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Case Report

Distal Intersection Syndrome Combined With Partial Attritional Changes of the Extensor Carpi Radialis Brevis in Tennis Players



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The purpose of this study is to report the cases of 2 tennis players with distal intersection syndrome, a rare pathological condition, combined with partial attritional changes of the extensor carpi radialis brevis tendon. Both individuals were able to return to their original level of performance after surgical intervention consisting of synovectomy within the distal intersection and release of the distal part of the extensor retinaculum. Physicians should familiarize themselves with distal intersection syndrome, which can cause dorsoradial wrist pain in tennis players. If pain is prolonged, tendon attrition may occur, and surgical treatment may be indicated.

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Anatomically, 2 areas called “intersections” exist near the wrist joint along with the extensor carpi radialis brevis (ECRB) and extensor carpi radialis longus tendons in the dorsal second compartment.¹ The 2 tendons are intersected by the abductor pollicis longus and extensor pollicis brevis, which are proximal to the wrist joint (first or proximal intersection), and are intersected again 3–5 cm further distally by the extensor pollicis longus (EPL) tendon as it swings past the distal end of Lister’s tubercle (the second or distal intersection).²

Intersection syndrome is a general term for conditions that cause pain on the dorsoradial side of the wrist joint during wrist motion. It can occur at either the proximal or distal intersection points described above.^{1,2} Proximal intersection syndrome is a rare but well-known condition that occurs between the first and second dorsal compartment proximal to the wrist joint.³ Distal intersection syndrome (DIS) is a rare, lesser-known condition and involves tenosynovitis at the cross-section between the second and third compartments distal to the wrist joint.^{1,4} In the literature, patients with DIS were found to be exposed to

occupational or recreational risk factors such as manual work or sports activity.¹ Inflammation within the ECRB and extensor carpi radialis longus tendon sheath extends to the EPL tendon sheath, which promotes tenosynovitis and possibly eventual EPL tendon rupture.⁵ Additionally, Ferree et al⁶ reported a unique case of DIS combined with a frayed ECRB tendon after non-displaced distal radial fracture that was associated with prolonged dorsal wrist pain.

Recently, we treated 2 tennis players with DIS that induced partial attritional changes of the ECRB tendon; 1 of these patients also experienced a complete EPL tendon rupture. We present the case reports as well as a review of the literature.

Case Reports

Two cases involving DIS combined with partial attritional ruptures of the ECRB tendon were reviewed. This report was approved by the institutional review board of Hiroshima University Hospital. There was no history of trauma that affected wrist pain in either case or any inflammatory conditions, such as rheumatoid arthritis, revealed via laboratory examination.

Case 1

A 20-year-old right-handed male college soft tennis player visited our clinic after experiencing right dorsoradial wrist pain

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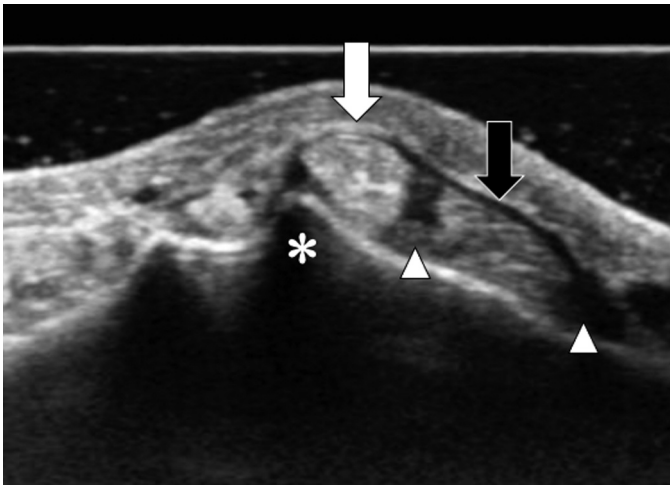


