



Available online at
ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com



Original article

Middle phalangectomy with shortening fusion of the fifth finger in Dupuytren's digital hooks



Raccourcissement digital avec ablation de la phalange moyenne de l'auriculaire dans les crochets digitaux de la maladie de Dupuytren

G. Raimbeau^{a,b,*}, N. Bigorre^{a,b}, W. Balti^{a,b}, F. Rabarin^{a,b}, J. Jeudy^{a,b}, P.-A. Fouque^{a,b}, B. Cesari^{a,b}, Y. Saint-Cast^{a,b}

^a Centre de la Main, Angers assistance Main, Village Santé Angers Loire, 47, rue de la Foucaudière, 49800 Trélazé, France

^b CHU Tahar Sfar, avenue Tahar Sfar, 5100 Mahdia, Tunisia

ARTICLE INFO

Article history:

Received 10 May 2018

Received in revised form 13 October 2018

Accepted 21 December 2018

Available online 19 January 2019

Keywords:

Dupuytren's disease
 Arthrodesis
 Little finger
 Digital hook

Mots clés :

Maladie de Dupuytren
 Arthrodèse
 Auriculaire
 Crochet digital

ABSTRACT

Severe contracture of the little finger due to Dupuytren's disease continues to be a therapeutic problem. Fifth finger amputation, which is sometimes the only solution, has a major negative impact on function and appearance, and exposes the patient to adjacent digital hook aggravation. Middle phalangectomy with finger shortening fusion is an alternative surgical solution. The aim of this study was to report on a continuous series of 36 cases treated with this approach. This was a retrospective series of 33 patients (26 males and 7 females) operated from 1994 to 2015. All patients had severe contracture of their little finger and 30 had prior surgery. The combined extension lag was 143° (75–270), with considerable functional deficit and poor appearance. The surgical technique consisted of a dorsal approach, a more or less extensive excision of the middle phalanx, and arthrodesis with alignment of the remaining bone segments, while preserving the fingertip/nail complex. The following outcomes were determined when the patients were reviewed: functional discomfort and use, appearance, residual pain, pulp sensitivity, recurrence of contracture and overall satisfaction. Six patients were dead and two were lost to follow-up. Twenty-five patients (27 cases) were reviewed at a mean follow-up of 64 months (12–280). There were no post-operative complications. Twenty-two patients (24 cases) were satisfied or very satisfied. The resulting appearance was graded at 7.13/10 (1–10). Pain on a 10-point Visual Analog Scale was 0.46 (0–5). Cold intolerance was found in 9 cases (33.3%) and decreased fingertip sensitivity in 3 cases (11.1%). The hand could be flattened in 21 cases; in the other cases, it could not be flattened due to contracture in another finger. Wearing gloves was again possible in 26 cases. Fusion was achieved in 18 of the 21 cases evaluated with X-rays at the last follow-up (85.7%). All the other cases had a non-union with no clinical repercussions. There were 5 local recurrences at the level of the little finger. Finger shortening through a dorsal approach seems to provide satisfactory outcomes in patients with Dupuytren's disease who have severe contracture of the little finger. This technique results in an acceptable looking functional finger, which has sensation and no significant morbidity.

© 2018 SFCM. Published by Elsevier Masson SAS. All rights reserved.

R É S U M É

Le crochet digital sévère de l'auriculaire dans la maladie de Dupuytren reste un défi thérapeutique. L'amputation du rayon parfois proposée ou demandée par le patient a un résultat fonctionnel et esthétique lourd. L'ablation de la phalange moyenne avec arthrodèse raccourcissante est une solution chirurgicale qui peut alors être proposée. Nous rapportons les résultats de notre expérience à propos d'une série rétrospective de 36 cas. Il s'agissait de 33 patients, 26 hommes et 7 femmes d'âge moyen de

* Corresponding author at: Centre de la Main, Angers assistance Main, Village Santé Angers Loire, 47, rue de la Foucaudière, 49800 Trélazé, France
 E-mail address: raimbeau@centredelamain.fr (G. Raimbeau).

