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Percutaneous Needle Fasciotomy Versus Limited Fasciectomy for Dupuytren Disease: A Linear Model Assessment of Short-term Efficacy

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Background: There is no consensus about the best treatment for Dupuytren contracture in the hand. In particular, whether to use a percutaneous needle fasciotomy (PCNF) in preference to a limited fasciectomy (LF).
Methods: We performed a retrospective review of the outcomes of 74 joints treated with either PCNF or LF. Baseline characteristics, complications, and active extension deficit (AED) were assessed at 3 weeks and 3 months posttreatment. Reoperative procedures were analyzed to assess the effectiveness of repeated procedures.
Results: Our results suggest that there is no significant difference between PCNF and LF in reducing AED at 3 weeks ($P = 0.504$) or 3 months ($P = 0.66$). Moreover, our data suggest that the risk of a surgical complication was the same for both procedures, after adjustment for confounders ($P = 0.613$). Our study suggests that a reoperative PCNF was 15.3% less effective in reducing the AED compared with a primary PCNF at 3 months postoperatively ($P = 0.032$); whereas there was no change in the effectiveness of a reoperative LF in reducing AED at both 3 weeks ($P = 0.839$) and 3 months ($P = 0.449$).
Conclusions: We believe that PCNF should be used as the primary treatment for nonrecurrent and recurrent Dupuytren contractures. More frequent use of PCNF may help to reduce waiting times for treatment and may enable better resource allocation. Further prospective studies should be carried out. *(Plast Reconstr Surg Glob Open 2024; 12:e6326; doi: 10.1097/GOX.0000000000006326; Published online 22 November 2024.)*

INTRODUCTION

Dupuytren disease (DD) of the hand is a benign, chronic, and incurable condition characterized by progressive flexion of the metacarpophalangeal (MCP) and interphalangeal joints due to contraction of subcutaneous cords of collagen.[1]

DD is believed to be hereditary, with potentially modifiable risk factors, such as alcohol consumption and diabetes mellitus.[2,3] To relieve the symptoms, many interventions have been described, including percutaneous needle fasciotomy (PCNF), limited fasciectomy (LF), and dermofasciectomy. Currently, PCNF and LF are the procedures most widely performed at our institution. PCNF is a minimally invasive technique, which uses a needle to disrupt the cords. In contrast, LF excises the diseased fascia to release any flexion deformities. Although popular, LF is a time-consuming procedure, and recovery is longer and more painful compared with PCNF.[4]

In this study, the specific choice of intervention was determined by the personal preferences of the surgeon and the patient, the extent of the contracture (ie, the total active extension deficit [AED]), the number of digits affected, and the ability of the patient to tolerate general anesthesia. Some surgeons prefer PCNF as first-line treatment for all DD cases, regardless of the severity of the total flexion deformity,[5] whereas others prefer LF. Currently, there are no clear, standardized protocols for managing

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DD with PCNF versus LF in the literature. Therefore, there are wide variations in surgical practice between surgeons. Moreover, previous randomized controlled trials (RCTs) have failed to adequately assess the effect of repeated procedures because patients with recurrent DD were excluded from the comparison.[6,7] Furthermore, we believe that insufficient adjustment has been made in previous studies for confounding variables when comparing the mean reduction in AED between PCNF and LF.[7,8] To improve upon this, we constructed a linear model and included an analysis of the proportional reduction in extension deficit attributable to differences in contracture severity. Previous studies also suggest that treatment of the proximal interphalangeal (PIP) joint using PCNF may contribute to greater morbidity due to its proximity to digital nerves and flexor tendons.[9] Therefore, we wanted to explore whether treating PIP joints leads to higher postoperative complication rates. We then compared changes in AED using PCNF versus LF at 3 weeks and 3 months postoperatively and compared the postoperative morbidity of PCNF versus LF. Finally, we tried to determine whether reoperative surgery was correlated with diminished efficacy in reducing the AED.

Takeaways

Question: Is percutaneous needle fasciotomy (PCNF) or limited fasciectomy (LF) the preferable treatment for primary Dupuytren disease? Is there a difference in the efficacy of PCNF versus LF for reoperative procedures?

Findings: There is no significant difference in the efficacy of PCNF versus LF in reducing the extension deficit and complication rates. However, reoperative PCNF appeared to be 15.3% less effective than LF in reducing the extension deficit at the 3-month mark.

Meaning: PCNF should be considered as first-line treatment for primary and recurrent Dupuytren disease because it is just as safe and effective as LF as well as being quicker, cheaper, and easier to perform.

