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Utilizing an ultrasound guided 5-in-1 trigger point and hydrodissection technique for interscapular mid-thoracic myofascial pain: A retrospective review

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A B S T R A C T

Poor posture can lead to excessive strain of the neck and upper back musculature, leading to irritation of the dorsal scapular nerve (DSN) and spinal accessory nerve (SAN). A 5-in-1 trigger point technique has been described that specifically target trapezius, rhomboids, levator scapulae, SAN and DSN in a single percutaneous injection. We modified the technique to include hydrodissecting the DSN and SAN to provide further pain relief from possible nerve entrapments. Our retrospective review revealed that the modified 5-in-1 technique is a safe and effective way to address medial periscapular pain, often seen with anterior head carriage and upper crossed syndrome. Patients who received the modified 5-in-1 technique had statistically significant pain relief, allowing them to participate in rehabilitation programs.

1. Overview

Periscapular and mid-thoracic myofascial pain is often a common presentation in physiatry and pain medicine outpatient practices. With the COVID-19 pandemic, many individuals around the world were transitioned to a remote working environment. This often entailed a non-ideal ergonomic setup, requiring increased use of mobile devices and portable laptop computers, leading to individuals looking down at their devices for long periods of the day. Poor ergonomics can lead to poor posture, anterior head carriage, and upper cross syndrome, resulting in excessive strain in the erector spinae, rhomboids, levator scapulae, and trapezius musculature [1]. We believe this can also lead to possible irritation or entrapement of the dorsal scapular nerve (DSN) and spinal accessory nerve (SAN). Specific trigger point injections have been utilized to target painful trigger points in the upper trapezius muscle as well as the area between the medial border of the scapula and thoracic spine. A 5-in-1 trigger point technique has been described to specifically target the trapezius, rhomboids, levator scapulae, SAN, and DSN in a single percutaneous injection [2]. In addition to targeting the intramuscular trigger points, we utilize this technique with an emphasis on hydrodissection of the DSN and SAN to provide further relief from pain that may arise from peripheral nerve entrapments.

2. Objectives

Our objective was to conduct a retrospective review of patients receiving the modified 5-in-1 technique that entailed hydrodissecting the SAN and the DSN at the medial border of the scapula in conjunction with the multiple periscapular intramuscular trigger points. The goal was to provide pain relief from trigger points and possible nerve entrapments, allowing patients to participate more robustly in rehabilitation programs. The technique has been described to target the trapezius muscle, rhomboid minor muscle, levator scapulae, SAN, and DSN with one percutaneous injection [3]. Literature on the efficacy of targeting the DSN for chronic pain relief with this posterior approach is limited, as most focus on more proximal nerve blocks for perioperative analgesia [4–6].

3. Anatomy

The DSN can be targeted for pain associated with parts of the neck, upper thoracic, and interscapular region. The DSN is a proximal branch of the brachial plexus, derived mostly from the C5 nerve root. As it exits the brachial plexus, the DSN pierces the middle scalene muscle and travels posteriorly between the scalenus posterior muscle and the serratus posterior superior and levator scapulae muscles [7]. The nerve

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innervates the rhomboid major and minor muscles as well as the levator scapulae as shown in some studies [3]. The nerve travels distally along the medial border of the scapula along with the dorsal scapular artery. This is an ideal region to target the DSN, where it appears to still provide both motor and sensory innervation [8]. Although predominantly a motor nerve, it can provide sensation to the medial periscapular region, where nerve entrapment can cause pain in some patients [9]. The spinal accessory nerve, also known as Cranial Nerve XI, originates in the rostral spinal cord and primarily serves as a motor nerve, supplying the sternocleidomastoid and trapezius muscles. Neuronal cell bodies are located within the spinal cord before exiting and forming the accessory nucleus, which is situated anterolateral to the upper cervical spinal cord segments. These nerve fibers exit the accessory nucleus, traverse superiorly through the foramen magnum, and then exit the skull through the jugular foramen. As it descends, it runs alongside the internal carotid artery and internal jugular vein before proceeding posteriorly, roughly midway along the posterior border of the sternocleidomastoid muscle. The spinal accessory nerve continues its posterior course through the posterior triangle of the neck, remaining superficial to the levator scapulae. It then proceeds to remain superficial, providing innervation to the trapezius muscles as it descends inferiorly over the scapula [10]. The posterior courses of both nerves are illustrated in Fig. 1.