59,7 ans (37–90) opérés entre 1994 et 2015 par cinq opérateurs. Trois patients avaient été opérés de manière bilatérale. Il s'agissait d'une maladie de Dupuytren sévère ou récidivante avec un antécédent chirurgical dans 30 cas, de 1,66 intervention en moyenne. Le déficit d'extension moyen était de 143° (75–270) avec 20 stades 3 et 16 stades 4 selon la classification de Tubiana. La chirurgie était motivée par une gêne fonctionnelle quotidienne dans tous les cas, avec dans 8 cas une douleur déclarée. L'intervention était réalisée dans tous les cas sous anesthésie locorégionale et consistait à un abord dorsal, une excision plus ou moins étendue de la phalange moyenne avec une arthrodeuse d'alignement en rectitude, en conservant le complexe pulpo-unguéal. Six patients étaient décédés et deux perdus de vue, les 25 autres patients (27 cas) ont été revus au recul moyen de 64 mois (12–280). Nous n'avons déploré aucune complication postopératoire. Vingt-deux patients (24 cas) étaient satisfaits ou très satisfaits. Le résultat esthétique était coté à 7,13/10 (1–10), la douleur selon l'échelle visuelle analogique était de 0,46 (0–5). On trouvait une sensibilité douloureuse au froid dans 9 cas (33,3%) et une diminution de la sensibilité pulpaire dans 3 cas (11,1%). La main pouvait être posée à plat dans 21 cas, pour les autres l'auriculaire n'était pas responsable de cette gêne. Le port de gant était redevenu possible dans 26 cas, ainsi que le serrage de main dans 25 cas. La consolidation osseuse était acquise dans 18 cas sur 21 radiographiés le jour de la révision (85,7%), on trouvait dans les autres cas une pseudarthrose sans retentissement clinique. Nous avons déploré 5 récurrences locales au niveau de l'auriculaire, dont 3 ont été améliorées par une nouvelle aponévrectomie segmentaire. Le raccourcissement digital se révèle une solution intéressante dans les crochets digitaux sévères de l'auriculaire dans la maladie de Dupuytren. Il permet de conserver un segment digital fonctionnel, sensible et esthétique et de redonner une main sociale grâce à la conservation du complexe pulpo-unguéal.

© 2018 SFCM. Publié par Elsevier Masson SAS. Tous droits réservés.

1. Introduction

The management of recurrences of Dupuytren's disease is challenging. In fact, after the initial surgical treatment, the fibromatosis often recurs or spreads and provokes a recurrence with finger contracture. The surgical techniques used in the context of recurrences are more difficult to carry out with a higher risk of complications (nerve or artery lesion, infection, skin necrosis) than the initial surgery [1]. In the little finger, the contracture can be severe, mainly at the proximal interphalangeal joint (PIP), and can result in a hook finger. Amputation of the ray [2] can be proposed to or requested by the patient; however, this reduces the hand's functional ability and negatively impacts its appearance [3]. To preserve the fingertip complex, we instead resect the middle phalanx (middle phalangectomy) and fuse the shortened finger.

The aim of this study was to evaluate the clinical and radiological outcomes of this surgical technique through a retrospective study of 36 cases with a minimum 12 months' follow-up. We also analyzed the risk factors for recurrence after this type of procedure.

2. Patients and methods

This was a retrospective study of 36 cases of middle phalangectomy with shortening arthrodesis performed between 1994 and 2015.

2.1. Patients

The study included 33 patients (26 men, 7 women) with a mean age of 59.7 years (37–90); 3 patients underwent bilateral surgery (Table 1). In 30 cases, the procedure was done for a recurrence. These patients had previously undergone an average of 1.66 procedures (1–4): 5 fasciotomy, 26 fasciectomy, 1 skin reconstruction and 3 skin grafts. In the other 6 cases, this was the primary surgical procedure because of considerable little finger contracture.

The pre-operative extensor lag was 143° (75–270). In the Tubiana classification, 20 cases were stage 3 and 16 were stage

4. The flexion deformity of the metacarpophalangeal (MCP) joint was 35.3° (0–100), while it was 84.3° (35–110) in the PIP joint and 20.8° (–20–90) in the interphalangeal joint.

