Retrospective Study

Effect of Ultrasound-Guided Rhomboid Interfascial Plane Block on Pain Severity, Disability, and Quality of Life in Myofascial Pain Syndrome – A Case Series With One-Year Follow-Up

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Background: Myofascial pain syndrome (MPS) is a condition characterized by trigger points in the taut bands of skeletal muscles, commonly affecting the trapezius, rhomboid, and supraspinatus muscles. Rhomboid intercostal block (RIB), an interfascial plane block used to assist perioperative analgesia might be a potential treatment option in MPS.

Objectives: To investigate the short and long-term effects of ultrasound-guided RIB in reducing the severity of pain, disability, and improving quality of life in MPS patients with trigger points in the rhomboid muscle.

Study Design: Retrospective study.

Setting: Physical medicine and rehabilitation outpatient clinic in a university hospital.

Methods: Patients with a diagnosis of MPS who received ultrasound (US)-guided RIB between November 2021 and January 2022 were enrolled in this study. All patients reported pain lasting ≥ 3 months and severity ≥ 4/10 on numeric rating scale (NRS), without any comorbidities affecting the neuromuscular system. Trigger points in the rhomboid muscle were treated with US-guided RIB. Pain intensity was evaluated using a NRS at pre-treatment and one week, one month and one year after the injection. At pre-treatment, one month, and one year after treatment, self-administered neck pain and disability scale and Nottingham Health Profile were evaluated.

Results: A total of 23 patients were included in this study (5 men and 18 women, with an average age of 45). Pain severity was statistically significantly reduced in approximately 90%, 60-70%, and 50% of the chronic MPS patients at the first week, first month, and first year following injection, respectively. Disability scores improved significantly in 70% and 56% of those patients at the first month and first-year follow-up. Improvement in the quality of life was observed at the first month and maintained at the first-year follow-up.

Limitations: The retrospective design of this study is a limitation. Due to the lack of a control group, this treatment option could not be compared with other treatments.

Conclusions: Our study demonstrated that RIB might be an effective long-term treatment option for MPS in the reduction of pain and disability, improvement of quality of life and overall patient satisfaction.

Key words: Myofascial pain syndrome, trigger point, pain, pain management, interventional ultrasound

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Myofascial pain syndrome (MPS) is a regional pain syndrome characterized by trigger points in the taut bands of skeletal muscles (1). MPS is one of the most common reasons for admission to a musculoskeletal specialist. Trauma, repetitive overuse of muscles, postural abnormalities, spinal diseases, or joint problems might be responsible for MPS. Trigger points can be observed in any muscle of the body. The most commonly affected muscles in the upper extremity are the trapezius, rhomboid, and supraspinatus muscles. Trapezius and rhomboid muscles involved in MPS among chronic back pain patients were reported as 91% and 46%, respectively (2).

Management of MPS includes pain control through deactivation of trigger points followed by treatment of the underlying pathology. Education, postural exercises, and ergonomic advices are important. Deactivation of trigger points can be achieved via stretching exercises, massage, compression, manual therapy, muscle relaxants, and local injections. Dry needling, short- or long-acting local anesthetics, steroids, or botulinum toxins might be administered directly to the trigger points. Mechanical effect of the needle is proposed to cease the dysfunctional activity of the motor end plates in the muscle (3,4). Local anesthetics suppress the conduction of action potentials in the nerves and inhibit the transmission of painful stimuli via blocking the voltage-gated sodium channels (5).

Rhomboid intercostal block (RIB) is an interfascial plane block used to assist perioperative analgesia in the anterior and posterior hemithorax following trauma of the thoracic region, breast surgery, or other surgeries. RIB is usually administered in the auscultation triangle, which is an area surrounded laterally by the medial border of the scapula, medially by the lateral border of the trapezius, and inferiorly by the latissimus dorsi muscle (6). Floor of the triangle is formed by the rhomboid muscle. Mechanism of action of interfascial block injections is thought to depend on the spread of local anesthetics in the fascia between the rhomboid and trapezius muscles, blocking the posterior branches of thoracic T2-T9 spinal nerves rather than targeting a specific nerve (7). RIB may lead to temporary anesthesia in the relevant dermatomes (6).

Studies demonstrated that the need for narcotic analgesics was reduced significantly in the 24 hours following surgery when RIB was applied alone (8,9) and together with the subserratus block (10). Case reports and series demonstrated that RIB block injections can be used to provide analgesia of the anterolateral thorax in the setting of acute or chronic pain with short-term benefits (11,12). However, its long-term effect is not known.