PATIENTS AND METHODS

This is a retrospective cohort study. We collected data on patients who underwent PCNF and LF between January 2018 to December 2022 at a single center in the United Kingdom. Our primary source was the electronic hospital record. Patients were excluded if there was insufficient total follow-up (<3 months), if they had Dupuytren contracture of the first digit, and if they underwent reoperation using a different surgical intervention other than the original procedure. The final cohort consisted of procedures performed by 2 senior surgeons (N.T. and N.K.), who each preferred to use LF or PCNF for the primary treatment of DD using a standardized surgical approach.

Baseline characteristics (such as age and site of involvement) and risk factors (such as diabetes mellitus, alcohol consumption, smoking, epilepsy, and family history of DD) were recorded.[10] The primary outcome (AED) was noted for each treated joint at approximately 3 weeks and 3 months follow-up. The efficacy of each intervention was measured using Tubiana staging (Table 1) compared with the AED at the initial presentation. Patients were further categorized by the location of contracture, such as the joint type and digit number.

Table 1. Classification of DD According to Tubiana Staging

Phase	Description
0	Physiological finding
N	Palmar or digital node without developed flexion contracture
1	Extension deficit 0–45 degrees
2	Extension deficit 45–90 degrees
3	Extension deficit 90–135 degrees
4	Extension deficit >135 degrees

DD was categorized into different stages based on the extension deficit, providing a clear framework for assessing the severity of the condition. Each stage is defined by a specific range of extension deficit degrees, from no contracture (stage 0) to severe contracture (stage 4).

Although a large change in AED might be necessary for a patient's quality of life to return to normal, we wanted to take into account the morbidity of each intervention and the reoperation rate. To help us measure this, we collected data on the type of adverse events, especially delayed wound healing, infection, pain (especially complex regional pain syndrome type 1), and neurological symptoms. We also noted if the procedure performed was a reoperation to determine if there was any difference in the effectiveness of a reoperation in reducing AED.

Surgical Procedures

Percutaneous Needle Fasciotomy

Our senior author (N.K.) practices PCNF with a modified technique as described here. The treatment area is anesthetized using 2% lidocaine + adrenaline or 0.5% marcaine with adrenaline, using a 19G Sterican needle. In cases involving multiple digits (>2), a wrist or axillary block is used (using 20–40 mL of a 50:50 mix of 2% lidocaine + adrenaline and 0.5% marcaine + adrenaline). As depicted in Figure 1, PCNF requires gradual and progressive division of the skin, together with any longitudinal cord structures, and release of any contracted volar plates, while maintaining continuous passive extension on the digit—until complete finger extension is achieved. The blue arrow indicates the direction of the firm pressure, which must be applied continuously to the finger-tip to keep the cord tissues under maximum tension because this makes it easier to divide them with the needle tip (Fig. 1B). The red arrow indicates the direction of movement of the needle tip, which should be at 90 degrees to the cord tissues (Fig. 1B). To reduce the risk of accidental injury to the neurovascular (NV) structures, PCNF is always performed under loupe magnification because our modified technique is not done blindly. (**See Video [online]**, which demonstrates the modified PCNF technique featured in Figure 1. This procedure was performed by the senior author [N.K.].) Use of adrenaline in the treated area also ensures a bloodless field without the need for a tourniquet. Therefore, critical structures remain visible throughout, and these can be preserved. Patients are reassured that any open wounds should heal well by secondary intention (typically by 2–3 weeks) even when the flexor