The surgical intervention was motivated by functional disability in every patient with 8 patients also experiencing pain. Shaking hands was impossible in 33 cases and wearing of gloves was impossible in 35 cases.

2.2. Surgical technique

A dorsal H approach was used in 26 cases and a longitudinal approach in 10 cases (Fig. 1A). A middle phalangectomy was performed next by grinding down the bone with a periosteal elevator (Fig. 1B). When a complete phalangectomy was performed (22 cases), the resection was accompanied by decortication at the head of the proximal phalanx and the base of the distal phalanx. When a partial phalangectomy was performed (14 cases), the PIP joint and middle phalanx were resected to achieve full finger extension while preserving the distal interphalangeal (DIP) joint. Next, the two phalanges were reduced with intramedullary K-wire fixation using an inside-out technique (Fig. 1C). In two cases, fixation was achieved with an intramedullary compression screw. Volar fasciotomy was performed in 10 cases and fasciectomy in 5 cases. The patients' hand was then immobilized in a surgical dressing for 15 days; once the dressing was removed, immobilization was continued with a segmental brace for another 4 weeks.

2.3. Methods

The patients were reviewed by an independent observer at the final follow-up. Patient satisfaction, appearance, functional disability and pain were evaluated using a Visual Analog Scale. Every patient also evaluated their cold sensitivity, ability to shake hands and wear gloves. The development of recurrence, presence of a neuroma or reduction in epicritical sensation were documented. The range of motion in the carpometacarpal joint of the 5th ray and the MCP joint were measured. The ability to grasp cylindrical objects 1, 7.5 and 10 cm in diameter was also determined (Fig. 2). Lastly, X-rays were taken to verify bone union and whether the finger extension had been corrected.

Table 1
Pre-operative and post-operative data for the 33 patients (36 cases) in this study.

N	Sexe	Age	Pre-operative ROM			Follow-up (Months)	Satisfaction	Pain (VAS/10)	Recurrence	Post-operative result			Cylinder hold			X-rays: fusion
			MCP	PIP	DIP					MCP	CMC 5	Pulp-palm dist. (cm)	1 cm	7.5 cm	10 cm	
1	M	61	65	35	0	12	Satisfied	0	No	97	15	4	Yes	Yes	Yes	Yes
2	M	64	0	90	20	12	Satisfied	0	No	110	15	2	Yes	Yes	Yes	Yes
3	M	56	20	90	-10	Lost to FU										
4	M	63	80	100	-20	59	Satisfied	0	Yes	60	10	2	Yes	Yes	Yes	Yes
5	F	70	0	90	90	280	Fairly satisfied	5	No	Reviewed by telephone						
6	M	47	0	90	60	19	Satisfied	0	No	100	25	3	Yes	Yes	Yes	No
7	M	80	60	100	0	Died										
8	M	76	20	90	40	78	Very satisfied	0	Yes	120	30	2	Yes	Yes	Yes	Yes
9	F	42	0	90	0	117	Satisfied	0	Yes	110	30	3	Yes	Yes	Yes	Yes
10	F	69	45	75	-20	58	Very satisfied	0	No	110	10	4	No	Yes	Yes	Yes
11	M	41	30	80	20	Died										
12	M	67	0	60	60	Died										
13	M	49	90	90	90	191	Satisfied	0	No	Reviewed by telephone						
14	F	63	90	90	55	277	Very satisfied	0	No	Reviewed by telephone						
15	M	62	60	60	0	22	Satisfied	0	Yes	95	20	3	No	Yes	Yes	Yes
16	M	43	50	110	0	43	Satisfied	0	No	110	15	4	No	Yes	Yes	Yes
17	M	63	30	80	20	75	Very satisfied	2.5	Yes	100	30	1.5	Yes	Yes	Yes	No
18	M	51	30	60	0	26	Very satisfied	0	No	Reviewed by telephone						
19	M	52	30	90	0	12	Very satisfied	0	No	Reviewed by telephone						
20	M	65	90	90	0	55	Very satisfied	0	No	110	25	3	Yes	Yes	Yes	Yes
21	M	49	90	90	45	Died										
22	M	54	30	90	20	Died										
23	M	37	40	80	40	33	Satisfied	0	No	Reviewed by telephone						
24	M	66	0	75	0	34	Very satisfied	0	No	95	35	4	No	Yes	Yes	Yes
25	M	64	0	100	40	Died										
26	M	90	90	90	40	45	Not satisfied	4	No	60	20	2	No	Yes	Yes	Yes
27	M	57	45	80	0	62	Satisfied	0	No	100	35	3	Yes	Yes	Yes	No
28	F	82	100	100	-20	12	Satisfied	0	No	95	20	3.5	Yes	Yes	Yes	Yes
29	M	64	0	80	-20	20	Very satisfied	1	No	90	25	5	No	No	Yes	Yes
30	M	48	30	70	0	81	Very satisfied	0	No	100	20	3.5	No	Yes	Yes	Yes
31	F	64	15	70	65	33	Very satisfied	0	No	120	15	3	Yes	Yes	Yes	Yes
32	F	65	15	70	0	26	Very satisfied	0	No	80	15	5.5	No	No	No	Yes
33	M	60	10	90	45	21	Fairly satisfied	0	No	110	30	4	No	Yes	Yes	Yes
34	M	54	15	90	60	24	Satisfied	0	No	105	15	4	Yes	Yes	Yes	Yes
35	M	52	0	100	30	Died										
36	F	59	0	100	0	Lost to FU										

