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Topics in diagnostic imaging

Treatment of supraspinatus tendinopathy with ultrasound guided dry needling

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Abstract

Objective: The purpose of this case study is to describe the treatment of a patient with tendinopathy using sonographically guided dry needling. Tendinopathies are a highly prevalent problem in musculoskeletal medicine, and no one form of treatment has gained universal acceptance as being superior to another.

Clinical Features: A 30-year-old woman with a 4-month history of anterolateral right shoulder pain was diagnosed with supraspinatus tendinopathy upon physical examination, which was confirmed with diagnostic sonography.

Intervention and Outcome: Sonography was used to guide an acupuncture needle into the pathologic tissue to induce a humoral healing response. Therapeutic exercise was also prescribed. At 10-day follow-up, increased echogenicity was found in the previously heterogenous hypoechoic areas. The patient also experienced a subjective resolution of her shoulder pain, which did not return with increased physical activity.

Conclusions: Sonographically guided dry needling was shown to be beneficial for this patient as evident by sonographic changes pre- and postprocedure.

Introduction

Tendinopathies are a highly prevalent problem in musculoskeletal medicine.[1] Conventional conservative treatments consist of the passive modalities such as rest, cryotherapy, nonsteroidal anti-inflammatory drugs, and bracing.[2,3] These treatments aim at relieving the patient's pain with a passive modality, not by stimulating regeneration or repair.[4] Therapeutic ultrasound (US) is a passive modality aimed at inducing tendon remodeling; however, it has little evidence for support. The only therapy found to repeatedly remodel and strengthen the degenerated tendon is therapeutic exercise, which continues to be the mainstay form of active conservative treatment. However, no one form of treatment has gained universal acceptance.[5]

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Until recently, magnetic resonance imaging has been the imaging modality of choice for rotator cuff pathology. This imaging is not performed in most private practices. However, high-frequency US has recently become a widely accepted to investigate rotator cuff abnormalities and is capable of providing real-time imaging with a sensitivity and specificity equal to those of magnetic resonance imaging.[6] Ultrasonography offers a live image that is able to be correlated on site with physical examination findings.[7] Furthermore, US guidance for the purpose of the procedure also allows for ease in locating the pathologic tissue[8] for diagnostic purposes and may also be used to pinpoint that same tissue for treatment, minimizing disruption or trauma to healthy tissues.[2,5,9] At present, there are no published reports on the use of US-guided dry needling for tendinopathy in a chiropractic setting. Therefore, the purpose of this case study is to describe the treatment of sonographically guided dry needling to a tendinopathy.

Case report

A 30-year-old woman presented with a 4-month history of constant right anterior lateral shoulder pain. The patient described her pain as being 6/10 (0 = no pain, 10 = extreme pain) on a visual analog scale and achy in nature when at rest, but sharp with motion overhead. The patient stated that she regularly participates in intense Olympic lifting and plyometric exercise with a CrossFit organization. She expressed that overhead motions exacerbated her pain, whereas resting the arm at her side for prolonged periods without using it would reduce the pain slightly. The patient had no tenderness to palpation of the shoulder and no visible signs of trauma or surgical scaring. Range of motion in the right shoulder was normal with the following exceptions: abduction was limited by pain at 90°; flexion was limited by pain at 110°; external rotation at 90° of abduction was painful at end range but not limited; internal rotation at 90° of abduction was only 60°; however, it was not painful. Impingement sign, Hawkin test, and Speed test all reproduced the patient's sharp anterior lateral shoulder pain. Sonographic images were obtained with a GE Logiq portable diagnostic US unit (GE Healthcare, Milwaukee, WI) using a multifrequency 7- to 13-MHz linear transducer. A heterogeneous hypoechoic area was visible on both the longitudinal and transverse image (Figs 1 and 2). The transducer was rocked to confirm that this finding was not an anisotropic effect. This finding is consistent with a tendinosis of the supraspinatus tendon.[10-12]

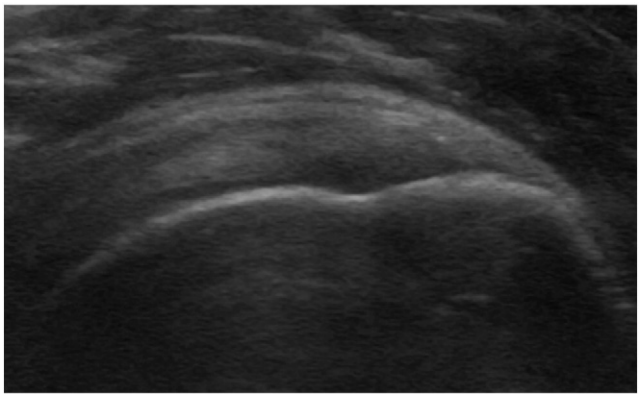

Fig 1. Sagittal view of the supraspinatus tendon prior to dry needling. Heterogeneous hypoechoic area is present within the tendon.

