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Effect of Perineural Dextrose Injection on Myofascial Pain Syndrome

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ABSTRACT

Background: Myofascial pain syndrome (MFPS) is defined as the motor, sensory, and autonomic signs resulting from trigger points (TrPs).
Objectives: To assess the effectiveness of the perineural injection in patients with MFPS.
Materials and methods: The study was conducted at AL Ramadi Teaching Hospital, Department of Rheumatology, Ramadi City, Iraq. The study period was from June 2019 to January 2021. A retrospective review of 100 patients with prospectively collected clinical and radiologic data was performed to evaluate the effectiveness of perineural injection on MFPS. A 3 ml of 5% dextrose solution was managed sub-cutaneous straight at the labeled chronic constrictive injury and tender spots rounding the knee. The VAS and WOMAC were calculated for each participant at the time of the presentation and 1, 3, and 6 months following treatment.
Results: The mean age of the patients was 60.93 ± 6.17 years (25-70 years). Three-quarters (75/100) of the cases were female. Seventy subjects were from the age group ≥ 40 years, while the remaining 30 cases were from the age group < 40 years. Fifty-five cases were with right-sided involvement. Successful results were achieved in 90% of the participants. There were no statistically significant differences between the effective and not effective groups regarding the age, gender, and the involved side (P-value > 0.05). There was a reduction in the mean VAS (8.47 ± 0.77) of pain and WOMAC (78.99 ± 5.69) score at the time of presentation to 1.87 ± 1.32 for the VAS and 17.84 ± 4.66 WOMAC at 6-months post-injection period. No complications were reported in all patients apart from mild pain at the injection site.
Conclusion: Perineural dextrose injection was successful in 90% of the patients with MFPS. This modality results in a sharp reduction of both VAS and WOMAC scores from the time of the presentation to 6-months post-treatment. We recommend using this modality because it is easy, effective, and safe.
Keywords: Myofascial Pain Syndrome; Perineural Injection; Autonomic Symptoms; Perineural Dextrose Injection.

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INTRODUCTION

Myofascial pain syndrome (MFPS) is defined as the motor, sensory, and autonomic signs made by trigger points (TrPs). TrP is a hyper-irritable area in skeletal muscles or fascia that is accompanied by a hypersensitive palpable nodule in a taut band. It is painful on compressions and may cause characteristic raised pains, stated tenderness, motor dysfunctions, and autonomic incidences [1].

The optimum existing suggestion supports that TrPs develop thereafter muscle overuse. Numerous possible mechanisms can have a function, like eccentric excess, sub-maximal continued, and sub-maximal concentric contraction. A significant influence is believed to be local ischemia, which causes an acidic pH and successive releases of numerous inammatory intermediaries in muscles tissue. TrPs were sorted as "active" (making clinical pains complaints) or "latent" (symptomless but tender on palpations) [2].

Perineural injection therapy (PIT) is a new advancement in regenerative medicine. It is targeting cutaneous nerves as a possible pains producer. Firstly, defined by Pybus and Wyburn-Mason, PIT targets neuro-genic inflammations in sub-cutaneous nerves that possibly produce pains. PIT was

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more described by Lyftgoft employing dextrose injections, providing considerable pain control in a series of 300 Achilles tendinopathy. But this therapeutic method is still widely not known; consequently, they wanted to record the impact of PIT in managing complex regional pain syndrome (CRPS) and its result on pains and function restorations [3].

Three cases that met the Budapest Criteria for CRPS have been managed with a series of PITs. The cutaneous nerves have been palpated with their course until tender chronic constrictive injury (CCI) spots have been faced. The CCI points are made by cutaneous nerve swelling proximal to its point of penetrations of the fascia layer at the fascial transition zone (FTZ). When recognized, the CCI spots were cleaned with alcohol; utilizing a 25 G hypodermic needle, 2-5 mL of 5% dextrose was applied sub-cutaneous straight at the CCI spots. On average, the cases receiving 1-3 injections every week to tender CCI spots of the cutaneous nerves supply the dermatomes covering the influenced part or joint [3]. We aimed to assess the effect of perineural injection on MFPS.

MATERIALS AND METHODS

A retrospective review of 100 patients with MFPS with prospectively collected clinical and radiologic data was performed to evaluate the effectiveness of perineural injection on MFPS. Seventy-five were females and 25 were males. The study was conducted at AL Ramadi Teaching Hospital, Department of Rheumatology, Ramadi City, Anbar Governorate, Iraq. The study covered the period from June 2019 to January 2021.

The Ethical Approval Committee of the University Of Anbar accepted the protocol of the study (Reference number 119, on 8-11-2021). A knowledgeable agreement was given by all cases registered in this work.