The primary hypothesis of this study was that ultrasound (US)-guided RIB would reduce the severity of pain in patients with MPS who had a trigger point in the rhomboid muscle in the short and long term. The other hypothesis was RIB would reduce disability and improve quality of life one month following injection and this effect would last at one-year follow-up.

Methods

Patients

This retrospective study was approved by the Medical Ethics Committee (Koç University) (2022.028. IRB1.023). This study was performed in accordance with the "Strengthening the Reporting of Observational Studies in Epidemiology" Guidelines (13).

Patients who had a trigger point in the rhomboid muscle and were administered RIB in physical medicine and rehabilitation outpatient clinic, between December 1, 2021 and January 15, 2022, were enrolled in this study. Experienced physiatrists determined active trigger points via palpating tender spots in the taut band of rhomboid muscles during physical examination according to Simons et al (14). Patients with trigger points in the medial trapezius, which were detected by the local twitch response as the needle was passing through the trapezius muscle, were not included in this study (15). Inclusion criteria were age ≥ 18 years, duration of pain ≥ 3 months, and severity of pain ≥ 4/10 on the Numeric Rating Scale (NRS-11). Patients with motor weakness, radiculopathy, previous cervical spinal surgery, neurologic, cognitive, psychiatric, or rheumatologic diseases, cancer, systemic infection, or inflammation were excluded.

Procedure

To guide the intervention, Esaote MyLab Class C (Genova, Italy) US device equipped with the linear array US transducer (LA 523, B-mode, frequency 4-13 MHz) was used. The patient was asked to lie in the prone position, and anatomical landmarks (C7 and thoracic spinous processes, superomedial, and inferior angle of scapula) were marked. The linear transducer was placed longitudinally over the active trigger point. After the location was confirmed, the injection area was cleaned. Before the injection, contours of rib and pleura were identified by the movements of the latter

during respiration. The insertion of the needle was targeted to the underlying fascia of the rhomboid muscle over the rib at the level of the most tender point. Considering the maximum dose recommendations (2 mg/kg [0.8 mL/kg] of bupivacaine 0.25% in a maximum total dose of 175 mg [70 mL]) (16), approximately 20 mL bupivacaine 0.25% was injected via an in-plane technique with 45° caudocranial direction using a 22-G 50 mm US-visible peripheral nerve block needle (B. Braun Stimuplex Ultra 360, Melsungen, Germany) (Fig. 1). The cranial spread of the injectate between the fascial planes was visualized (Fig. 2). In case of visualization of the injectate in the rhomboid muscle, the tip of the needle was redirected below the rhomboid to the interfascial planes.

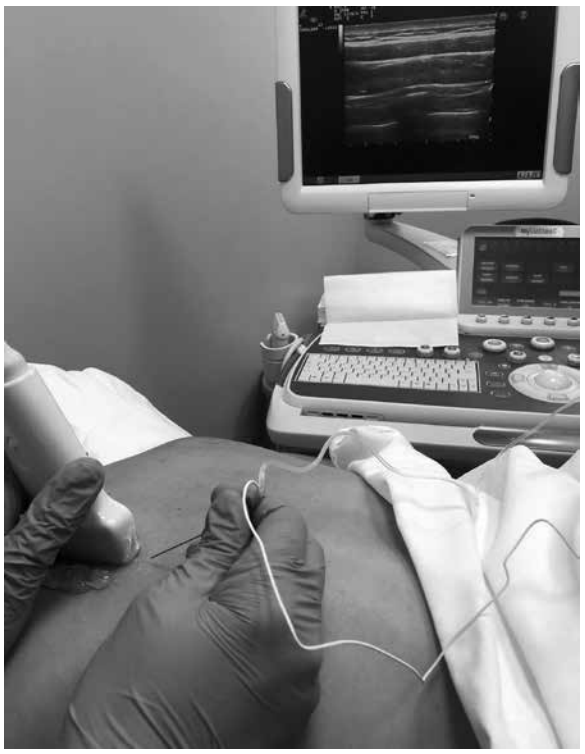

Fig. 1. *Insertion of a US-visible peripheral nerve block needle into the underlying fascia of the rhomboid muscle via in-plane technique.*
US, ultrasound

