

Extensor Tendoscopy of the Wrist



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Abstract: Extensor tenosynovitis of the wrist can lead to rupture of the extensor tendons. Extensor tenosynovectomy is indicated if the tenosynovitis cannot be controlled by conservative measures. Open tenosynovectomy requires extensive dissection of soft tissue, including the extensor retinaculum. This article describes extensor tendoscopy of the wrist. This technique allows approach to the extensor compartments with small incisions and minimal soft tissue dissection. It is indicated when extensor tenosynovitis persists despite adequate medical treatments including medications, immobilization, and steroid injection. Synovectomy of the extensor compartments can be performed with preservation of the extensor retinaculum. This technique is contraindicated if the wrist cannot be flexed or there is severe tendinopathy of the extensor tendon that may need open reconstruction. The purpose of this technical note was to describe a minimally invasive approach of complete synovectomy of the extensor compartments with preservation of the extensor compartment.

Extensor tendons of the hand are stabilized by the extensor retinaculum, with septations dividing the extensor tendons into 6 discrete compartments.¹ Extensor tenosynovitis of the wrist is a common presentation of rheumatoid arthritis (Fig 1). Rupture can occur by invasion of pannus into the tendon or by pannus due to compression, both causing edema, ischemia and necrosis.² Unless it resolves with medical management, preventative tenosynovectomy is indicated to prevent tendon rupture.³ Classically, this is performed openly with exploration of the involved extensor compartments. It requires extensive soft tissue dissection including the extensor retinaculum. Tendoscopy is endoscopy of the tendon sheath. Currently, the popularity of this technique is increasing given its ability to uniquely treat tendon issues of the foot and ankle region.⁴ We employ the technique of tendoscopy to explore and debride the extensor compartments of the wrist. This has the advantage of preservation of the integrity of the

extensor retinaculum of the wrist. It is indicated when tenosynovitis persists despite adequate medical treatments including medications, immobilization, and steroid injection.^{5,6} This technique requires flexion of the wrist to allow the introduction of the arthroscope and arthroscopic instruments. Therefore, it is contraindicated if the wrist cannot be flexed. Moreover, it is contraindicated in case of severe tendinopathy of the extensor tendon, which may need open reconstruction (Table 1). The extensor tendons are divided into the 3 zones (distal, proximal, and at the extensor retinaculum). Endoscopic examination and debridement should be performed in all 3 zones to ensure completeness of tenosynovectomy.

Technique

Patient Positioning

The patient is in supine position with an arm tourniquet (Zimmer, Warsaw, IN) to provide a bloodless operative field. A towel is put under the wrist to keep the wrist slightly flexed.

Portal Placement

The wrist dorsal swellings and the extensor retinaculum are outlined. Five millimeters distal and proximal portals are made at the distal and proximal ends of the swelling and in line with the fourth extensor compartment (Fig 2). There portals are coaxial and interchangeable as viewing and instrumentation portals.

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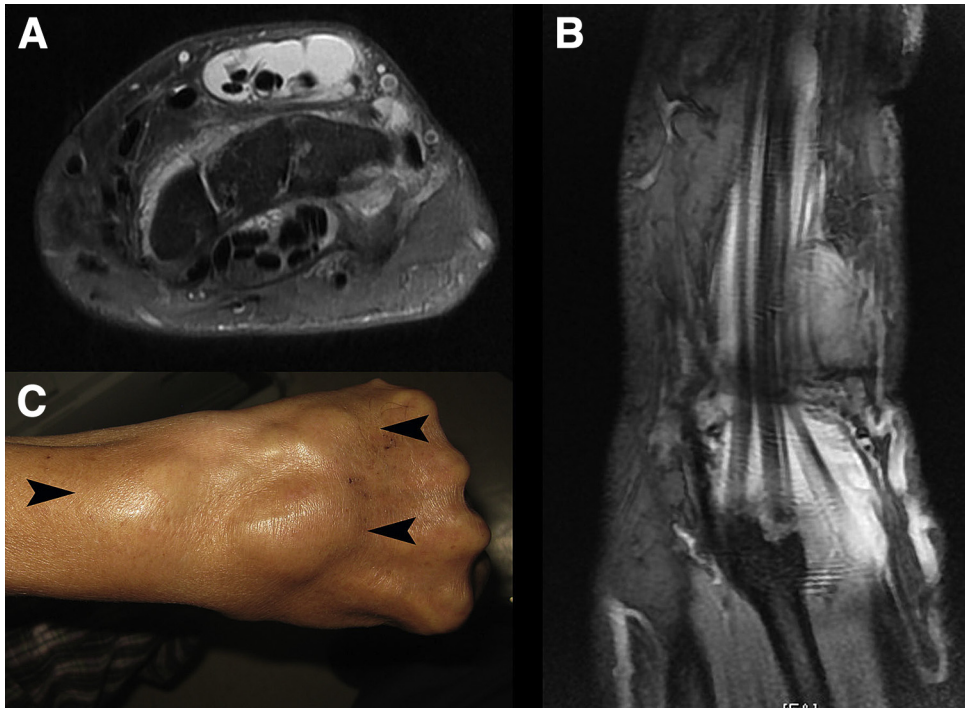