Figure 1. Ultrasonographic findings of case 1 (right: radial) at the patient's initial visit are shown. The ECRB tendon (white arrow) is elevated and extended over the Lister's tubercle (*) during active wrist extension. Mild hypertrophy of the synovium (high signal) and synovial fluid pooling (low signal) (arrowheads represent a signal change in the third compartment) around ECRB and extensor carpi radialis longus tendons (black arrow) are suspected.

when hitting the ball for a few weeks. Swelling and tenderness were present over the distal part of the dorsal second compartment, and active wrist extension with thumb flexion induced severe pain. Ultrasound examination revealed partial detachment of the dorsal extensor retinaculum from Lister's tubercle, elevation of the ECRB during wrist extension, and synovial fluid pooling around the ECRB and extensor carpi radialis longus tendons (Fig. 1). Tenosynovitis around these tendons at the level of the distal intersection was suspected, and corticosteroid injection (5-mg triamcinolone) into the second compartment was administered. The injection relieved symptoms and allowed him to return to playing tennis. Eight months after the initial visit, he had difficulty extending the thumb and consulted our clinic again. The silhouette of EPL was not detected, extension of the interphalangeal joint of the thumb was limited, and he could not lift his thumb with his palm on the table (positive lift-off test). Ultrasound examination revealed a complete rupture of the EPL tendon at the wrist. We planned a cable graft using the palmaris longus tendon to preserve the complete isolation of thumb extension. After the application of a slow curved longitudinal incision over the EPL tendon, its complete rupture was confirmed, along with synovial hypertrophy around the tendon stumps and within the dorsal second compartment. Additionally, detachment of the extensor retinaculum from Lister's tubercle and exposure of the bone surface of its radial side was confirmed. After synovectomy, partial attritional changes of the ECRB tendon on its ulnar surface were also observed (Fig. 2). A tendon graft for EPL tendon rupture and release of the extensor retinaculum at the distal part of the second compartment were performed. The thumb and wrist were immobilized using a volar orthosis, with the thumb fully extended and wrist extended 20° for 3 weeks, and standard range of motion exercises were followed. Three months after surgery, he was able to return to playing tennis without any wrist pain or thumb extension limitation.

Case 2

A 23-year-old right-handed male high-level, amateur tennis player (regional champion) complained of left dorsoradial wrist pain during his double-handed backhand stroke and consulted our clinic.

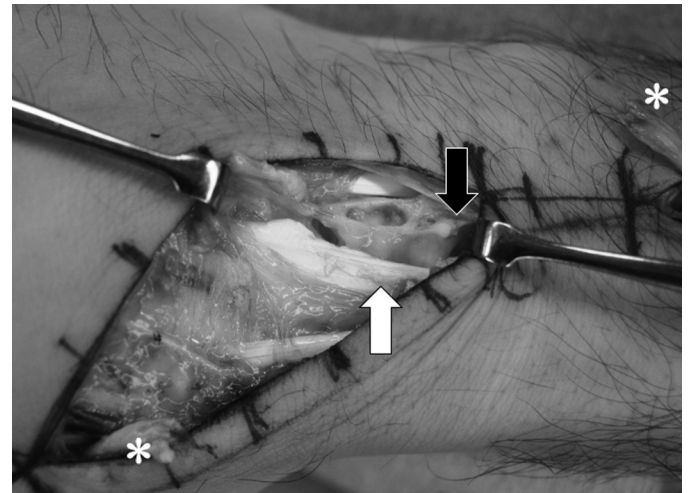


Figure 2. Intraoperative findings of case 1. The partially frayed ECRB tendon (white arrow) and bone exposure of Lister's tubercle (black arrow) are shown. Asterisks indicate the stump of the ruptured EPL tendon.

