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ORIGINAL STUDY

Percutaneous needle fasciotomy in Dupuytren's contracture : is it a viable technique ?

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The aim of this retrospective study was to evaluate the results of 44 percutaneous needle fasciotomies for Dupuytren's contracture, performed from March 2005 to June 2010. The mean age of the 36 patients was 58 years and the mean follow-up period was 28 months. The assessment was based on the clinical records and clinical evaluation. Pre-operative and postoperative total passive extension deficit and complications were registered. Recurrence and patient satisfaction were also noted. The results in stage I and II of Tubiana were interesting, with an average improvement of more than 70%. For more severe deformities, the correction obtained was not so satisfactory and decreased significantly over time. The cumulative rate of minor complications was significant (11/44) but there were no major complications or permanent sequelae. Most of the patients were satisfied with the result and would recommend the procedure or would be willing to repeat it if necessary. The recurrence rate was 9%. Percutaneous needle fasciotomy appeared in this study as a minimally invasive, simple and fast technique with low morbidity. These features make this technique a valid alternative in mild stages of Dupuytren's disease.

Keywords : complications ; Dupuytren ; needle fasciotomy ; recurrence ; surgery ; outcome.

INTRODUCTION

Although the condition had been described previously by others, Guillaune Dupuytren was first to present in 1831 a thorough analysis of the anatomy, aetiology and treatment of the diseased palmar aponeurosis (*4*). Historically, surgical treatment regimens for Dupuytren's disease have undergone a complete pendulum movement. In London, Astley Cooper and Henry Cline had described a therapeutic fasciotomy as early as 1777 (*2*). Later, with the flowering of the anaesthetic techniques, more aggressive surgical techniques have emerged in an attempt to treat the disease in a more definitive way. In 1834, Goyrand described partial fasciectomy, and later in 1842, Fergusson proposed total fasciectomy, and these remained the gold standard despite a significant rate of complications and recurrence (*6*). With the revival of interest in minimally invasive techniques in medicine, a group of French rheumatologists, led by Lermusiaux (*12*), reintroduced percutaneous fasciotomy in the late 70's, per-

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forming it with a needle and under local anaesthesia. Since then, percutaneous needle fasciotomy (PNF) gained in notoriety, like other recent techniques such as enzymatic fasciotomy (*11*), owing to a faster recovery with the use of a less invasive technique and acceptable outcome and recurrence rate. The aim of this study was to investigate the postulated benefits and risks of PNF in the short-medium term.

PATIENTS AND METHODS

We retrospectively studied 36 patients (44 rays) treated surgically by PNF from March 2005 to June 2010. Inclusion criteria were : a) total passive extension deficit of at least 30° in the metacarpophalangeal (MCP), proximal interphalangeal (PIP) and/or distal interphalangeal (DIP) joints ; b) no previous surgical treatment for Dupuytren in the same hand ; c) operated by at least one of the three hand surgeons of the department ; d) at least 12 months of follow-up after surgery. Two patients that met all these criteria but have undergone revision surgery were not included but were taken into account to calculate the recurrence.

The clinical investigation included :

A) Patient's file consultation with registration of preoperative and postoperative (after the period of immobilization) deformity, surgical time and complications, either minor (transient paraesthesias, haematoma, skin cracks) or major (infection, skin necrosis, digital nerve and artery damage, ruptured flexor tendon).
B) Clinical interview with assessment of patient satisfaction, registration of the deformity and postoperative evaluation of sensitivity (Semmes-Weinstein monofilament) and flexor integrity (measuring the distance from the pulp of the fingers to the distal palmar crease while making a fist). The pre and postoperative deformity was quantified as the total passive extension deficit (TPED) of the MCP, PIP and DIP joints and classified according to the classification of Tubiana (*16*).

The PNF was performed on an inpatient basis with general /locoregional anaesthesia and a tourniquet on the arm. The treatment was done in one session regardless of the extent of the disase. The cord responsible for the contracture was identified and sectioned at various levels in the palm and/or fingers with a 25-gauge needle mounted on a syringe, from distal to proximal. The finger was then passively extended to obtain the maximum release. The surgery ended when there was no palpable cord left. Fingers were then immobilized within an extension splint for a period of three weeks. After the immobilization period patients were encouraged to actively and passively mobilize the fingers without restrictions.

In the data analysis we used a descriptive analysis, indicating the mean and standard deviation (SD) or proportions, as applicable.