The procedure began with the patient seated with her arm in the modified Crass position. This position pulls the supraspinatus tendon anteriorly and out from under the acromioclavicular joint. The area to be treated was then prepared with isopropyl alcohol, and universal precautions were maintained. A sterile transducer cover was placed over the transducer head, and a generous amount of sterile transmission gel was applied. The transducer was then placed over the area of interest, and the image was optimized prior to the intervention being performed. Under US guidance, a 0.50 × 75–mm HL Seo Won sterile acupuncture needle (Gyeonggi-do, Korea) was guided percutaneously into the pathologic tissue with care taken to not penetrate down to the articular cartilage. Once the needle was within the

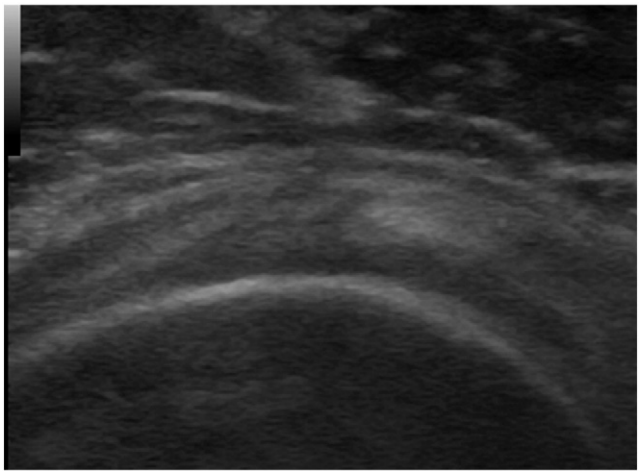

Fig 2. Transverse view of the supraspinatus tendon prior to dry needling. Heterogeneous hypoechoic area is present within the tendon.

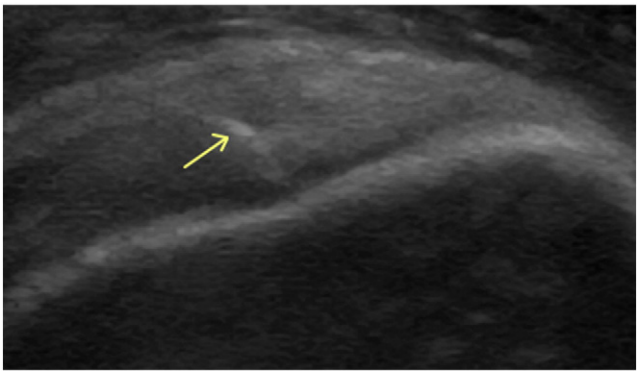

Fig 3. Sagittal view of the supraspinatus with arrow marking the end of the needle with reverberation artifact below.

pathologic tissue, the tendon was fenestrated approximately 15 times (Fig 3). The duration of the fenestration was approximately 40 seconds, following which the needle was then immediately removed. Upon removal of the needle, the transmission gel was removed with sterile 4 × 4 gauze; the cutaneous area was again swabbed with isopropyl alcohol; and the puncture site was covered with a sterile Opsite adhesive film dressing (Smith & Nephew, San Antonio, TX) to avoid contamination. The patient was instructed to perform slow unresisted range of motion movement for 2 days following the needling. Beginning the third day following the needling, the patient began band-resisted range of motion exercises in flexion, abduction, and internal and external rotation. On day 6, she was able to return to her regular exercises at 50% of her usual intensity or weight.