Cases with active infections, osteomyelitis, history of chronic infections around the knee joints, immune disorders, rheumatic disorders, or other systemic inflammation disorders, cases who had experienced preceding operations on the knees, cases with hemorrhage tendency (genetic or acquired), and complicated cases have been omitted from this work.

Perineural Injection and Physio-therapy Programs

The author has accomplished all injecting procedures. The injection was initiated 21-day postoperatively and repeated every 21-day for 3 times. The patient have been located in a supine position and the knee was bent. The injection was achieved underneath the aseptic condition employing a 25-G hypodermic needle. The cutaneal nerves rounding the knee have been palpated with their course and tender CCI spots (CCI spots are tender spots in the cutaneous nerves that happen when the nerves are stuck in the penetrations of the fascia layer at the FTZ) have been indicated with a skin pen (Figure 1). A 3 ml of 5% dextrose (Turkish Koak-Farma) solution was managed sub-cutaneous straight at the labeled CCI and tender spots rounding the knee. All cases were exercised at home with a qualified physiotherapist involving stretches, stabilizations, and strengthening exercises 3-times every week. The cases have been suggested to avoid heavy everyday activities and for resting the treated knee for 3-day. Anti-inflammatory medications have been forbidden excluding acetaminophen, which can be utilized at most 4-times daily at 500 mg when the pains became non-bearable.

Outcomes

It was assessed through direct meetings by one person who was not involved in the study. The pain was assessed in all cases using the visual analogue scale (VAS) of pain [4], in which strength of the movement-evoked pains ranged between 0 (no pain) to 10 (maximum pain). Western Ontario and McMaster Universities Arthritis Index (WOMAC) has been utilized to assess pains, physical functions, and difficulty [5]. This is a 24-item index usually utilized for the assessment of knee degenerative arthritis. Following-up investigations of the patients have been accomplished non-dependently by one of the co-authors at baseline 1 and 3 months thereafter the treatments.

The statisticians and the evaluators have been blinded concerning the interventions. The outcomes in the last follow-up have been sorted as effective and not effective.

Statistical Analyses

Variables have been introduced as mean SD. 2-way2 repeated measures analyzing of variance has been utilized for time comparing of group impacts. At P-value < 0.05, the results are considered to have a statistical significance difference.

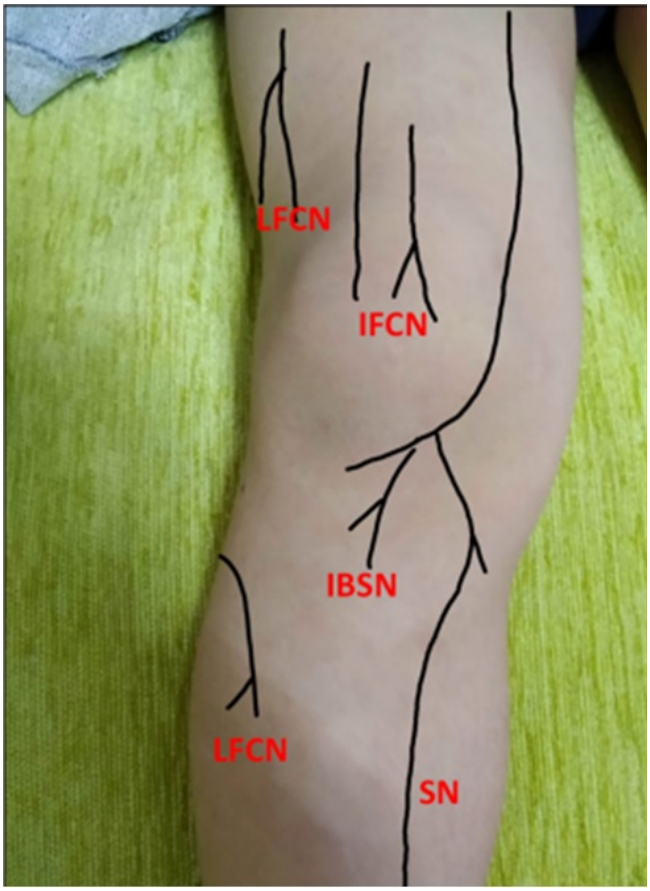

Figure 1. Tender CCI spots. IFCN = intermediate femoral cutaneous nerve, LFCN = lateral femoral cutaneous nerve, IBSN = infra-patellar branch of the saphenous nerve, and SN=saphenous nerve.

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RESULTS

The age of the enrolled patients ranged from 25 to 70 years with a mean age of 60.93 ± 6.17. There were 70 cases from the age group ≥ 40 years, 75 females (males/females ratio of 1/3), and 55 with right-sided involvement (Table 1).

Perineural dextrose injection was effective in 90% of the cases. The mean age was 60.05 ± 5.17 years in the effective group. There were no statistically significant differences between the two groups (effective vs not effective) regarding the demographic variables (age and gender) and the involved side (P-value > 0.05) (Table 2).