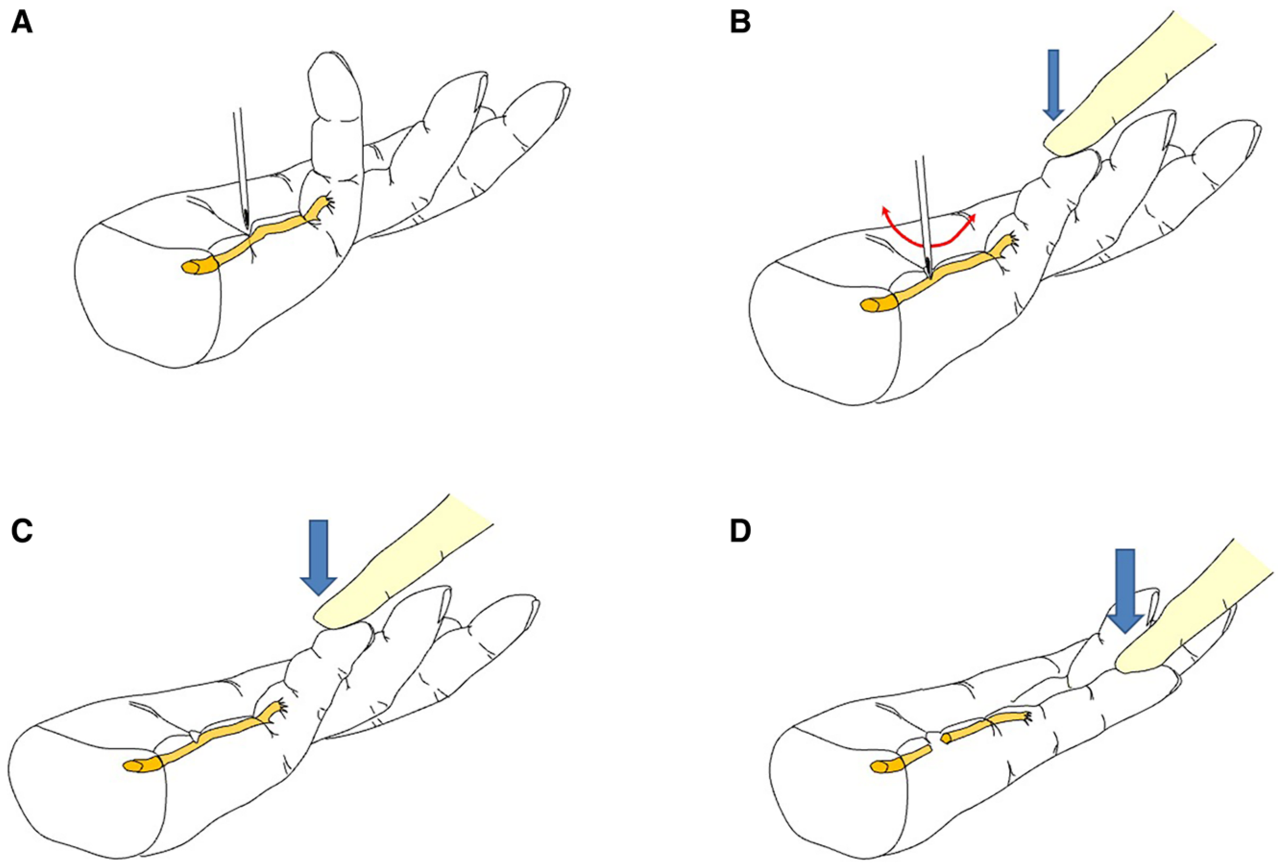

Fig. 1. The sequential steps required to achieve finger extension using PCNF. A, The affected finger is passively extended to tighten any longitudinal Dupuytren cord(s) under the skin. B, The tip of a 19G needle is used as a small knife to divide any contracted skin and underlying Dupuytren cord structures. C, Once the cord tissue(s) have been partially divided, the passive extension force is increased until any remaining cord tissues rupture. Repeat step B if the cord tissues do not rupture. D, The finger becomes progressively straighter as any structures keeping the finger in flexion are gradually divided under direct vision using the 19G needle or are ruptured through the passive extension of the digit. Illustrations by the senior author (N. K.).

tendons or NV bundles are exposed. This is particularly true for PCNF at the PIP joint. For clarification, a video demonstrating the steps of the modified PCNF has been provided (**Video [online]**).

Limited Fasciectomy

The surgical approach is tailored to the severity of the contracture and includes different incision patterns, including Brunner incisions for mild contractures and Skoog incisions (with conversion to Z-plasties) for those with very flexed digits. Regional anesthesia is used for most cases, whereas wide awake local anesthesia no tourniquet is used as an alternative for selected primary cases. Depending on the patient's personal preference, general anesthesia may also be used. LF aims to remove all the diseased cords while preserving critical structures, such as the NV bundles. The procedure may also require release of the volar plates but aims to avoid excessive force that could damage the joint. In cases of recurrence, or when dissection is particularly challenging, a microscope may be used for separation of scar tissue from critical hand structures.[11] A tourniquet is used for all cases requiring regional or general anesthesia.

Postoperative Follow-up

For postoperative care, patients were asked to attend multiple follow-up appointments within the first month to monitor the progress of wound healing and to look for any complications resulting from the surgery, regardless of the technique used. Patients are also asked to wear a thermoplastic splint to keep their fingers in full extension at rest and at night for 3–6 months. Patients who underwent PCNF were then advised to continue extension splinting at night—indefinitely. Splints were remolded between appointments to tailor for changes in AED after treatment. In addition, the active range of motion of affected joints was measured by the hand therapist to monitor changes between follow-up periods. Home exercise programs, simple analgesia, and scar massage were often recommended to relieve pain and improve wound healing.[12]

Statistical Analysis

Baseline characteristics and the presence of risk factors were presented as frequency tables. To analyze the efficacy of each surgical procedure, the percentage decrease in AED was compared with the baseline for each treated joint at 3 weeks and 3 months. Multiple linear regression