At the 10-day follow up, the patient expressed that she had experienced significant soreness on the day of and the day following the needling procedure. She stated that this subsided and that she only experienced mild soreness for the next 2 days. By the fifth day following the needling, she no longer experienced

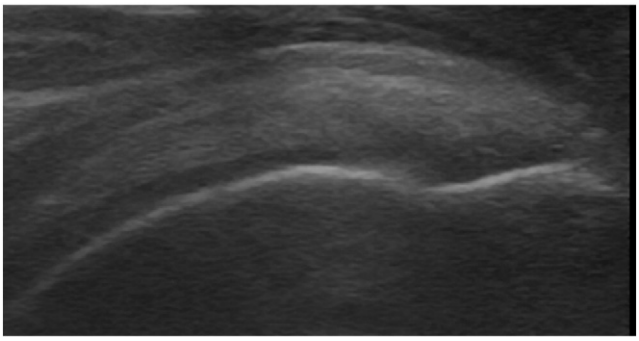

Fig 4. Sagittal view of the supraspinatus tendon 10 days after dry needling. Increased echogenicity in the previously heterogeneous hypoechoic tissue.

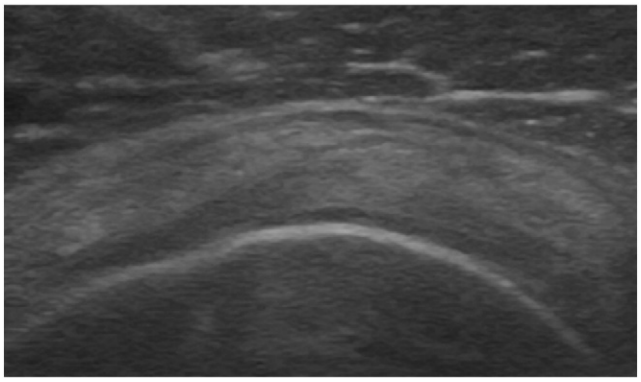

Fig 5. Transverse view of the supraspinatus tendon 10 days after dry needling. Increased echogenicity in the previously heterogeneous hypoechoic tissue.

soreness. The patient stated that between day 5 and day 10, her shoulder pain began to resolve. By the follow-up on day 10, the patient had experienced a full resolution of symptoms. She denied any discomfort in previously painful ranges of motion. She was allowed to return to her regular CrossFit training at day 14 and continued to experience no increase in pain with activity. Posttherapy imaging found an increase in echogenicity in the formerly heterogeneous hypoechoic area within the supraspinatus tendon (Figs 4 and 5). The patient gave permission for this case to be published.

Discussion

This case study is the first of its kind to use visualization under sonography to target pathologic tissue in the dry needling process. This process is unique in that the practitioner is able to pinpoint tendinotic fibers with minimal if any disruption to normal healthy fibers. This technique demonstrates a therapy that may effectively be used as a first-line therapy or as a secondary treatment for a refractory case where other therapies have not successfully resolved the pathology. Sonographically guided dry needling in this case was able to identify tendinotic tissue within the tendon substance itself, almost completely eliminating disruption of normal intact tissues. It is known that repeated fenestration of the tendon by the needling mechanically disrupts the scar tissue, causing bleeding.[13,14] The bleeding into the newly fenestrated tendon is what drives growth factors to stimulate healing.[2] Induction of the healing cascade is mediated by both transforming growth factor–β and basic fibroblastic growth factor, which are both present in

the blood.[15,16] Initiation of the healing process causes remodeling within the tendon and restores most of its mechanical properties.[9] These growth factors stimulate healing by both promoting cellular proliferation and increasing matrix synthesis.[17]

It is the opinion of this author that the increased cellular proliferation and matrix synthesis explain the increase in echogenic signal within the treated tendon as well as the subjective resolution of the patient's pain. By using transforming growth factor–β and basic fibroblastic growth factor to induce tenocyte proliferation and matrix synthesis, the mechanical properties of the tendon are restored without multiple treatments over multiple weeks.

Limitations

There are several limitations to this case study. These findings were in a single patient; as such, these results may not be applicable to the general population. This case is also limited by the lack of blinding, as the clinician performing the original physical examination performed both the diagnostic imaging and the needling. In addition, the case presented was a low-grade tendinopathy; and results may not be similar in a more severe tendinopathy. These findings should be further examined with a larger population and with various grades of tendinopathy in an effort to evaluate the efficacy of this therapy.

Conclusions

This case had a positive outcome, suggesting that sonographically guided dry needling into a tendinopathy may induce remodeling of the tendon. It is suggested that this therapy may be used as a primary therapy; however, more likely, it would be used in the treatment of tendinopathies that are refractory to therapeutic exercise or other forms of therapy.

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