pm$ 10). Approximately 97% of the fingers fully corrected at surgery remain straight. Recurrence rate was 2.2% among fully corrected fingers. However, 2 (40%) out of 5 partially corrected fingers had recurrence. No complication of any kind was noted and no antibiotics used. Hand function was measured using PEM score correlated well with the residual contracture.

Conclusion Percutaneous needle fasciotomy is safe, effective, has very low complication rates, and yields comparable results to standard fasciectomy.

Keywords

- Dupuytren's disease
- fasciotomy
- percutaneous needle fasciotomy
- surgical treatment

Introduction

Dupuytren's disease (DD) is a common entity with the prevalence ranging from 2 to 42% among the Caucasian population.¹ The disability depends on the joint involved (metacarpophalangeal joint [MCPJ] or proximal interphalangeal joint [PIPJ]), severity of the contracture at each joint, and number of fingers involved. Early age of onset and distant involvement are hallmarks of severe disease. Lack of curative treatment has provoked clinicians for interventions that give long-term relief and fewer complications.

Percutaneous needle fasciotomy (PNF) is a surgical technique for treatment of DD, which has gained popularity in the past three decades.^{2–6} This technique has many potential advantages over open surgery. It is performed in an outpatient

setting under local anesthesia. Patients do not have to wait on a waiting list for the operating theater and do not need to be admitted to a hospital. No sutures are used in this technique, and patients can use their hands and return to work earlier. This procedure is expected to be safe and associated with lower and less serious complications. It also seems very cost-effective for the National Health Service (NHS) trusts and helps in reducing waiting lists.⁷ This article investigates the safety and efficacy of PNF for Dupuytren's contracture.

Materials and Methods

Ethical approval for this study to proceed was obtained from the University's School of Health & Social Care Research

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Governance Ethics Committee and The Research & Audit Department of the hospital where this simple surgery has been in use for the treatment of patients suffering from DD. At the time of this study, PNF was performed only for the contracture of MCPJs of the fingers.

After explaining the procedure to the patient and informed consent, approximately 2 to 4 mL of 2% lignocaine is infiltrated around the disease cord using a small needle. A white (19G) needle is passed under the skin proximal to the landmarks for the transverse fibers of the palmar fascia, superficial to the cord. Transverse movements of the bevel of needle are used to cut the cord carefully. No up-and-down perforating was performed. Once completed, the finger is straightened with gentle pressure to gain full correction. Gauze and crepe dressing is used, and patients are allowed to go home with instruction to keep the hand elevated in a sling overnight, take down the dressing next day, and start using the hand normally. Patients are instructed to undertake stretching exercises to help avoid early recurrence. They are seen in the outpatient clinic again in 2 to 3 weeks for a wound check (wound breakdown and/or infection) and to make sure that they have mobilized and do not require physiotherapy. They are discharged at this time if they have no stiffness and have achieved full correction.

A retrospective study was designed to analyze the outcome of PNF in the hand performed in the department of hand surgery over a period of 2½ years. All patients who underwent PNF during this period were included in the study.

Inclusion Criteria

- Palpable/visible palmar cord of DD causing contracture of MCPJ of the finger/fingers such that the patient cannot rest the hand flat on the table (Hueston's "table-top test")
- No restriction of age or sex
- No restriction for other medications, including anticoagulants

Exclusion Criteria

- Contracture of PIPJ
- Contracture of thumb
- Recurrent MCPJ contracture, where previously standard open fasciectomy has been performed

A National Research Ethics Service (NREC)-approved questionnaire, which has been used and validated by British Society for Surgery of the Hand (BSSH),⁸ was posted to the patients at their home address along with a participant information sheet and stamped addressed envelope. The patients who did not respond in 2 weeks were sent a reminder. To improve the validity of study, the case notes of all the patients were also reviewed. This was done mainly to corroborate whether their responses matched with the information in the clinic letter at their past hospital outpatient visit. The patients who responded (Q9) by marking on the picture showing their hand not fully straight were then seen in the outpatients clinic to confirm and measure the contracture.