4. Ultrasound-guided DSN and SAN nerve blocks

Ultrasound-guided DSN blocks have routinely been used in perioperative pain management, especially post shoulder surgery. It has also been targeted in pain management at indicated anatomical sites. There are currently two common ultrasound-guided approaches to performing a DSN block using a 25 gauge 1.5 inch needle and typically a local anesthetic with or without corticosteroid [4]. The first is an anterolateral approach. The needle is inserted into the middle scalene muscle at the apex between the sternocleidomastoid and trapezius. The second is a posterior approach. The rhomboid muscles are palpated and the needle is inserted between the scalenus posterior and levator scapulae muscles or along the medial aspect of the scapula. The technique utilized for our patients is similar to the posterior approach under ultrasound guidance. Unlike the dorsal scapular nerve, ultrasound-guided spinal accessory nerve blocks are not commonly utilized in perioperative pain management. While techniques for SAN nerve blocks at the posterior triangle for myofascial pain relief have been documented, they are not a standard practice in the field [11].

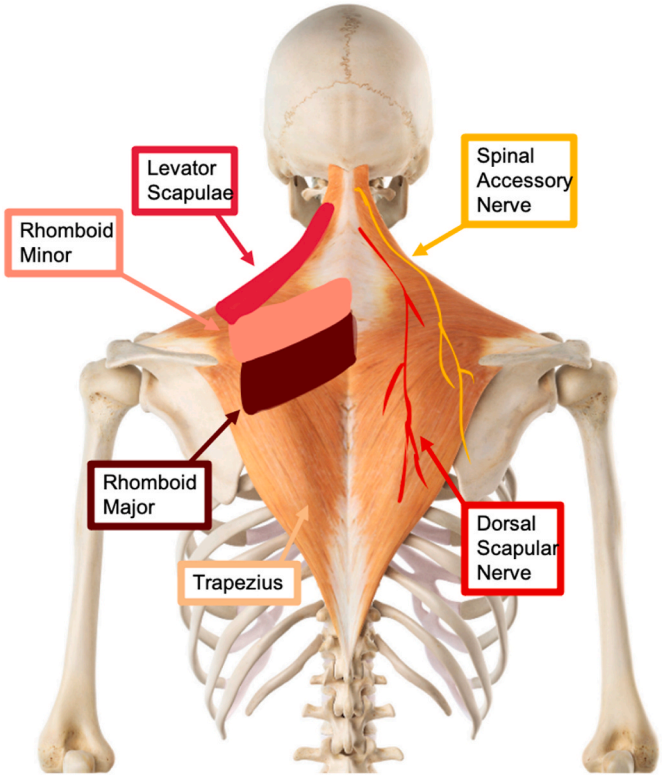

Fig. 1. Anatomical illustration demonstrating the posterior pathways of the dorsal scapular nerve (DSN), spinal accessory nerve (SAN), and musculature targets for the 5-in-1 technique.. *(By Rhea Kothari, used with permission.)*

5. Methods

After obtaining IRB approval, a retrospective chart review was conducted to evaluate the efficacy of pain relief after receiving the injection. A total of 25 patients, who received a DSN block from a single physician were chosen consecutively from chart review from January 2022 to December 2022. Demographics including sex and age were recorded. Clinical characteristics including duration of pain prior to injection was recorded as well as the Visual Analogue Scale (VAS) at baseline, at 2-week follow up, and at 12-week follow up. While some consensus guidelines suggest a minimal clinically important difference (MCID) of 30 % or more, the authors believed that a 40 % or greater improvement in the VAS score would be more significant and provide stronger support for a rehabilitation protocol [12]. Patients were excluded from this review if any of the aforementioned demographical or clinical information was unavailable.

