### UNIVERSITE DE LAUSANNE - FACULTE DE BIOLOGIE ET DE MEDECINE

Service de Chirurgie Plastique, Reconstructive et Esthétique

# Resection of the flexor digitorum superficialis for trigger finger with proximal interphalangeal joint positional contracture

#### THESE

préparée sous la direction du Professeur Wassim Raffoul (avec la co-direction du Docteur Louis Kinnen)

et présentée à la Faculté de biologie et de médecine de l'Université de Lausanne pour l'obtention du grade de

# DOCTEUR EN MEDECINE

par

#### Yann FAVRE

WE 805 FAV

Médecin diplômé de la Confédération Suisse Originaire de St-Barthélemy (Vaud)

Lausanne

2012

Bibliothèque Universitaire de Médecine / BiUM CHUV-BH08 - Bugnon 46 CH-1011 Lausanne

BATE 3691

L | Université de Lausanne Faculté de biologie et de médecine

Ecole Doctorale Doctorat en médecine

Imprimatur

Vu le rapport présenté par le jury d'examen, composé de

Directeur de thèse	Monsieur le Professeur W <b>assim Raffoul</b>
Co-Directeur de thèse	Monsieur le Docteur Louis Kinnen
Expert	Monsieur le Professeur Alain Farron
Directrice de l'Ecole doctorale	Madame le Professeur S <b>tephanie Clarke</b>

la Commission MD de l'Ecole doctorale autorise l'impression de la thèse de

# Monsieur Yann Favre

# intitulée

Resection of the flexor digitorum superficialis for trigger finger with proximal interphalangeal joint positional contracture

Lausanne, le 18 octobre 2012

pour Le Doyen de la Faculté de Biologie et de Médecine

20000

Madame le Professeur Stephanie Clarke Directrice de l'Ecole doctorale

# RESECTION OF THE FLEXOR DIGITORUM SUPERFICIALIS FOR TRIGGER FINGER WITH PROXIMAL INTERPHALANGEAL JOINT POSITIONAL CONTRACTURE

Journal of Hand Surgery - American Volume, accepté le 27 Juillet 2012

Yann Favre, Louis Kinnen

Open release of the A1 pulley is a widely known procedure for the treatment of trigger finger. However, a subset of patients present trigger finger with a positional contracture of the proximal interphalangeal joint. These patients usually have a long history of trigger finger or have already undergone one surgery to treat trigger finger. In both instances, surgical intervention with only transection of the A1 pulley is ineffective. In this study, 36 patients (39 fingers) were treated by resection of the flexor digitorum superficialis after section of the A1 pulley (mean age: 63 y). We performed a retrospective review with a mean follow up of 30 months. The mean pre-operative extension deficit of the proximal interphalangeal articulation was 24 degrees, and 28 of the 39 affected fingers achieved full extension following the surgical intervention. All of the resected tendons had histological damage. This technique is a useful treatment for selected patients whose trigger finger is associated with a positional contracture.

#### Abstract

**Purpose** : Open release of the A1 pulley is a widely known procedure for the treatment of trigger finger. A subset of patients presents with both trigger finger and a positional contracture of the proximal interphalangeal joint. These patients usually have a long history of trigger finger or have already undergone a surgical release of the annular pulley. This study is a retrospective review of the outcomes of resection of the flexor digitorum superficialis for patients whose trigger finger was associated with a positional contracture of the proximal interphalangeal joint.

Methods : Thirty-six patients (39 fingers) were treated by resection of the flexor digitorum superficialis after section of the A1 pulley. The mean age of the patients was 63 y (range: 45 - 90 y). Seven patients (19 %) had previously undergone an open release of the A1 pulley and had developed a positional contracture of the proximal interphalangeal joint 2 to 5 months afterwards. We performed a retrospective review with a mean follow-up of 30 months (range: 12 - 60). No patient was lost to follow-up. The active range of motion was recorded at the proximal interphalangeal joint pre- and postoperatively.

**Results** : The mean pre-operative positional contracture of the proximal interphalangeal joint was 24 degrees (range: 15-30 degrees). The mean postoperative positional contracture of the proximal interphalangeal joint was 4 degrees (range: 0 -10 degrees). The most commonly affected digit was the middle finger (26 fingers, 67%). In 28 fingers (72%), full extension was achieved following only the surgical procedure. The remaining 11 fingers (28%) had a postoperative residual positional contracture (range: 5 -10 degrees). However, all fingers achieved a full range of motion after physical therapy and an injection of betamethasone. All of the resected tendons had histological damage.