Recurrence was defined as the reappearance of more than a mild flexion contracture at the same MCPJ sufficient to produce positive Hueston's table-top test. This correlates

with any deformity greater than a mild MCPJ contracture in the images of the questionnaire. The questionnaire consisted of two parts: (1) Dupuytren's Study Questionnaire and (2) Patient Evaluation Measure (PEM). It has good face validity, avoids the surgeon's bias or interobserver error, and the reproducibility of responses is confirmed independently.⁸

Hand function and disability were assessed using the PEM.⁹ This is a validated patient-completed questionnaire investigating symptoms, disability, and satisfaction.^{10,11} Each question has a 7 interval visual analogue scale of answers, from 1 to 7, and total score is counted. The higher the score is, the poorer is the hand function. Patients were divided into four groups with score less than 20 taken as normal hand, 20 to 29 as mild disability, from 30 to 40 as moderate disability, and score above 40 as severe disability of the hand.

Results

A total of 68 patients had PNF surgery on 73 fingers. Forty-seven (52 fingers) patients returned the questionnaire posted to them, a response rate of 70%. Out of the 47 questionnaires received, 1 was not fully completed, hence excluded from data analysis. Complete data were available for analysis on 51 fingers from 46 patients. Forty-six (90.2%) patients were male and 5 (9.8%) were female. Thirteen (25.5%) patients were diabetic and 2 (4%) were epileptic. Twelve (23.5%) patients had positive family history of having close relative suffering from DD. Three (6%) patients had disease in the plantar surface of foot.

Mean follow-up was 15 months (standard deviation [SD] ± 10) ranging from 5 to 36 months (► **Table 1**). Of the total 51 fingers, only 3 (5.8%) had recurrence. One of these was in a patient whose the finger was recorded as fully corrected (a correction of ≤ 5 degrees) and two were in fingers that were recorded as only partially corrected (residual contracture > 5 degrees) at the time of surgery. Twenty-nine (97%) out of 30 fingers fully corrected at surgery remained straight. One out of 46 fully corrected fingers had a recurrence, which needed further surgery (open fasciectomy). Two out of five partially corrected fingers had recurrence. No complication of any kind, including nerve injury, vascular injury, skin tear, or infection, was noted in any of these patients and none of them required any antibiotics.

Approximately 76% of the patients had a PEM score of less than 20 at follow-up and only two patients scored more than 40 (marked impairment in hand function). Both had revision surgery (► **Table 2**). Patient's satisfaction was measured on a scale of 1 to 7 in three different categories—score 1 being very satisfied to score 7 being very unsatisfied. The cumulative mean score of 4.80 with SD of ± 2.58 was obtained. Approximately 82% of the patients had cumulative score less than 6. Two (4%) patients were not satisfied with the procedure, and these were the two who had recurrence of disease (► **Table 2**).

Spearman's correlation test showed a significant positive correlation between residual contracture at follow-up and total score on the PEM of hand function ($r_s = 0.540$, $n = 51$, $p < 0.001$, two tailed). A Wilcoxon signed ranks test showed

Table 1 Surgical outcomes

Variables	Frequency (and %F)	Range	Mean (SD)
Follow-up months		5–36	15 (+/– 10)
Correction at time of surgery			
Not at all	1 (2%)		
Partial	4 (7.8%)		
Almost full	17 (33.3%)		
Full	29 (56.9 5)		
Recurrence			
Yes	3 (5.8%)		
No	48 (94.2%)		
Complications			
Nerve injury			
Yes	0 (0%)		
No	51 (100%)		
Vascular injury			
Yes	0 (0%)		
No	51 (100%)		
Infection			
Yes	0 (0%)		
No	51 (100%)		
Function of hand			
Preoperative contracture			
Straight	0 (0%)		
< 30°	3 (5.9%)		
30–60°	30 (58.8%)		
> 60°	18 (35.3%)		
Postoperative contracture			
Straight	41 (80.4%)		
< 30°	7 (13.7%)		
30–60°	2 (3.9%)		
> 60°	1 (2%)		

Abbreviation: SD, standard deviation.

that change in “function of hand” as measured by patient recording of contracture, before surgery and at follow-up, was statistically significant ($z = 5.82$, $n\text{-ties} = 50$, $p < 0.001$).

