Intralesional therapy in carpal tunnel syndrome: A sonographic-guided approach

W. Grassi, A. Farina, E. Filippucci, C. Cervini

Department of Rheumatology, University of Ancona, Italy
Walter Grassi, MD, Professor; Antonella Farina, MD, Clinical Research Fellow; Emilio Filippucci, MD, Clinical Research Fellow; Claudio Cervini, MD, Professor.

Please address correspondence and reprint requests to: Walter Grassi, MD, Clinica Reumatologica, Università degli Studi di Ancona, Ospedale A. Murri, Via dei Colli no. 52, 60035 Jesi (Ancona), Italy. E-mail: reuman@popcsi.unian.it

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ABSTRACT

Objective: The aim of this pictorial essay is to show a representative example of sonographic-guided injection in carpal tunnel syndrome associated with tenosynovitis of the finger flexor tendons.

Methods: Images were obtained using a real-time ultrasound system (AU4-idea; Esaote Biomedica, Genoa, Italy) equipped with a 13-MHz linear transducer. The best injection site was detected using a fine metal clip placed between the skin and the transducer. The images here were obtained in a patient with rheumatoid arthritis and carpal tunnel syndrome secondary to tenosynovitis of the finger flexor tendons.

Results: Steroid injection within the carpal tunnel under sonographic control was easily performed. All steps of the needle placement within the widened tendon sheath were carefully evaluated on the monitor screen. Marked clinical improvement occurred shortly thereafter (3 days) and increased over the next 6 weeks.

Conclusion: A detailed assessment of the carpal tunnel and a correct, safe placement of the needle for steroid injection can be quickly performed under sonographic guidance.

Introduction

Conventional “blind” local corticosteroid injection of the carpal tunnel is an effective therapy for patients with carpal tunnel syndrome (CTS). If performed by a trained rheumatologist, this is a quick, inexpensive, and effective procedure, especially in patients with CTS secondary to flexor tenosynovitis. However, the risk of tendon and nerve damage can be significant if the injection is not performed according to clearly defined cardinal rules (1). Moreover, nerve lesions induced by the tip of the needle can occur even after standard placement of the needle due to possible variations in the position of the median nerve from patient to patient. Ultrasonography offers an inexpensive and efficient technique for the rapid and accurate assessment of soft tissues (2-4). Intra-lesional therapy under sonographic guidance may play a key role in allowing the safe placement of the needle in “critical areas” such as the carpal tunnel (5). The aim of this pictorial essay was to propose a rapid and simple method of performing sonographic-guided intralesional therapy in CTS and to familiarize rheumatologists with the sonographic features of CTS.

Fig. 1. Rheumatoid arthritis. Transverse scan of the carpal tunnel (13-MHz linear transducer). Finger flexor tenosynovitis with marked tendon sheath widening. Note the large volume of synovial fluid (*) surrounding the deep flexor tendon of the first finger (Id). The median nerve (n) is flattened. fc = flexor carpi radialis tendon; Hs = superficial flexor tendon of the second finger; IId = deep flexor tendon of the second finger; IIIs = superficial flexor tendon of the third finger; r = radius.
Patient and technique

**Patient**

The images in this report were obtained in a typical RA patient with CTS secondary to finger flexor tenosynovitis. The patient was a 50-year-old male with a 2-year history of rheumatoid arthritis (RA). His CTS was of rapid onset and characterized by severe symptoms (nocturnal pain in his right hand associated with a loss of feeling and paresthesias of the first three fingers). Tinel’s and Phalen’s signs were markedly positive.

**Methods**

Images were obtained using a real-time ultrasound system (AU4-idea; Esaote Biomedica, Genoa, Italy) equipped with a 13-MHz linear transducer. Sonographic examination of the carpal tunnel included longitudinal and transverse scans on the volar side. Needle placement in the carpal tunnel and the steroid injection were performed in four steps:

1) the entrance point of the needle was determined by placing a fine metal clip between the skin and the transducer. The best injection site could be selected when the acoustic shadow of the metal clip crossed the carpal tunnel at a safe distance from blood vessels, tendons, and the median nerve;

2) the point of injection was marked on the skin by a pencil;

3) the introduction of the needle into the target area (widened tendon sheath) was performed under sonographic guidance (transverse scan of the carpal tunnel). The needle appears as a distinct, hyperechoic, small round spot generating a “comet-tail” artifact;

4) the aspiration and injection of the steroid was performed under sonographic control (6-10).

**Sonographic appearance of carpal tunnel**

Figure 1 shows the sonographic features of the right carpal tunnel before intralesional therapy. The median nerve can be easily distinguished from the adjacent tendons on the basis of its position within the tunnel and the typical echotexture (isolated echoic dots against an anechoic background surrounded by a sharply echoic contour corresponding to the perineurium) that contrasts with the typical cross-sectional aspect of the tendons (multiple tightly packed echogenic dots) (11, 12).

The main finding was a marked tendon sheath widening of the deep flexor tendon of the first finger with compression of the median nerve. The morphology and echotexture of the right median nerve were normal. The shape and size of the right and left nerves showed no difference. There was no clinical or sonographic evidence of flexor tenosynovitis of the wrist and/or carpal tunnel syndrome in the left hand.

**Sonographic-guided injection**

Figure 2 shows the identification of the safest access route to the widened tendon sheath.
Fig. 4. During the injection, the drops of triamcinolone (*) appear as a cluster of soft echoes surrounding the hyperechoic needle (arrowhead); t = tendons; n = median nerve; * = synovial fluid.

Fig. 5. Sonographic follow-up (six weeks after the injection). A. Baseline scan; B. Follow-up scan. Tendon sheath widening is consistently reduced and finger flexor tendons are no more clearly separated by the large volume of synovial fluid. A still evident sheath widening of the flexor longus pollicis, is the only feature indicating an active process of tenosynovitis (*). Id = deep flexor tendon of the first finger; fc = flexor carpi radialis tendon; IIs = superficial flexor tendon of the second finger; IIId = deep flexor tendon of the third finger; n = median nerve.
don sheath. The optimal entrance point (width = 5 mm) is located between the medial nerve and the flexor carpi radialis tendon. Figure 3 shows the correct placement of the needle inside the tendon sheath. Figure 4 shows the sono- graphic pattern just after the injection. The steroid suspension appears as a mildly echoic area around the needle. Marked clinical improvement occurred within 3 days after the steroid injection and was still present at the follow-up visit 6 weeks later (Fig. 5).

Discussion
This pictorial essay shows that a correct and safe placement of the needle for steroid injection into the carpal tunnel can be performed under sonographic guidance. The best point for the injection can be selected to allow the safest approach to the target area, which usually corresponds to the area of the greatest fluid collection within a widened tendon sheath. This approach may avoid iatrogenic lesions to the tendon or nerve caused by the tip of the needle and/or the corticosteroid injection. Sonographic guided injection could improve the clinical efficacy of the intralesional treatment of CTS by allowing corticosteroid injection into the most appropriate target area.

Sonographic-guided intralesional therapy requires high quality sonographic equipment with very high-frequency transducers (not less than 8-MHz). High power resolution plays a key role in ensuring the “step by step” control of needle placement in the target area.

References