Fig 1. Magnetic resonance imaging of the left wrist of the illustrated case showed the fourth and fifth extensor compartments: (A) transverse view and (B) coronal view. (C) Clinical photo of the left wrist showed swellings at the dorsum of the distal forearm and the hand dorsum.

Tendoscopy of the Fourth Extensor Compartment

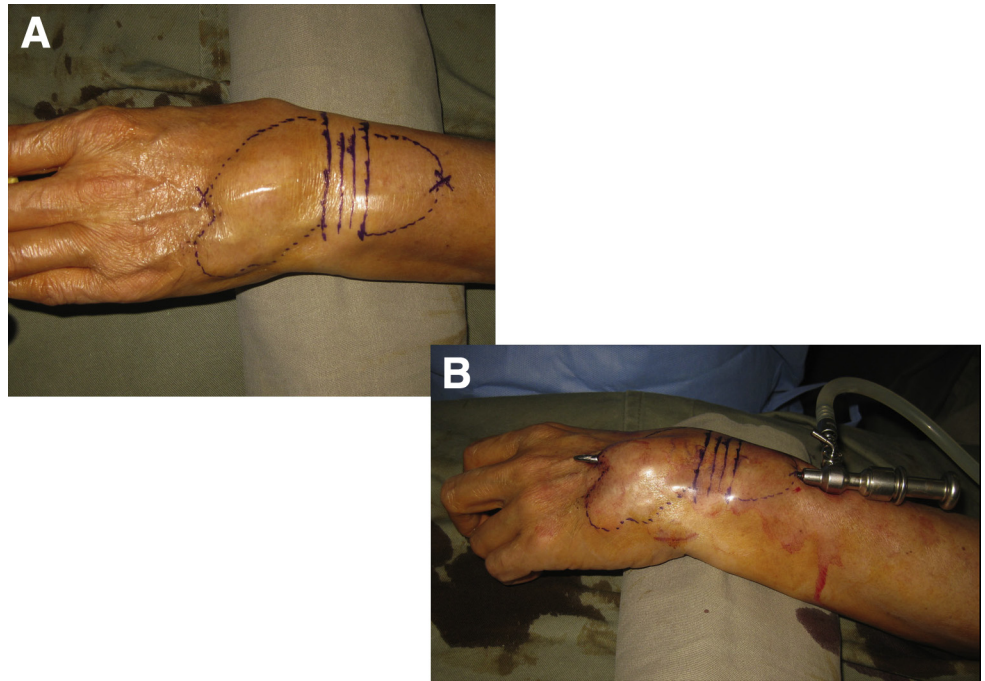
A 2.7-mm 30° arthroscope (Henke Sass Wolf, Germany) is inserted into the proximal portal. The arthroscope passes through the fourth extensor compartment and examines the parts of extensor tendons distal to the extensor retinaculum. The wrist can be radially and ulnarly deviated to improve the span of the arthroscopic visualization. The inflamed synovium and fibrous bands are resected by an arthroscopic shaver (Smith & Nephew) via the distal portal (Fig 3). After completion of debridement of this zone, the arthroscope is advanced distally to exit via the distal portal. The arthroscope is removed and the cannula is left in situ. A Wissinger rod (Richard Wolf GmbH, Knittlingen, Germany) is inserted into

the cannula. The cannula is removed and reinserted along the rod via the distal portal. The rod is removed and the arthroscope is reinserted into the cannula. The part of the extensor tendons proximal to the retinaculum can be examined and tenosynovectomy can be performed (Fig 4). After clearance of this zone, the arthroscope is withdrawn into the fourth compartment, and tenosynovectomy is then performed at this zone. The tendons are examined for any attenuation or partial tear. It is important to perform a complete synovectomy, including the individual tendon and the fibro-osseous wall of the compartment. The underlying cortex should be examined for any bony prominence or spike, which should be shaved if present. The sequence of