Once patients were enrolled, a thorough history and physical exam was obtained for each patient. Patients often self-described poor posture, and reported spending many hours on a laptop or a mobile device with a flexed cervical spine. The pain distribution commonly involved pain in the trapezius muscle radiating into the medial border of the scapula and/or ipsilateral posterior shoulder. Patients were educated on the importance of rehabilitation with physical therapy and home exercises program to correct posture, address their anterior head carriage, and strengthen the erector spinae and interscapular musculature. The aforementioned procedure was offered if patients were unable to participate in a rehabilitation program due to pain or had minimal relief from a previous exercise program. The procedure could be repeated if the patient had significant relief from the initial injections but had recurrence of the pain.

As for the procedure, the medial border of the scapula was first palpated and a linear ultrasound transducer was then placed in a medial to lateral orientation at the level of the scapular spine (Fig. 2). In this plane, the trapezius muscle can be seen superficially. Deep to this muscle depending on the level of entry, either the levator scapula or rhomboid minor muscles can be seen. Between the trapezius muscle and rhomboid minor, the spinal accessory nerve can be visualized in the fascial plane. Deep to the rhomboid muscle, the serratus posterior superior and other paraspinal muscles can be visualized with the pleura and lungs deep to these structures (Fig. 3). Next, the dorsal scapular artery (DSA) and corresponding nerve is identified using the Doppler tool on the ultrasound. The transducer can be placed in a cephalad-caudal orientation, to confirm the DSA in long axis (Fig. 4). Once the DSA is identified, an in-plane injection can be performed.

After local anesthesia of the skin with a 25 gauge 1.5 inch needle with 1 % lidocaine, a 22 gauge 3.5 inch spinal needle was inserted in a medial to lateral direction. First the trapezius muscles was infiltrated, followed by hydrodissection of the spinal accessory nerve. Then the needle was advanced to the rhomboid minor muscle and infiltrated. The dorsal scapular artery and the adjacent DSN was then hydrodissected between the serratus posterior, levator scapulae and rhomboid minor. Each location is injected with 2–3 cc with a total volume of 10–15 cc consisting of 5 cc 1 % lidocaine, 5 cc normal saline with or without steroid. The needle was then withdrawn and injection site was covered with a bandage The patient was provided with post-procedure instructions which included avoiding submersion of the injected area for

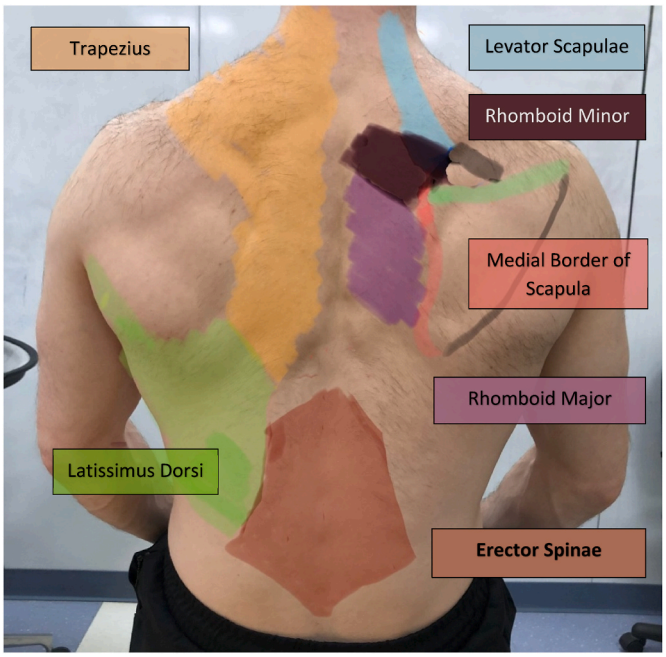

Fig. 2. Superficial anatomy of commonly identifiable structures on Ultrasound.

48 h and monitoring for side effects including any weakness. Patients were allowed to return to daily activity immediately after the injection.