Table 2. Baseline Characteristics of Final Patient Cohort, Consisting of Mean Age, Number of Joints Assessed, Treated Joint Type, Treated Hand, Type of Surgery, and Treated Digit

Variable Assessed	Value
Total number of patients, n	40
Mean age, SD (range)	66.8, 10.4 (46–84)
Total number of joints, n	74
Treated joint type:	
MCP, n	18
PIP, n	54
DIP, n	2
Type of surgery used	
PCNF, n (%)	40 (54.1)
LF, n (%)	34 (45.9)
Treated hand	
Left, n (%)	37 (50)
Right, n (%)	37 (50)
Treated digit, n (%)	
2	4 (5.41)
3	8 (10.8)
4	24 (32.4)
5	38 (51.4)

The baseline characteristics of the study population, including the mean age of the patients, the total number of joints assessed, and the distribution of treated joint types and procedures. This comprehensive overview helps contextualize the study's findings by detailing the demographics and clinical profiles of the included patients.

Table 3. Risk Factor Exposure of Treated Joints

Variable Assessed	Value
Diabetes mellitus, n (%)	9 (12.2)
Positive family history of DD, n (%)	3 (4.1)
Positive smoking status, n (%)	11 (14.9)
Positive alcohol consumption, n (%)	39 (52.7)
Epilepsy, n (%)	0 (0)

The prevalence of major risk factors for DD within the study cohort is outlined, including diabetes mellitus, family history of DD, smoking status, and alcohol consumption. Understanding these risk factors is crucial for interpreting the study results in the context of potential confounders.

Table 4. Odds Ratio of Developing a Complication with LF as Reference Using Logistic Regression, Adjusted for Diabetes Mellitus, Family History of DD, Smoking, and Alcohol

Risk Factors	PCNF, Odds Ratio (95% CI), *P*	Hosmer–Lemeshow Test, χ^2, *P*
Nil	0.608 (0.199–1.858), 0.382	
Diabetes mellitus	0.609 (0.198–1.873), 0.387	
Family history of DD	0.596 (0.194–1.833), 0.366	
Smoking	0.608 (0.199–1.861), 0.384	
Alcohol	0.734 (0.230–2.343), 0.602	
Overall	0.737 (0.225–2.408), 0.613	3.680, 0.720

The data provided compare the risk of postoperative complications between patients treated with PCNF and those treated with LF, adjusted for diabetes mellitus, family history of DD, smoking, and alcohol consumption. The findings indicate no significant difference in the likelihood of developing complications between the 2 treatment modalities, suggesting that both PCNF and LF have comparable safety profiles when considering these specific risk factors.
CI, confidence interval.

was used at the 2 timepoints to look for any decrease in AED comparing PCNF and LF. For this analysis, the major risk factors (alcohol consumption and diabetes mellitus) and preoperative AED were adjusted as covariates. The rationale for selecting these particular risk factors was that these factors have the highest elevated odds ratios among all the risk factors identified.[2,3] To compare the complication rates, logistic regression was applied to calculate the odds ratio of developing a complication comparing PCNF and LF, with adjustment for confounders. To analyze the effect of repeated PCNF or LF on maintaining digital extension, multiple linear regression was used to determine and compare the percentage decrease in AED, while adjusting for preoperative AED. All tests were carried out using SPSS 29.0 (IBM 2022, Armonk, NY). A 2-tailed *P* value of less than 0.05 was considered significant.

RESULTS

The final cohort was composed of 40 patients, 74 treated joints. The baseline characteristics and locations of the treated joints are shown in Table 2. The cohort was evenly divided, with 40 (54.1%) joints undergoing PCNF and 34 (45.9%) joints receiving treatment with LF. The average age was 66.8 years (±10.4 years, 46–84 years). The cohort included MCP joints 24.3% (18), PIP joints 72.9% (54), and DIP joints 2.7% (2). The risk factor exposure of each treated joint used to adjust for confounding is presented in Table 3.

Complication Rates

Both univariate and multivariate analyses demonstrated no significant difference in the odds ratio of 3-month postoperative morbidity comparing PCNF versus LF (Table 4). Adjusting for major risk factors (diabetes mellitus, family history of DD, smoking, and alcohol consumption), the odds ratio of developing complications post-PCNF, relative to LF, was 0.737 (95% confidence interval, 0.225–2.408, $P = 0.613$). Adjustment for the listed risk factors did not alter the odds of a complication occurring, suggesting that these specific characteristics do not influence the safety profile of either treatment.

