De Quervain tenosynovitis: New enlargement plasty of the first dorsal compartment

Anatomical study and clinical retrospective study

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ABSTRACT

Objective: To establish the anatomical feasibility of the first dorsal compartment (FDC) enlargement and to report our clinical experience with this new technique compared with the traditional release. **Materials and Methods:** Anatomical study of 12 cadaver wrists to corroborate first compartment enlargement and its relationship to the sensitive branch of the radial nerve. Clinical retrospective study of patients who had undergone surgery between 2014 and 2019 due to De Quervain tenosynovitis (DQT) refractory to nonsurgical management, over 18 years of age, with no previous surgical history and a 12-month minimum follow-up. The 22-patient series was divided into two groups: enlargement (Group A) and simple release (Group B). Average ages were 47 years (Group A) and 50 years (Group B). Subjective outcome was evaluated by the visual analogue scale (VAS) for pain, the Quick-DASH score, and the Patient Satisfaction Questionnaire Short Form (PSQ-18). Objective outcome was evaluated by goniometry and dynamometry tests. **Results:** The anatomical study proved the increase of the FDC laxity and its close relationship to the sensitive branch of the radial nerve. The clinical study follow-up periods were of 24 months in Group A and 50 months in Groups B. Average VAS scores were 0.5/10 in Group A and 1/10 in Group B). Satisfaction index was 97% in both groups. Quick-DASH scores, and goniometry and dynamometry tests yielded no significant differences. **Conclusions:** The new enlargement plasty of the FDC for the surgical treatment of DQT in this anatomical and clinical study proved to be a reproducible and effective technique.

Tenosinovitis de De Quervain: nueva plástica de aumento del continente del primer compartimento dorsal. Estudio anatómico y experiencia clínica inicial

RESUMEN

Objetivos: Determinar la viabilidad anatómica del aumento del continente del primer compartimento dorsal y comunicar la experiencia clínica de esta nueva técnica comparada con la liberación clásica. **Materiales y Métodos:** Estudio anatómico de 12 muñecas cadavéricas para comprobar el aumento del continente del primer compartimento y su relación con la rama sensitiva radial. Estudio clínico retrospectivo que incluyó a pacientes >18 años, sin cirugías previas, con tenosinovitis de De Quervain sin respuesta al tratamiento ortopédico, operados entre enero de 2014 y 2019, y con un seguimiento mínimo de 12 meses. Veintidós pacientes fueron divididos en: grupo A (aumento) y grupo B (liberación simple). La edad promedio era 47 (grupo A) y 50 años (grupo B). La evaluación subjetiva incluyó la escala analógica visual para dolor, el puntaje QuickDASH y el cuestionario de satisfacción PSQ-18; el examen objetivo consistió en evaluaciones goniométrica y dinamométrica. **Resultados:** El estudio anatómico demostró un aumento del continente del primer compartimento dorsal y una íntima relación con la rama sensitiva radial. El seguimiento promedio del estudio clínico fue 24 y 50 meses, en los grupos A y B, respectivamente. El puntaje promedio de la escala analógica visual para dolor fue 0,5/10 (grupo A) y 1/10 (grupo B). El índice de satisfacción fue del 97% en ambos grupos. El puntaje QuickDASH, las evaluaciones goniométrica y dinamométrica no arrojaron diferencias significativas. **Conclusiones:** La nueva plástica de aumento del continente del primer compartimento dorsal para tratar la tenosinovitis de De Quervain en este estudio anatomoclínico resultó eficaz y reproducible.

Key words: De Quervain; enlargement; sensitive branch of the radial nerve.

Level of Evidence: III

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INTRODUCTION

DQT is a commonly seen condition in Orthopedics practice and usually considered of minor importance[1,2] Surgery is the standard procedure after failure of conservative treatment, including analgesia, physical therapy, splinting, and infiltration. There is a range of literature on surgical techniques for DQT: different types of incisions (transverse, oblique and longitudinal) and different types of approaches (simple incision, partial resection and platy of the FDC). Postoperative complications, irrespective of the use technique, are well documented and include: problems associated with the sensitive branch of the radial nerve, persistence or recurrence of tendinopathy symptoms, FDC tendon subluxation, and scar adhesions.[3,4]

The purpose of this study is to establish the anatomical feasibility of the first dorsal compartment (FDC) enlargement and to report our initial clinical experience with this new surgical technique compared with the traditional release.

