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The effect of integrated injection techniques for the serratus posterior superior muscle on interscapular pain, upper extremity pain, and paresthesia

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The aims of this study were to establish the role of the serratus posterior superior (SPS) muscle in patients with thoracic (interscapular) back pain, upper extremity pain, and paresthesia refractory to conservative treatment and to propose an effective integrated injection therapy. In eight patients with chronic interscapular pain that had lasted for more than 6 months, we delicately palpated the interscapular area in the gentle hug position to diagnose the exact location of the lesion. A 22- to 25-mm, 30-gauge thin hypodermic needle was inserted at the tender point, and the needle was advanced until the needle tip touched the rib. Subsequently, a mixture of 0.5% lidocaine and 12.5% glucose was injected. Immediately after each procedure, the visual analogue scale score improved from $\geq 7-8/10$ to $0-2/10$ and then to $0-1$ after the completion of all treatments. The total number of treatments was 5–10, and the total treatment period did not exceed 2 months. The SPS muscle is important in patients with interscapular pain, upper extremity pain, and paresthesia. We propose repetitive and integrated injection therapy as a safe and effective treatment without the need for steroids, fluoroscopy, or ultrasound guidance.

KEY WORDS: Serratus posterior superior, Intermediate back muscles, Paresthesia, Injections, Prolotherapy

INTRODUCTION

Interscapular pain is a common condition caused by cervical disc herniation, upper thoracic facet joint disorders, low cervical spondylosis, and myofascial pain syndrome [1]. Physicians have reported that interscapular pain is associated with nerve root compression, facet joint syndrome, or muscle trigger point. However, determining the location of the true lesion leading to symptoms is difficult on radiological examinations including ultrasonography [2]. This is because in certain cases, the position of the true lesion and that seen on the image do not correlate, and certain symptoms occur even in the absence of lesions. In cases of chronic and severe interscapular pain, the effects of medical and conservative treatments, including nerve block and surgical treatment, are not usually satisfactory to manage upper extremity pain and paresthesia.

The serratus posterior superior (SPS) muscle was described by Sato [3]. This

muscle usually originates from the dorsal midline fascia at C6 and descends to the T2 or T3 level. It extends into the upper borders of the 2nd to the 5th ribs, and is innervated by the T1–T5 intercostal nerves [3,4]. The SPS muscle is estimated to be primarily involved in proprioception and aids in inhalation by elevating the ribs. SPS muscle pain extends to the back of the shoulder, upper triceps area, elbow, ulnar side of the forearm and hand, and the fifth digit [5].

Through integrated injection therapy targeting this muscle, pain in the interscapular area and pain and paresthesia in the upper extremities improves. In this paper, we differentially diagnosed pain caused by the SPS muscle and proposed a safe and effective injection therapy that uses a thin hypodermic needle.

CASE REPORT

Patient selection

As per our inclusion criteria, we included patients treated at Dr. Sirh's Pain Clinic between March 1, 2019, to September 30, 2019; those complaining of interscapular pain, those with or without

upper extremity pain and paresthesia, those with pain scores greater than 7 out of 10; and those not responsive to medical treatment, physical therapy, manual therapy, or conservative treatment for more than 6 months. Patients with radiological findings of nerve-compressing lesions requiring surgical intervention were excluded.

Injection posture

The procedure was performed in a sitting position. We described it as 'gentle hug position,' which refers to the position with the scapula fully abducted and arm internally rotated (Fig. 1). The patient's forehead was placed against the wall for support. Since the insertion (usually main lesion) area of the SPS muscle is hidden inside the medial border of the scapula, it is fully exposed through this posture and is easy to palpate over the ribs.

Injection material

A mixture of 0.5% lidocaine and 12.5–15% dextrose (2% lidocaine, 50% dextrose diluted with normal saline) was administered. No steroid was used.

Fig. 1. Gentle hug position with full protraction of the scapula. The margin of the scapula (anatomical position: black dots; and gentle hug position: red dots) and trigger points are marked (X points) (The model in Fig. 1 is one of the authors of this study.).

Fig. 2. The needle was inserted toward the tender points in the same direction as the pressure of the thumb, and the needle was advanced until the needle tips contacted the rib surface. Most lesions are located in the tenoperiosteal junction area, which is exposed when the scapula is maximally protracted; therefore, when injecting the injectate, the needle tip should be kept in contact with the rib.

Procedure

The insertion area of the SPS muscle was carefully palpated with the doctor's thumb. Patients were instructed to say "yes" if they felt pain when pressed, and that point was set as the target point. Tender points, fibrous nodules, and symptom-related lesions were located and marked with a marking pen. Each target point was specifically placed on the rib under careful palpation in order to avoid its entry into the intercostal space to prevent pneumothorax. The needle was inserted toward the tender points in the same direction using thumb pressure, and the needle was advanced until its tip contacted the bone surface (Fig. 2). We used 2.2–2.5-cm-long, 30-gauge needles. Once the needle tip touched the rib, 0.5 mL of the mixed solution was injected at each lesion site, in combination with a blind nerve block, trigger point injection, and prolotherapy, if necessary. Fluoroscopy or ultrasonography guidance was not performed.

Assessment

We reviewed the electronic medical records in Dr. Sirh's Pain Clinic retrospectively.

Immediately after the procedure, we assessed the self-reported pain intensity scores of the patients using the visual analogue scale (VAS). We also assessed the VAS scores before and at the end of

the procedure.

Treatments were administered 2–3 times a week for the first few treatments and subsequently tapered to once a week and once every 2–3 weeks as symptoms improved.

We assessed the duration and number of treatments until the end of the procedure. The data were not analyzed using comparative statistics, as this paper is a technical note.

