Ultrasonographic Evaluation of de Quervain Disease

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De Quervain disease is a job-related tenosynovitis that affects the synovial sheath of the tendons of the abductor pollicis longus and extensor pollicis brevis muscles; it is associated with pain and functional impairment and progresses to cause local fibrosis with blockage or triggering of the thumb. High-resolution ultrasonography of the wrist was performed in eight patients with de Quervain disease; the examination was performed in axial and coronal scans with a 13 MHz linear transducer. The evaluation of normal wrists helped to define the normal sonographic anatomy of the first extensor compartment; obvious changes of the tendon sheath were noted in all cases of de Quervain disease (thickening and edema of the synovial sheath and fluid within the sheath). We conclude that ultrasonography is able to confirm the clinical diagnosis of de Quervain disease and may have a role in the follow-up of this disorder. KEY WORDS: Tendon; Tenosynovitis; Hand; Wrist.

The synovial sheath of the tendons of the abductor pollicis longus and extensor pollicis brevis muscles can be affected by an inflammatory disease known as de Quervain disease after the Swiss surgeon who first described the syndrome in 1885. De Quervain disease is a stenosing tenosynovitis that causes an impairment of the tendons of the muscles that abduct and extend the thumb, affecting primarily the synovial sheath in the region of the radiocarpal joint; it can be considered a work-related disease, since it is associated with longstanding microtrauma (typing, computer work). The disease is relatively frequent (it was the most commonly found tendon disorder in the distal forearm in the follow-up of 146 female workers), and it requires and early diagnosis to avoid surgery, which becomes necessary when the synovial sheath becomes thickened and fibrotic.

High-resolution ultrasonography provides good quality images of normal and abnormal tendons because of its high spatial resolution; high-field MR imaging, with surface coils, generally considered unsurpassable in musculoskeletal diseases, provides high contrast resolution but lacks real-time capabilities that are necessary in evaluating tendons. Although the ultrasonographic findings in tendon disease have been well described in the literature, the specific features of de Quervain disease have not been reported.

The aim of this study was to evaluate the signs that can be found with high-resolution ultrasonography in de Quervain disease.

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MATERIALS AND METHODS

High-resolution ultrasonography of the wrist was performed in eight patients (seven women and one man; mean age, 37 ± 7 years) who complained of intense spontaneous pain in the first extensor compartment of the wrist (five on the right side, three on the left), with consequent functional impairment of the thumb. The time elapsed between the onset of the symptoms and the clinical evaluation varied between 2 and 14 weeks. Clinical history revealed a long duration of occupational use of the hands in five of eight patients (three professional typists and two assembly line workers), whereas the other three had no particular history of manual or wrist-stressing work. Examination revealed a painful swelling of the abductor pollicis longus and extensor pollicis brevis tendon sheath; a positive Finkelstein maneuver (pain during ulnar deviation of the flexed wrist with the thumb adducted) indicated the diagnosis of de Quervain disease.

The examination was performed using axial and coronal scans along the radiocarpal and first carpometacarpal joints with a 13 MHz linear transducer. Passive movements of the thumb helped to evaluate the freedom of movement of the tendons, and contralateral extension of the examination was useful to confirm the alterations in normal anatomy on the affected side.

None of the patients underwent surgery; only four agreed to receive conservative therapy (two to six injections of steroids and local anesthetic into the tendon sheath), which gave complete relief in three patients and partial relief in one patient, who nevertheless had a complete but delayed remission of the symptoms (occurring 3 to 4 months later, as opposed to 1 to 2 months in the other three treated cases). The four patients who refused therapy either progressed to the chronic stage (two cases with functional impairment of the thumb and clinically evident thickening of the sheath) or had complete healing (two cases). Interestingly, the three patients without positive history of work using the hands healed completely (one with therapy and two without).

All patients were followed with ultrasonography until complete remission (six cases) or chronic evolution of disease (two cases).

RESULTS

Normal Anatomy

Axial scan (Fig. 1) identifies the dorsal bony plane (processus styloideus of the radius, os naviculare, os trapezius) and two groups of tendons with their synovial sheaths: an external one, composed by the abductor pollicis longus (lateral) and extensor pollicis brevis (medial) tendons, barely identifiable as separate entities, and an internal one, composed by the extensor pollicis longus tendon alone. Between the bones and the tendons the radial artery frequently is visible. Coronal scans (Fig. 2) can be obtained along the external group of tendons, which remain clearly visible up to the distal insertion, but do not allow any differentiation between the two tendons of the group.

Tendons show the normal fibrillar pattern and have a mean diameter of 1.5 ± 0.2 mm, whereas the sheath is visible as a multilayer hypoechoic line about 0.6 ± 0.3 mm thick.

De Quervain Disease

Degenerative changes of the tendon sheath were noted in all cases during the acute stage. In six patients the sheath was thicker than normal (mean thickness, 5 ± 2 mm), with a noticeable loss of the normal multilayer structure, which was interrupted by multiple small hypoechoic areas. The tendons themselves were compressed by the distended sheath, but were not involved by the degenerative process because their normal texture was unchanged (the fine and parallel echoes of the endotendineum septa were clearly visible in all cases, with no interruption or distortion of their parallel alignment). In two cases, the structural changes of the tendon sheath were particularly extensive (complete loss of the normal structure of the sheath, which became a thickened hypoechoic layer), with evidence of a thin, hypoechoic rim of fluid between the sheath and the tendon, which resulted in marked compression. In these cases, the tendon and tendon sheath complex resembled a unique hypoechoic structure (Fig. 3); in one of the two cases, the inflammation was so extensive that a thin fluid rim was noticed outside the proximal part of the tendon sheath. Intense hypoechogenicity of the sheath and fluid seemed associated with a more recent onset of the symptoms (the three patients who showed these alterations were examined 2 to 4 weeks after onset) (Figs. 4, 5), whereas complete loss of the normal structure of the sheath seemed typical of long-standing disease (two patients who were examined after 10 and 14 weeks) (Fig. 6).