MATERIALS AND METHODS

Anatomical study

We studied 12 formalin-preserved wrists to assess the feasibility of the enlargement technique and confirm the relationship between FDC and the sensitive branches of the radial nerve. Wide skin incisions were performed along the FDC to expose the sensitive branch of the radial nerve and its relationship to the FDC (Figure 1). Then the FDC was exposed. We then identified FDC tendons distal to the radial styloid, the possibility of the presence of supernumerary tendons or separate compartments. Following the enlargement plasty, FDC swelling was examined (Figure 2).

Figure 1. Cadaver dissection: close relationship between radial nerve (*1) and the first dorsal compartment (*2: radial artery).

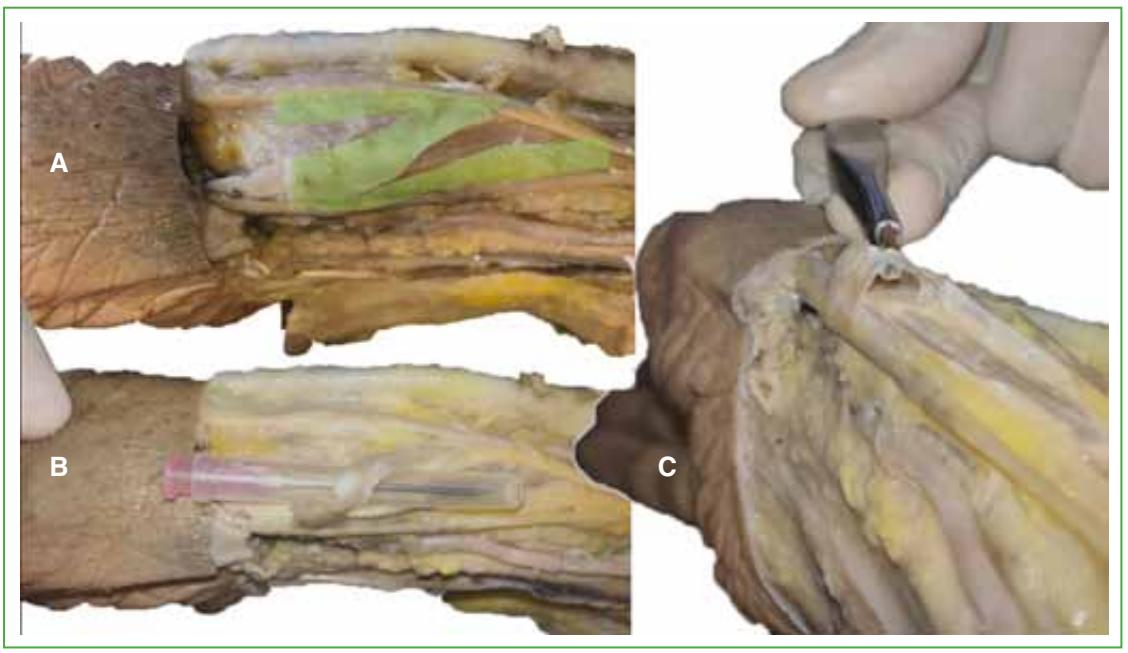

Figure 2. Surgical technique in a cadaveric model. **A**. Image showing the first dorsal compartment diameter increase and its overlapping incomplete section. **B and C**. Images showing the objective increase laxity in the first dorsal compartment.

Surgical technique

The surgical technique may be performed under local anesthesia, regional anesthesia being the most widely used. Anatomical landmarks are traced (radial styloid and radial side of the distal radius). We performed a longitudinal incision of approximately 1.5cm, from the radial styloid proximally along the radial side of the distal radius (Figure 3).

Figure 3. Modified approach to the study technique. The skin is moved dorsally **(A)** to allow for a palmar scar **(B)**.