CMC5: carpometacarpal (little finger);DIP: distal interphalangeal; F: female; FU: follow-up; M: male; MCP: metacarpophalangeal; PIP: proximal interphalangeal; ROM: range of motion; VAS: visual analog scale.

2.4. Statistics

The results are presented with 95% confidence intervals (95% CI). Either Student's *t*-test or the Fisher test was used for comparisons, depending on the type of variable being analyzed. A *P*-value < 0.05 was considered statistically significant. The statistical analyses were done using the R software, version 2.14.2 (<http://www.R-project.org>).

3. Results

Six patients died and two were lost to follow-up. The independent rater was able to review 25 patients (27 cases) (Fig. 3) at a mean follow-up of 64 months (12–280). Nineteen of these patients (21 cases) were reviewed in person with X-rays. The six other patients could not travel to the clinic, thus were contacted by telephone.

At the final review, 22 patients (88.9%) were satisfied or very satisfied. Pain was graded at 0.46/10 (0–5), disability at 2.63/10 (0–9), and appearance at 7.13/10 (1–10). Cold sensitivity was found in 9 cases (33.3%). The hand could be flattened in 21 cases (77.8%). The other hands could not be flattened because of contracture in another finger than the little finger. Wearing gloves was possible in

26 cases (96.3%) and shaking hands was possible in 25 cases (92.6%) (Fig. 4).

A 1-cm cylinder could be held by the operated hand in 12 cases (57.1%), a 7.5-cm cylinder in 19 cases (90.5%) and a 10-cm cylinder in 20 cases (95.2%). The range of motion of the carpometacarpal joint of the 5th ray was 21.6° (10–35), and that of the MCP joint was 98.8° (60–120) (Fig. 5). The pulp-to-palm distance was 3.29 cm (1.5–5.5). The epicritical sensation was reduced in 3 cases, but no neuroma was present. Fusion was achieved in 18 cases (85.7%) (Fig. 6). Recurrence developed in 5 cases and required surgical revision with segmental fasciectomy in 2 cases. We did not identify any significant risk factors for recurrence (Table 2).