**Conclusions** : This technique is a useful treatment for selected patients whose trigger finger is associated with a positional contracture.

Type of Study / Level of Evidence : Therapeutic IV.

**Keywords:** trigger finger, flexor digitorum superficialis, positional contracture, resection

#### **INTRODUCTION**

Trigger finger was described by Notta in 1850 <sup>(1)</sup> and is one of the most frequent pathologies of the hand. Section of the A1 pulley is the treatment of choice when conservative therapy fails, and the postoperative results are usually excellent. However, some patients develop a progressive contracture of the proximal interphalangeal articulation a few weeks after the release of the A1 pulley <sup>(2-5).</sup> The contracture of the PIP joint should be tested by passively flexing the MCP joint to 90 degrees and then extending the PIP joint. If this maneuver allows full passive extension of the PIP joint, the contracture is called positional. The contracture of the PIP joint might be fixed or positional. Also patients with a long-standing trigger fingermight also present with a positional contracture of the proximal interphalangeal (PIP) joint <sup>(6)</sup>. The positional contracture may be due to degenerative enlargement and/or shortness of the flexor digitorum superficialis (FDS). Osterman et al. proposed 3 surgical options for the treatment of trigger finger with proximal interphalangeal joint contracture: partial FDS resection, complete FDS resection, or reduction tenoplasty of the FDP <sup>(7)</sup>. Le Viet et al. treated these patients by resection of the ulnar slip of the FDS when trigger finger was associated with a deficit of motion of the proximal interphalangeal joint in adult patients <sup>(6)</sup>. Other authors have reported successful results with combined A1 pulley release with partial or complete FDS resection in children with persistent triggering and/or fixed flexion contractures of the PIP joint <sup>(8-9)</sup>.

This study is a retrospective review of the outcomes of resection of the FDS tendon for 36 adult patients whose trigger finger was associated with a positional contracture of the proximal interphalangeal joint between 2005 and 2008.

#### MATERIALS AND METHODS

In this retrospective review, the senior author treated 332 trigger fingers in 298 adult patients over a four-year period (2005 - 2008). Of those, 262 patients (88 %) were treated only by section of the A1 pulley. The remaining 36 patients (12 %) also presented with a positional contracture at the PIP joint. Thirty one were women (86 %). Seven women (19 %), had previously undergone an open release of the A1 pulley by the senior author and had developed a positional contracture of the proximal interphalangeal articulation 2 to 5 months after the first operation. The average time interval from first to revision surgery was 6 months. The mean age of the patients was 63 y (range: 45 - 90). The long finger was the most often affected by both trigger finger and positional contracture (26 fingers, 67 % of the fingers). The ring, index, and small fingers followed with 9 (23 %), 3, and 1 cases respectively. In 33 patients (92%), only 1 finger was involved. Three of the patients presented 2 affected fingers each. The mean follow-up period was 30 months (range: 12 - 60). No patient was lost to follow-up. The active range of motion was pre-operatively tested by passively flexing the MCP joint to 90 degrees and then extending the PIP joint. All our patients had a positional contracture at the PIP joint. We did not exclude any patients with a fixed contracture. In all our patients, the positional contracture of the PIP joint persisted perioperatively after section of the A1 pulley. The active range of motion was recorded at the PIP joint pre- and postoperatively with the wrist and the metacarpophalangeal joint at neutral.

One patient had diabetes. No patient had previously received injectable glucocorticoids or had a past history of trauma, rheumatoid arthritis, hemodialysis, Dupuytren disease, psoriasis, or gout. Our institution does not require institutional review board approval.

#### **Operative Technique**

All operations were performed by the senior author under local anesthesia. A tourniquet was applied over the upper arm and inflated after elevation of the arm. A longitudinal incision was placed at the level of the A1 pulley. The neurovascular structures were protected by right angled retractors, and the A1 pulley was exposed and split longitudinally. After release of the A1 pulley, extension of the proximal interphalangeal joint was still impaired in all patients. Proximal traction and distal sectioning of the FDS 2-3 mm from the decussation of the tendon was performed to allow optimal gliding of the flexor digitorum profundus (FDP) (Fig. 1). Distally-directed traction was then followed by proximal sectioning of the tendon. (Fig. 2) The excised tendon segment measured 4 to 5 cm. Macroscopically, all of the FDS tendons had lost their normal surface smoothness and brightness, and this was observed to a lesser degree in the FDP tendons. All resected tendons were sent for pathology and showed histological damage (Fig. 3 and 4). The PIP joint range of motion was assessed pre - and postoperatively with the wrist and the metacarpophalangeal joint to 0 degree. No joint capsulectomy or release was done. A compressive bandage was then applied following skin closure, and the fingers were placed in a postoperative extension orthosis for 48 hours.

