

# **Ultrasound-guided de Quervain tendon release : feasibility study and clinical results (n=11)**

P.Croutzet, MD  
Clinique de l'Union  
31200 Toulouse

## **ABSTRACT**

Hand tenosynovitis like trigger fingers have been successfully treated with ultrasound-guided percutaneous procedures.

The hypothesis of authors was the de Quervain's syndrome could be successfully treated with a specific ultrasound-guided percutaneous procedure, as it is for trigger finger.

Authors proposed to assess, in an anatomic study, the feasibility and safety of a new and specific procedure to perform an ultrasound-guided percutaneous release for de Quervain's syndrome ; and then to assess its efficiency in a clinical prospective series. (n=11).

## **METHOD**

**I-Cadaveric lab (n=14)** : 14 specimen wrists were analysed with ultrasound. We used a specific blade (1,8mm thin, nondisposable, blunt tip) and an ultrasound device with a high frequency transducer (22MHz). We performed a 1,5mm incision five millimeters proximal to the trapezio-metacarpal joint enabling a retrograde section of the two parts of the first retinaculum compartment during an In-Plane approach. Then, in every case, we evaluated, with an open approach, the efficiency of the release, and safety for the superficial nerves.

**II-Prospective clinical series (n=11)** : Under local anesthesia, 11 patients were operated on, and we reported the outcomes concerning morbidity and efficiency. A dressing was kept for one day. Clinical examinations with VAS were performed pre-operatively and post-operatively after 1 and 3 months.

## **RESULTS**

**I-Cadaveric lab(n=14)** : authors were able to identify with ultrasound the type of first compartment septation (subcompartmentalization ) in 13 cases (n=14). The misidentification induced one incomplete release. No damages of the superficial radial nerve were observed despite close relationship.

**II-Clinical series (n=11)** : the duration of surgery was 10min (5-18) and no kind of morbidities was noticed, none sensitive disorders. All patients were improved and satisfied but one patient was still painful after 3 months (VAS=3), in strength work only.

## **CONCLUSION**

Ultrasound-guided percutaneous release in the de Quervain's disease is a safe and reliable procedure without specific morbidity but many care should be taken to avoid superficial nerves and to identify with ultrasound the correct type of subcompartmentalization.

## INTRODUCTION

Ultrasound-assisted percutaneous trigger finger release has already been described with success <sup>1,2,3,4</sup>. De Quervain's syndrome is a stenosing tenosynovitis of the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) tendons in the first extensor compartment of the wrist. This pathology looks like the trigger finger disease in its pathogeny. The hypothesis of authors was the de Quervain's disease could be successfully treated with a specific ultrasound-guided percutaneous procedure as it is for trigger finger.

In a cadaveric study, authors proposed to assess the feasibility and safety of a new and specific procedure, taking account the relevant anatomy of this gesture and analyzing the interest of a new specific blade, to perform an ultrasound-guided percutaneous release for de Quervain's syndrome. Then, we assessed some preliminary clinical results in the first 3 cases.

## METHOD

### I-Cadaveric lab :

7 specimens were operated on both sides (**n=14**).

After an ultrasound assessment using a Logic e GE ultrasound device with a high frequency transducer (the L10-22-RS), we identify the presence of septums responsible of subcompartmentalization. It has been previously established ultrasound had a positive predictive value in the detection of subcompartmentalization around 75%<sup>5</sup>. Taking specific care to the anisotropic effect, we separate 3 types of first compartment subcompartmentalization depending on the Hiranuma classification <sup>6,7</sup> : type I- no septum ; type II-full length septum, type III -distal septum only (Fig 2).

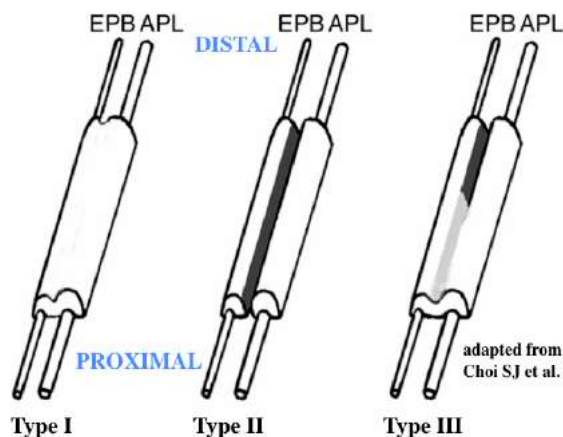


Fig 1 : Different types of sheath depending on subcompartmentalization (septation)

Then, we drew the landmarks, along each tendon EPB and APL, with the distal and the proximal part of the compartment (Fig 2). We performed a transversal 2mm incision in a skinfold one centimetre distal to the radial styloid, then we introduced a 18-gauge needle to perforate the tendon sheath prior to introduce the specific blade (Fig 3).