4. Discussion

Recurrence after surgery is a progression of Dupuytren's disease that is more severe when the diathesis is strong, especially in the little finger, which has a worse prognosis with a recurrence rate of 17.2% to 20% [4–6]. When a patient presents with severe contracture of the little finger, partial or complete amputation of this digit is usually proposed to or requested by the patient. Tonkin et al. [2] disclosed a 9.1% amputation rate in their study of 154 procedures (14 amputations, of which 12 were at the little

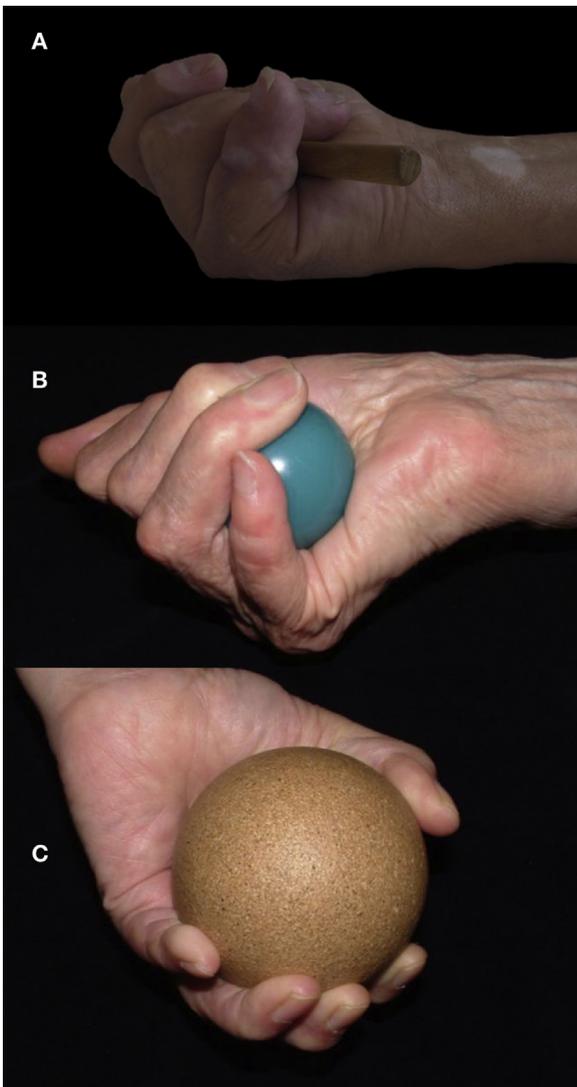


Fig. 1. Surgical technique. Dorsal H or longitudinal approach (A). Complete one-piece middle phalangectomy (B). Fixation of the shortening fusion with two intramedullary K-wires inserted using the inside-out technique (C). Technique opératoire.

finger). The outcome of amputations in this context is not satisfactory, with a risk of flexion deformity, neuroma-related pain or phantom finger syndrome [3]. Thus, Jensen et al. advocate performing proximal amputation (MCP or metacarpal level) to reduce the risk of complications. However, they suggest looking for other technical alternatives in the context of disabling recurrence of Dupuytren's disease in the little finger [3].

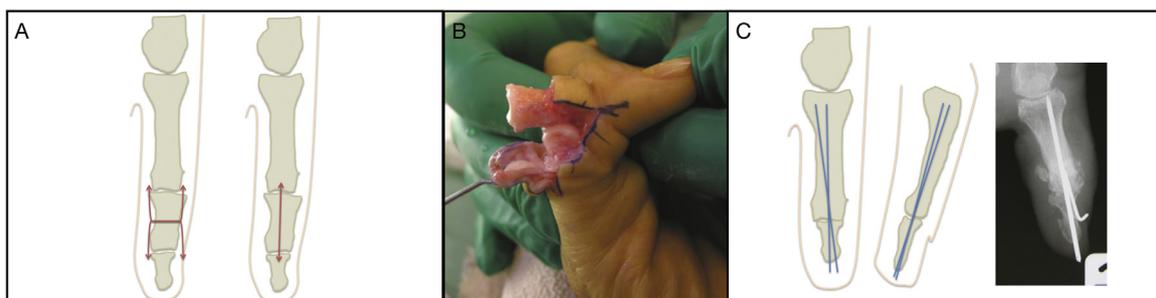


Fig. 2. Evaluating the patient's ability to grasp cylinders of 1 cm (A), 7.5 cm (B) and 10 cm (C) in diameter.

