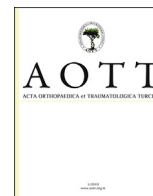


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## One portal endoscopic release of the first extensor compartment in de Quervain's disease



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### ABSTRACT

**Objectives:** We aimed to present preliminary result of one portal endoscopic assisted release of first dorsal compartment at wrist in a case series with de Quervain disease as a minimal invasive surgical method.

**Materials and methods:** The patients, who underwent an endoscopic-assisted release of the first extensor compartment for de Quervain's disease by same hand surgeon between 2015 and 2017, were retrospectively analyzed. Operative treatment was considered if the patients did not respond to non-operative treatment including oral anti-inflammatory medications, splinting, and steroid injection. Surgical release was recommended after minimum four months of unsuccessful non-operative treatment, including a steroid injection. 10 wrists were treated with one portal endoscopic assisted release. All patients were evaluated at an average of 16.1 months follow-up using visual analog scale (VAS) pain ratings and the Disabilities of Arm, Shoulder and Hand (DASH) score.

**Results:** The mean operating time was 13.9 min (range, 10–21 min). The mean VAS and DASH scores were improved from 8.2 to 1.9 and 70.51 to 2.81 respectively. No significant difference was found between operated and non-operated arms in postoperative pinch and strengths. Transient superficial radial nerve paresthesia (two wrists) and significant scar tenderness (one) were identified in three cases. There was no patient that complain of unsightly scar and tendon subluxation.

**Conclusions:** One portal endoscopic assisted release of the extensor compartment is an effective and safe minimal invasive procedure with similar complication rates reported previously in open and endoscopic procedures in patients with de Quervain's disease who are unresponsive to non-operative treatments.

**Level of Evidence:** Level IV Therapeutic Study

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### Introduction

The most entrapment site of tendon at the wrist has been reported as the first dorsal compartment. The entrapped tendons of Extensor Pollicis Brevis (EPB) and Abductor Pollicis Longus (APL) in the first extensor compartment of wrist was first reported in 1895 by the Swiss surgeon Fritz de Quervain. It has also been described as

washer woman's sprain, gamer's thumb, mother's wrist or mother's thumb.<sup>1</sup>

The patient points the tip of the radial styloid as a pain center and typically complaint as this pain is aggravating by thumb use. A swelling and tenderness at the tip of the radial styloid are the prominent signs with the severe pain on resisted active extension of the thumb, loss of ulnar deviation and a positive Finkelstein's test (aggravation of pain by 'grasping the patient's thumb and quickly abducting the hand ulnar ward').<sup>2,3</sup> It seems to be more appropriate to consider this as a tendinosis rather than a tendinitis, because of the pathologic specimens demonstrate thickening of tendon sheath with collagen disorientation and most notably the accumulation of mucopolysaccharide as an indicator of mucoid changes rather than inflammation.<sup>4,5</sup>

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Although the exact pathophysiology is not completely understood, de Quervain's tenosynovitis seems to be self-limited disease in the larger part of patients. Nonsurgical treatments include local corticosteroid injections, NSAID, splinting, and some therapeutic modalities such as stretching, strengthening, and iontophoresis. And some surgical treatment modalities for releasing the first dorsal extensor compartment at wrist such as open surgery or endoscopy assisted minimal invasive surgery must take into account in case of failure in conservative treatment options mentioned above.<sup>6,7</sup> Additionally, differences of number of channels in first dorsal compartment and existence of septa between APL and EPB are seen more in patients with de Quervain disease than normal population. These anatomic variations should be kept in mind for the purpose of preventing the complications that may occur with surgical treatment and for the success of steroid treatment.<sup>8</sup>

We aimed to present preliminary result of one portal endoscopic assisted release of first dorsal compartment at wrist in a case series with de Quervain disease as a minimal invasive surgical method.

