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Ultrasound-Guided Intraparaneurial, Extraradicular Hydrorelease for Adhesive Cervical Radiculopathy: A Case Report

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Background: Adhesive C6 radiculopathy, a notable type of cervical radiculopathy, is the development of adhesive scar tissue or fibrosis surrounding nerve roots. This case report details the role of image-guided modalities in alleviating symptoms in a patient with adhesive cervical radiculopathy.

Case Report: A 43-year-old female patient presented with a several-month history of right neck pain radiating specifically to the posterior shoulder, radial forearm, thumbs, and index area. Physical Sign: 1. negative Spurling's sign, 2. no muscle wasting, 3. pain felt on right neck based upon left-side Spurling's maneuver, suggesting tight right scalene muscle, 4. weak right wrist resisted extension manual muscle testing (MMT) (4+/5), compared to left counterpart (MMT 5/5). Ultrasonography over right neck revealed an engorged/enlarged C6 root near trunk level, which uniquely observed a margin between the root and peripheral connective was blurred on its superficial junction.

Conclusions: This case report reveals the efficacy of ultrasound-guided intraperineurial, extraradicular hydrorelease in treating patients with adhesive cervical radiculopathy.

Key words: Ultrasound-guided hydro prelease, adhesive C6 radiculopathy, minimally invasive procedure, intraperineurial

BACKGROUND

Cervical radiculopathy is impingement or inflammatory irritation of the cervical spine nerve root, which is commonly caused by cervical spondylosis or intervertebral disc herniation (1). Cervical radiculopathy is the most common disease in the cervical spine, affecting patients around 50-55 years of age (2). Among the various types of cervical radiculopathy, C6 radiculopathy is a frequent manifestation, often presenting with pain radiating down the upper extremity along the C6 nerve root, which includes the posterior aspect of the upper arm as well as the radial side of the forearm and first 2 digits of the hand (3).

One notable type of cervical radiculopathy is adhesive C6 radiculopathy, which is defined as the development of adhesive scar tissue or fibrosis around the nerve root (4). This fibrosis can be caused by numerous sources, including previous surgeries, disc herniations, or chronic inflammation, and leads to restricted movement and persistent pain. The management of this condition is quite challenging due to the complex nature of nerve root adhesion and its differentiation from other forms of radiculopathy (5).

The currently used modalities for adhesive cervical radiculopathy include physical therapy, medications, steroid injections, and more invasive surgeries (6). In our case, this modality offered considerable relief to the patient's pain. This technique combines readily accessible imaging with a minimally invasive procedure to accurately alleviate pain at its source.

This case report presents a patient with adhesive cervical radiculopathy and the role of image-guided mo-

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dalities in alleviating symptoms. In this case, ultrasound (US)-guided intraperineurial, extraradicular hydro prelease was performed. This innovative technique involves the injection of a fluid solution under US guidance to target the fibrotic adhesions surrounding the nerve root (7) (Fig. 1). The procedure aims to release the adhesions and reduce the nerve root's tension, thereby relieving pain and improving function (8). Another treatment modality similar to the US-guided intraperineurial, extraradicular hydrorelease is percutaneous epidural adhesiolysis with the Racz technique, which has shown to be an efficacious treatment modality as well (10). However, this case study is focused on the use of US as an imaging modality to make intraperineurial, extraradicular hydrorelease a safe, reliable means of treatment for adhesive cervical radiculopathy.

Through this case report, we explore the clinical presentation and observed outcomes to illustrate the potential benefits of US-guided hydro prelease in treating adhesive cervical radiculopathy. This approach offers a cost-effective, minimally invasive treatment compared to alternative surgical interventions, potentially improving patient outcomes.

CASE PRESENTATION

A 43-year-old female patient presented with a several-month history of right neck pain radiating to her right upper extremity, especially the posterior shoulder, radial side of forearm, thumbs, and index area. She denied major trauma or surgical history related to this symptom. There was no previous history of diabetes or peripheral neuropathies. Physical Sign: 1. negative Spurling's sign, 2. no muscle wasting, 3. pain felt on her right neck based upon left-side Spurling's maneuver, suggesting tight right scalene muscle, 4. weak right wrist resisted extension manual muscle testing (MMT) (4+/5), compared to its left counterpart (MMT 5/5). However, no x-ray or electromyography and nerve conduction velocity data were available upon her visit.