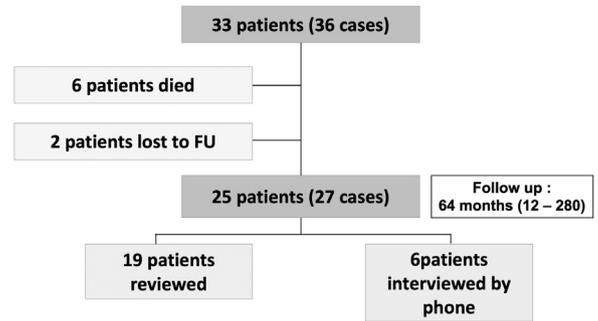


Fig. 3. Study flow chart.

In 1973, Moberg [7] proposed three alternatives to finger amputation when volar surgery is no longer feasible:

- cross-finger flap;
- finger fusion;
- extension osteotomy.

For us, a heterodactyl flap is not an option as the dorsal skin is harvested from the ring finger in combination with prolonged syndactyly to reduce the scar fibrosis reaction. This technique can only be performed for small defects created by restoring finger extension, as long as the neurovascular structures can be mobilized in a matrix of palmar fibrosis. In addition, in these recurrence cases, dissection is difficult because the fibrosis infiltrates the connective tissue left around the neurovascular bundles and the tendon sheath during the first fasciectomy. For moderate skin defects, other flaps [8,9] can be used after the fasciectomy. Extension osteotomy of the neck of the proximal phalanx is more ingenious, as it corrects the flexion deformity; however it only shifts the PIP mobility arc, which remains the same. This technique is limited by the height of the bone wedge resected, which itself depends on the stiffness of the volar tissues. While it improves finger opening, it does not correct the flexion deformity as much as our proposed middle phalangectomy. Moberg does not perform bone fixation; instead, he aligns the finger in a cast for 3 to 4 weeks then starts finger mobilization before radiological bone union is obtained. The third option is shortening PIP fusion with resection of 10–15 mm bone fixed at 25° by a cortical bone strip harvested from the olecranon. This construct has only been used by one author, who stated the operated patient could wear a glove. In our study, 96% could wear a glove. Tonkin et al. [2] validate this choice but prefer using a tension band technique with two K-wires and an interosseous figure-of-eight wire.

Watson and Lovallo [10] also prefer interphalangeal arthrodesis over amputation in cases of Dupuytren's disease recurrence with severe contracture of the little finger after repeated surgical treatment using a volar approach. They reported satisfactory



Fig. 4. Clinical outcome with restoration of the little finger's extension, which allows the hand to be flattened.

function and fusion in every one of their 14 cases. The main complaint was the inability to hold small objects in the ulnar portion of the hand. We had the same finding with only 57.1% being able to hold a 1-cm diameter cylinder. According to Watson, the principle of this fusion is bone resection at the distal third of the proximal phalanx to achieve 30° flexion deformity.

Haimovici [11] proposed a fourth option: Swanson silicone implant arthroplasty. This restored more than 60° range of motion in 73% of cases, but the drawback was PIP flexion deformity inherent to this type of arthroplasty. Tonkin et al. [2] also evaluated



Fig. 5. Clinical outcome with compensation by hyperflexion of the MCP joint to achieve finger curling.

this option; however, for the little finger, they prefer an osteotomy or fusion procedure to ensure the finger's stability.

The phalangectomy that we have described here allows finger-to-palm curling because of the MCP and carpometacarpal joints' mobility. This mobility actually improves over time because the patient does not have pain during gripping motions. The stability of the shortened finger allows forceful gripping and, because the hook finger has been eliminated, the ability to hold cylindrical objects of a size useful in daily living (7.5 cm and 10 cm cans). Wearing gloves and hand shaking without catching are the most appreciated by patients, along with the good appearance, due to the preservation of the fingertip.