Table 1. Pearls and Pitfalls of the Extensor Tendoscopy of the Wrist

Pearls	Pitfalls
<ol style="list-style-type: none"> 1. Extensor tendoscopy is indicated when tenosynovitis persists despite adequate medical treatments. 2. The distal and proximal portals are made at the distal and proximal ends of the swelling and in line with the fourth extensor compartment. 3. Complete synovectomy of the extensor tendons at the zones proximal, distal, and at the extensor retinaculum. 4. Tendoscopy of the adjacent compartments is possible by the switching rod technique. 	<ol style="list-style-type: none"> 1. It is contraindicated if the wrist cannot be flexed 2. It is not suitable if there is severe tendinopathy of the extensor tendon. 3. Another distal portal is needed for tendoscopy of the first extensor compartment.

Fig 2. Extensor tendoscopy of the left wrist. (A) The wrist is placed under a towel to allow slight flexion of the wrist. The swellings of the distal forearm and the hand and the extensor retinaculum are outlined. The distal and proximal portals are made at the distal and proximal ends of the swelling and in line with the fourth extensor compartment. (B) The portals are coaxial and the cannulotrocar can pass through both portals.



debridement of the 3 zones of the extensor tendons is not important, but it is important to have complete synovectomy of all 3 zones.

Tendoscopy of the Fifth and Sixth Extensor Compartments

After complete synovectomy of the tendons of the fourth compartment, tendoscopy of the fifth compartment is performed. With the arthroscope in the fourth extensor compartment via the distal portal, the proximal edge of the fibrous septum between the fourth and fifth compartments is identified. The Wis-singer rod is then inserted into the fifth extensor compartment at the other side of the fibrous septum via the proximal portal. The arthroscope is removed and the rod is advanced to exit through the distal portal. This is facilitated by ulnar deviation of the wrist (Fig 5). The arthroscopic cannula can be inserted into the fifth compartment along the rod, and tendoscopy of the fifth extensor compartment can then be performed (Video 1). The switch of the arthroscope can be repeated with further ulnar deviation of the wrist if tendoscopy of the sixth extensor compartment is indicated.

Tendoscopy of the Third and Second Extensor Compartments

If tendoscopy of the third or the second compartment is indicated, the arthroscope can be switched from the fourth compartment with radial deviation of the wrist (Fig 6).

Tendoscopy of the First Extensor Compartment

If tendoscopy of the first compartment is indicated, for example, surgical release in case of resistant de Quervain disease, another distal portal over the first metacarpal should be made because the first compartment is at a plane different from the rest of the hand.

Discussion

Extensor tenosynovitis at the wrist often is accompanied by rheumatoid arthritis, gout, trauma, mycobacterium, hyperparathyroidism, and amyloidosis induced by long-lasting hemodialysis.⁵ The proliferation of the tenosynovial lining can lead to impaired function owing to scarring and adhesions. It commonly presents as a mass with or without wrist pain and often leads to the limitation of range of motion.^{2,5,6} The ongoing tenosynovial inflammation may ultimately lead to tendon rupture, which is a serious complication that impairs hand function.¹ The goal of tenosynovectomy is to limit progression of the tenosynovial proliferation to prevent subsequent tendon rupture.⁶ Open approach requires extensive dissection of wound and soft tissue, including the extensor retinaculum, to ensure complete synovectomy. Extensor tendoscopy of the wrist allows complete tenosynovectomy of the extensor compartment to be performed in a minimally invasive manner. It has the advantages of small

