The intersection syndrome: Ultrasound findings and their diagnostic value

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KEYWORDS

Intersection syndrome;
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Abstract *Introduction:* The intersection syndrome is a well-known overuse syndrome of the distal forearm. It is characterized by noninfectious, inflammatory changes involving the area of intersection of the first (abductor pollicis longus and extensor pollicis brevis) and second (extensor carpi radialis longus and extensor carpi radialis brevis) extensor compartments in the dorsoradial aspect of the distal forearm. Imaging modalities used to diagnosis this syndrome include ultrasonography (US) and magnetic resonance imaging. The purpose of this report is to describe typical US findings in the intersection syndrome and to demonstrate the diagnostic value of this approach.

Materials and methods: We reviewed US findings in 4 patients (mean age 40 years) referred to our staff for symptoms suggestive of the intersection syndrome (pain, swelling, erythema, and edema of the wrist).

Results: In all 4 cases, the US examination revealed peritendinous edema and synovial fluid within the tendon sheaths at the intersection between the first and the second dorsal extensor tendon compartments.

Discussion: Our experience shows that the intersection syndrome is associated with typical signs on US. This imaging modality can be considered a reliable tool for diagnosing this syndrome and may eliminate the need for other more expensive tests.

Sommario *Introduzione:* La sindrome intersezionale è una sindrome infiammatoria che coinvolge i tendini del primo (abditore lungo del pollice ed estensore breve del pollice) e secondo (estensore radiale lungo e breve del carpo) compartimento dei muscoli estensori della mano. Le tecniche di imaging utili per lo studio di questa patologia sono rappresentate dall'ecografia e dalla Risonanza Magnetica. Il nostro studio ha avuto come obiettivo la descrizione del quadro ecografico di tale affezione allo scopo di dimostrare l'importanza e l'eshaustività della metodica. *Materiali e metodi:* Sono stati inclusi nello studio quattro pazienti, di età compresa tra 28 e 53 anni, con sintomatologia clinica riconducibile alla sindrome intersezionale (dolore, gonfiore, eritema o edema nella regione del polso).

Risultati: Il quadro ecografico della sindrome intersezionale in tutti i casi ha mostrato la presenza di edema peritendineo e versamento sinoviale all'interno delle guaine tendinee dei tendini del primo e secondo compartimento determinando la scomparsa del piano divisorio iperecogeno tra i due gruppi tendinei.

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Discussione: I risultati della nostra esperienza confermano che la metodica ecografica fornisce segni tipici in tale affezione e pertanto può essere considerata come tecnica sufficiente per lo studio di pazienti con sintomatologia riconducibile alla sindrome intersezionale.
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Introduction

Ultrasonography plays a fundamental role as a first-line imaging study in the diagnosis of musculotendinous injuries. The intersection syndrome is a noninfectious, inflammatory condition that affects that portion of the distal forearm where the first extensor compartment tendons (those of the abductor pollicis longus and the extensor pollicis brevis) pass over—or intersect—those of the second extensor compartment (the extensor carpi radialis longus and the extensor carpi radialis brevis tendons). In patients suffering from this syndrome, US reveals tenosynovitis (synovial fluid within the tendon sheaths) and peritendinous edema. The underlying pathophysiological mechanisms are still the subject of debate, but the syndrome is clearly caused by overuse of the muscles of the forearm, which is associated with typical signs and symptoms [1], including pain, swelling, erythema, edema at palpation, and crepitus during flexion and extension of the wrist. The area of involvement is proximal to the Lister tubercle of the distal radius [2], and pain is reported at the point of intersection between the extensor tendons of the first and second compartments [3].

The intersection syndrome must be differentiated from inflammatory forms of tenosynovitis (particularly De Quervain's disease), ganglion cysts, infections, sprains involving the ligaments of the wrist, muscle strains, soft-tissue tumors, and Wartenberg's syndrome (entrapment of the sensory branch of the radial nerve) [4].

The aim of our study was to demonstrate the value of US in the work-up of patients with the intersection syndrome based on a review of cases diagnosed by our group.

Materials and methods

In a 3-year period, 4 patients were referred to our institute for evaluation of symptoms typical of the intersection syndrome (i.e., pain and swelling involving the dorsal aspect of the wrist, crepitus during active or passive movement of the wrist, and swelling in the region of the involved tendons). The mean age of the patients (2 men aged 28 and 53 years [Fig. 1] and 2 women, 45 and 34 years of age) was 40 years. In all 4 cases, the involved wrist was examined with a sonographic scanner equipped with a 7.5–14 MHz linear transducer. The wrists were scanned in the axial and longitudinal planes to detect tendinosis, tenosynovitis, and/or subcutaneous edema.

The first patient, a 28-year-old man, presented with recent-onset pain, edema, and erythema involving the distal portion of the forearm. The second, a 53-year-old farmer, reported wrist pain that interfered with his work. The third patient, a 45-year-old woman, reported pain and swelling of the wrist that had recently developed when she

started playing tennis regularly, and the fourth patient (a 34-year-old woman) was referred for a suspected ganglion cyst. None of involved wrists had ever been examined with magnetic resonance imaging.