Effectiveness in Reducing AED

To compare efficacy, we calculated the percentage decrease in AED of each treated joint as the dependent variable. Multiple linear regression was performed at the 2 timepoints to look for significant differences across surgery types. At each timepoint, 3 models were established: a univariate analysis based on the type of surgery alone, a multivariate analysis based on the type of surgery adjusted for preoperative AED, and finally, a multivariate analysis based on the type of surgery adjusted for preoperative AED, diabetes mellitus, and alcohol consumption. PCNF was used as the reference (constant). From Table 5, we found that LF, after adjusting for confounders (model 3), resulted in a 3.7% lower percentage decrease in AED at 3 weeks ($b = -0.037$), when compared with PCNF, although statistical significance was not reached ($P = 0.504$). In Table 6, the final regression model showed a 2.6% higher percentage decrease in AED at 3 months ($b = 0.026$), when

Table 5. The 3-week Analysis of Percentage Decrease of AED Using Linear Regression

Model		Unstandardized Coefficients				95% CI for *B*		
		B	SE	*t*	Sig.	Lower Bound	Upper Bound	Adjusted R^2
1	PCNF	0.735	0.039	18.804	<0.001	0.657	0.813	−0.014
	LF	−0.008	0.057	−0.147	0.884	−0.123	0.106	
2	PCNF	0.881	0.081	10.879	<0.001	0.720	1.043	0.03
	LF	−0.012	0.056	−0.217	0.828	−0.124	0.100	
	Preoperative AED	−0.002	0.001	−2.044	0.045	−0.004	0.000	
3	PCNF	0.809	0.087	9.246	<0.001	0.634	0.983	0.102
	LF	−0.037	0.055	−0.671	0.504	−0.146	0.073	
	Preoperative AED	−0.002	0.001	−1.770	0.081	−0.004	0.000	
	DM	−0.071	0.084	−0.846	0.400	−0.239	0.097	
	Alcohol	0.135	0.057	2.366	0.021	0.021	0.248	

Analysis of the percentage decrease in AED at 3 weeks posttreatment, comparing PCNF and LF. The linear regression analysis, adjusting for preoperative AED, diabetes mellitus, and alcohol consumption, showed that the difference in AED reduction between PCNF and LF was not statistically significant at 3 weeks. This suggested that both treatments were equally effective in the short-term improvement of joint extension.
CI, confidence interval.

Table 6. The 3-month Analysis of Percentage Decrease of AED Using Linear Regression

Model		Unstandardized Coefficients				95% CI for *B*		
		B	SE	*t*	Sig.	Lower Bound	Upper Bound	Adjusted R^2
1	PCNF	0.739	0.042	17.556	<0.001	0.655	0.822	−0.006
	LF	0.046	0.062	0.739	0.463	−0.077	0.168	
2	PCNF	0.916	0.086	10.609	<0.001	0.744	1.089	0.053
	LF	0.041	0.060	0.684	0.496	−0.078	0.160	
	Preoperative AED	−0.003	0.001	−2.337	0.022	−0.005	0.000	
3	PCNF	0.891	0.095	9.347	<0.001	0.701	1.081	0.086
	LF	0.026	0.060	0.442	0.660	−0.093	0.146	
	Preoperative AED	−0.003	0.001	−2.209	0.031	−0.005	0.000	
	DM	−0.132	0.092	−1.441	0.154	−0.315	0.051	
	Alcohol	0.073	0.062	1.187	0.239	-0.050	0.197	

The percentage decrease in AED at 3 months posttreatment, comparing PCNF and LF through linear regression adjusted for the same variables as in Table 5. The results indicated a slight, yet not statistically significant, difference in AED reduction favoring LF. These findings implied that the 3-month efficacy of PCNF and LF in improving joint extension may be similar, with no clear advantage for either treatment.
CI, confidence interval.

compared with PCNF. Similarly, this difference did not reach statistical significance (P = 0.660). Therefore, we concluded that both treatments were equally effective in reducing AED at both 3 weeks and 3 months.

Impact of Repeated Surgical Procedures

Multiple linear regression was applied to compare the percentage decrease in AED after repeated operations to those without in each of the interventions (ie, PCNF versus LF). Preoperative AED was adjusted as a confounder to account for variations in the severity of DD. Although repeated PCNF showed no significant difference (P = 0.407) in reducing AED at 3 weeks (Table 7), there was a 15.3% (b = −0.153) reduction in percentage decrease of AED at 3 months, when compared with patients who underwent PCNF for the first time (Table 8). This was statistically significant (P = 0.032). On the other hand, we found no significant difference in percentage decrease in AED between repeated LF and first LF, at both the 3-week (Table 9) and 3-month (Table 10) timepoints. This suggests that the effects of repeated LF were better maintained compared with repeated PCNF.