An examination revealed swelling and tenderness, localized to the area of distal intersection. Magnetic resonance imaging revealed synovial fluid pooling in the second dorsal compartment (Fig. 3). A wrist orthosis was applied, and steroid injection (5-mg triamcinolone) was administered; however, the patient was unable to return to playing tennis due to persistent pain when a backhand stroke was attempted. Two months after his initial visit, we planned a synovectomy within the distal intersection. Using a transverse incision at the distal part of Lister's tubercle to expose the second and third compartments, serous yellow fluid and synovitis in the second and third dorsal compartments and partial attritional changes of the ECRB tendon in contact with the EPL tendon and the dorsal edge of the extensor retinaculum were identified (Fig. 4). We performed a synovectomy within the second compartment and released the extensor retinaculum over the ECRB and EPL tendons distal to Lister's tubercle to relieve pressure. Additionally, the frayed portion of the ECRB tendon was trimmed. His wrist was immobilized for 3 weeks, and standard range of motion exercises were followed. Three months after surgery, the patient was able to completely return to playing tennis.

Discussion

In both the cases, synovial hypertrophy within the distal intersection combined with partial attritional changes of ECRB tendon was identified. Further, complete EPL tendon rupture was noted in 1 case. DIS has been reported to be caused by repeated wrist movement associated with workplace and sporting activities, but this is the rare case report of DIS with partial ECRB ruptures associated with repeated microtrauma due to tennis strokes.¹

Wrist pain/injury caused by tennis activity has increased as the game has been modernized, and some wrist injuries appear to be related to the use of certain forehand grip types and the predominant use of a 2-handed backhand.⁷ The wrist joint of the dominant hand is extended during the forehand stroke and that of the nondominant hand is extended during the backhand stroke. In soft tennis, the wrist joint of the dominant hand fully extends throughout both forehand and backhand strokes. Distal intersection tenosynovitis may be linked to the presence of stenosing tenosynovitis of the second or third compartments.⁴ As the proximal part of the extensor retinaculum has been proposed to play a role in the development of proximal intersection syndrome, its

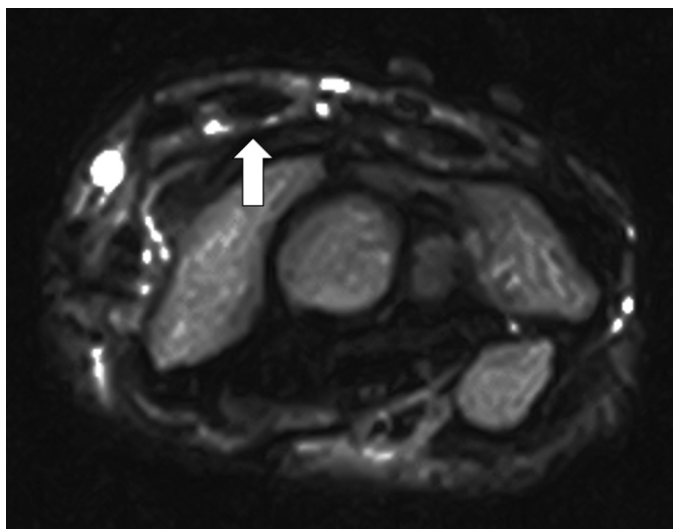


Figure 3. Magnetic resonance image (T2-weighted image) taken at the patient's initial visit. The high signal area around the ECRB tendon (white arrow) is shown.

distal part is likely to play a similar role in constricting the tendon sheath of radial wrist extensors or the EPL in case of DIS.^{4,8}

This kind of chronic partial laceration of the ECRB tendon at the distal intersection has not been reported previously. Based on operative findings, it is conceivable that possible causes of the laceration were: (1) compression stimulation by the extensor retinaculum due to repeated wrist extension movements, (2) mechanical stimulation due to bone exposure of Lister's tubercle after retinaculum detachment, and (3) compression stimulation of the EPL due to grip movement.

EPL rupture has been reported as a complication of DIS and was also observed in case 1.⁵ The steroid injection may have also contributed to the EPL rupture in this case. However, flexor tendon ruptures after steroid injection are previously reported in older patients who received multiple injections.⁹ Additionally, intra-tendinous injection was suspected. Our case was a young patient who received a small-dose single injection using loss of resistance technique to avoid intratendinous injection. Thus, we believe that the most probable cause of tendon rupture was synovitis from the second to the third compartment.¹⁰ Indeed, tissue fragility due to synovitis and compression stimuli between the second compartment and the distal edge of the extensor retinaculum were determined to be the most likely reason for tendon rupture.