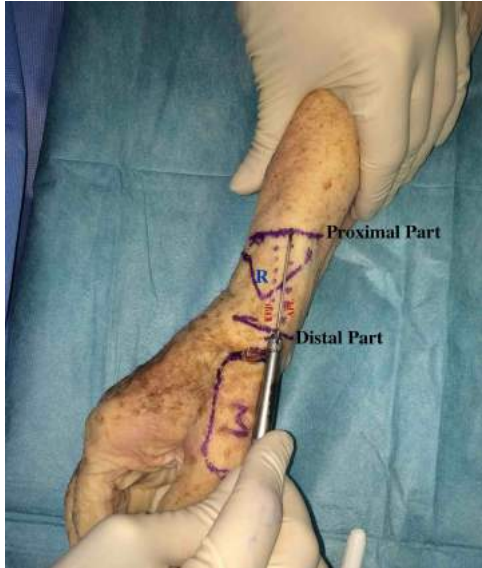


Fig 2 : Landmarks



Fig 3 : Specific blade

Trough a continuous ultrasound In-plane control, we performed a retrograde section of the first compartment of the extensor (Fig 4 & 5). This gesture was performed twice in Type II and III (once for the APL and once for the EPB) in order to be sure the two tendons have been released (Fig 6 & 7).



Fig 4 : Surgical setup



Fig 5 : Specific gesture



Fig 6 : Penetration of the blade



Fig 7 : Continuous In-plane section

After this ultrasound procedure, we evaluated in every case:

- the efficiency concerning the sheath release, the section of retinaculum roof and septums (Fig 8)
- the morbidity on tendons and sensitive branches of the radial nerve (Fig 9)

## **II-Prospective clinical series (n=11):**

We included 3 patients; all had a history of pain at the radial aspect of the wrist and a positive Finkelstein test despite the failure of a previous steroid injection. We recorded Visual Analogue Scale (VAS) pain and DASH score. After local anesthesia, we performed this specific ultrasound-guided percutaneous procedure. At the end of the procedure, an ultrasound-guided steroid injection was done in each case. The analysis criteria were only the duration of the surgery and the morbidity on tendons and nerves at 3 weeks. Efficiency wasn't evaluated in this preliminary series and will be furthermore.

Our sample number was too small for us to perform a reliable statistical analysis.

The study protocol was approved by our institutional review board (Clinique de l'Union); written informed consent was obtained from each patient prior to surgery.

## **RESULTS**

### **I-Cadaveric lab (n=14) :**

Before the procedure, ultrasound exam identified different types of septum :

- Type I : no septum n=7
- Type II : full septum n=3
- Type III : distal septum only n=4

Concerning the efficiency of the procedure, the superficial part of the retinaculum was successfully sectioned in all cases for type I and II (Fig 9). One case of Type I identified with ultrasound was indeed a type III after surgical exploration; in this case, the distal septum wasn't sectioned preventing the full release of the EPB. This case was considered as a failure.

Concerning the morbidity of the procedure: the superficial sensitive branches of the radial nerve were intact in all cases (Fig 10).

Some superficial abrasions were observed on the tendons in 5 cases due to the tip of the blade at the penetration level (distal part of the compartment).



Fig 8 : Efficiency, quality of the section and release



Fig 9 : Morbidity, integrity of the superficial nerves

**II-Clinical preliminary outcomes (n=3):**

We identified one Type I and two Type III. The duration of surgery was 10 minutes (5-18), no morbidity was noticed on skin, tendons or superficial nerves.

**DISCUSSION**

**-Concerning the anatomy of the superficial radial nerves :**

We didn't notice any sensitive nerve laceration or abrasion but we suggest a very deep care concerning the superficial nerves.

The anatomy of the superficial radial nerves has been precisely described by Gurses et al<sup>8</sup>: the superficial radial nerve gives a branch to the thumb (the lateral dorsal digital branch to the thumb) 50 mm proximal to the radial styloid but there is a wide range of variation in this length from 26mm to 72mm<sup>8</sup>.