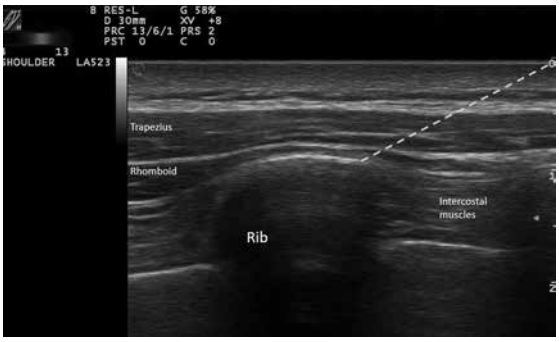

Fig. 2. *US image of an injection (rib, pleura, fascia below the rhomboid, needle, injectate). US: ultrasound.*

Outcome Measures

Demographic variables, including age, gender, education and employment status, height, weight, and body mass index, were recorded. Severity of pain and self-perceived change in pain following injection were measured before, one week, one month, and one year after the injection. Disability and health status were measured before, one month, and one year after the injection.

Severity of pain at rest and during movements was assessed by NRS-11. The patients were asked to mark their perceived severity of pain on an 11-point rating scale graded between "0: no pain at all" and "10: worst pain imaginable". NRS-11 has been determined to be a reliable and valid scale for the patients with chronic spinal pain (17). Pain rating with a decrease of ≥ 3 points or ≥ 50% was considered a good treatment response (18).

Disability was evaluated by a self-administered Neck Pain and Disability Scale (NPDS), which consists of 20 items, divided into 4 dimensions: neck movements; pain intensity; effects on emotion and cognition; and interference with daily life activities (19,20). Each item is scored from 0 (no pain or activity limitation) to 5 (worst pain or maximal limitation) and summed up for the total score ranging from 0 to 100 points. Higher scores indicate greater disability. Turkish version of the scale was shown to be reliable and valid (21). Functional status improvement with a ≥ 40% reduction in disability score was regarded a positive treatment response (18).

Nottingham Health Profile (NHP) is used to evaluate subjective health status (22). It consists of 38 items and evaluates health status under 6 domains, which are energy (3 items), pain (8 items), emotional reactions (9 items), sleep (5 items), social isolation (5 items), and physical activity (8 items) (Table 1). Answers to questions are either yes or no. Each domain is scored from 0 (worst) to 100 (best) and is calculated by summation of the items multiplied by different weighing scores. Total NHP score is calculated by averaging the scores of 6 domains. Validity and reliability of its Turkish version were performed (23).

The Global Rating of Change (GROC) scale was used to evaluate the change perceived by patients after treatment. The GROC scale has been used as a self-reported measure for an external change in variables, such as pain or disability in some musculoskeletal diseases (24-26). The patient is asked to evaluate the current state of health based on the difference that develops from the previous current state on a 15-point scale. It measures the patient's improvement or worsening over time. Scoring ranges from 'much worse' (-7) to 'much better' (+7) at first-week, first-month, and first-year postinjection (27).

Data Analysis

Data were analyzed using the SPSS Statistics 28.0 software program (IBM Corporation, Armonk, NY). Continuous and categorical variables were presented as median and IQR and percentages. Related-samples Friedman's 2-way analysis of variance by ranks was used to assess changes in measurements before and after the intervention.

Results

A flow diagram of the study is provided in Fig. 3. A total of 23 patients with a trigger point in the rhomboid muscle were treated with RIB during the study period. Diagnosis in addition to MPS was fibromyalgia (n = 5) and cervical degenerative disc disease (n = 5). Descriptive data of patients are listed in Table 2.

Sides of the block were right, left, and bilateral in 10, 5, and 8 patients, respectively. Level of the blocks were T3, T4, T5, T6, T7, and T8 in 2, 9, 5, 8, 4, and 3 of the 31 blocks, respectively. Total volumes of bupivacaine 0.25% injected were 20 mL in all of the unilateral blocks except for 3 patients (35 mL in one patient weighing 120 kg and 15 mL in 2 patients) and, in bilateral blocks, total volumes were 20, 30, and 40 mL in 5, 1, and 2 patients, respectively. Following the block, dermatomal hypoesthesia was observed in 5 patients, and no anesthesia was observed in any of the patients. There were no short- or long-term side effects.

Severity of pain during movement, at rest, and at night before and after RIB was demonstrated in Table 3. There was a statistically significant difference among groups and the difference resulted from the values before RIB injection and other values. There was no statistically significant difference among values reported after RIB injection. When the patients were classified based on clinically meaningful reduction in their worst NRS-11 score, 87% (20 out of 23), 61% (14 out of 23), and 50% (10 out of 20) were regarded as responders at one week, one month, and one year, respectively, after RIB.