Results

In all four patients, the US examination revealed peritendinous edema and synovial effusions within the tendon sheaths of the first and second compartments, which eliminated the hyperechoic plane that normally divides the two tendon groups (Fig. 1). Significant degrees of subcutaneous edema, which have been reported in patients with the intersection syndrome [2], were not present in any of our patients. In two of the patients with longer-standing symptoms, the tendon sheaths presented irregular thickening with small, hyperechoic nodules within the context of the effusion, which are indicative of proliferative changes in the synovial membrane. The younger woman (34 years old) presented marked thickening of extensor carpi radialis longus and the extensor carpi radialis brevis tendons. The older woman (aged 45) had recently taken up tennis. The sonogram of her arm showed a large amount of synovial fluid located mainly in the tendon sheaths of the second compartment. The 53-year-old farmer presented moderate tendinosis that was also more severe in the second compartment. The first patient we observed had moderate edema involving the first and second tendon compartments.

Discussion

The intersection syndrome was described for the first time in 1841 by Velpeau, and it is also referred as adventitial bursitis, subcutaneous perimyositis, Abductor pollicis longus syndrome, peritendinitis crepitans, cross-over syndrome, and oarsmen's wrist [1]. The term *intersection syndrome* was proposed by Dobyns et al. in 1978. It refers to the intersection (at an angle of around 60°) of the musculotendinous junctions of the first and second extensor compartment tendons [5]. It should not be confused with distal intersection tenosynovitis of the wrist, a recently described condition that involves the second and third dorsal extensor compartment tendons (with symptoms localized in a more distal segment of the wrist) [6].

The syndrome usually develops in patients involved in activities associated with repeated flexion-extension movements of the wrist (e.g., sports like canoeing, skiing, tennis, discus throwing, or farm work) [7,8]. As Palmer and Lane-Larsen pointed out in 1994, onset is generally reported shortly after the patient begins a new sport [8].

The underlying pathophysiologic mechanisms have yet to be defined [9,10], but two theories (not necessarily

Fig. 1 A 28-year-old man with the intersection syndrome. US shows (proximal to distal): (A) proximal cross-over point with the abductor pollicis longus (APL) and extensor pollicis brevis (EPB), which pass over the extensor carpi radialis longus (ECRL) and extensor carpi radialis brevis (ECRB) tendons; (B) synovitis of the tendons of the first (APL – EPB) and second (ECRL) osteofibrous extensor compartments; (C) synovitis of the ECRL and ECRB; (D) distal cross-over point with the extensor pollicis longus (EPL) that passes over the ECRL and ECRB, and distal to the intersection with the EPL, absence of fluid in the extensor tendon sheaths of the second compartment.

mutually exclusive) have been advanced. The first holds that the syndrome is caused by friction between the bellies of the abductor pollicis longus and the extensor pollicis brevis muscles and the tendon sheaths of the extensor carpi radialis longus and the extensor carpi radialis brevis [11]. The second theory attributes the syndrome to narrowing of the sheaths of the extensor carpi radialis longus and the extensor carpi radialis brevis tendons, which leads to swelling and pain (entrapment secondary to stenosis) [1].

The intersection syndrome must be differentiated from De Quervain's tenosynovitis (which involves an area a few centimeters distal to that affected by the intersection syndrome, i.e., near the styloid process of the radius [3]); ganglion cysts; Wartenberg syndrome (entrapment of the superficial radial nerve); tenosynovitis of the second and third compartments of the wrist; wrist ligament sprains; and muscle strains.

In most cases, treatment is conservative. The wrist should be placed at rest and stressful, repetitive movements avoided [12,13]. Pain and inflammation can be relieved with oral nonsteroidal anti-inflammatory drugs and local application of ice [2]. If the symptoms persist, local infiltration of slow-acting steroids may be useful [4]. If the conservative approach fails, surgery may be indicated. It consists of tenosynovectomy and fasciotomy of the abductor pollicis longus to decompress the cross-over point [14].

The diagnosis is made on the basis of clinical findings, which must be confirmed by imaging studies (US and MRI).

The US findings are typical and significant: peritendinous edema and fluid-filled tendon sheaths at the point of intersection of the first and second dorsal extensor tendon compartments, interruption of the hyperechoic plane that separates the two groups of tendons; tendon thickening (best observed on transverse scans); tendinosis (moderate to severe); muscle and subcutaneous edema (not present in the patients we examined).

In our study, US was the first-line imaging study, and it provided sufficient information for a reliable diagnosis of intersection syndrome, without other tests.

There are no studies in the literature that demonstrate the value of US as the first-line imaging study in these cases (only retrospective reviews of MRI studies), but in our experience, US findings supported by data from the history and physical examination were sufficient for the correct diagnosis of intersection syndrome.

Conflict of interest statement

The authors have no conflict of interest.

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