Modern ultrasound device with ultra-high frequency transducer permit to observe the radial superficial branches. Nevertheless, because the division of the superficial radial nerve into the dorsal branch of the thumb may be very distal in some cases (26mm proximal to the styloid), we recommend performing an ultrasound assessment of this specific division and landmark it, prior to the procedure.

Gurses et al <sup>8</sup> had also analyzed the relationship of the superficial radial nerves and the sensitive branch of the thumb to the midline of the first extensor compartment of the wrist. The closest relationship was between the lateral dorsal digital branch to the thumb at the distal part of the first compartment: they measured a 2mm distance (Fig 10). Although it is now possible to identify with ultrasound the sensitive branches in the transversal scan, it is still complicated with a longitudinal scan ; which was the scan we used during the In-plane section. Therefore, we recommend, prior to the procedure, to landmark the exact location of the lateral dorsal digital branch to the thumb at the level of the skin incision, using a transversal scan.

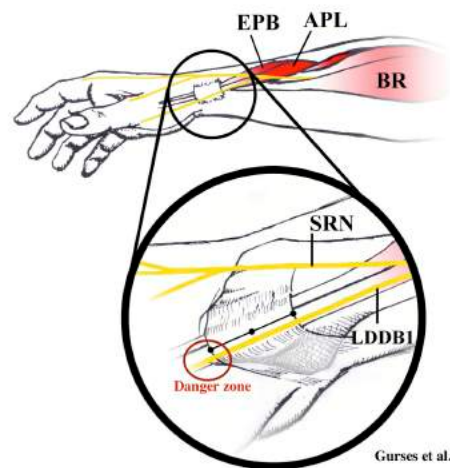


Fig 10: Relationship between the superficial nerves and the first extensor compartment

-Concerning the anatomy of the sheath (retinaculum roof and septums):

In our study, 50% of the cadavers had no septation but we consider the incidence of subcompartmentalization may be different in a population of de Quervain disease . Indeed, some clinical studies have described a septation up to 65%, suggesting a potential effect of subcompartmentalization at the origin of the pathology<sup>5,9</sup>.

Otherwise, in clinical practice, the use of Doppler permit to localise the 1,2 intercompartmental supraretinacular artery that is known to be a good landmark for release gesture <sup>10</sup>.

-Concerning the failure of full release we had in one case :

Only one incomplete release was observed in the third cadaver wrist. It was a type III septation that was misidentified with ultrasound. The type III is not the most frequent and the failure of ultrasound identification of this separate subcompartment would therefore be responsible for failure of decompression. In de Quervain's syndrome, there is a thickening of the retinaculum and septum that should help a better recognition<sup>11,12</sup>. We consider the improvement of our learning curve in ultrasound identification and precise gesture should improve our successful release in the future.

-Concerning the devices :

The blade we used was originally designed for trigger finger but suited also perfectly for this procedure. The blade has a blunt tip to penetrate intrasheath followed by a sharp blade to cut the sheath. Its specific shape enables to control precisely the section of the retinaculum because the tissue to be cut is localized between the blade tip

and the transducer, so we avoid the metallic artefact visible behind the blade. The continuous In-plane control decreases morbidity and ensures a complete section from the distal tip to the proximal edge of the retinaculum. The blade is less than 2mm-thin enabling a percutaneous procedure and has also the advantage to be very cheap because it is not a disposable device.

-Concerning the steroid injection :

In our experience of trigger finger disease, a steroid injection at the end of the procedure has improved pain relief and efficiency. In a comparative study between percutaneous trigger finger with and without steroid injection, Patel et al<sup>13</sup> described 4 times less unsatisfactory results with steroid injection, suggesting a high benefit of steroid injection. For this reason, we decided to add a steroid injection at the end of the procedure for all cases.

-Concerning the other procedures described in literature:

Different open procedures have been described <sup>14,15</sup> and most authors prefer a transversal skin incision 1,5 to 3cm-long over the radial styloid. The main complications are sensitive disorders: up to 35% of patients have transient symptoms of superficial radial nerve injury. The second point of unsatisfactory results concerns scar issues: pain, tenderness, and hypertrophy.

In 2007, Slade and Merrell<sup>16</sup> were the first to describe endoscopic release for de Quervain's disease. In 2011 and 2013, Kang et al<sup>17</sup> reported better outcomes and fewer complications using a modification of this technique when compared with open release.

