Application of High Frequency Ultrasound on Wrist Joints

In this issue of the *Journal of Medical Ultrasound*, the application of high-frequency ultrasound on wrist joints, especially with a focus on De Quervain disease, carpal tunnel syndrome, and ultrasound-guided injection techniques, is intensively reviewed and comprehensively discussed [1].

De Quervain disease, defined as stenosing tenosynovitis of the first extensor compartment of the wrist, is the most common wrist disorder referred for ultrasound imaging. The best landmark for the transducer placement is on the radial styloid. The longitudinal plane is suitable for dynamic examination of tendon gliding, whereas the transverse view serves as a better window to inspect the retinaculum, internal septa, and accessory tendons [2,3]. Increased sizes with hypoechoic changes in the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) tendons are typical findings [4]. In the acute inflammatory stage, the synovial sheath may be filled with effusion, and hypervascularity is easily seen under power Doppler sonography. In the chronic phase, synovial hypertrophy, marked thickening, and hypoechoic appearance may be present at and inside the retinaculum of the first compartment.

The most common pattern of tendons inside the first extensor compartment is one or two APLs and one EPB in a single compartment [5]. Many anatomic variations of the first extensor compartment exist that may potentially interfere with the response of a corticosteroid injection. APL tendons frequently have multilamellar texture, whose prevalence was up to 89% of specimens at dissection [4]. The investigator should be cautious about not misdiagnosing multilamellar appearance as longitudinal split tear. Another common variation is the presence of a vertical or oblique linear septum-like structure extending from the extensor retinaculum between the APL and EPB or the presence of completely separate hypoechoic circular rims around the EPB and APL. One study demonstrated 100% sensitivity (95% confidence interval, 74–100%) and 73% positive predictive value (95% confidence interval, 47–91%) in identifying subcompartmentalization by using ultrasound [5]. Another research exhibited a similar diagnostic accuracy of ultrasound in detecting subcompartmentalization and high prevalence (41%) of septum-like structures at asymptomatic contralateral wrists in patients with De Quervain disease [2].

Another diagnosis, named intersection syndrome, is usually confused with De Quervain disease. It is a noninflammatory condition that affects the portion of the distal forearm where the first extensor compartment tendons pass over the tendons in the second extensor compartment (extensor carpi radialis longus and extensor carpi radialis brevis tendons). The typical location of the intersection is proximal to the Lister tubercle of the distal radius, whereas the painful site in De Quervain disease is more distal. The ultrasound findings comprise significant tendon swelling, peritendinous hypervascularity, and effusion within the tendon sheaths at the point of intersection [4]. However, even though the above findings are absent, the diagnosis of intersection syndrome can be made if the pain is elicited through dynamic examination at the crossover region between the first and second extensor compartments.

Application of high-resolution ultrasound on patients with carpal tunnel syndrome is a hot issue for research. Most studies use clinical presentations and electrical diagnostic findings to compare with the designated sonographic parameters. The parameters include morphological changes in median nerves such as cross-sectional area and flattening ratio or estimation of external compression such as the bowing of the flexor retinaculum [6]. All the measurements can be performed from the inlet to the outlet of the carpal tunnel, and the diagnostic accuracy varies according to the site. Several meta-analyses have been published in exploring the sensitivity and specificity of ultrasound in the diagnosis of carpal tunnel syndrome [7–9]. Most meta-analyses noted that measuring the median nerve cross-sectional area by ultrasound gives complementary information but failed to serve as an alternative to electrodiagnostic testing for diagnosis of carpal tunnel syndrome. A recent meta-analysis demonstrated that using 9 mm² of the cross-sectional area at the carpal tunnel inlet was the best single diagnostic criterion with a diagnostic odds ratio of 40.4 (sensitivity 87.3%,
Although ultrasound may not replace the role of electrodagnostic testing, it can be considered an easy and useful tool for the screening of carpal tunnel syndrome.

Ultrasound-guided injection therapy has emerged as a mainstream approach in musculoskeletal pain medicine [10]. The guided injection has been shown to lead to a resolution of symptoms in 97% of wrists with De Quervain disease in a case series [11]. A randomized controlled trial further indicated a more significant decrease in the ultrasound-guided group than in the manual injection group from baseline to 4 weeks after injection [12]. Because the existence of septum inside the first compartment is common in wrists with De Quervain disease and hinders the diffusion of steroids, the guided injection can direct the medication to each subspace and results in treatment success. Regarding carpal tunnel syndrome, a local steroid injection is effective for short-term symptom relief. The benefit of guided therapy is the precise targeting of the soft tissue adjacent to the median nerve without injury to the nerve [13]. However, to date, only a few studies can demonstrate the better effectiveness of guided injections against carpal tunnel syndrome compared with the blind approach.

To summarize then, in this issue of the Journal is an interesting study on a standardized measurement of the scapholunate ligament ("The Sonographic Squeeze Test: Assessing the Reliability of the Dorsal Scapholunate Ligament") [1]. This article is important to the background knowledge of ultrasound assessment of wrist joints. We expect that in the near future, further studies will emerge to demonstrate the quantitative findings of symptomatic intersection syndrome and the effectiveness of guided injection for this specific wrist disorder.

References


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