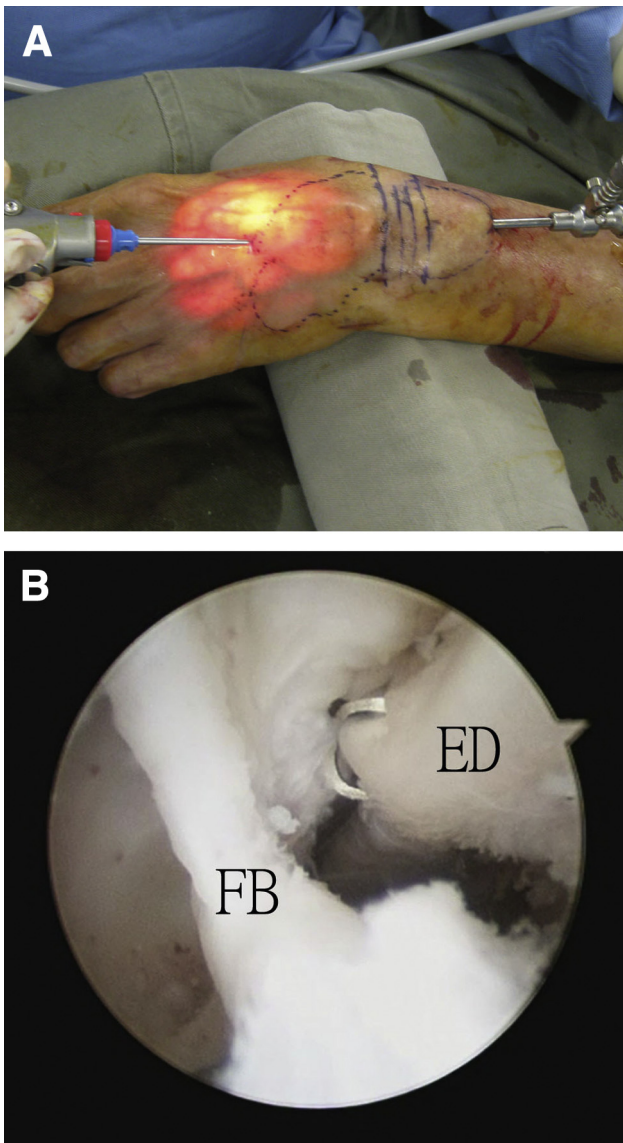


Fig 3. Extensor tendoscopy of the left wrist. (A) With the proximal portal as the viewing portal, synovectomy of the tendons distal to the extensor retinaculum can be performed with an arthroscopic shaver via the distal portal. (B) Arthroscopic view shows tenosynovectomy of the tendon of the extensor digitorum communis (ED). There is a fibrous band (FB) formed due to the tenosynovitis.

incisions, better cosmesis, minimal soft tissue dissection, and preservation of the extensor retinaculum.

Extensor tenosynovitis commonly affects the fourth extensor compartment and, therefore, the proximal and distal portals are aligned with the fourth extensor compartment.⁶ The portals are coaxial and can be

switched as viewing and instrumentation portals. This allows complete visualization of the fourth compartment and its tendons.

The extensor retinaculum is fixed to the distal radial and ulna, and the location of the extensor compartments remains unchanged with wrist motion. Therefore, the portal tract between the proximal and distal portals can be aligned to different extensor compartment by radial or ulnar deviation of the wrist. This together with the technique of insertion of the Wissinger rod to the neighbor compartment allows switching of the arthroscope and arthroscopic instruments to the adjacent compartments. Theoretically, the second to sixth extensor compartments can be examined through these 2 portals. However, the exact number of compartments that can be examined depends on the possible degree of radial and ulnar deviation of the wrist. The first compartment cannot be examined through the distal portal as the thumb is at the plane different from the rest of the hand. Another distal portal should be made along the first metacarpal distal to the first extensor compartment if tenosynovectomy or release of this compartment is indicated, for example, de Quervain disease.

During the procedure, it is important to ensure complete synovectomy of individual tendon and the fibro-osseous wall of the involved compartment. Besides tenosynovitis, extensor tendon rupture can be due to chafing of the tendon against bone, as in case of a dorsally subluxated ulna or Lister tubercle.² Therefore, any bony prominence or spike at the osseous bed of the extensor compartment should be shaved. Subluxated ulnar head, if present, should be treated accordingly.