Results

In our report, all eight patients showed almost complete improvement of upper back pain, upper extremity pain, and paresthesia immediately after treatment.

The treatments were repeated according to the severity of symptoms. The pain-free interval gradually increased to a few days, a few weeks, and a few months as the total number of treatments increased.

The VAS score decreased from 7–10 to 0–2 immediately after treatment and to 0–1 at the end of treatment. All patients stopped taking all analgesic drugs. In addition, patients continued to use anticoagulants throughout the treatment period, but no complications or side effects were observed, except for negligible bleeding and bruising, which occurred infrequently.

The total number of procedures was 5–10, and the total treatment period did not exceed 2 months.

Ethical Statements

This study was approved by the Institutional Review Board (IRB) of Wiltse Memorial Hospital Joint Research Ethics Committee in Suwon, Korea (IRB approval number: 2021-W06). The requirement for written informed consent was waived by the IRB owing to the retrospective nature of this study. The informed consent from the patients in figure 1 was obtained. All procedures were performed in accordance with the Declaration of Helsinki.

DISCUSSION

Interscapular pain is clinically common, and many patients present with arm pain or paresthesia. Although various radiological tests were performed to assess for problems arising from interscapular pain (including nerve root compression by intervertebral discs) no evident lesions were found in many patients [2].

In patients with interscapular pain, cervical radiculopathy, dorsal scapular nerve (DSN) entrapment, and myofascial lesions of the trapezius, the rhomboid muscle should be considered in the differential diagnosis.

In a study evaluating the signs and symptoms of cervical radiculopathy, it was demonstrated that C5, C6, C7, and C8 radiculop-

athy may appear with symptoms in the interscapular region [6,7]. Unlike cervical radiculopathy, SPS muscle lesions do not worsen pain due to cervical spine movements and are not accompanied by weakening of arm strength or abnormal reflexes; rather, the pain worsens when the arm is extended forward or when the patient is lying on the side of the lesion [5].

The entrapped site of the DSN is usually located in an area that penetrates the middle scalene muscle or the rhomboid muscle [2]. Compared to SPS lesions, rhomboid muscle lesions are located on the medial side and do not cause radiating pain to the arm. Patients with rhomboid muscle lesions complain of pain even when lesions are pressed with significantly less pressure. Rhomboid muscle lesions can be easily treated if the disease is not severe, but in cases of intractable interscapular area pain caused by SPS lesions, DSN block alone does not improve the symptoms. Because the rhomboid muscle lesions generally occur on the medial side and are mostly superficial, if there is muscle twitching in the rhomboid muscle during the procedure, the lesion can be managed by injecting a small amount of the solution superficially.

This technical report describes the cases of eight patients in whom SPS muscle injections were used for intractable interscapular pain, upper extremity pain, and paresthesia due to SPS muscle calcification, fibrosis, trigger points, and tears.

Upon radiological examination, all eight patients had no operative lesions in the cervical spine. In these patients, tender spots at the SPS insertion site were identified. Immediate symptomatic improvement was confirmed when injection treatment was performed on the exact site. This improved not only interscapular area pain but also radiating pain and/or paresthesia to the arm, suggesting that SPS lesions should be included in the differential diagnosis of interscapular pain and arm pain/paresthesia along with cervical spondylosis.

In our study, most of the SPS muscle lesions were fibrotic nodules, identified as taut bands, or calcifications. Most of the lesions are diagnosed as enthesopathy; therefore, when injecting the injectate, needle tips should be kept in contact with the rib. Since the SPS muscle insertion site is covered by the scapula in the anatomical position, it must be sufficiently protracted to palpate the lesion area. Hence, patients were placed in a gentle hug position to increase the treatment effect, and injectate mixed with glucose solution was used to strengthen the tendon [8].

As a side effect, pneumothorax can occur; therefore, there have been attempts to treat SPS lesions using ultrasound to prevent this complication [9,10]. However, when treating SPS lesions, the ultrasound probe can actually take up space, limiting visualization of the lesion surface and interfering with needle insertion.

Hence, we propose that it is more efficient to perform the treat-

ment by palpating the ribs using the blind technique. Even obese patients can be safely treated without side effects if the needle is not inserted more than 25 mm, with awareness of the needle depth during treatment.

This study had some limitations. This paper is a technical note without a sufficient number of patients and a statistical comparative analysis. The data were retrospectively reviewed. Although most patients with SPS muscle problems also have cervical spine and shoulder problems, we did not enroll patients who simultaneously received treatment for the above-mentioned problems. Additional studies comparing SPS muscle integrative treatment to the known treatments for problems observed in the cervical spine, shoulder, and SPS muscles are useful and required in the future.

CONCLUSION

Interscapular pain is a symptom with various causes that need to be identified. The SPS muscle, which has been overlooked so far, is an important cause of interscapular pain, and it can also accompany upper extremity pain and paresthesia. Delicate palpation with proper pressure was performed in the gentle hug position for the establishment of diagnosis, and treatment was performed using a 22–25-mm, 30-gauge thin hypodermic needle to minimize side effects, including pneumothorax. Since SPS muscle lesions are primarily at the site of attachment, they were treated with a mixed solution of glucose and lidocaine without any steroids. This study suggests that a safer and more effective treatment can be provided through repetitive and integrated injection treatment of the SPS muscle with the blind technique using delicate palpation, even without imaging guidance.

This technical report showed that problems observed in the SPS muscle are significantly more important than commonly realized, and SPS myofascial pain and enthesopathy are critical components of successful treatment. Hence, we recommend a thorough investigation and treatment of SPS muscle lesions in patients with chronic interscapular area pain, upper extremity pain, and paresthesia refractory to medical or surgical treatments.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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