A diagnosis of DIS was made by combining local findings, such as the presence of localized swelling and tenderness, with magnetic resonance imaging and ultrasound imaging findings.^{1,4} The diagnosis in the 2 cases reported here was confirmed based on local imaging studies. Both patients complained of severe pain induced by active wrist extension combined with active thumb flexion or grip movement. Both experienced severe pain while hitting a ball with active wrist extension and gripping a racket handle, which requires full flexion of the thumb. This motion of active and full wrist extension and thumb flexion may have acted as a provocation test for the diagnosis of DIS.

The common treatment for DIS involves activity restriction, a wrist orthosis, nonsteroidal anti-inflammatory drug administration, and corticosteroid injection. Although these were performed in our cases, they were ineffective, and an operative treatment was suggested to eliminate restrictions on sporting activity. Synovectomy in the compartment was recommended, and in our cases, release of the peripheral part of the extensor retinaculum, which

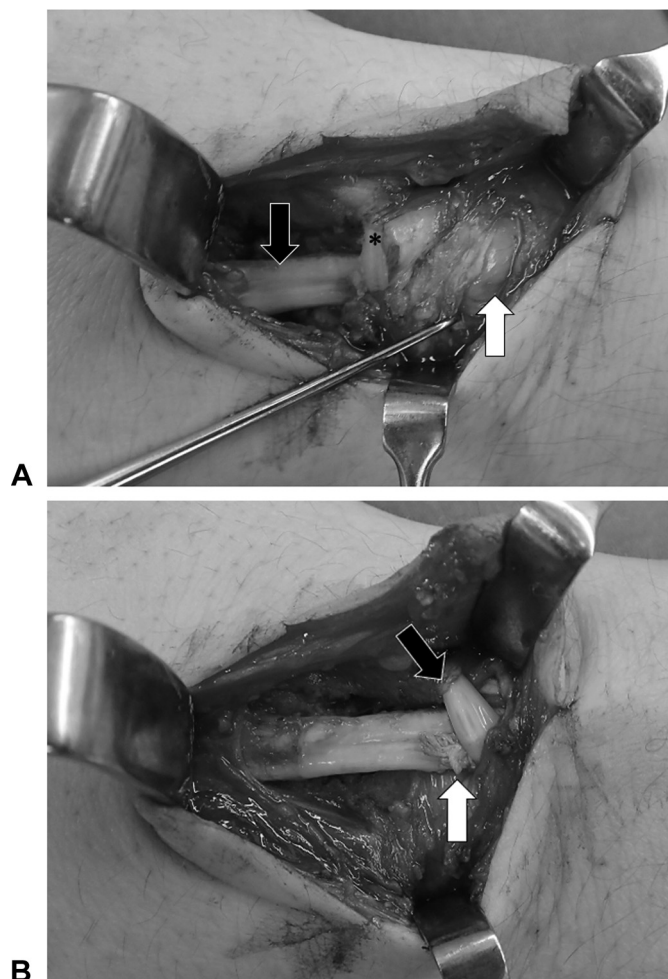


Figure 4. Intraoperative findings of case 2. **A** Hypertrophy of the synovium around the ECRB tendon (black arrow) and within the second compartment (white arrow) is shown (an asterisk indicates the EPL tendon). **B** The surface of the ECRB tendon is frayed (white arrow) at the point of the EPL tendon run over (black arrow) and at the distal edge of the extensor retinaculum.

was the cause of compression of the ECRB tendon from intraoperative findings, was also performed. The patients were able to return to tennis activities after surgery. Both patients experienced prolonged pain before surgery, accompanied by partial rupture of the ECRB tendon. If pain is prolonged, it may be associated with tendon attrition, and surgical treatment may be indicated.

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