The potential risks of this procedure include damage to the extensor tendon and the cutaneous nerves. It is important to minimize the suction during debridement of the tendon surface and should examine the tendon frequently during the tenosynovectomy. To minimize the risk of damage to the cutaneous nerve, the skin of the portals is incised and the subcutaneous tissue is spread with a hemostat before incision of the deep fascia. The superficial radial nerve and its branches are usually not at risk even if tendoscopy of the first compartment is performed. It is because the proximal portal is ulnar to the nerve. Moreover, the working space is deep to the deep fascia and should be away for the branches of the superficial radial nerve, which are at the subcutaneous layer (Table 2).

Fig 4. Extensor tendoscopy of the left wrist. (A) The arthroscope is advanced distally to exit via the distal portal. The arthroscope is removed, and the cannula is left in situ. A Wissinger rod is inserted into the cannula. (B) The cannula is removed and reinserted along the rod via the distal portal. The rod is removed, and the arthroscope is reinserted into the cannula. The part of the extensor tendons proximal to the retinaculum can be examined, and tenosynovectomy can be performed. (C) Arthroscopic view shows the tendons of extensor digitorum communis (ED) under the extensor retinaculum (ER).

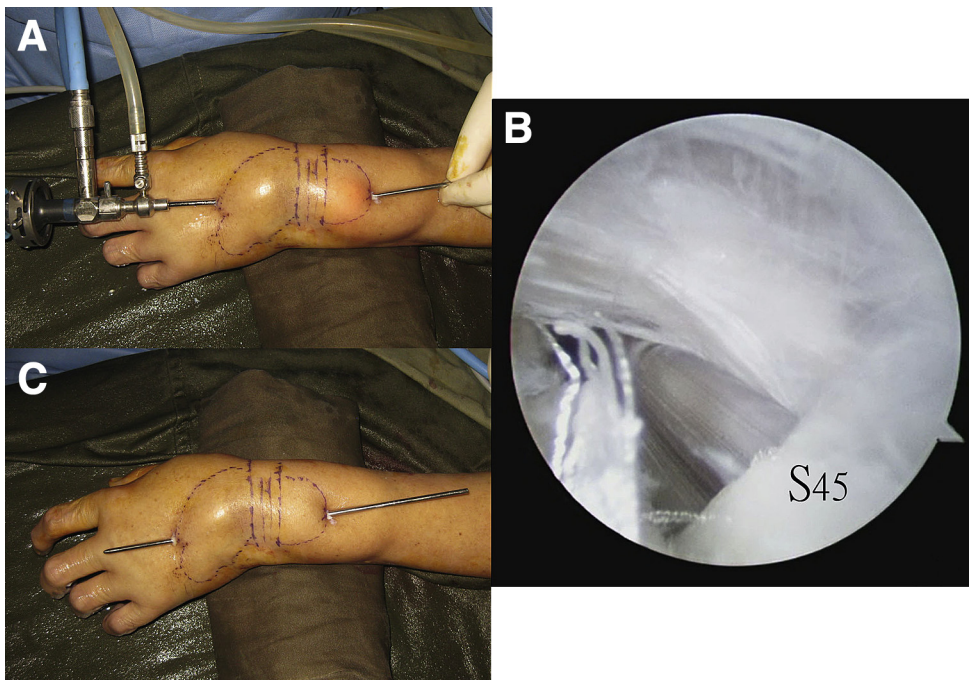
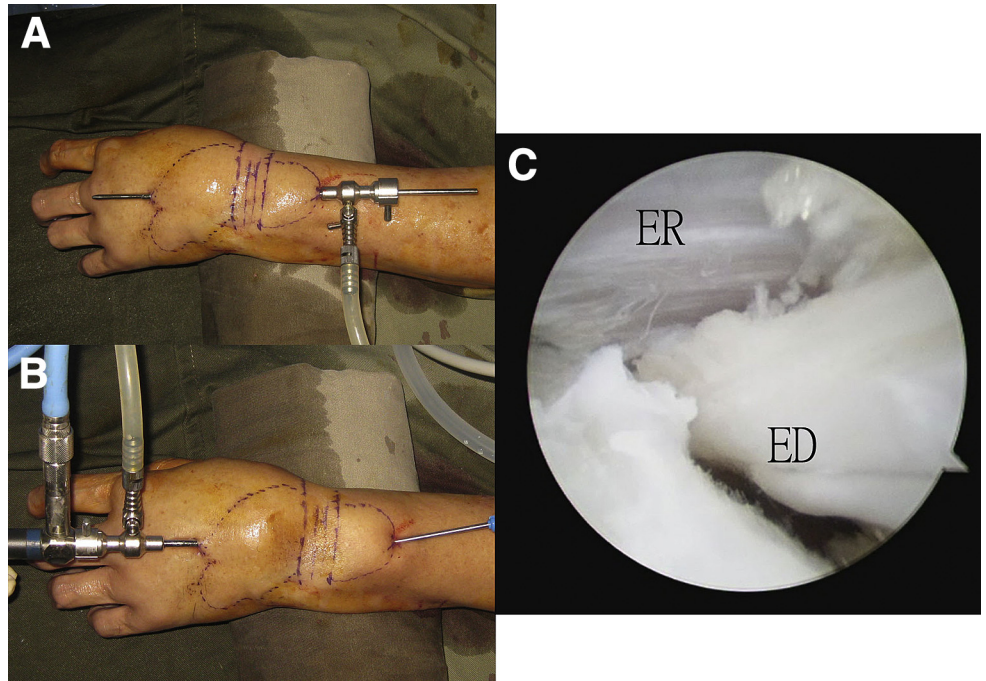