DISCUSSION

Our results suggest that PCNF was just as effective as LF in reducing AED. Although many surgeons are reluctant to use PCNF when there is a PIP joint flexion deformity, patients with a PIP joint flexion deformity formed the majority of our cohort. Moreover, our data suggest that the odds of developing a complication after PCNF were no different to patients undergoing LF for a PIP joint flexion deformity. Our findings challenge the view that PCNF should only be used to treat a flexion deformity at the MCP joint and suggest that PCNF can be used for a much wider range of situations than it is at present.

Moreover, PCNF is cheaper, quicker, and easier to perform than LF, and can be used to treat a larger range of patients because it can be performed easily under local or regional anesthetic.[6] In a previous study, the mean cost for PCNF was US $3335 compared with $4734 for LF.[13] A larger discrepancy is seen in the UK public healthcare system, where LF costs 7 times more than PCNF (£777 compared with £111).[6,14] In many cases, PCNF can also be performed in an out-patient setting because specialist

Table 7. Effect of Reoperations on Percentage Change in AED Using PCNF at 3 Weeks, Adjusted to Preoperative AED

		Unstandardized Coefficients				
Model		*B*	SE	*t*	Sig.	Adjusted R^2
1	Constant	0.761	0.053	14.401	<0.001	−0.012
	Repeated PCNF	−0.059	0.080	−0.737	0.466	
2	Constant	1.002	0.109	9.158	<0.001	0.110
	Preoperative AED	−0.004	0.001	−2.468	0.018	
	Repeated PCNF	−0.063	0.075	−0.838	0.407	

Examines the impact of repeated PCNF procedures on the percentage change in AED at 3 weeks, adjusted for preoperative AED levels. The analysis suggested that reoperations using PCNF do not significantly alter the effectiveness of the procedure in the short term, indicating that PCNF maintains its efficacy even when performed multiple times.
CI, confidence interval.

Table 8. Effect of Reoperations on Percentage Change in AED Using PCNF at 3 Months, Adjusted to Preoperative AED

		Unstandardized Coefficients				
Model		*B*	SE	*t*	Sig.	Adjusted R^2
1	Constant	0.803	0.052	15.575	<0.001	0.064
	Repeated PCNF	−0.148	0.078	−1.893	0.066	
2	Constant	1.110	0.100	11.094	<0.001	0.276
	Preoperative AED	−0.005	0.001	−3.443	0.001	
	Repeated PCNF	−0.153	0.069	−2.225	0.032	

The effect of reoperations investigates the 3-month efficacy of repeated PCNF procedures on AED reduction, again adjusted for preoperative AED. The findings reveal a statistically significant decrease in the effectiveness of repeated PCNF procedures in reducing AED at 3 months, suggesting that the benefits of PCNF may diminish with subsequent treatments.
CI, confidence interval.

Table 9. Effect of Reoperations on Percentage Change in AED Using LF at 3 Weeks, Adjusted to Preoperative AED

		Unstandardized Coefficients				
Model		*B*	SE	*t*	Sig.	Adjusted R^2
1	Constant	0.729	0.047	15.429	<0.001	−0.031
	Repeated LF	−0.008	0.104	−0.080	0.937	
2	Constant	0.785	0.123	6.390	<0.001	−0.056
	Preoperative AED	−0.001	0.002	−0.497	0.622	
	Repeated LF	−0.022	0.109	−0.204	0.839	

Here, the focus is on the short-term impact (3 weeks) of repeated LF procedures on AED reduction, taking into account preoperative AED. The results indicated no significant difference in the effectiveness of LF, whether as a first time or repeat procedure, in improving joint extension shortly after surgery.
CI, confidence interval.

Table 10. Effect of Reoperations on Percentage Change in AED Using LF at 3 Months, Adjusted to Preoperative AED

		Unstandardized Coefficients				
Model		*B*	SE	*t*	Sig.	Adjusted R^2
1	Constant	0.763	0.053	14.274	<0.001	−0.008
	Repeated LF	0.101	0.118	0.855	0.399	
2	Constant	0.787	0.140	5.638	<0.001	−0.040
	Preoperative AED	0.000	0.002	−0.183	0.856	
	Repeated LF	−0.095	0.124	0.767	0.449	

The data given explore the 3-month impact of repeated LF procedures on AED reduction, adjusted for preoperative AED. Unlike repeated PCNF, the analysis showed that the effectiveness of LF in reducing AED does not significantly change with reoperations, which suggested consistent efficacy of LF regardless of the number of procedures over our study period.
CI, confidence interval.

equipment is not required, further reducing the strain on healthcare systems.