We support this trend for mini-invasive surgery and we propose for the first time a percutaneous procedure for de Quervain's syndrome. Our general goal was to improve recovery and decrease morbidity, especially the sensitive disorders and scar issues.

## **CONCLUSION**

An ultrasound-guided percutaneous release of de Quervain disease is possible. This procedure is a safe and reliable procedure without specific morbidity but many care should be taken to avoid superficial nerves.

Further clinical evaluations should be performed to confirm the quality of outcomes and efficiency with time.

## BIBLIOGRAPHY

1. Paulius KL, Maguina P. Ultrasound-Assisted Percutaneous Trigger Finger Release: Is it Safe? *Hand N Y N* 2009;4(1):35–7.
2. Saengnipanthkul S, Sae-Jung S, Sumananont C. Percutaneous release of the A1 pulley using a modified Kirschner wire: a cadaveric study. *J Orthop Surg Hong Kong* 2014;22(2):232–5.
3. Bain GI, Turnbull J, Charles MN, Roth JH, Richards RS. Percutaneous A1 pulley release: a cadaveric study. *J Hand Surg* 1995;20(5):781–784–786.
4. Zhao J-G, Kan S-L, Zhao L, et al. Percutaneous first annular pulley release for trigger digits: a systematic review and meta-analysis of current evidence. *J Hand Surg* 2014;39(11):2192–202.
5. Choi S-J, Ahn JH, Lee Y-J, et al. de Quervain disease: US identification of anatomic variations in the first extensor compartment with an emphasis on subcompartmentalization. *Radiology* 2011;260(2):480–6.
6. Hiranuma A, Houjo H, Sakaguchi S. De Quervain's tenosynovitis and anatomical variation of first extensor compartment. *Orthop Surg* 1972;23:1186–1188.
7. Gurses IA, Coskun O, Gayretli O, Kale A, Ozturk A. The anatomy of the fibrous and osseous components of the first extensor compartment of the wrist: a cadaveric study. *Surg Radiol Anat SRA* 2015;37(7):773–7.
8. Gurses IA, Coskun O, Gayretli O, Kale A, Ozturk A. The relationship of the superficial radial nerve and its branch to the thumb to the first extensor compartment. *J Hand Surg* 2014;39(3):480–3.
9. Jackson WT, Viegas SF, Coon TM, Stimpson KD, Frogameni AD, Simpson JM. Anatomical variations in the first extensor compartment of the wrist. A clinical and anatomical study. *J Bone Joint Surg Am* 1986;68(6):923–6.
10. Inhyeok R, Kyungchul K. 1,2 intercompartmental supraretinacular artery can be a landmark for surgery of De Quervain's disease. *J Hand Surg Eur Vol* 2010;35(8):684–5.
11. Giovagnorio F, Andreoli C, De Cicco ML. Ultrasonographic evaluation of de Quervain disease. *J Ultrasound Med Off J Am Inst Ultrasound Med* 1997;16(10):685–9.
12. Lee K-H, Kang C-N, Lee BG, Jung W-S, Kim DY, Lee C-H. Ultrasonographic evaluation of the first extensor compartment of the wrist in de Quervain's disease. *J Orthop Sci Off J Jpn Orthop Assoc* 2014;19(1):49–54.
13. Patel MR, Moradia VJ. Percutaneous release of trigger digit with and without cortisone injection. *J Hand Surg* 1997;22(1):150–5.
14. Abrisham SJ, Karbasi MHA, Zare J, Behnamfar Z, Tafti AD, Shishesaz B. De Quervain Tenosynovitis: Clinical Outcomes of Surgical Treatment with Longitudinal and Transverse Incision. *Oman Med J* 2011;26(2):91–3.
15. Gundes H, Tosun B. Longitudinal incision in surgical release of De Quervain disease. *Tech Hand Up Extrem Surg* 2005;9(3):149–52.
16. Slade J, Merrell G. Endoscopic release of the first dorsal extensor tendon compartment. In: *Techniques in wrist and hand arthroscopy*. Philadelphia: Slutsky DJ, Nagle DJ, ed; 2007. p. 253–6.
17. Kang HJ, Koh IH, Jang JW, Choi YR. Endoscopic versus open release in patients with de Quervain's tenosynovitis: a randomised trial. *Bone Jt J* 2013;95–B(7):947–51.