RESULTS

A total of 36 patients (44 rays) were included in the study. The right hand was treated in 25 cases ; the ring finger was the most affected (Table I). The mean age at time of surgery was 58 years (39-81 years) ; 80% of patients were male. Twelve patients had a history of surgery for Dupuytren's disease in the contralateral hand. In our series, the fasciotomy was exclusively palmar in 21 rays, digitopalmar in 17 and digital in 6. The mean follow-up period was 28 months (12-63 months).

The initial deformity was classified according to the classification of Tubiana (Table II) and the reduction in TPED was calculated as a percentage of the value of preoperative TPED (Table III). The average TPED before surgery was 96° (35-185). In

Table I. — Localization of the disease within the hand

Finger	Number of cases
Thumb	0
Index	0
Middlefinger	2
Ring finger	24
Little finger	18

Table II. — Pre-operative assessment of the fingers by the Tubiana classification

Tubiana Grade	Number of cases
I (0-45°)	5
II (45°-90°)	18
III (90°-135°)	13
IV (> 135°)	8

Table III. — Reduction of TPED post-operatively and at follow-up (as percentage [mean ± SD] of the original deformity)

Tubiana Grade	Reduction of TPED at the post-op	Duration of follow-up (months)	Reduction of TPED at the follow-up
I (0-45°)	74 ± 7%	27 ± 12	74 ± 7%
II (45°-90°)	78 ± 18%	29 ± 34	76 ± 18%
III (90°-135°)	64 ± 16%	28 ± 29	54 ± 26%
IV (> 135°)	60 ± 5%	30 ± 20	50 ± 31%

the immediate postoperative period the mean TPED was 31° (10-70) and at follow-up 38° (10-125). The mean surgical time was 16 minutes (11-37) and there was a gradual decrease in this duration over time. In our series we noted the presence of skin fissures in 7 rays (16%) that healed with dressing care and without complications, and transient paraesthesias in 4 digits (9%) that resolved within a few months. The cumulative rate of minor complications was thus 25%. No major complication occurred.

When asked about their degree of satisfaction, 94% (34/36) of the patients were satisfied with the result (except 2 who are waiting for revision surgery) and 92% (33/36) would recommend the procedure or would be willing to repeat it if necessary. Taking into account the two patients that were not included in this study because they needed revision surgery and the two patients waiting for revision surgery, we registered a recurrence rate of 9% (4/46).

DISCUSSION

Although Dupuytren's contracture is a benign, but progressive and relapsing disease, the treatment should seek to restore hand function and prevent progression of the disease. The choice of a more or less aggressive surgery depends on the severity of the disease, on the patient's morbidity and on the surgeon's experience and there are few randomized comparative studies attesting the effectiveness of percutaneous needle fasciotomy (PNF) and limited fasciectomy (LF). This study investigates the benefits and risks of PNF in the short-medium term. When we look at the literature about this subject, we find studies of poor methodological quality with little information about patient characteristics, selection and outcome evaluation. In general, papers report on a limited number of results and it is often unclear at what time point outcomes were measured (*14*). The reported recurrence rate varies widely, from 11% to 65%, and obviously must be interpreted with caution, given the differences in population and the period of time after surgery in which they have been observed as well as on the definition of recurrence (*3*). Based on the evidence, the main benefits offered by PNF is a short-term reduction in the degree of contracture, with the patients experiencing less morbidity, faster recovery and fewer complications (*14*).

Badois *et al* (1993) performed PNF in 138 patients and found a rate of 81% of excellent/good results on the short-term and 69% on the long-term (5 years). However, the rate of minor complications was significant (20%) and the five-year recurrence rate was 50.4% (*1*). Duthie and Chesney (1997) in a retrospective study of 82 patients at 10 years of follow-up, and performing percutaneous fasciotomy with a scalpel, showed a low rate of minor complications (4%) and a reoperation rate of 66% after an average time of 60.4 months (*5*). Foucher *et al* (2001) performed PNF in 311 fingers ; the first 100 patients had a mean follow-up of about 3.2 years. They found a recurrence rate of 58% ; they recorded virtually no complications (*7*). More recently, in 2006, van Rijssen *et al* published the first part of a comparative study between PNF and LF with regard to the immediate results. They found overlapping results in stages I and II of Tubiana but a statistically significant difference in favour of LF in stages III and IV. The rate of major complications was 5% for LF versus 0% for PNF. Patient satisfaction was almost equal, but hand

Table IV. — Recurrence rate at follow-up

Tubiana Grade	Recurrence rate as defined by McFarlane and Jamieson in 1966	Recurrence rate as defined by Hueston in 1974
I (0-45°)	0/5 (0%)	0/5 (0%)
II (45°-90°)	0/18 (0%)	1/18 (6%)
III (90°-135°)	0/13 (0%)	8/13 (62%)
IV (> 135°)	4/10 (40%)	10/10 (100%)

function directly after treatment was considered better in the PNF group, as was the degree of discomfort that patients experienced (*17*). With regard to complications, Symes and Stothard reported two signficant complications (false aneurysm and injury to flexor digitorum profundus) following PNF in a patient on anticoagulants and questioned the safety of the procedure under such conditions (*15*).