## Materials and methods

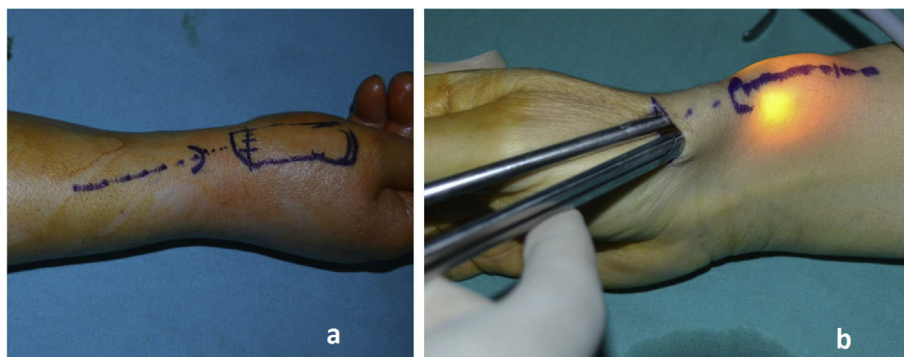
All patients, who underwent an endoscopic-assisted release of the first extensor compartment for de Quervain's disease by highly experienced (level 5) same hand surgeon (KE) between 2015 and 2017, were retrospectively analyzed.<sup>9</sup> Diagnosis of de Quervain's disease was based on the pain and tenderness over the radial styloid and a positive Finkelstein test.<sup>3</sup> Operative treatment was considered if the patients did not respond to non-operative treatment including oral anti-inflammatory medications, splinting, and steroid injection. Surgical release was recommended after minimum four months of unsuccessful non-operative treatment, including a steroid injection. Patients with an inflammatory tenosynovitis, such as rheumatoid arthritis; those who had a traumatic injury history of the distal radius and ulna, such as bone and soft-tissue injury; and those with other symptomatic diseases on the same limb that could affect disability scores of the limb, such as frozen shoulder, shoulder impingement syndrome, medial epicondylitis or cubital tunnel syndrome were excluded. A total of 10 wrists of 10 patients treated with endoscopic release for de Quervain's disease with an average 16.1-month (4–49 months) follow-up were found to meet the criteria. There were nine females and one male patient with a mean age of 40.5 years (17–53 years). The right wrist was involved in six patients and the left in four. All patients had one or more steroid injection before surgical release. The average symptom duration before release with endoscopic assistance was 14.5 months (4–48 months).

For functional evaluation, we evaluated subjective pain and disability using visual analog scale (VAS) pain ratings and the Disabilities of Arm, Shoulder and Hand (DASH) score of all patients preoperatively and final time of follow up. We also used post-operative measurements of pinch and grip strengths of operated hands with comparing the non-operated hands.