Ultrasonography over her right neck revealed an engorged/enlarged C6 root near trunk level, with a unique feature that the margin between the root and peripheral connective was blurred on its superficial junction (Fig. 2). Junctional adhesion between the nerve root and its perineurium is suspected. This has been seen corroborated in previous studies (9) as well. Diagnosis was done by US, which is subjective like any

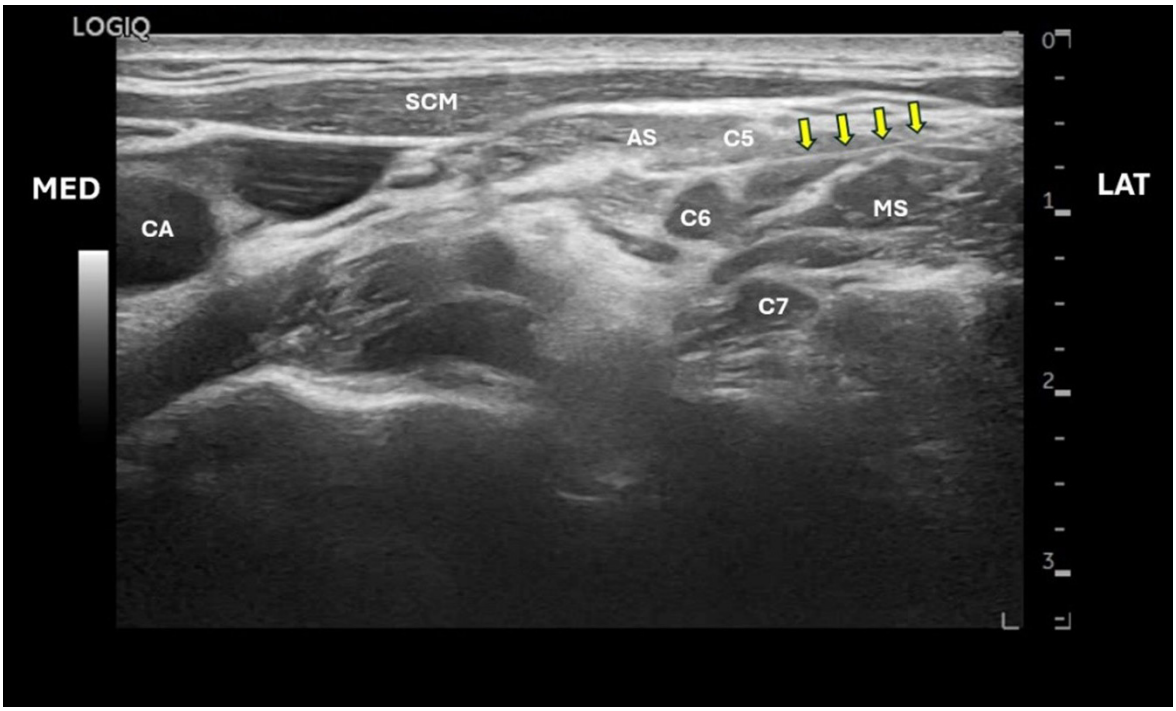

Fig. 2: US image showing the US-guided intraperineurial, extraradicular hydrorelease procedure, with fluid injection to release adhesions around the cervical nerve root to alleviate radiculopathy symptoms. US = ultrasound, C5 = C5 nerve root, C6 = C6 nerve root, C7 = C7 nerve root, CA = carotid artery, SCM = sternocleidomastoid muscle, AS = anterior scalene muscle, MS = middle scalene muscle, LAT = lateral, MED = medial, arrows = needle trajectory.

US diagnosis, but the performer for this case report has extensive US experience.

Under the impression of adhesive right C6 radiculopathy, the US-guided intraperineurial, extraradicular hydrorelease was performed.

The patient was lying in the decubitus position, facing away from the interventionist. Injectate: 2.5 mL hyaluronic acid + 2.5 mL 5% dextrose in water. Trajectory: short-axis, lateral to medial.

Targeting: intraperineurium of C6 root. Technique: bevel down, needle tip approaching periradicular hyperechoic lesions. Note that the intraperineurial echotexture was revealed during the procedure, and the patient subjectively felt a radiation sensation toward almost precisely the area of her discomfort sensations (11).

After hydrorelease, compared to its left counterpart (MMT 5/5), there was an immediate regain of power to complete MMT. No recurrence of signs or symptoms 2 and 4 weeks after the injection treatment.

DISCUSSION

The most important finding from this patient's procedure is that her complaint of a several-month history of right neck pain radiating to her right upper extremity, especially her posterior shoulder, radial side of the forearm, thumbs, and index area, was improved by US-guided intraperineurial, extraradicular hydrorelease around the C6 nerve root. Furthermore, there was an immediate regain of strength to the resistance of right wrist flexion following hydrorelease. This immediate relief was not obtained from her previous treatment modalities of physical therapy, which included cervical traction and interferential wave treatments, as well as oral nonsteroidal anti-inflammatory drugs and muscle relaxants. These modalities only offered some relief in pain for only a matter of days, but fail to provide the lasting relief seen in US-guided intraperineurial, extraradicular hydrorelease.