Multiple linear regression analysis was performed to find the predictors of better hand function following the PNF surgery. Flexion contracture (severity of disease), correction achieved at time of surgery, and the condition of the finger at time of follow-up (residual contracture at the time of study) were used as predictor variables (► **Table 3**). Using the enter method, a significant model emerged ($F = 14.19$, $p < 0.001$). The model explains 44.2% variance (adjusted $R^2 = 0.442$).

Table 2 Subjective outcomes

Variables	Frequency (and %F)	Range	Mean (SD)
Subjective function of hand			
Bent in the finger		1–6	1.86 (1.26)
sensations in the hand		1–5	1.32 (0.91)
Pain in the hand		1–5	1.67 (1.03)
Use of hand for fiddly things		1–6	1.86 (1.38)
General movements of hand		1–5	1.84 (1.23)
Grip of hand		1–6	1.92 (1.26)
Hand for very day activities		1–4	1.53 (0.92)
Hand for work		1–5	1.61 (1.08)
Appearance of hand		1–4	1.54 (0.88)
General feelings about hand		1–4	1.67 (0.99)
Patient satisfaction			
Overall treatment at hospital		1–5	1.29 (0.78)
General condition of hand now		1–4	1.80 (1.05)
Expectations achieved		1–5	1.71 (1.02)
Subjective hand function			
Total score		10–48	16.61 (9.45)
Score < 20	39 (76.5%)		
Score from 20–29	6 (12%)		
Score from 30–39	4 (8%)		
Score ≥ 40	2 (4%)		
Patient satisfaction			
Total score		3–14	4.80 (2.58)
Score up to 6	42 (82.4%)		
Score from 7–12	7 (13.7%)		
Score > 12	2 (4%)		

Abbreviation: SD, standard deviation.

Table 3 Multiple linear regression—model summary

Predictor variable	B	SE B	β	p Value
Contracture before surgery	2.78	1.81	0.17	0.131
Correction achieved at time of surgery	−7.72	2.11	−0.60	0.001
Residual contracture at time of study	0.58	1.58	0.06	0.715

Abbreviations: B, fitted values; SE, standard error of fitted values.
 $R = 0.690$, $R^2 = 0.475$, adjusted $R^2 = 0.442$.

Preoperative contracture and contracture at time of follow-up were not found to be significant predictors of subjective hand function ($p > 0.05$). However, correction achieved at time of surgery was a significant predictor of subjective hand function ($p = 0.001$).

Discussion

The main variables assessed in this study were initial deformity, correction at time of surgery, recurrence rate, complication rate, hand function, and disability. Statistically significant improvement was achieved in Dupuytren's contracture with 97% fingers, fully corrected at surgery, remaining straight. Preoperative contracture and contracture at time of follow-up were not found to be significant predictors of subjective hand function. However, correction achieved at time of surgery was a significant predictor of subjective hand function. The hand function measured using PEM score correlated well with the residual contracture. It was evident from the study that deformity at follow-up is related to poor hand function and disability. Similar findings have been reported in previous studies.