Our study suggests that there was no significant difference in the recurrence of a flexion deformity after PCNF or LF. In part, this is explained by the short study period. In contrast, other studies have suggested that there is a higher recurrence rate after treatment with PCNF.[7] However, it is important to note the reasons why a patient may consent to reoperation for a recurrence. By comparison with LF, PCNF is less painful and has a shorter rehabilitation (2–3 weeks for PCNF compared with 3 months for LF). Therefore, patients undergoing PCNF are more likely to consent to reoperation, a factor that has not previously been considered in the literature. Moreover, the thresholds used to define a recurrence remain ambiguous and unstandardized. Compared with

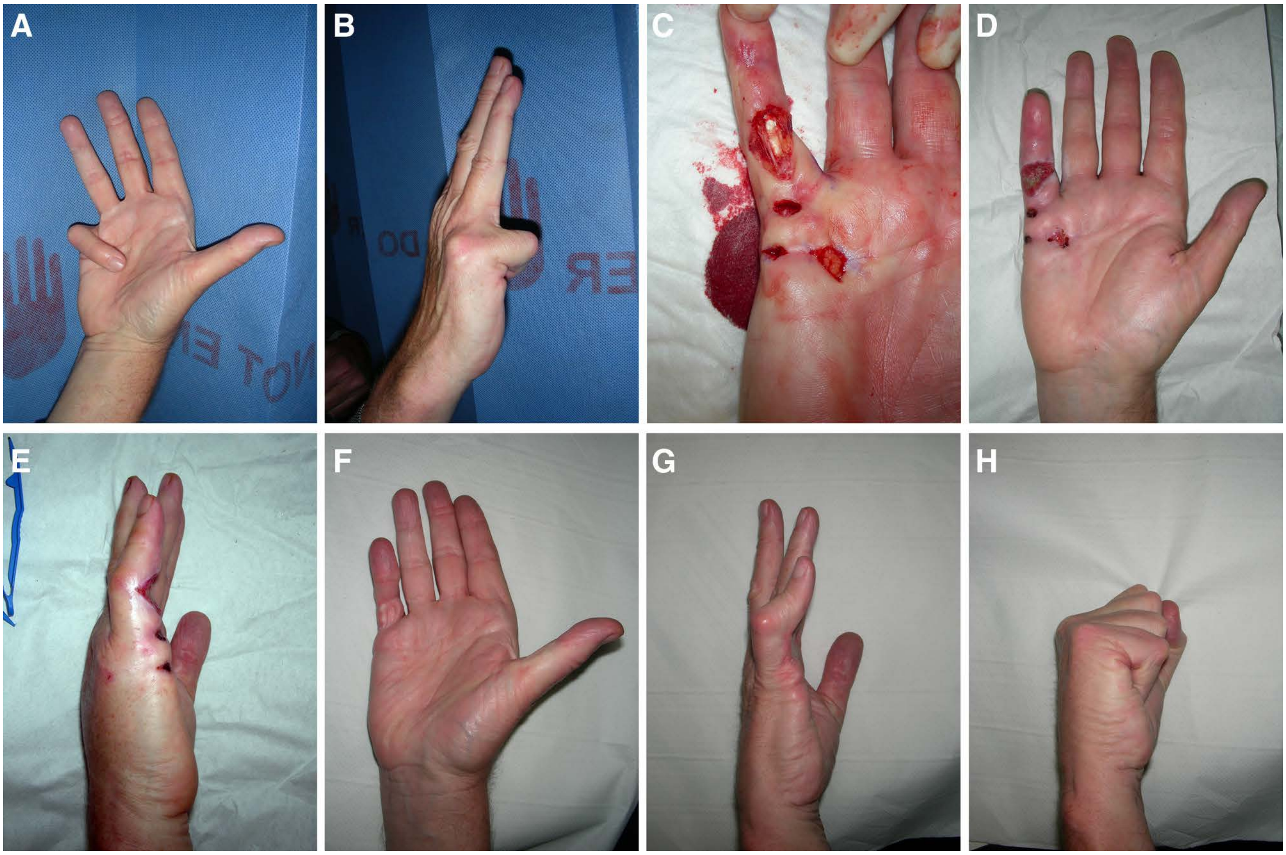

Fig. 2. Wound healing by secondary intention after PCNF. A, Preoperative anterior view of the hand. B, Preoperative lateral view of the hand. C, Intraoperative view showing exposed flexor tendons and NV bundles. D, Anterior view at 10 days postrelease. The tendons and NV bundles are completely covered by granulation tissue. E, Lateral view at 10 days postrelease. F, Anterior view at 42 months after release. The wounds have completely re-epithelialized. G, Lateral view at 42 months after release. There is a slight recurrence of the original flexion deformity. H, Lateral view of the patient attempting to make a fist.

LF, patients (especially older patients) would much rather undergo retreatment with PCNF.[7] Therefore, future studies should include questionnaires to measure the reasons why patients undergo reoperation after LF or PCNF.