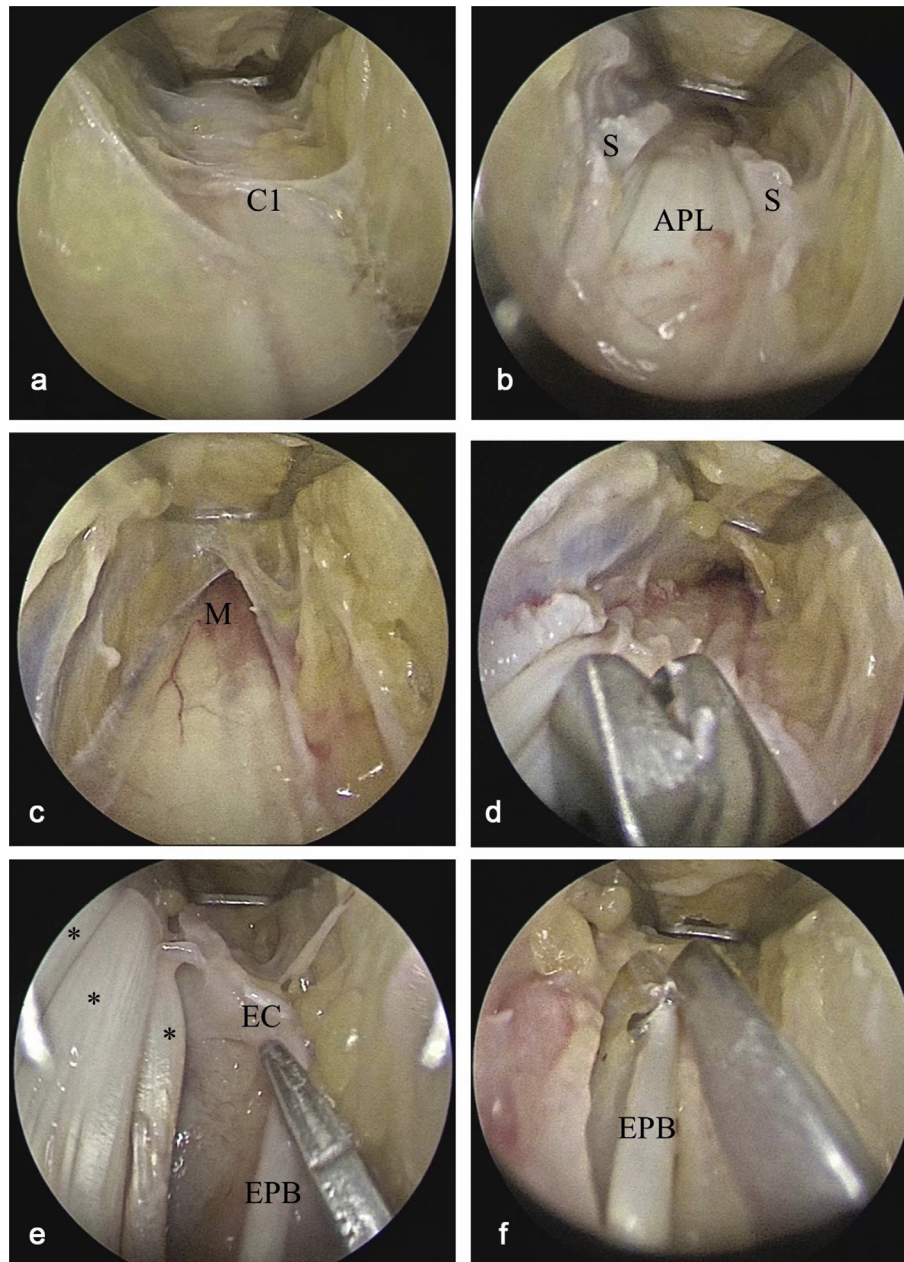
After the patients have been given detailed information about the study, the written informed consent was obtained from all participants before the involvement to the trial. This study was conducted in accordance with the rules of the Declaration of Helsinki. It was approved by the Ethics Committee of the University, Faculty of Medicine (2017/14-9).

## Surgical technique

The wrist is placed over a towel roll in a neutral position with a tourniquet inflated. The radial styloid process and the course of the first extensor compartment at the radial side of the wrist were palpated and marked (Fig. 1a). A 2 cm superficial transverse incision just proximal to the thumb carpometacarpal (CMC) joint establishes the entry portal. The incision is in line with the first dorsal compartment at the insertion of the abductor pollicis longus (APL) tendon, 2–3 cm distal to the end of the radial styloid. A small hemostat is used to clear the overlying subcutaneous tissue off the fascia enveloping the thumb CMC joint. A small right-angle retractor elevates the subcutaneous tissue off the tendons of the first dorsal compartment. A long delicate hemostat is next used to bluntly create a working space between the skin and subcutaneous tissue down the length of the first dorsal compartment. A hooded endoscope with assembled a 4 mm 30 angled scope (The Hoffmann endoscopic cubital tunnel set, KARL STORZ®, Tuttlingen, Germany) which creates a tent-like endoscopic working space is inserted above the fibrous fascial sheath of the first dorsal compartment, distal to the radial styloid and the extensor tendon retinaculum that maintained a working space and a dry endoscopic inspection of the first dorsal compartment is performed beginning distally over the CMC joint. The scissors are introduced into the distal portal and used to bluntly dissect the overlying subcutaneous tissue off of the fascia in a retrograde fashion (Fig. 1b). Then, the fascia over the first dorsal compartment is incised starting distal to the radial styloid and moving proximally till the musculotendinous junction of these two muscles are seen (Fig. 2a–c). Some antegrade or retrograde knives (ECTRA II, Smith & Nephew®) can be used for too narrowed compartment release (Fig. 2e–f). The tendon slips of the APL and extensor pollicis brevis (EPB) are identified under direct visualization. For to ensure the release of both the EPB and