Table 1. *Scores of NPDS and NHP.*

Variable	Median (IQR)			
	Before (n = 23)	1 month after (n = 23)	1 year after (n = 17)	*P* value
NPDS	52 (30)	20 (38)	25 (50)	< 0.001
NHP				
Energy	39 (76)*	0 (39)*	37 (63)	0.110
Pain	47 (58)*	20 (39)*	23 (61)	0.010
Emotional reactions	9 (35)*	0 (0)*	0 (21)	0.013
Sleep	13 (35)	0 (22)	0 (6)	0.223
Social isolation	0 (0)	0 (0)	0 (0)	0.146
Physical activity	9 (42)	9 (21)	0 (21)	0.375
Total	25 (29)**	7 (19)**	10 (27)**	0.007

IQR: interquartile range, RIB: rhomboid intercostal block, NPDS: neck pain and disability scale, NHP: Nottingham health profile.
**P* values between before RIB and one month after RIB for pain, emotional reaction, and energy subscores of NHP: 0.002, 0.003, and 0.004, respectively.
*** P* values for total NHP scores between before and one month and between before and one year: < 0.001, and 0.026, respectively.

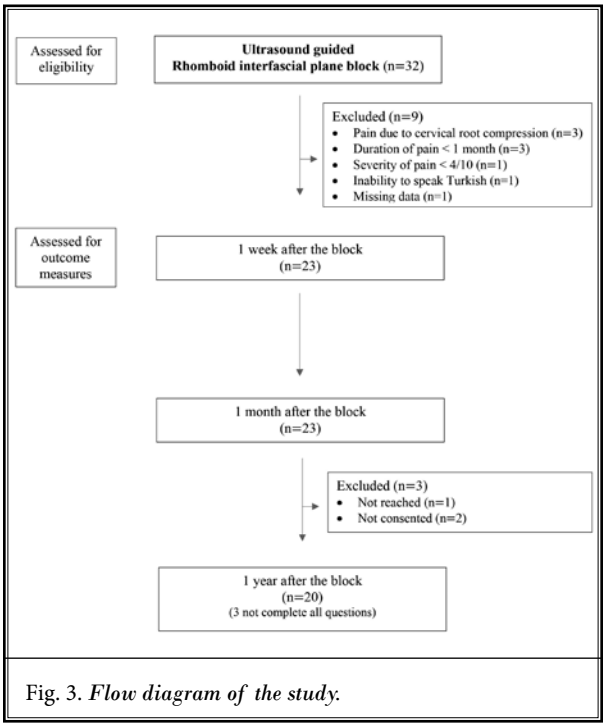

Fig. 3. *Flow diagram of the study.*

According to GROC, all patients reported improvement one week and one month after RIB, except for 2 and 4 patients who reported no change, respectively. At one year following RIB, 15 out of 20 reported improvement, 4 patients reported no change, and one patient got worse (Fig. 4). When GROC ≥ 5 was taken into account as a clinically meaningful improvement, the percentage of patients who rated meaningful improvement was 87%, 70%, and 50% at one week, one month, and one year, respectively, after RIB, which is very similar to the percentages of patients with improvement in NRS-11.

NPDS scores, NHP subscores, and total score are provided in Table 1. Median NPDS scores were decreased at the first month and first-year follow-up. There was no significant difference between the median values of the first month and first year (Fig. 5). Percentage of responders based on NPDS was 70% and 56% at the first month and first year, respectively.

Energy, pain, and emotional reactions subscores of NHP were significantly decreased after RIB at first month (Table 1). Median NHP total scores were reduced at both one month and one year after RIB (Fig. 6).

Discussion

The findings of this study demonstrated that one dose of US-guided RIB injection significantly reduced severity of pain in approximately 90%, 60% to 70%, and 50% of the chronic MPS patients at the first week, first month, and first year, respectively, following injection. Disability scores improved significantly in 70% and 56% of those patients at the first month and first-year follow-up, respectively. Improvement in quality of life was observed at the first month and maintained at first-year follow-up.