Under 2.5 magnification, blunt longitudinal dissection is performed, and the sensitive branch of the radial nerve is gently pushed apart to the dorsal side. After complete exposure of the FDC, the abductor pollicis longus and extensor pollicis brevis tendons should be identified at a distal level. A longitudinal incision is made along the dorsal aspect of the compartment from distal to proximal, and then another longitudinal incision along the palmar aspect, proximal to distal. These incisions over the FDC retinaculum must overlap at least a few millimeters. Adequate compartment enlargement should then be confirmed (Figure 4). Intracompartmental septation is then assessed (if present, septa are excised from beneath the retinaculum to increase compartment capacity) (Figure 5). Lavage, hemostatic control, and skin closure with intradermal suture are performed. A padded sterile dressing is applied.

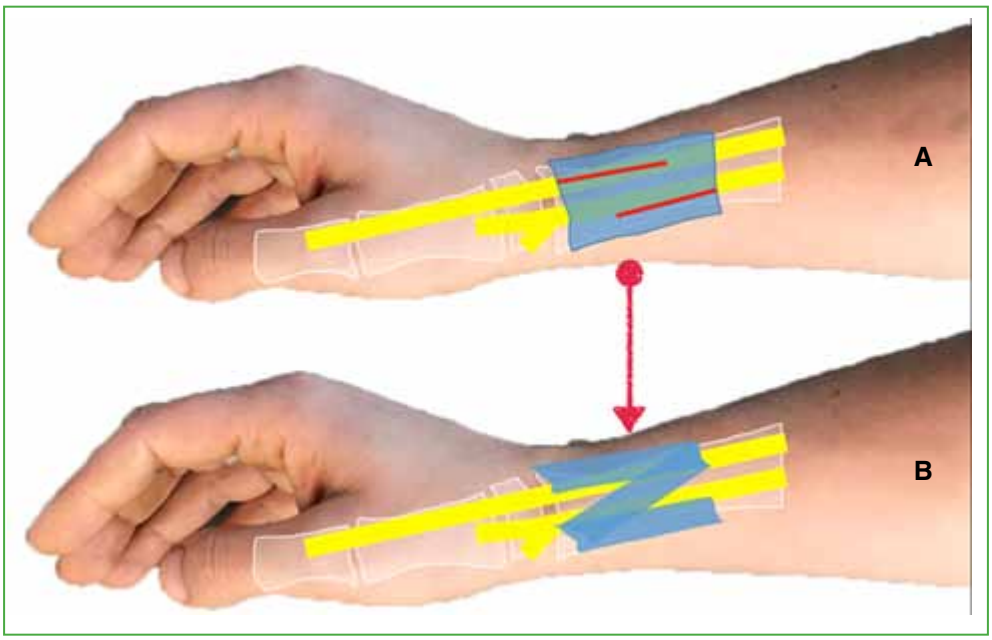

Figure 4. Layout of the first dorsal compartment and the performed incisions (**A**) to achieve the compartment enlargement (**B**).