**Fig. 1.** Photography of marked surgical landmarks for releasing the first extensor compartment at wrist (a). The demonstration of releasing of extensor compartment with scissor under endoscopic view (b).



**Fig. 2.** Endoscopic images of APL and EPB tendons in the first extensor compartment before releasing (a). Endoscopic image showing complete release of first dorsal compartment sheath with underlying tendons (b). The extensor compartment release was ended after the musculotendinous junction of APL and EPB tendons visualized (c). Removal of extra synovial tissues with arthroscopic grasper (d). Endoscopic images of EPB tendon in a separate compartment (e). Endoscopic image of compartment that is containing EPB tendon, releasing with antegrade knife. (f). *Abbreviations:* C1, first dorsal compartment; S, sheath; APL, Abductor Pollicis Longus; M, musculotendinous junction; EPB, Extensor Pollicis Brevis; EC, separate extra compartment. *Asterisks:* Abductor Pollicis Longus slips.

APL, we stabilized the first metacarpal and manually flexed and extended the metacarpal phalangeal joint. Through the endoscope, the EPB tendon was visualized gliding proximally and distally while the APL tendons remained stationary. If all tendons were either stationary or gliding, then we searched for a separate compartment as described by Slade 3rd.<sup>10</sup> Complete release of the retinaculum was confirmed by elevating the tendon with an endoscopic probe. In cases with inflammatory tenosynovitis in the compartment, the tenosynovium was removed using a grasper or shaver (Fig. 2d). Postoperatively, the wound was closed with two stitches and a compressive dressing was worn and tolerable movement of the wrist and thumb was encouraged

in all patients. After suture removal at ten days, the patient is allowed to resume activities without restrictions. No splints or braces are used.

#### Statistical analysis

Statistical analysis was performed SPSS for windows version 22.0 program. Categorical data were reported as number and percent. Continuous data were reported as mean(x) ± standard deviation (SD). Normality for continued variable in groups was determined by Shapiro Wilk test. The variables showed normal distribution ( $p < 0.05$ ). So, unpaired and paired t test were used for

comparison of variables between the studies groups. A value of  $p < 0.05$  was considered significant.

## Results

The mean operating time was 13.9 min (range, 10–21min). The mean VAS pain score improved from 8.2 to 1.9 points and DASH score from 70.51 to 2.81 (Table 1). No significant difference was found between operated and non-operated arms in postoperative pinch and strengths (Table 2).

In terms of complications, one patient (10%) had significant scar tenderness and transient paresthesia of the superficial radial nerve was occurred in two wrists (20%). The symptom related to the superficial radial nerve was resolved spontaneously in around 12 weeks postoperatively. There was no patient that complain of unsightly scar and tendon subluxation (Table 3).

No patient had to be converted to the open procedure for failure of visualization or inability to achieve appropriate release.