Posttherapeutic recovery was expressed by thinning of the sheath, which nevertheless remained thicker (3 ± 1 mm) and less echoic than normal (Fig. 7); patients who progressed to the chronic stage did not
show any thinning of the sheath, which remained hypoechoic and without evidence of the normal multilayer structure.

**DISCUSSION**

De Quervain disease is a tenosynovitis of the first extensor compartment of the wrist; it can be considered a work-related disease, since it frequently is associated with highly repetitive movements in jobs using the hands. All of the cases of de Quervain disease observed by Minamikawa and coworkers had job-related symptoms1 and the disease was the most commonly found tendon disorder in the distal forearm in the follow-up of 146 female workers.1 The inflammation affects the synovial sheath of the tendons of the abductor pollicis longus and extensor pollicis brevis muscles; is associated with pain, swelling of the sheath, and functional impairment; and progresses to determine local fibrosis with "blockage" (compromise of the movements of abduction) or "triggering" (loss of gradual movements of abduction) of the thumb. Therapy is based on multiple injections of steroids and local anesthetic agents into the tendon sheath or surgical release of the tendons when conservative therapy fails. In the latter case, a septum, which anatomically separates the tendons, can be responsible for the failure.5,6

The application of high-frequency ultrasound transducers has increased the diagnostic possibilities of this technique in the evaluation of tendon diseases. When a tenosynovitis is present, ultrasonography detects thickening and edema of the synovial sheath, fluid within the sheath, and degenerative alterations of tendons.3 The only reports in the literature describe one case of massive tenosynovitis of the extensor digitorum muscle7 and a case of de Quervain disease alone.8

MR imaging, on the other hand, has been proposed in the evaluation of tenosynovitis of the wrist9,10 in general and of de Quervain disease in particular. In a review of five cases, Glajchen and Schweitzer concluded that increased thickness of the extensor pollicis brevis and abductor pollicis longus tendons was the most reliable finding on MR imaging, being present in all cases, and that peritendinous edema also was a reliable finding.11 The weak points of MR imaging, however, are the lack of real-time capabilities, which prevent the evaluation of tendon movements, and formation of some artifacts, which could lead to misdiagnosis, such as the "magic angle" effect (caused by changes in the dipolar interactions between water hydrogen protons, which are loosely bound along collagen fibrils in organized tissue such as tendon or articular cartilage, causing focal increased signal intensity on short echo time MR images when tendons are aligned at 55 degrees to the main magnetic field)12 and particular anatomic conditions that may simulate disease (multiple slips of the abductor pollicis longus tendon simulate longitudinal tears; the extensor pollicis longus tendon normally demonstrates increased signal intensity, simulating tendinitis).13 Furthermore, MR imaging is more expensive and time-consuming than ultrasonography.
Although limited by the small number of cases and the lack of surgical or pathologic confirmation, our experience indicates that de Quervain disease has no particular sonographic aspect with which it can be differentiated from a generic tenosynovitis: all of the typical signs described previously with MR imaging can be detected and add to the final diagnosis (various degrees of thickening of the sheath, fluid within or outside the sheath). In particular, the anatomic evidence of an inflammation limited to the synovial sheath, with rare involvement of the tendons themselves, is confirmed by ultrasonography, which did not demonstrate any degenerative alteration of tendons in any stage of the disease.

However, ultrasonographic evaluation of de Quervain disease is limited by some weaknesses, some of which are already evident from the analysis of our experience. First of all, the diagnosis is almost always clinical, with no significant place for differential diagnosis (other specific and nonspecific causes of tenosynovitis in the first compartment, extrinsic compression of the tendons are definitely rare conditions that can be excluded or confirmed either clinically or by history); for this reason, the patients are not generally referred to the radiologist and do not undergo any biopsy procedure in the acute stage, since pathologic confirmation generally is not needed (sometimes patients do not undergo any therapy at all). Furthermore, ultrasonography as well as MR imaging can be affected by artifacts, such as the false hypoechoic appearance of tendons, which may mimic disease and takes place when the angle of insonation is less than 90 degrees. Ultrasonographic examination, however, could help to differentiate tenosynovitis from trauma and degenerative diseases, which sometimes affect the tendons of the first extensor compartment (thickening of the sheath is considered a specific sign of inflammation and is never noticed in degenerative disease) and could be useful in selecting patients who should undergo local therapy (when the severity of the disease is expressed by the presence of fluid) or surgical release of the tendon (when no significant thinning of the sheath is evident after 3 to 4 months). This type of information could be easily obtained with ultrasonography, whereas MR imag-
Figure 6 Coronal scan in chronic de Quervain disease after local therapy reveals a thickened sheath (marker) and a barely identifiable tendon.

...ing could be the method of choice in those patients who require a more comprehensive evaluation of the affected region (for example, when an extrinsic compression of the tendon is suspected).

In conclusion, we believe that ultrasonography is able to evaluate all the signs of de Quervain disease, allowing the clinician to obtain an early and accurate diagnosis; moreover, ultrasonography can be the method of choice during the follow-up of the disease, in guiding the local injection and in evaluating the healing of the synovial sheath.

REFERENCES