Our approach was inspired by an article from Mitz and Lemerle [12] who insisted on not sacrificing the fingertip complex when it was preserved in the emergency context; this helps prevent the risk of neuroma and maintain pulp sensitivity. We followed their recommendations, namely by performing a dorsal H incision in 26 cases and using axial K-wire fixation, often with a second anti-rotation K-wire. Our initial evaluation of 9 patients found good esthetics and function with intact pulp sensation at 62 months

Table 2
Analysis of risk factors for recurrence of Dupuytren disease after middle phalangectomy and finger shortening.

	Recurrence		No recurrence		Statistical analysis	
Cases	5		22			
Age (mean, range)	61.2 (42–76)		60 (37–90)		Student's <i>t</i>	<i>P</i> = 0.85
Sex	Men	Women	Men	Women	Fischer	Odds ratio: 1.48, <i>P</i> = 1
	4	1	16	6		
Pre-op extensor lag	134° (90–180)		147° (75–270)		Student's <i>t</i>	<i>P</i> = 0.48
Phalanx resection	Total	Partial	Total	Partial	Fischer	Odds ratio: 1.41, <i>P</i> = 1
	3	2	15	7		
Follow-up (months)	62 (12–280)		70 (22–117)		Student's <i>t</i>	<i>P</i> = 0.73

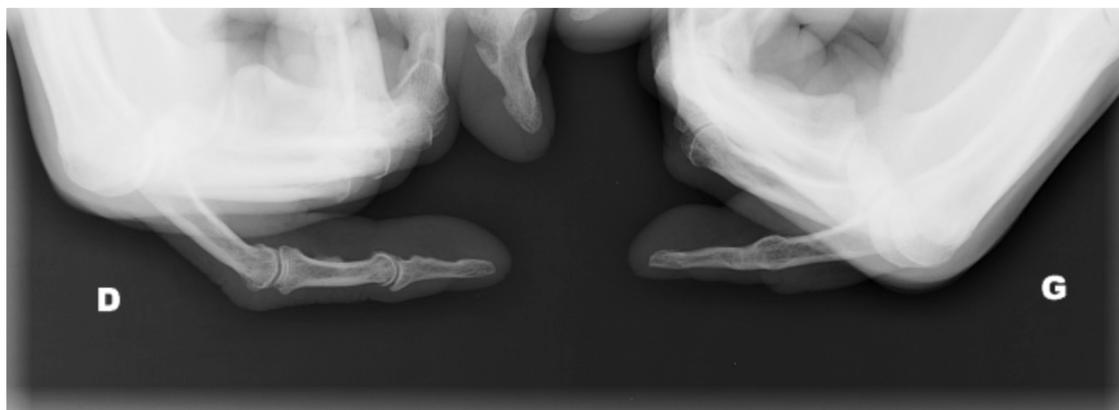


Fig. 6. Comparative X-rays showing that fusion is achieved, and the little finger can be extended.

[13]. The current study confirms these initial results with the same follow-up but a larger number of patients.

Teboul et al. [14] reported good functional outcomes and appearance in one patient after 1 year with a 70% subjective satisfaction rate and a pulp-to-palm distance of 1 cm. More recently, Liverneaux et al. [15] used this technique in seven patients, four of whom had a Dupuytren's related finger hook. The fixation construct consisted of an intramedullary screw. All of the patients achieved fusion, despite some patients having an immediate post-operative gap between fragments. In our study using K-wire fixation, the nonunion rate was 14.7%, but none of these cases required surgical revision or were painful. Liverneaux's study reported fewer cases of cold sensitivity and altered pulp sensation; however, these outcomes are related to the number of prior procedures and the dissection challenges.

As for recurrence, in our preliminary report of 9 cases without recurrence at a mean of 62 months, we felt the magnitude of the skeletal shortening was protective against recurrence [13]. In the current study, there were 5 recurrences out of 27 cases at a mean follow-up of 64 months, with 2 cases requiring an additional segmental procedure. We could not identify any predictors of recurrence. This is evidence that Dupuytren's disease has a progression potential specific to each patient. We currently have no predictive factors other than Hueston's notion of strong diathesis [16]. However, certain items can be considered as risk factors for recurrence such as the male gender, smoking and alcohol abuse [17]. In this context, we performed middle phalangectomy as the primary procedure in six cases and had very good outcomes without recurrence. Nevertheless, Tonkin et al. [2] recommend conservative first-line surgery and they only perform salvage procedures by arthrodesis in complex revision cases.