## Discussion

In the present study, we presented clinical outcomes of a new technique using one portal endoscopic assisted release of the first extensor compartment of de Quervain's disease at an average 16.1 months follow-up. The results of our study showed that the endoscopic release technique produced similar clinical outcome in terms of DASH scores, VAS scores, complication rates and esthetic appearance compared with open and endoscopic assisted previously reported in literature (Tables 1–3). The EPB tendon runs in a separate subcompartment of the first compartment in 27–79% (Table 3).<sup>11–14</sup> In current study, we found a 40% rate for this situation. Authors warning about the insufficient results with patients de Quervain release may be related of neglected subcompartmental EPB presence.<sup>11,15</sup> Surgical treatment of the first extensor compartment for de Quervain's disease with a longitudinal or transverse incision has been accepted as an effective procedure in patients who are not responded to non-operative treatment.<sup>13,14,16–19</sup> However, there are some reasons to consider an endoscopic approach to first dorsal compartment release rather than a traditional open release. Harvey et al. Demonstrated scar adherence to the underlying tendon in two out of 20 surgical patients and temporary paresthesia of the radial sensory nerve in three patients.<sup>20</sup> Arons et al. described 14 complications in 16 consecutive patients including three hypertrophic painful scars, one tendon subluxation, two neuromas, and three adhesions.<sup>16</sup> A study by Ta et al. showed 2% with severe scar tenderness, a 5% recurrence rate, and a 2% sensory nerve injury out of 43 patients.<sup>21</sup> In study of Scheller et al, there were six postoperative complication in 94 patients, including one superficial wound infection, one delayed wound healing and four transient radial nerve lesions in 94

patients.<sup>18</sup> Altay et al. described 4 complications in 34 patients that including two patients with wound infections, two patients with scar tenderness and all cases have cosmetically acceptable scars.<sup>19</sup> Clearly, although surgical treatment of De Quervain's is perceived as a simple and effective surgical procedure, when examined closely, there is a need for improvement. Because, patient satisfaction is significantly associated with long-term complication after surgery.<sup>10,21</sup> In 40% of forearms, the lateral dorsal digital branch of superficial radial nerve passes directly over the first extensor compartment along its entire length.<sup>22</sup> Poublon et al. showed that, there is a large variation in the course of the superficial branch of the radial nerve over the first extensor compartment and no complete safe zone can be defined.<sup>23</sup> The endoscopic approach allows us to keep our incisions outside of the hypersensitized zone of injury.<sup>10</sup> Additionally, arthroscopic approach allows for an extensive neurectomy of the tiny branches of the superficial radial nerve (SRN), which may innervate the first dorsal compartment. Therefore, the minimally invasive approach along with this neurectomy may result in faster and more complete pain relief, with less risk for painful scar development.<sup>10,24</sup> With a conventional technique, the extensor retinaculum is opened along the midline portion. This technique can therefore sometimes cause volar subluxation of the tendon.<sup>25</sup> Either incising the extensor retinaculum at the dorsoulnar corner or reconstruction of the compartment after release and transposition of the EPB tendon could prevent palmar subluxation of the tendons after release of the extensor compartment.<sup>26,27</sup> In our series, no patients had the palmar subluxation of the tendons by incising the first extensor compartment at the dorsoulnar corner.

We found a few endoscopic assisted surgical releases in patients with de Quervain's disease so far. The first study was presented in 2007 by Slade and Merrell. They described their technique using two portals, the distal portal 2–3 cm distal to the end of radial styloid and proximal portal 4–6 cm proximal to the radial styloid. In their series of 45 patients, no cases experienced neuromas, superficial radial nerve injuries, significant scar tenderness, infection and tendon subluxations. All patients reported subjective satisfaction without any relapse.<sup>10</sup> The second study was presented by Kang et al. (2011). As a modification of surgical technique described above as using two portals and using the 1.5-mm metal stick to create working space and the Haki knife for the Arthro-Knife. In their study, the pain and disability scales demonstrated a significant improvement at a minimum one-year follow-up in both open and endoscopic release groups. The operating time in the endoscopic release group was little longer (average 4 min) than in the open release group. And there were found transient superficial radial nerve injury in five cases (19%) of open surgery group postoperatively (Table 3).<sup>13</sup> The superficial radial nerve gives the lateral dorsal digital branch to the thumb at  $50 \pm 13$  mm (minimum, 26 mm; maximum, 72 mm) proximal to the radial styloid.<sup>22</sup> In the endoscopic release studies, two portals, one distal and the other 3–6 cm proximal to the radial styloid process were used.<sup>10,13,26</sup> The superficial radial nerve does not in close relation to midline of the first extensor compartment's distally. After branching proximal to the radial styloid, superficial radial nerve diverged from the first extensor compartment, whereas the lateral dorsal digital branch of the superficial radial nerve traversed parallel to the midline of the first extensor compartment radially.<sup>22</sup> The nerve density gradually decreases from proximal to distal of the first compartment and a safe zone is formed distal of the radial styloid.<sup>23</sup> For these reasons, we thought it would be safer to using a single portal distal to the radial styloid.