#### RESULTS

The mean pre-operative positional contracture of the PIP joint was 24 degrees (range: 15 - 30 degrees), and the mean postoperative positional contracture of the PIP joint was 4 degrees (range: 0 -10) within a mean follow-up of 30 months (range: 12-60). The difference between the pre- and postoperative extension deficit was statistically significant (p's < 0.000, paired t-test). In 28 fingers (72) %), full extension was achieved following only the surgical procedure. The remaining 11 fingers (28 %) had a postoperative residual contracture (range: 5 -10 degrees). However, all fingers achieved a full range of motion after injection of betamethasone and physical therapy (active range of motion, passive stretch, and use of an extension orthosis). The most commonly affected digit was the long finger (67%). Three patients presented 2 affected fingers each, and they did not have a higher incidence of recurrent positional contracture. Two patients had postoperative residual triggering at the PIP joint, and both were treated with an injection of betamethasone, which completely resolved the triggering. One patient had a hematoma that had to be drained. Two had painful scars that resolved with massage and betamethasone treatment. Two patients had a postoperative flexion deficit of the PIP joint with distances between the finger pulp and the distal palmar fold of 1 and 2 centimeters, which did not disturb the daily activities of these 2 elderly patients. The flexion deficit of the PIP joint could be attributed to the osteoarthrosis of the PIP

joint. Bowstringing, infection, chronic regional pain syndrome, digital nerve damage, and swan neck deformity were not observed postoperatively.

#### DISCUSSION

Trigger finger is a common disease process treated by hand surgeons, and the open surgical procedure used to treat trigger finger is universally accepted. The complication rates after open trigger finger release range from 1 % to 43 % <sup>(2,3,10,11)</sup>. Contracture of the PIP joint, which may limit daily activities, is one of the commonly described postoperative complications <sup>(2-5,12)</sup>. Although contracture of the PIP joint might present as a complication after trigger finger release, most patients who present a positional contracture at the proximal interphalangeal joint have never undergone an operation on their finger but have a long history of triggering. In our review, 19 % had a positional contracture after an initial operation for A1 pulley release, and 81 % had a positional contracture after a long history of triggering.

We have resected the FDS tendon since 2005 in carefully selected patients whose triggering was associated with a positional contracture of the PIP joint. Excision of the whole FDS tendon was proposed by Wissinger in 1971 to treat with tendon entrapment in the digital sheath in a patient with rheumatoid arthritis <sup>(13)</sup>. Resection of only the ulnar slip FDS tendon was described in 1978 by Ferlic and Clayton for rheumatoid arthritis. Ferlic claimed that the entire FDS could be excised if a patient had a mild flexion contracture of the proximal interphalangeal joint <sup>(14)</sup>. Le Viet et al. treated patients whose triggering was associated with a contracture of the PIP joint by FDS ulnar slip resection <sup>(6)</sup>. In

their series, full extension of the PIP joint was restored in all fingers when the pre-operative contracture at the PIP joint was 30 degrees or less. Although the postoperative results were good, we have observed 2 main disadvantages of this technique. First, the incision extends from the proximal palmar crease to the proximal half of the middle phalanx. A larger incision raises the risk of postoperative hypersensitivity of the scar. Second, Le Viet described 2 cases of A2 pulley rupture, which required reconstruction and lengthened convalescence. Marcus et al. treated trigger finger in diabetics using excision of the ulnar slip of the FDS with or without A1 pulley release. Unfortunately, preoperative active range of motion was inconsistently recorded. At short-term follow-up, PIP joint contracture averaged 10 degrees <sup>(15)</sup>. Cardon et al. reported successful results with combined A1 pulley release with partial or complete resection of the FDS in 6 children <sup>(8)</sup>.

In all our patients, stenosing tenosynovitis involved the degenerate FDS tendon and the A1 pulley with subsequent triggering and PIP joint contracture. In some rare cases, the FDP tendon and the A3 pulley are involved in triggering, and an A3 pulley excision has been successful <sup>(16)</sup>. If the FDP tendon shows intratendinous ganglia, debulking of the enlarged tendon by reduction flexor tenoplasty has been described <sup>(17)</sup>. In our series, 2 patients had postoperative residual triggering at the PIP joint, and both were treated successfully with an injection of betamethasone. However, if the

residual triggering persists after injection of betamethasone, reduction flexor tenoplasty of the FDP or release of the A3 pulley would be therapeutic options.