The results in our patients appear interesting in stages I and II of Tubiana. An improvement in TPED of more than 70% was achieved post-operatively and the correction tended to persist over time (Table IV). For more severe deformities, the correction obtained was not so satisfactory and decreased over time. This shows that PNF may not be suitable for more severe contractures, as also concluded Foucher *et al* (*7*) and van Rijssen *et al* (*17*).

PNF has proved to be a simple and fast technique and we observed a gradual decrease in surgical time with growing experience. Regarding complication rates in the literature our results from PNF are comparable with those reported by Foucher *et al* (*7*), Badois *et al* (*1*) and van Rijssen *et al* (*17*). The rate of minor complications was significant (25%) but there have been no major complications or permanent sequelae.

In terms of recurrence, previous authors have reported a rate of recurrence between 11% and 65% because of differing definitions of recurrence. We considered recurrence as "recurrent joint contracture sufficient to require further surgery" as defined by McFarlane and Jamieson in 1966 (*13*). Taking into account the two patients that were not included in this study because they underwent revision surgery and the two patients waiting for revision surgery, we register a recurrence rate of 9% (4/46). If we consider a positive Hueston table-top test (*10*), when TPED exceeds 30°, as a recognised sign to indicate surgical intervention and so as a sign of recurrence, then the rate of recurrence will be 39% (18/46). However, we consider the first definition more realistic since although it is not based on objective measurements, it correlates best with the degree of patient satisfaction. Moreover, the latter definition cannot be applied to more severe deformities as it is often not possible to achieve a nearly complete correction of the deformity. Regardless of its definition, recurrence occurred in the more severe stages or when we had achieved a smaller correction of the deformity (Table IV). This study confirms the observation that recurrent contracture is more likely to occur with greater initial deformity, and that there is an inverse relationship between the degree of surgical correction and recurrent contracture (*3*). This might suggest that either there must be more active residual disease after incomplete correction or that the disease is more aggressive (*9*).

The two patients that underwent revision surgery and the two patients that were not satisfied with the surgery were "young" patients (between 43 and 56 years) with severe deformities (TPED > 135º) and rapidly progressive disease that probably was not an indication for this procedure.

This study has some limitations. In addition to assessing the stage of disease according to the classification of Tubiana, it would be important to establish whether the deformity occurs at the MCP or interphalangeal joint as the prognosis is different. We could not establish this difference since it is a retrospective study and only the TPED from the

preoperative and immediate postoperative period was available. It would also be important to standardize in terms of follow-up duration since discrepancy on this point can lead to a bias in terms of results. However, when we look at our results, we see a similar mean follow-up period for all stages. Thus, we can say that in the short to medium term there is no tendency in aggravation of the deformity in stages I and II in contrast to Tubiana stages III and IV. The question is whether these findings are related to the effect of the treatment or to the natural course of the disease. It is known that there is an increased tendency to aggravation of the deformity, the greater the initial deformity, even after good surgical correction and also that there is an inverse relationship between the degree of surgical correction and recurrent contracture. Another limitation was related to the measurement of the deformity. Although the deformities at final follow-up have been assessed by the same observer, this was not the case for preoperative and immediate postoperative measurements, which can lead to interobserver variability.

CONCLUSIONS

Percutaneous needle fasciotomy is a minimally invasive, simple and fast technique, which allows a rapid functional recovery with a low morbidity. Compared with other more invasive techniques, it provides good results in the short and medium term, in stages I and II of Tubiana. These features make the technique a valid alternative in the treatment of mild and moderate forms of Dupuytren's contracture. However, there must be a careful selection of patients to achieve optimal results, as these are discouraging in young patients with rapidly progressive disease. We emphasise the need for more studies assessing this technique with regard to long-term results and more prospective randomized comparative studies versus open techniques and enzymatic fasciotomy. It would also be important to establish an universal definition for recurrence to standardize the results.

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