Fig 5. Extensor tendoscopy of the left wrist. (A, B) With the arthroscope in the fourth extensor compartment via the distal portal, the proximal edge of the fibrous septum between the fourth and fifth compartments (S45) is identified. The Wissinger rod is then inserted into the fifth extensor compartment at the other side of the fibrous septum via the proximal portal. (C) The arthroscope is removed, and the rod is advanced to exit through the distal portal. This is facilitated by ulnar deviation of the wrist.

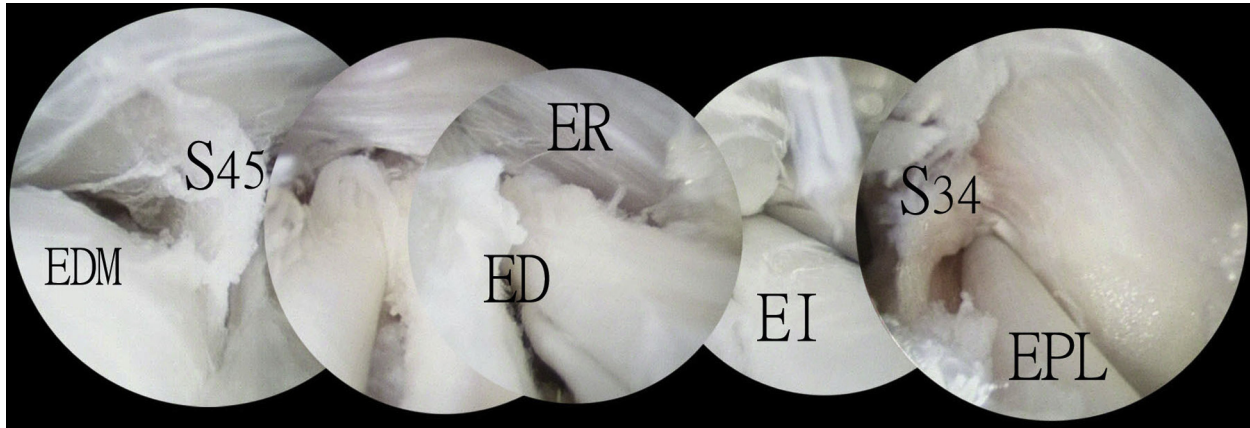


Fig 6. Extensor tendoscopy of the left wrist. Arthroscopic views of the third, fourth, and fifth extensor compartments with the proximal portal as the viewing portal. (ED, extensor digitorum communis; EDM, extensor digiti minimi; EI, extensor indicis; EPL, extensor pollicis longus; ER, extensor retinaculum; S45, fibrous septum between the fourth and fifth compartments; S34, fibrous septum between the third and fourth compartments.)

Table 2. Advantages and Risks of the Extensor Tendoscopy of the Wrist

Advantages	Risks
1. Small incisions	1. Risk of damage to the extensor tendons of the instrumented compartment
2. Better cosmesis	2. Risk of damage to the cutaneous nerves
3. Minimal soft tissue dissection	
4. Preservation of the extensor retinaculum	

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