5. Conclusion

Excision of the middle phalanx with fusion of the remaining two phalanges is a reliable and reproducible technique for treating recurring severe contracture of the little finger from Dupuytren's disease. This is a viable alternative to amputation. The patients

greatly appreciate the appearance and function achieved by preserving the nail bed/fingertip complex.

Disclosure of interest

The authors declare that they have no competing interest.

References

- [1] Coert JH, Nérin JP, Meek MF. Results of partial fasciectomy for Dupuytren disease in 261 consecutive patients. *Ann Plast Surg* 2006;57:13–27.
- [2] Tonkin MA, Burke FD, Varian JP. The proximal interphalangeal joint in Dupuytren's disease. *J Hand Surg Br* 1985;10:358–64.
- [3] Jensen CM, Haugegaard M, Rasmussen SW. Amputations in the treatment of Dupuytren's disease. *J Hand Surg Br* 1993;18:781–2.
- [4] Tropet Y, Deck D, Vichard P. Lesions of the little finger in Dupuytren's disease. *Ann Chir Main Memb Super* 1994;13:101–6.
- [5] Rolland H, Voche P, Dap F, Merle M. Résultats à plus de 5 ans du traitement de l'auriculaire au stade IV de la maladie de Dupuytren. *La Main* 1996;1:107–12.
- [6] Goubier JN, Le Bellec Y, Cottias P, Ragois P, Alnot JY, Masmajeun E. Isolated fifth digit localization in Dupuytren's disease. *Chir Main* 2001;20:212–7.
- [7] Moberg E. Three useful ways to avoid amputation in advanced Dupuytren's contracture. *Orthop Clin North Am* 1973;4:1001–5.
- [8] Colson P, Janvier H, Gandolphe M. A Sterling Bunnell procedure for the repair of the digital commissures by rotation of flap grafts. *Ann Chir Plast* 1960;5:205–12.
- [9] Jacobsen K, Holst-Nielsen F. A modified McCash operation for Dupuytren's contracture. *Scand J Plast Reconstr Surg* 1977;11:231–3.
- [10] Watson HK, Lovallo JL. Salvage of severe recurrent Dupuytren's contracture of the ring and small fingers. *J Hand Surg Am* 1987;12:287–9.
- [11] Haimovici N. Alloarthroplasty alternative therapy of fixed flexion contracture of the fingers in Dupuytren's disease. *Handchirurgie* 1978;10:135–48.
- [12] Mitz V, Lemerle JP. Value of pulp recession in inveterate hook fingers. Technique/indications. *Ann Chir Main Memb Super* 1991;10:324–30.
- [13] Raimbeau G, Rabarin F, Cesari B, Saint Cast Y, Fouque PA. Digital shortening with auricular second phalanx amputation into the Dupuytren's digitals hooks. *J Hand Surg Eur* 2007;32:101.
- [14] Teboul F, Sabri E, Goubier JN. Case report: middle phalanx resection as an alternative treatment to amputation of recurrent Dupuytren's contracture of the fifth digit. *Eur J Plast Surg* 2012;35:901–3.
- [15] Honecker S, Hidalgo Diaz JJ, Naito K, Pire E, Prunières G, et al. Proximodistal interphalangeal arthrodesis of the little finger: a series of 7 cases. *Hand Surg Rehabil* 2016;35:262–5.
- [16] Hueston JT. Dupuytren's contracture. Edinburgh: E&S Livingstone; 1963. p. 51–120.
- [17] Hindocha S, Stanley JK, Watson S, Bayat A, et al. Dupuytren's diathesis revisited: evaluation of prognostic indicators for risk of disease recurrence. *J Hand Surg Am* 2006;31:1626–34.