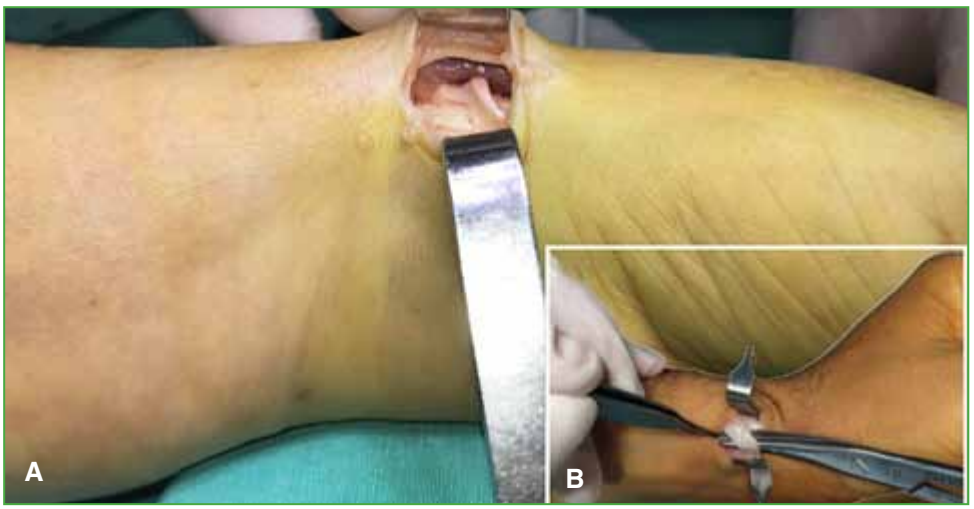

Figure 5. Intraoperative image showing the enlargement of the first dorsal compartment (**A**) that enables an easy introduction of the Mayo scissors (**B**).

Clinical study

We conducted a retrospective cohort study. Study population included patients who underwent surgery at the Hospital Privado Universitario de Córdoba between January 2014 and January 2019 due to DQT refractory to nonsurgical management (analgesia, physical therapy, splinting, and infiltration), over 18 years of age, with no previous surgical history and a 12-month minimum follow-up. Exclusion criteria: work-related etiology; previous or simultaneous hand or wrist injuries, whether degenerative or inflammatory.

After excluding 13 patients from the original 35 subjects, the final study population was comprised of 22 treated patients. Patients were divided according to surgical technique into two groups of 11 patients each: Group A, enlargement technique (8 females and 3 males); and Group B, FDC simple release with a standard longitudinal approach over the FDC (8 females and 3 males). Group A average age was 47 years (range, 18-70), and Group B average age was 50 years (range, 26-73).

All surgeries were performed by hand surgeons. Subjective outcome was evaluated using the VAS for pain, the Quick-DASH score, and the PSQ-18. Objective outcome was evaluated by goniometry and strength tests (grip, tip-to-lateral pinch, pulp-to-lateral pinch) using a Jamar dynamometer. Statistical analysis was performed with IBM SPSS Statistics 19.0 software using chi-squared for qualitative variables and non-parametric tests for medians of independent quantitative variables. Values were considered to be statistically significant at $P < 0.05$.

We studied the potential complications: scar adhesion, persistence of symptoms, neuromas or symptoms associated with the sensitive branches of the radial nerve.

RESULTS

The anatomical study evidenced the close relationship between the sensitive branches of the radial nerve with the FDC: one of them lying immediately superficial to the FDC, and other dorsal to the FDC. Only 1 of the 12 wrists had a branch palmar to the first dorsal retinaculum. These findings account for performing a more palmar incision, thus avoiding scarring above the sensitive branch of the radial nerve and aiming at a better aesthetic outcome by avoiding the radial and dorsal regions, which scars are more evident.

Cadaver enlargement plasty evidenced a clear increase of the FDC laxity, which effortlessly allowed for the removal or intracompartmental septa.

In the clinical study, Group A average follow-up was of 24 months (range, 12-56), and Group B average follow-up was of 50 months (range 20-70). Surgery involved the dominant arm in 46% of Group A cases and in 48% of Group B cases. Time from surgery to medical discharge averaged 17 days (range, 14-30) in Group A and 32 days (range, 14-90) in Group B.

The subjective evaluation yielded a 0.5/10 and 1/10 VAS score average for Group A and Group B, respectively. The average satisfaction index of both groups was 97%, with approval of the scar's aesthetic appearance and no clear preference for either technique. The Quick-DASH score analysis also yielded no significant differences between groups.

Results of the goniometry and strength tests (grip, tip-to-lateral pinch, pulp-to-lateral pinch) were also comparable between groups (Tables 1 and 2).

There were no complications nor revision surgeries.

DISCUSSION

This study addresses a subject that has been widely reported on in the literature, with multiple technique descriptions and acceptable results. In this comparative series, we analyzed whether the proposed compartment enlargement plasty produced comparable or superior outcomes to their simple release.