The US-guided hydrorelease offered effective results in the patient's overall function and pain relief for her adhesive cervical radiculopathy. This further supports the current literature on US-guided hydrorelease as an efficacious treatment for radiculopathy. One retrospective cohort study (12) of US-guided nerve hydrodissection of the cervical nerve roots showed an improvement in pain relief (≥ 50%) in 80.9% of 85 patients who underwent the procedure after one month. Another case study (13) of a 56-year-old patient with chronic C6

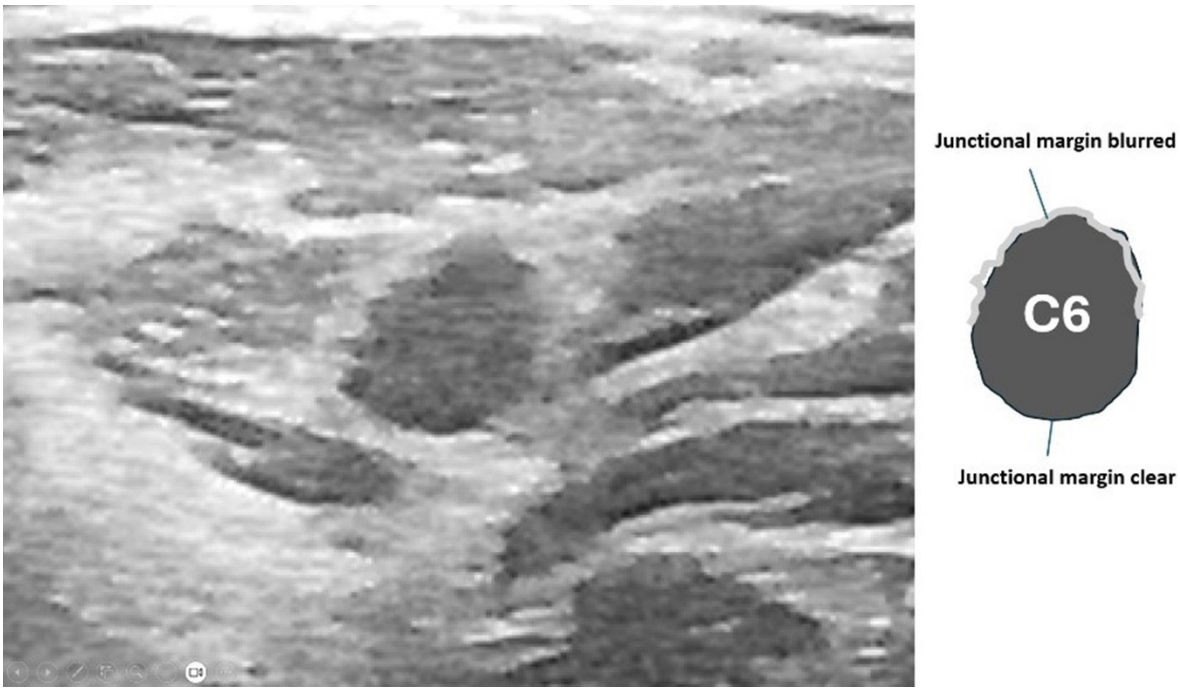

Fig. 1. US image of the C6 cervical nerve root, showing detailed visualization of the nerve structure and surrounding tissues for diagnostic assessment. US = ultrasound.

radiculopathy reported significant improvement in the left arm/forearm numbness 2 weeks after the US-guided injection. Both studies further illustrate the rapid progress of cervical nerve root compression symptoms similar to our case after undergoing US-guided hydrorelease.

This treatment is not limited to the cervical region and has been used in multiple body areas. One of the familiar places is in the lumbar spine to help alleviate myofascial pain caused by the multifidus muscle (14). This study yielded similar results to the cervical region, with a notable improvement in pain before and 5 minutes after hydrorelease of 7.19 ± 1.01 and 2.85 ± 1.25 on the visual analog scale (14). Another common area of interest is in the treatment of carpal tunnel syndrome (CTS). One study (15) found the effects of US-guided hydrodissection persisted for 6 months, indicating the substantial efficacy for mild-to-moderate CTS.

Using US for imaging to help guide a procedure is as efficacious as other more advanced imaging modalities while not exposing the patient to potentially harmful radiation (16). US machines are readily available and have improved resolution, which allows for the visualization of tendon infrastructure and individual peripheral nerve fascicles (17). Moreover, the cost of more advanced imaging modalities (e.g., magnetic resonance imaging, positron emission tomography, and computed tomography) has limited their potential use for treatments, while US has markedly decreased cost, allowing excellent access to US imaging (18). Some experts believe that fluoroscopically guided transforaminal injections are below the standard of care because of their inability to accurately visualize and reliability to avoid the radicular artery (19). This case and a study by Frush et al (18) shows how the real-time visualization using US to avoid vascular structures like the radicular artery can potentially reduce the risk of an arterial injury, illustrating the safety of the US technique. One future proposed technique would be US-guided multifidus intramuscular hydrolysis, focusing on the junctions between the muscle layers. This is a similar approach to C6 root hydrolysis, but this would also target the other cervical roots (C5, C7, C8).

CONCLUSIONS

This case report reveals the efficacy of US-guided intraperineurial, extraradicular hydrorelease in treating patients with adhesive cervical radiculopathy. With the use of readily available imaging like US guidance, the afflicted areas can be precisely targeted, increasing the procedure's accuracy and safety. Further studies and more extensive clinical trials must confirm its efficacy and long-term benefits.

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