There are some limitations to this study. First, it was retrospective and included a small number of patients with short-term follow-up data. Secondly, we did not have a control group. When comparing endoscopic assisted release technique with open

**Table 1**

The comparisons of VAS and DASH changes.

Variable	Preoperative $\bar{x} \pm SD$	Postoperative $\bar{x} \pm SD$	p
VAS	8.20 $\pm$ 1.75	1.90 $\pm$ 1.85	0.0001
DASH	70.51 $\pm$ 26.81	2.81 $\pm$ 3.84	0.0001

**Table 2**

The comparisons according to grip and pinch strengths postoperatively.

Variables	Operated Arm $\bar{x} \pm SD$	Non-operated Arm $\bar{x} \pm SD$	p
Grip Strength	24.47 $\pm$ 8.39	28.76 $\pm$ 7.34	0.240
Pinch Strength	6.45 $\pm$ 2.18	7.19 $\pm$ 1.66	0.406

**Table 3**  
Studies Relating Surgical Treatment of de Quervain's Disease.

	Study	Operated Wrist	DASH Score	VAS Scale	Surgical Approach	EC Septum	Additional pathology	SRN injury	Tendon Subluxation	Infection	Scar tenderness	Unslightly scar	Relapse
Open Surgery	Arons <sup>16</sup> 1987	16	ND	ND	Longitudinal	ND	None	5	1	None	None	None	None
	Yuasa <sup>11</sup> 1998	22	ND	ND	Isolated SC release of EPB	16	None	None	None	None	None	None	None
	Ta <sup>21</sup> 1999	43	ND	ND	ND	12	None	1	None	None	1	None	2
	Mellor <sup>17</sup> 2000	22	ND	ND	Longitudinal	ND	None	6	None	2	None	4	3
	Scheller <sup>18</sup> 2009	94	ND	ND	Longitudinal	ND	None	4	None	1	None	None	None
	Okada <sup>12</sup> 2011	24	ND	ND	Excision of extra slips of APL	12	None	None	None	None	None	None	None
	Altay <sup>19</sup> 2011	36	ND	1.8 PO	Transverse	ND	None	None	None	2	2	None	None
	Kang <sup>13</sup> 2011	26	6.8 PO	0.5 PO	Transverse	17	None	5	None	None	None	None	None
	Lee <sup>14</sup> 2014	33	3.4 PO	1.3 PO	Transverse	18	8 Ganglia	None	None	None	None	None	None
	Endoscopic Assisted	Slade <sup>10</sup> 2007	43	ND	ND	Two Portal	ND	None	None	None	None	None	None
Kang <sup>13</sup> 2011		24	1.5 PO	0.1 PO	Two Portal	19	None	None	None	None	None	None	None
Present study 2017		10	2.8 PO	1.9 PO	One Portal	4	None	2	None	None	1	None	None

DASH: Disabilities of Arm, Shoulder and Hand. VAS: Visual Analogue Scale. PO: Postoperatively. SC: Subcompartmental. APL: Abductor Pollicis Longus. EC: Extracompartmental. ND: Not declared. SRN: Superficial Radial Nerve.

procedures, extra cost of required endoscopic equipment (camera, monitor, light source etc.) is a disadvantage of endoscopic technique. In the future, a prospective, comparative and randomized study should be followed to demonstrate clearly which procedure is best for patients with de Quervain's disease, who are unresponsive to non-operative treatments.

Our results suggest that the endoscopic release of the first extensor compartment seems to be an effective and safe procedure in patients with de Quervain's disease who are unresponsive to non-operative treatments, even though it requires a learning curve for endoscopic skills and endoscopic instruments which cause extra cost.

### Conflicts of interest

None.

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