In a randomized control trial of 166 treated rays, van Rijssen et al⁵ found 63% improvement in total passive extension deficit (TPED) using PNF technique and 79% improvement in TPED in patients treated with fasciectomy. The major complication rate was significantly less (0%) in patients treated with PNF compared with 5% in limited fasciectomy (LF) group. The hand function was remarkably better in patients treated with PNF, and less degree of discomfort was reported in this patient group. In a further study, van Rijssen and Werker¹² reported good results at MCPJs in which the mean reduction in contracture was 88%. This has also been noted in many other studies in the literature along with the fact that it has much less complication rate.⁶

Badois et al¹³ reported 81% excellent or good short-term results and were maintained in 69% of patients at 5 years. They recommended the technique in the early stage of the disease. Foucher et al³ reported good results in 79% of cases and did not find any neurovascular or tendon injury when the PNF was performed for MCPJ contracture. However, when it was performed for IPJ contracture, one nerve injury and decline in benefits from surgery were noted. They recorded a recurrence rate of 58% at a follow-up of 3.2 years. In both these studies, the results are mixed from MCPJs and PIPJs, and this may be the reason for the high recurrence rates reported. Rowley et al⁴ found this technique effective and useful, especially for the contracture of MCPJ in a prospective study of 78 hands. The authors' observations reinforce their finding.

Leclercq¹⁴ reported a high incidence of complications, particularly nerve injury in five cases and flexor tendon injury in six cases, following PNF which were seen as tertiary referrals. However, all nerve injuries were in patients who had needle fasciotomy in fingers and only one tendon injury was recorded for which surgery was restricted to the palm.

A multicenter audit of open fasciectomy⁸ conducted by the BSSH showed that the outcome following DD surgery was not well documented. The study concluded that good correction can be achieved by fasciectomy, but it has a high

complication rate and significant rate of recurrence of contracture. The results include all surgical treatments. This is common in most of the published literature about DD, making it difficult to compare specific treatments.

Not many studies are available in the literature comparing the outcomes of PNF with the standard open fasciectomy, and there is not enough evidence to draw any general conclusion. Different studies have reported a variable complication and recurrence rate in both the groups. However, from the available evidence in the literature, especially in the case of mild to moderate contractures involving the MCPJ, PNF has similar short-term results but with much lower complication rates.⁶ It is associated with less discomfort, early return to work, and higher initial short-term satisfaction among patients. The National Institute for Clinical Excellence recommends needle fasciotomy as a treatment for Dupuytren's contracture, suggesting that those with less severe disease or with contractures mainly affecting the MCPJ would benefit most.¹⁵ Very few complications have been reported for which treatment is limited to the palm.^{6,14,16}

The good outcome has been defined as, "A slight limitation of flexion or extension with a recurrence being occasionally present but too slight to interfere with normal activity."^{17,18} In this study, a good outcome was achieved in 94% of the patients using this definition. Forty-one (80.4%) patients had fully straight fingers and 7 (13.7%) had only a slight limitation of extension with flexion contracture less than 30 degrees, which was not interfering with their normal daily activities.

In this study, "recurrence" was defined according to Dias and Braybrooke⁸ as "any deformity that was more than a mild Metacarpophalangeal Joint contracture that correlates to the positive Hueston table top test." The standard open fasciectomy surgery has a reported recurrence rate between 2 and 47% by using the aforementioned criteria.^{8,17-20} The overall recurrence rate in this study was 5.8%, which was further categorized as 2.2% in fully corrected fingers and 40% in partially corrected fingers.

This study has some shortcomings that need to be kept in mind when drawing conclusions. The sample size was small, and it reflects only the practice of one hand unit. Second, the follow-up period was relatively short (mean 15 months). Third, the authors assume in this study that hand function and disability occur mainly due to the worst (most contracted) finger in that hand; however, other hand conditions such as bilateralism or involvement of multiple digits could affect the hand function score. Finally, because it is a retrospective study, it is always possible that patients may not be able to remember the exact preoperative deformity 2 years following their operation; this potential bias cannot be eliminated. However, this is a common study design used in previous studies, which the authors are using as a benchmark for comparison.

A large prospective randomized control trial would be an ideal to confirm the finding of this study, and long follow-up is desirable to help find delayed recurrence.

This study gives a very good insight for practicing hand surgeons about PNF, which seems to give excellent short-term results, acceptable for patients and cost-effective for the health care providers.

Conflict of Interest
None.

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