Although trunk interfascial plane blocks, such as the erector spinae and rhomboid blocks, are commonly applied for perioperative analgesia in trauma, breast, and thoracic surgeries to reduce pain and opioid use (28-33), there are only a case report and a study using RIB in the treatment of MPS (10,34). In a recent study performed by Köse et al (34), similar improvement was demonstrated in pain severity (a reduction in median NRS-11 from 5 to 2) in 30 patients with similar age, gender, and duration of pain as in our study. Although disability was improved in their study similar to ours, the change in quality of life was not statistically significant 6 weeks after the block, which was in contrast to our findings. Another difference from our study was that they administered 8 mg of dexamethasone in addition to 15 mL of 0.25% bupivacaine. We observed that improvements can be demonstrated via only 0.25% bupivacaine without an addition of steroids in all treatment outcomes assessed. Injection location was the auscultation triangle in Köse et al (34); whereas, we performed injection over the most tender point in the rhomboid muscle.

In a case with MPS, RIB injection containing 20 mL of 0.25% bupivacaine and 8 mg of dexamethasone significantly decreased pain severity at 4 weeks. Ekinci et al (12) to administer RIB while the patient was in a sitting position and in a craniocaudal direction, different

Table 2. *Descriptive data of the patients with a trigger point in the rhomboid muscle.*

Variable	Median (IQR) (n = 23)
Gender	
Woman, n (%)	18 (78%)
Man, n (%)	5 (22%)
Age, y	45 (23)
Height, m	1.64 (0.12)
Weight, kg	75 (24)
BMI, kg/m^2	27.10 (6.06)
Duration of pain, mo	24 (87)

IQR, interquartile range; BMI, body mass index.

Table 3. *The severity of pain with movement, at rest and at night before RIB, and one week, one month, and one year thereafter.*

NRS-11	Median (IQR)				
	Before (n = 23)	1 week after (n = 23)	1 month after (n = 23)	1 year after (n = 20)	*P* value
	6.0 (5.0)*	2.0 (3.0)	3.0 (4.0)	2.5 (5.0)	< 0.001
At rest	4.0 (5.0)**	2.0 (2.0)	2.0 (4.0)	3.0 (5.8)	0.006
At night	5.0 (5.0)***	0.0 (2.0)	2.0 (4.0)	0.0 (3.8)	< 0.001

IQR: interquartile range, RIB: rhomboid intercostal block, NRS-11: numeric rating scale.
*: *P* values between before and 1 week, 1 month, and 1 year after; < 0.001, 0.013, and 0.001, respectively.
**: *P* value between before and 1 week and 1 month after; 0.035 and 0.035, respectively.
***: *P* values between before and 1 week, 1 month, and 1 year after; 0.002, 0.024, and 0.005, respectively.

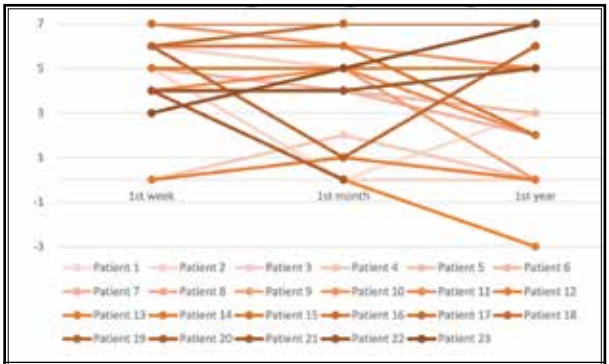

Fig. 4. *GROC at first week, first month, and first year following RIB.*
GROC, global rating of change; RIB, rhomboid intercostal block.

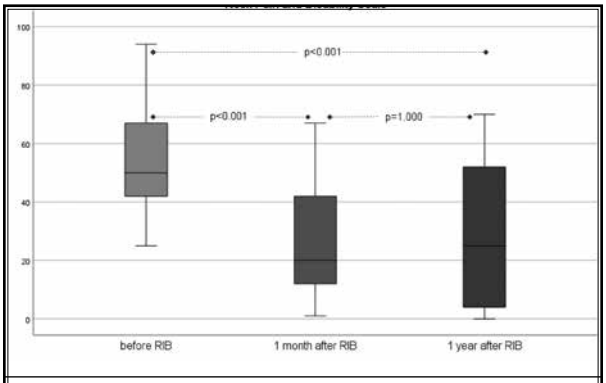

Fig. 5. *NPDS before, one month, and one year after RIB.*
NPDS, neck pain and disability scale; RIB, rhomboid intercostal block.