It is important to note that all the patients in this study adhered to a period of splintage after surgery. Previous RCTs have shown that, at 3 months postoperatively, patients who comply with splinting achieved a 2.21-degree mean increase in total active extension when compared with those who were not splinted.[4,15,16] Hitherto, no additional benefits of splinting have been shown,[4,15,16] although this could be attributed to the loose adherence criterion of splinting in these studies (eg, patients were analyzed when splints were worn ≥50% of the nights for the first 3 months).[16] In contrast, our senior author (N.K.) advises his patients to use an extension splint (at nighttime only), indefinitely. He emphasizes the importance of complying with splinting, as he believes that this helps to reduce the recurrence rate.

To further investigate whether PCNF should be used as a first-line treatment, the effect of repeat procedures was considered because DD is incurable. Our linear model suggests that a repeat PCNF was 15.3% less effective in reducing AED compared with patients who underwent PCNF the first time. In contrast, previous studies suggest that a repeat PCNF is just as effective as the first PCNF.[17] To explain the difference, it is possible that (in our study) patients who initially underwent PCNF had a greater contracture reduction at their reoperative procedure compared with those who initially underwent LF, at 3 months follow-up.[18] This underlines the need for further investigations to establish the long-term efficacy of reoperative PCNF and to clarify if these effects are sustained. If they are, then this could make PCNF even more cost-effective compared with LF.

Globally, LF is the most frequently used treatment for DD because of a belief that it produces a more durable outcome. However, a 5-year RCT suggested that the difference in durability compared with PCNF may be smaller than expected.[19] Interestingly, the RCT also found that patients treated with PCNF recovered normal hand use an average of 8 days earlier than LF.[19] Moreover, complication rates generally correlate with the invasiveness of a procedure. Therefore, although not statistically significant, it was interesting to note that our results showed lower odds of developing a complication after PCNF compared with LF. A previous meta-analysis has identified a high number of complications after surgical fasciectomy.[20] This meta-analysis suggested that patients undergoing reoperative surgery for recurrent DD experienced 10 times the number of digital nerve and digital artery injuries compared with primary DD. Other studies have suggested that postoperative LF complication rates increase with increasing severity of DD, in particular when PIP joint flexion exceeds 60 degrees.[21,22] Consequently, PCNF may be preferable for patients with recurrent DD due to its quicker recovery and lower complication rate despite the possibility that the effect of LF may be more durable.

It is also worth noting that the senior author's (N.K.) standard approach to PCNF is different from that used by others. Instead of limiting his dissection to just the cord tissues, he recommends dividing any structure that prevents extension, whether it be skin, fascia, flexor sheath, or volar plate. Although this results in large open wounds, the healing properties of patients with DD seem to be different from patients without DD, particularly about wound contracture.[5] Therefore, even though the tendons, nerves, and vessels end up being exposed, these structures are always covered by soft tissue (Fig. 2) by the end of the initial period of static splintage (lasting 9–10 days). The results of the present study justify the effectiveness and safety of this method of PCNF.

We acknowledge several limitations of this study. The retrospective study design led to the exclusion of a large number of potential subjects due to the absence of data, most notably the preoperative or postoperative active range of motion values. This highlights the potential for bias in our findings. Moreover, our analysis of qualitative data (including the reasons for reoperation) proved challenging. Such an analysis could potentially explain the higher reoperation rate after PCNF observed in other studies.[23] Although we adjusted for several risk factors, other factors (ie, duration of splintage) were not accounted for due to a lack of complete datasets. Finally, the short duration of follow-up in our study limits our conclusions about the durability of each procedure. Nevertheless, our methods and results could serve as a reference for future longitudinal studies with more samples and longer follow-ups.

CONCLUSIONS

This study suggests that treatment with PCNF was not associated with a greater risk of complications compared with LF. It also suggests that the ability of PCNF to reduce AED in the short term was no different compared with LF. Considering the speed of PCNF (it takes a few minutes compared with a few hours for LF), the cost-effectiveness of PCNF, and the wider applicability of PCNF (ie, a larger number of patients would be suitable for treatment), PCNF should be used more widely as a first-line treatment for both primary and recurrent DD, especially in a public health setting. Nevertheless, our findings suggest that PCNF may be less effective than LF for patients requiring reoperation at 3 months. Importantly, PCNF is just as safe as LF when used for reoperative surgery. Further prospective studies should be conducted to minimize systematic errors.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

ETHICAL APPROVAL

All procedures performed in the study involving human participants were in accordance with the ethical standards of the 1964 Declaration of Helsinki and its later amendments. The present study was approved as part of a local hospital audit.

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