Table 3 shows that the mean VAS of pain at the time of presentation (0 times) was 8.47 ± 0.77, while the least mean of VAS at 6 months was 1.87 ± 1.32. The mean WOMAC at the time of presentation (0 times) was 78.99 ± 5.69, while the least means of the WOMAC at 6 months was 17.84 ± 4.66 (Table 4). Table 5 shows that the mean change in the VAS from 0-6 months was 6.96 ± 1.52, while the mean change in the WOMAC from 0 to 6 months was 62.00 ± 5.86.

No complications were reported in all patients apart from mild pain at the site of the injection which shortly resolved on simple analgesia.

Table 1. Demographic characteristics of the 100 patients.

Variables	Value
Age (mean ± SD)	60.93 ± 6.17
Age per years	
< 40	30
≥ 40	70
Gender	
Males	25
Females	75
Side	
Right	55
Left	45

Table 2. Relationship between the effectiveness of perineural dextrose injection and the age, gender, and involved side of the 100 patients with myofascial pain syndrome.

Variables	Effective Number(%)	Not effective Number(%)	Total Number(%)	P-value
Age per years Mean ± SD	60.05 ± 5.17	60.95 ± 7.18		0.1155
< 40	27 (90)	3 (10)	30 (30)	0.973
≥ 40	63 (90)	7 (10)	70 (70)	
Total	90 (90)	10 (10)	100 (100)	
Gender				0.6366
Males	26 (86.6)	4 (13.4)	30 (30)	
Females	64 (91.4)	6 (8.6)	70 (70)	
Total	90 (90)	10 (10)	100 (100)	
Side				0.9926
Right	50 (90.9)	5 (9.1)	55 (55)	
Left	40 (88.9)	5 (11.1)	45 (45)	
Total	90 (90)	10 (10)	100 (100)	

Table 3. Visual Analogue Scale (VAS) of the pain of the 100 subjects.

VAS	Mean ± SD
VAS-0	8.47 ± 0.77
VAS-1 month	4.39 ± 1.09
VAS-3 month	2.35 ± 0.98
VAS-6 month	1.87 ± 1.32

Table 4. McMaster Universities Arthritis Index (WOMAC) of the 100 subjects.

WOMAC	Mean ± SD
WOMAC-0	78.99 ± 5.69
WOMAC-1 month	40.85 ± 7.66
WOMAC-3 months	23.73 ± 6.18
WOMAC-6 months	17.84 ± 4.66

Table 5. Measure of the effect (change) of the 100 subjects.

Variables	Mean ± SD
VAS 0-6 months	6.96 ± 1.52
WOMAC 06 months	62.00 ± 5.86

DISCUSSION

PIT is considered a secure, efficient therapy for cases who may not be applicants for joint replacing operation or biologic methods like stem cell injection or PRP. PIT manages injured and inflamed nerves. Chronic nerve pains are frequently caused by trauma, stiffness, sporting, overuses, work-related, and operative injury [6]. The main outcomes of the current study were that the success rate of the perineural dextrose injection was 90% and there was a sharp reduction in mean VAS WOMAC before and 6 months following treatment.

The last reports have concentrated on peri-operative, intra-operative, and post-operative acute pains controlling, and there is inadequate suggestion concerning the best managing chronic pains after total knee arthroplasty (TKA). In these limited studies, comprehensive and multidisciplinary approaches and case-specific treating methods have been suggested for the College of Physicians and Surgeons Pakistan (CPSP). Main treating methods for CPSP comprise medical, physical, pulsed radio-frequency, dry needles, and acupuncture treatments. But the rate of succeeding is lower in some of these treating options and no scientific base in others [7].

Any sensations that are apparent by the brain are conducted to the brain through the sensory nervous system. This is correct for sensation-like pains, heat, vibrations, or pressure. For instance, when a nerve is triggered by pain, the specific nerve cells produce an electric signal that is transferred through the nerves to the spine and then to the brain [8].

Imagine the specific nerve cell as being a room with a gate (named scientifically as a receptor). When this happens and moves from one room to the following, an electric signal is formed called action potential. When stimulating is ended, the door again closed. If the nerve is injured for whatsoever cause, this mechanism is disturbed [9].

In a study by Ismail et al. [10], 60 patients were en-

rolled for surgical treatment with TKA owing to developed knee osteoarthritis divided into two groups, Group-A consisting of cases who used 3 times of PIT mixed with standard post-operative TKA protocols throughout the same interval. Group B used standard post-operative TKA protocol (re-habilitation program, oral and intravenous analgesia). Clinical efficiency has been assessed using WOMAC and VAS at baseline and 1-, 3-, and 6-months following-ups. There was a nonsignificant change among the study groups regarding baseline information. Ismail et al. [10] showed that WOMAC and VAS scores of the cases in which this principle was used were significantly better than a group in which this principle wasnt used (P-value < 0.001). CPSP rate (significant pain [greater than 40mm]) of the cases who have treated with PIT decreased to 1/3 of the CPSP rate of the cases who didn't (6.4% versus 20.6%). Ismail et al. [10] showed that pains and clinical scores were significantly better in comparison to baseline values.

