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Ultrasound-guided procedures around the wrist and hand: How to do☆

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ABSTRACT

Ultrasound has emerged as a low-cost, radiation-free and effective imaging technique to detect joint abnormalities and to guide percutaneous procedures. Being superficial, wrist and hand tendons and joints represent a good target to perform such procedures using ultrasound guidance. This kind of approach allows for a clear and real-time visualization of the needles during their whole path. In this setting, the knowledge of technical aspects and tips is essential to act in the most accurate way on target tissues that can be as small as a few millimetres. The aim of this review is to summarize the local treatments of inflammatory and degenerative disease described in literature (such as treatment of De Quervain's tenosynovitis, trigger finger, trapezio-metacarpal joint osteoarthritis, etc.), emphasizing precautions and tricks based on day-by-day experience that may help to improve the outcome of percutaneous ultrasound-guided procedures around the wrist and hand.

1. Introduction

A number of different pathologic conditions can be encountered when evaluating patients affected by wrist and hand pain. These conditions include joint effusion and tenosynovitis, with or without synovial proliferation, trigger finger, De Quervain's disease, and ganglia. Despite the contribution of systemic therapy in the treatment of articular and peri-articular diseases, drug injection into joints, tendon sheaths, and other soft tissues still represents a valuable resource in daily clinical practice, especially when dealing with the abovementioned conditions [1]. In this setting, ultrasound has emerged as a low-cost, effective, and radiation-free imaging modality that can be used for diagnostic purposes [2,3] as well as to guide percutaneous procedures to treat these conditions with a minimally invasive approach [4,5].

Wrist and hand affections requiring ultrasound-guided procedures have been reported to account for up to 35% of all upper limb procedures [6] and include injections to treat tendon conditions, of which De Quervain's disease the most frequent, followed by trapezio-metacarpal osteoarthritis, trigger finger, and ganglion cysts drainage [6].

The basic aim of ultrasound-guided interventional procedures is to correctly place a needle into a specific site (e.g., articular space, tendon sheath) to drain fluid and/or to inject a therapeutic substance (e.g., steroids, hyaluronic acid) to control symptoms and to delay or avoid surgery. Several recent studies have reported better treatment outcomes when drugs are injected precisely into the target under ultrasound guidance [7,8]. Conversely, other reports indicate that complete accuracy of needle placement may not be essential for satisfactory outcome [9,10]. However, there is general agreement that precise needle placement reduces patient discomfort and potential incidental damages to adjacent structures [8,11].

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The purpose of this article is to review the technical approach to ultrasound-guided procedures that can be used to treat the most common inflammatory and degenerative diseases of the hand and wrist, placing special emphasis on practical suggestions for outcome improvement.

2. General principles of ultrasound-guided procedures in the musculoskeletal system

Diagnostic and subsequent interventional procedures of wrist and hand are performed using linear (7–15 MHz) or high frequency hockey-stick (12–18 MHz) transducers, depending on the depth of the target and the local anatomy. On the other hand, needle selection is based on the clinical question to be answered as well as the kind of drugs to be injected. In general, a variety of needles can be used to perform these procedures. Their size varies in terms of length (2–9 cm) and width (16–27 G).

All ultrasound-guided interventional procedures can be performed easily in an ultrasound ward but should be performed with a strict aseptic technique in order to avoid any risk of contamination by infectious organisms (bacteria, fungi, viruses) [12,13].

3. Radio-carpal joint

Placement of a needle into the radio-carpal joint can be done with both diagnostic (e.g., effusion drainage) and therapeutic purposes. Studies have shown that accuracy of intra-articular fluid aspiration and injection is increased using ultrasound guidance (97% and 100%, respectively) compared to blinded approach (32% and 58–82%, respectively) [10,11]. Needle placement with 100% accuracy has also been achieved using fluoroscopy, the use of which cannot be anymore justified, as ultrasound allows for achieving similar results without ionizing radiations [14].

3.1. Indications

Intra-articular injection of steroids can be performed in inflammatory arthritides, crystal arthropathies, and degenerative osteoarthritis with articular effusion [15]. When no effusion is present, hyaluronic acid can be used to slow down the degenerative process of osteoarthritis [16,17]. Local anaesthetic injections can be performed to assess the intra-articular relevance of pain and to induce short-term analgesia, although the role of these procedures is hardly debated [18,19].