6. Results

A total of 25 patients were included in this review, among which 11 (0.44) were female and 14 (0.56) were male (Table 1). The average age of the cohort was 49.5 years old. On average, patients had 21.8 weeks of pain before they underwent the procedure and their pain intensity was 6.5 ± 2.0 out of 10 on the VAS. The average pain intensity was 5.0 ± 2.1 after 2 weeks and 4.2 ± 1.7 after 12 weeks (Table 2). The reduction in pain score after 2 weeks and 12 weeks were both statistically significant, $p = 0.0028$ and $p < 0.0001$ respectivly (Fig. 5). The percent of pateints who achieved MCID after 2 weeks and 12 weeks was 36 % and 40 % respectively. No patients reported major adverse effects from the injection. All patients were prescribed a rehabilitation protocol after the procedure but adherence was not recorded.

7. Discussion

Our retrospective analysis of patients receiving the 5-in-1 trigger point injections showed that patients had significant pain relief from the intervention. This finding has various clinical implications as the incidence of neck pain has increased as more people were using laptops and mobile devices to work remotely during the COVID-19 pandemic [13].

Poor posture can lead to neuromuscular imbalance as well as various neuromuscular symptoms in the head, neck, shoulder, and upper back. Upper crossed syndrome results from an abnormal posture, usually an anterior head carriage, which alters the muscule activation pattern of erector spinae, rhomboids, levator scapulae, and trapezius musculature. Patients often present with non-specific pain in this region, with possible radiation into the upper trapezius and occiput, or lateral radiation to the shoulder [14].

A rehabilitation program is essential to stretch and strengthen these musculature, often with scapular stabilization, scapular squeeze, and extension of the cervical and thoracic spine [15]. However, there are limitations for patients who are unable to actively participate in a rehabilitation program due to pain. As the altered movement patterns such as scapular dyskinesis from the upper crossed syndrome can lead to possible irritation or entrapment of the DSN and SAN, this technique can be an effective and safe alternative to provide patients with immediate relief as well as motivation to focus on an active strengthening program.

No patients that were reviewed during this study reported any major adverse effects. No motor weakness or lateral scapular winging from the nerve block was noted. Ultrasound is necessary for this procedure to avoid deeper penetration that could potentially lead to lung infiltration and possible pneumothorax.

Strengths of the study include reliability as the technique was performed by a single interventional physiatrist at a single location to avoid variability in technique or equipment. In addition, no patients that were reviewed during this study reported any major adverse effects. However, any extrapolation from the study has to be made in caution as it is a retrospective review with a fairly small sample size. Future studies, ideally a randomized control trial that can include rehabilitation program participation, more functional data, and metric systems in addition to the VAS scores can be helpful in further evaluating this technique.

8. Conclusions

This modified 5-in-1 trigger point and hydrodissection technique is a safe and effective way to address medial scapular related pain, often seen with anterior head carriage and upper crossed syndrome. Although

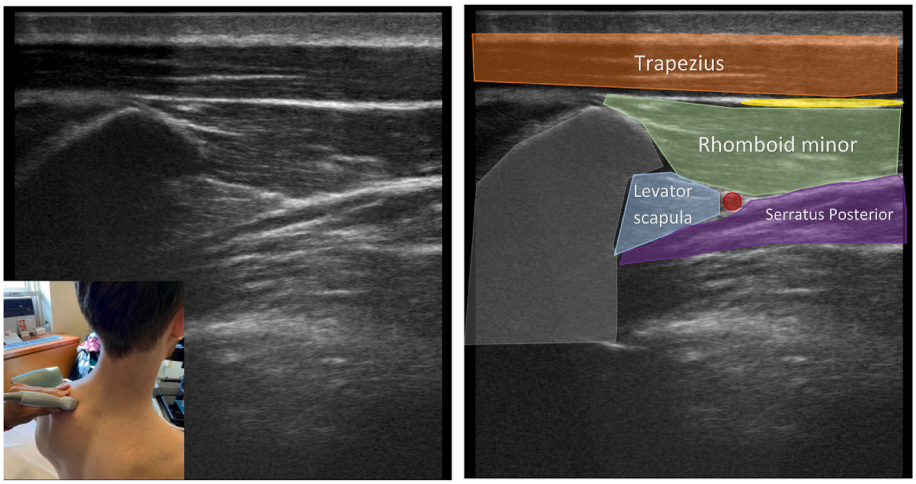

Fig. 3. Identification of the trapezius muscle (orange), spinal accessory nerve (yellow), rhomboid minor (green), levator scapula (light blue), dorsal scapular nerve (red) and serratus posterior superior (purple) with medial-lateral transducer orientation. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