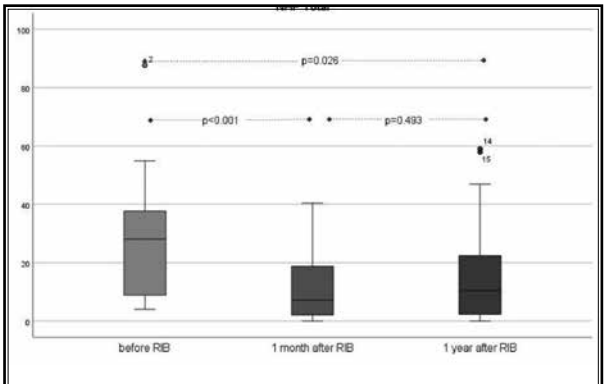

Fig. 6. *NHP total score before, 1 month, and 1 year after RIB.*
NHP, Nottingham health profile; RIB, rhomboid intercostal block.

from our technique. We performed the injection in a caudocranial direction while the patient was in a prone position, which helps to reduce the risk of vasovagal reactions and subsequent risk for unwanted needle displacements and consequences, such as pneumothorax. We recommend prone positioning in all patients, except for those who have a contraindication to lie prone. Ekinci et al (12) also prescribed 25 mg of oral dexketoprofen and 8 mg of thiocolchicoside twice a day for 2 weeks. The additive effect of these oral medications cannot be disregarded. Although there was no routine prescription of medication in our study, it was not possible to control whether patients used any self-administered painkillers given the retrospective nature of the study.

Domingo et al (9) performed US-guided interfascial block injections to the trapezius muscle of 25 patients with chronic MPS. They used 10 mL of 0.125% bupivacaine as an injectate. However, they observed only the immediate effect of the block on the severity of pain, which was a significant reduction from 7.6 to 1.6 in 10 minutes after the block. Short- or long-term effects were not assessed.

Injection of local anesthetic into fascial spaces extending between the muscles, which contain fibrous connective tissues rich in nerves and vessels, separates the interfascial planes and creates a block in the nerves (35,36). Success of analgesia in fascial plane blocks is associated with the volume and spread of the local anesthetics. Frequently used doses of local anesthetics are 20-30 mL or 0.2-0.4 mL/kg. During the procedure, maximum dose limits of local anesthetics should not be exceeded due to their potential toxicity secondary to possible systemic absorption. For analgesic purposes, diluted concentrations (such as bupivacaine 0.125%, 0.25%, or ropivacaine 0.2%) are usually preferred in these blocks. The anesthetic effect of bupivacaine might begin within 5-10 minutes and last up to 6 hours (16). However, we did not observe an anesthetic effect in any of our patients, except for hypoesthesia in a few of them.

Different block techniques have also been reported in MPS patients. In a patient with MPS, 2 repeated erector spinae injections with one week intervals were reported to provide pain control (37). In a randomized controlled study, erector spinae block was applied to the trigger point in the trapezius muscle, and compared with a trapezius muscle injection (38). US-guided trapezius muscle injection with 5 mL of 0.25% bupivacaine was applied to both groups. One week later, trapezius muscle injection group (n = 30) repeated the same injection, while the erector spinae group (n = 30)

underwent erector spinae block using 20 mL of 0.125% bupivacaine. A decrease in pain severity was observed in both groups according to the Visual Analog Scale score before (week 0) and after the injections (weeks 1, 2, 3, and 4); however, erector spinae block with trapezius muscle injection provided more effective analgesia.

In a woman with postmastectomy pain syndrome, who had both components of neuropathic pain and myofascial pain, erector spinae block and RIB injection eliminated neuropathic pain and left mild residual nociceptive pain (39). Piraccini et al (39) used levobupivacaine 45 mg and triamcinolone 40 mg within 15 mL of normal saline. They reported that the patient's well-being continued in the 3-month follow-up. This finding shows promise that block injections might lead to long-acting benefits in the management of pain.

Strengths of the Study

Long-term follow-up of patients and ensuring long-term effectiveness without using steroids are the strengths of our study. RIB is a long-term effective option for patients who cannot or are contraindicated to take oral medication and cannot use steroids.

Limitations of the Study

Retrospective design is a limitation of our study. Lack of a control group prevents us from comparing this treatment option with other treatments.

Conclusions

The positive results on pain in all these studies made us think that it may be beneficial in the treatment of MPS patients. In addition to improvement in pain, results, such as an increase in quality of life and a decrease in disability, have been satisfactory in our patients. However, randomized controlled clinical trials are needed to compare RIB as a treatment modality with other treatment modalities in MPS patients.

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