We believe that the chronic inflammation of the old and degenerate tendon caused an enlargement and/or shortness of the FDS and induced the flexion contracture of the PIP joint. In our series, 72 % of patients who had a positional contracture of 30 degrees or less recovered full motion following surgery. The other 11 fingers had only a small residual positional contracture (range: 5 -10 degrees). All patients achieved a full range of motion after injection of betamethasone and physical therapy.

Patients for whom independent FDS function is important, like most musicians, should be informed that this procedure could theoretically reduce their grip or pinch strength. Although grip strength or pinch strength were not quantified, none of the patients in this series complained of grip weakness at the last follow-up evaluation.

This study is limited by the retrospective nature of the investigations, but the surgical strategy, the satisfaction of the patients, and the good postoperative results of the senior surgeon's approach over a 4-year period indicated that the procedure is safe and effective.

#### REFERENCES

1. Notta A. Recherches sur une affection particulière des gaines tendineuses de la main. Arch Gen Med. 1850;24:142.

2. Lim MH, Lim KK, Rasheed MZ, Narayanan S, Beng-Hoi Tan A. Outcome of open trigger digit release. J Hand Surg 2007;32B:457-459.

3. Will R, Lubahn J. Complications of open trigger finger release. J Hand Surg 2010;35A:594-596.

4. Wolfe SW. Tenosynovitis. In: Green DP, Hotchkiss RN, Pederson WC, Green's Operative Hand Surgery, 5th Ed's. Elsevier, Churchill Livingstone, 2005;2137-2158.

5. Moriya K, Uchiyama T, Kawaji Y. Comparison of the surgical outcomes for trigger finger and trigger thumb: preliminary results. Hand Surg 2005;10:83-86.

6. Le Viet D, Tsionos I, Boulouednine M, Hannouche D. Trigger finger treatment by ulnar superficialis slip resection (U.S.S.R.). J Hand Surg 2004,29B:368-373.

7. Osterman AL, Sweet S. The treatment of complex trigger finger with proximal interphalangeal joint contracture. Atlas of the hand clinic, 1999;4-9.

8. Cardon LJ, Ezaki M, Carter PR. Trigger finger in children. J Hand Surg 1999;24A:1156-1161.

9. Bae DS, Sodha S, Waters PM. Surgical treatment of the pediatric trigger finger. J Hand Surg 2007;32A:1043-1047.

10. Turowski GA, Zdankiewicz PD, Thomson JG. The results of surgical treatment of trigger finger. J Hand Surg 1997;22A:145-149.

11. Thorpe AP. Results of surgery for trigger finger. J Hand Surg 1988;13B:199-201.

12. Ryzewicz M, Wolf JM. Trigger digits: principles, management, and complications. J Hand Surg 2006;31A:135-146.

13. Wissinger HA. Digital flexor lag in rheumatoid arthritis. Clinical significance and treatment. Plastic and Reconstructive Surgery 1971;47:465-468.

14. Ferlic DC, Clayton ML. Flexor tenosynovectomy in the rheumatoid finger. J hand Surg 1978;3A:364-367.

15. Marcus AM, Culver JE Jr, Hunt TR 3rd. Treating trigger finger in diabetics using excision of the ulnar slip of the flexor digitorum superficialis with or without A1 pulley release. Hand 2007;2:227-231.

16. Rayan GM. Distal stenosing tenosynovitis. J Hand Surg 1990;15A:973-975.

17. Seradge H, Kleinert HE. Reduction flexor tenoplasty. Treatment of stenosing flexor tenosynovitis distal to the first pulley. J Hand Surg 1981;6A:543-544.

# FIGURE LEGENDS

Figure 1:

Proximal traction and distal sectioning (red line) of the FDS 2-3 mm from the decussation of the tendon was performed to allow optimal gliding of the FDP

Figure 2:

Peroperative view of the long finger after sectioning of both slips of the FDS (red circle). The excised segment of FDS measured 4 to 5 cm.

Figure 3 :

The characteristic hierarchical structure of the collagen fibers is lost. Fibrous tissue in a reactive process is also present. Magnification : 400 X.

Figure 4 :

At the border of the collagen fibers, inflammatory cells are present around multiple capillaries. Magnification : 400 x.