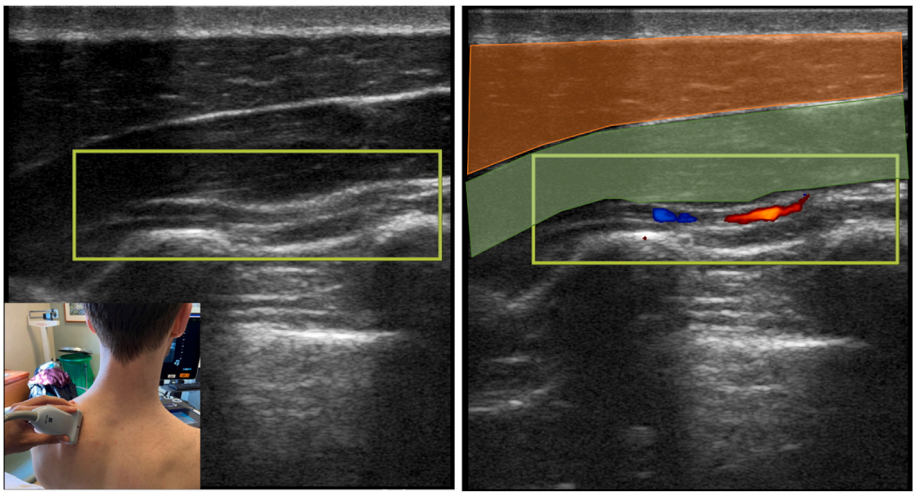

Fig. 4. Identification of the trapezius (orange), rhomboid minor (green), and dorsal scapular artery with superior-inferior orientation. Deep to the dorsal scapular artery, two ribs are visible with lung pleura visualized deeper. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Table 1
Demographic and clinical characteristics of all the patients including age, gender, length of pain duration and pain intensity at baseline using the Visual Analog Scale.

Age (y)	49.5 ± 10.4
Gender (n,%)	
Female	11 (0.44)
Male	14 (0.56)
Length of pain duration (weeks)	21.8 ± 13
Pain score at baseline	6.5 ± 2.0

Table 2
Pain intensity at baseline, 2 weeks and 12 weeks after the injection in numeric scale using the VAS compared to baseline, and percent achieving MCID at 2 and 12 weeks.

VAS (baseline)	6.5 ± 2.0	
VAS (2 weeks)	5.0 ± 2.1	$p = 0.0028$
VAS (12 weeks)	4.2 ± 1.7	$p < 0.0001$
MCID after 2 weeks (%)	0.36	
MCID after 12 weeks (%)	0.40	

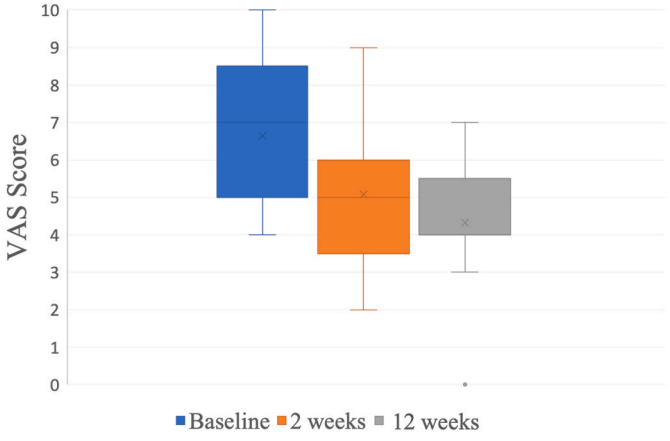

Fig. 5. Pain intensity patients reported at baseline, 2 weeks and 12 weeks as measured by the Visual Analog Scale. The percent of pateints who achieved MCID after 2 weeks and 12 weeks was 36 % and 40 % respectively.

this is an option to relieve pain temporarily, educating patients on the importance of posture correction through a rehabilitation program and ergonomics for work setup is key for long term relief.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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