3.2. How to do

The hand is positioned on the table with the palm facing down. The ultrasound probe is positioned on the dorsal side of the wrist along its major axis, thus allowing for imaging the distal radial epiphysis and the first carpal row. Although a lateral-medial in-plane approach can be used, this joint is preferably injected with a vertical out-of-plane approach. This approach may be more difficult for inexperienced operators. However, this usually allows for a shorter procedure with minimal discomfort for the patient. A description of the procedure is presented in Fig. 1.

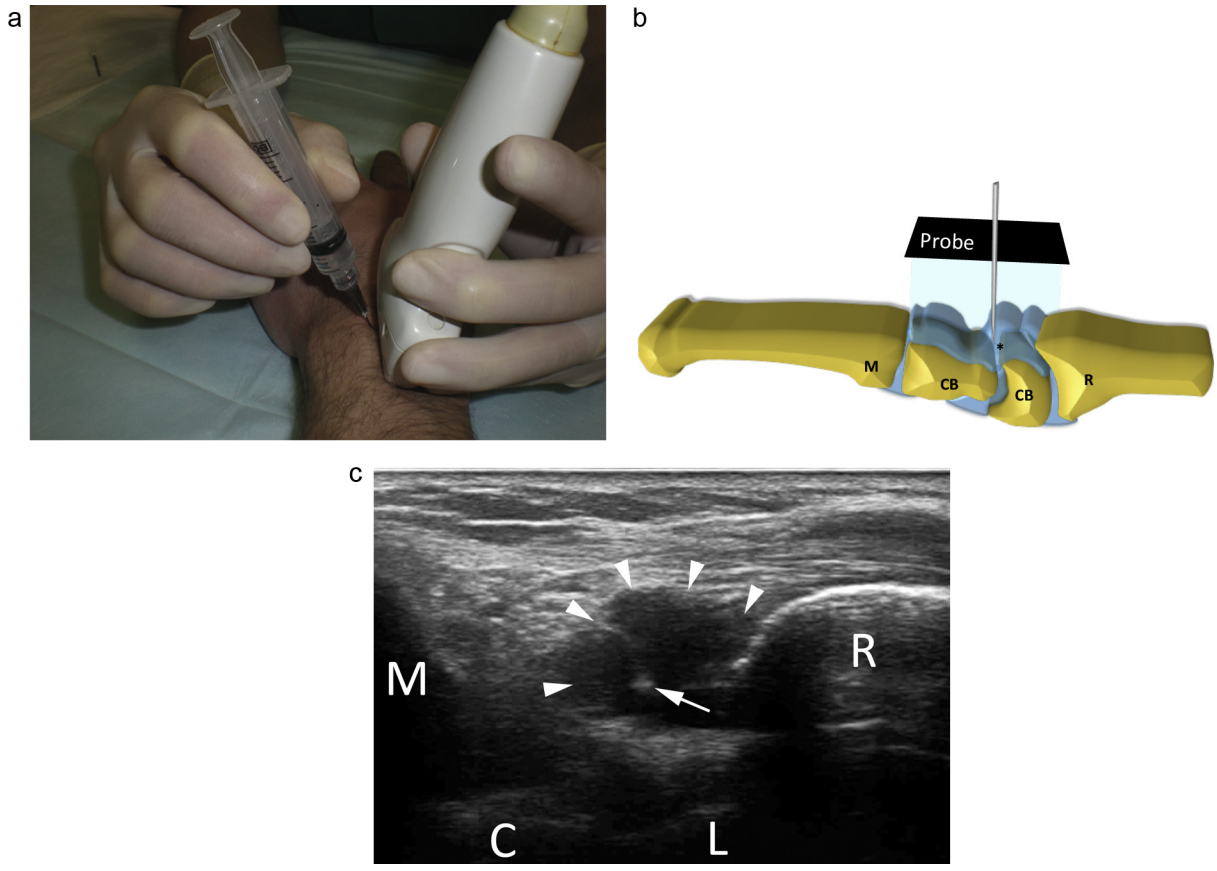

Fig. 1. Radio-carpal injection of steroid in a patient affected by rheumatoid arthritis accompanied by synovial proliferation. (a) The wrist is positioned with the palm on the table and the probe is oriented along the sagittal plan. The needle is inserted with an out-plane approach. (b) Schematic drawing of radio-carpal needle placement with out-plane approach. Needle tip is indicated with an asterisk. (c) Ultrasound sagittal image obtained over the dorsal aspect of the wrist. The needle can be seen as a small hyperechoic dot (arrow) within synovial proliferation (arrowheads) arising between the carpal bones. M = metacarpal bone; C = capitate; L = lunate; R = radius.

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