Multiple reports on simple release present good to excellent outcomes, however not without complications. One of the most common complications is FDC tendon luxation, which clinical presentation may indicate further interventions aimed at managing the symptoms.[1-4]

In the context of FDC enlargement plasty, studies present techniques involving different retinaculum flaps and sutures, resulting in longer surgical time.[5] This study enlargement plasty technique widens the compartment in a simple and quick fashion, not requiring sutures and avoiding the instability of the abductor pollicis longus and extensor pollicis brevis tendons.

Table 1. Comparative results of the goniometry tes

Affected wrist motion (degrees)			
	Group A	**Group B**	**Ind. sample median**
Flexion	87.3 (80-90)	81 (60-90)	
Extension	70.9 (65-85)	62.3 (45-80)	0.311
Pronation	71.8 (50-80)	80 (80-80)	
Supination	79.5 (75-80)	78.2 (70-80)	
Ulnar deviation	43.2 (25-45)	40.5 (35-45)	
Radial deviation	20.5 (15-30)	19.1 (5-30)	0.586
Affected thumb motion (degrees)			
	Group A	**Group B**	**Ind. sample median**
Metacarpophalangeal joint: flexion	54.5 (45-70)	57.3 (45-70)	0.361
Metacarpophalangeal joint: extension	0 (0-0)	0 (0-0)	
Interphalangeal joint: flexion	70.9 (60-80)	69.5 (40-80)	1
Interphalangeal joint: extension	0 (0-0)	0 (0-0)	
Abduction	57.3 (40-90)	61.8 (45-80)	0.361
Adduction	0 (0-0)	0 (0-0)	

Group A (enlargement technique) and Group B (simple release of the first dorsal compartment).

Table 2. Comparative results of the dynamometry tests

	Group A	**Group B**	**Ind. sample median**
RH grip strength (kg)	26.7 (22-32)	20.2 (2-34)	0.086
LH grip strength (kg)	21.5 (8-26)	20.7 (10-28)	0.67
RH TL strength (kg)	5.5 (3-8)	3.7 (1-6)	0.395
RH TL strength (kg)	5.1 (2-9)	3.6 (1-6)	0.67
RH PL strength (kg)	6 (5-8)	5 (1-8)	1
RH PL strength (kg)	5.7 (2-8)	5 (3-7)	0.086

Group A (enlargement technique) and Group B (simple release of the first dorsal compartment). RH: right hand; LH: left hand; TL: tip-to-lateral pinch; PL: pulp-to-lateral pinch.

Several authors also consider as complications or dissatisfactions related to the release technique those associated with the sensitive branch of the radial nerve, whether due to adhesions, neuritis, neuromas and lesions of the radial sensory nerve branch associated with the presence of simple-release-related scarring above the branch, due to lack of proper knowledge of the branch and its terminal branches anatomical arrangement or due to an inad-

equate surgical technique.[6] Concerning this aspect, we used a longitudinal palmar incision, short in length (which could be extended particularly in revision surgeries), which guarantees the scar not invading the radial sensory nerve branch space. Anatomical dissections were performed following the standard description and evidenced that the distribution and location of the radial sensory nerve branches have a close relationship with the roof of the FDC.[7-9] The scar palmar position results in a less evident scar, thus providing a more aesthetic outcome for the most exposed wrist aspect. Interestingly, despite this benefit, the satisfaction indexes of both groups (simple release and enlargement) showed no significant statistical differences. We failed to find comparative studies on the described incisions.

The strengths of this study include: homogeneity of the patient series conditions; cadaveric verification of the radial sensory nerve branch anatomical arrangement, constancy and relationship with the FDC; comparison of the study groups; and reproducibility of the study technique.

The limitations of this study include: the retrospective design; the limited number of patients; and the limited follow-up period of some patients. We consider that further clinical studies and imaging studies will support this study's results, and prove the surgical technique to be safe, simple, reproducible and effective, and that may lower the number of commonly reported complications.

CONCLUSIONS

The new enlargement plasty of the FDC for the surgical treatment of DQT in this anatomical and clinical study proved to be a reproducible and effective technique.

Conflict of interests: The authors claim they do not have any conflict of interests.

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