Nunez-Cortes et al. [11] attained clinical significance including pains improvement, motion range, functions, and myofascial TrPs in TKA cases treated by dry needles in combination with therapeutic exercise.

Hiltons law suggested that, as a consequence of embryologic developments, joints, joint movement, muscles, and the covering skin have an identical nerve supply. Rendering to this theory, injuries of the surface nerves, counting operative injuries, may disturb deeper structures. Somato-sensory small fibers may be stuck, exposed to resistance, and shocked in the skin and fascia layers rounding the muscles, ligaments, tendons, and joints. The accompanying ischemia can lead to an oxygen-glucose deficiency injury. When C fibers expire energy, they depolarize and begin to discharge [10].

MacIver and Tanelian, [12] in 1992 investigated the peptidergic C fiber reactions to ischemia and revealed a 652 rise of C fiber firing relative to control in responding to hypoglycemia.

It was suggested that hypo-glycemia-made C fiber firing leads to transient receptor potential vanilloid 1 (TRPV1) voltage gating. This by role released Calcitonin gene-related peptide (CGRP) and Substance P (SP), activating neuro-genic inflammations with pains and swelling of the nerve stem. PIT injection was positively utilized for chronic and recurrent pains. The injection targets the perineural part, dropping pains and swelling of the nerve trunk and reestablishing nerve functions, pains relief, and progressing movements. It was suggested that the prompt analgesic consequence of 5% dextrose is because of an impact on glucose-sensitive tandem pore potassium channel reestablishing repolarizations [10].

PIT wasn't utilized earlier to CPSP. But it was utilized for alike signs. Firstly, Lyftogt utilized PIT with dextrose for the management of 300 cases with Achilles tendinopathy and accomplished significant pain control in these cases [10].

In a recent study by Abu Zaid et al. (2018) [13], 100 cases with moderate and severe knee osteoarthritis were enrolled. The diagnosis of these cases depends on clinical and radiological (via plain X-ray) characteristics. The study evaluated the efficiency of PIT as a novel option in pain management, physical functions, ambulation activities, disabilities, and psychological grades in moderate and severe knee osteoarthritis. The study divided the patients into 4 groups. They revealed no baseline variances found among study groups. The improvement in group IV was non-significant (P-value > 0.05), while there was a significant development in all other groups (P-value < 0.05) in all primary and secondary outcomes post-therapy, 3 and 6-months later. In comparison between groups I, II, and III, the optimum development was in group III followed by a group I and then group II thereafter treating and 3-months later but a nonsignificant change was found among the 3 groups afterward 6-months follow-up.

Thor et al. [3] managed 3 Complex Regional Pain Syndrome (CRPS) cases (a case with frontal talofibular ligament injury, a case with shoulder injury, and a case with a sustained traumatic elimination of 5th and 4th distal interphalangeal joints). All these cases profited from the management and were capable of actively contributing to the treatment and all of their signs were healed. In this work, pain and functional scores of all cases in the PIT therapy group were improved in comparison to those in the no-PIT patients.

The limitations of the current work were its retrospective strategy, small sample size, short follow-up periods, and absence of a placebo control. Owing to the retrospective method of the work, the causal association among treatment and detected outcomes couldn't be confirmed. The influences of perineural injections were shared of mixed treatments, so their single influences couldn't be determined. There was no placebo group, so the development in pains over time and functions can only be clarified by the natural past of pains afterward knee replacements. Cases weren't blind to the treatments. Thus, expectancy and non-specific impacts of PIT can have a contribution to treatment influences. Consequently, more comprehensive research with bigger sample sizes and lengthier follow-up intervals can be beneficial.

CONCLUSION

This work might be the first stage in the investigation of an un-discovered topic. Several treatment influences of dextrose injections were defined in the previous studies, representing a diversity of causing mechanisms. Dextrose injection is promising in CPSP with its easy and safe injecting procedure, minimal complications (just mild pain), and elevated clinical effectiveness.

ETHICAL DECLARATIONS

Acknoweldgements

None.

Ethics Approval and Consent to Participate

The study was approved by the Ethical Approval Committee of the University Of Anbar. Informed consent was taken from every participant.

Consent for Publication

Not required.

Availability of Data and Material

All data are available on request from the corresponding author on reasonable reasons.

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Competing Interests

The author declares that there is no conflict of interest.

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Authors' Contributions

Khalil SI has designed the study and wrote the manuscript. Khalil SI read and approved the manuscript.

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