Original Article

Evaluation of lignocaine HCl as a therapeutic and diagnostic tool in myofascial pain dysfunction syndrome and internal derangement

ABSTRACT

Background: Myofascial pain syndrome MPS is one of the most common causes of chronic musculoskeletal pain. It clinically presents with hypersensitive points in the muscle called "trigger points". Most of the time it remains undiagnosed/undertreated and this leads to severity in symptoms. Deactivation/elimination of trigger points (TrPs) remains the cornerstone of myofascial pain dysfunction syndrome (MPDS) management. The most commonly employed techniques clinically are dry needling of the TrP, local anesthetics or saline injections into TrP, spray and stretch, and ultrasound/electrogalvanic stimulation. Although peripheral nerve blocks are widely used for chronic pain management, their role in myofascial pain dysfunction syndrome is not yet well established. Our study aims to demonstrate the role of mandibular nerve block using lignocaine hydrochloride in the management of MPDS.

Materials and Method: Our study is a single-centered randomized control trial performed to evaluate the diagnostic and therapeutic role of mandibular nerve block in treating myofascial pain dysfunction syndrome. A total of 20 subjects fulfilling the inclusion criteria were enrolled in the study. Clinical parameters (pain, mouth opening, and mandibular deviation) were assessed at each follow-up appointment.

Result: All of our patients had significant pain relief at the end of 1 month ($P < 0.001$), and a substantial improvement in mouth opening is also noted ($P < 0.001$). There was a significant improvement in deviation immediately after nerve block, and further gradual improvement was observed during each follow-up.

Conclusion: Our study confirmed the role of mandibular nerve block in myofascial pain management. The diagnostic value of mandibular nerve block in differentiating MPDS from internal derangement is also highlighted.

Keywords: Lignocaine hydrochloride, mandibular nerve block, myofascial pain

INTRODUCTION

Myofascial pain syndrome is a musculoskeletal condition that is thought to arise from localized, taut bands within the skeletal muscle tissue/tendons termed trigger points (TrPs). TrPs create foci of pain frequently characterized as dull, aching, and boring. Myofascial pain dysfunction syndrome (MPDS) also presents with a neuropathic component, evidenced by its referred pain patterns most commonly presenting as temporal headaches. Myofascial pain is unique, for the quality of pain experienced is highly dependent on the patient's perception.[1] MPDS has a complex pathogenesis and occurs as a result of multiple interacting mechanisms. The most commonly accepted mechanism is an abnormal increase in acetylcholine release at the motor endplate nerve terminal,

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which causes sustained muscle fiber contractions. These sustained contractions that clinically present as taut bands, in turn, cause local muscle ischemia either because of decreased blood flow and/or increased metabolic demands.[2]

Identifying and acknowledging the TrPs forms a major part of MPDS management. A myriad of treatment options are available all targeting the TrPs either directly or indirectly. Direct/definitive treatment involves addressing the etiologic factors that activate muscle TrPs such as emotional stress, sleep disorders, and work posture. However, in some patients, there can be idiopathic TrP activation, which demands invasive/noninvasive techniques focusing on these TrPs. Non-invasive modalities such as vapor-coolant spray and stretch, pressure and massage, and ultrasound stimulation cause muscle relaxation and relieve pain.[3] Studies on the effect of intraoral appliance therapy both hard and soft splints also show promising results.[4]

Non-responders/poor responders to these non-invasive methods should then be considered for minimally invasive techniques such as TrP injections. These include dry needling, saline/local anesthetic injection, and botulinum toxin injection. Another method is to induce repetitive muscle stimulation using electric currents provided by transcutaneous electrical nerve stimulation or electro-acupuncture.[5,6] Pharmacotherapy and physical therapy form an important part of supportive management. NSAIDs, tricyclic antidepressants, and muscle relaxants all are effective for pain relief. However, they simply make TrPs latent and do not eliminate them. Physical therapy is essentially a stretch therapy, wherein muscles are stretched to their full length but before the pain cycle starts in.[7]

Peripheral nerve block with local anesthetics such as lidocaine and bupivacaine has proven value in chronic pain management.[8] Although studies are proving their efficacy in temporomandibular myofascial pain syndrome, their clinical application is not yet well established. Our study aims to evaluate the role of mandibular nerve block using lignocaine in the management of MPDS.

MATERIALS AND METHOD

Our study was a single-centered randomized control study, conducted in the Department of Oral and Maxillofacial Surgery. Ethical clearance was obtained from King George Medical University U.P, Institutional Ethical Committee Ref No. 119 ECM IIA/P18.

Inclusion criteria

Patients diagnosed with myofascial pain, who had not received any treatment in the previous 8 weeks, and with pain level score >3 on the visual analog scale (VAS).

Exclusion criteria

Patients under systemic medications for pain relief, those with fibromyalgia, rheumatic or neurological diseases, patients with needle phobia, amide local anesthetic allergy, established internal derangement of temporomandibular joint and patients undergoing occlusal splint therapy or physiotherapy for MPDS.

Patients visiting our department directly or through some referral with the chief complaint of pain in the temporomandibular joint region and or temporal region were examined. After an initial assessment, a total of 20 patients fulfilling the predetermined inclusion criteria were enrolled in the study.

Technique

Mandibular nerve block technique as described by Gow-Gates was used in our study (Direct mandibular nerve trunk block). The local anesthetic used was 2% lignocaine hydrochloride with adrenalin (1: 1,00,000). It provides both motor and sensory blockade of mandibular nerve branches. Numbness in the lower lip, tongue, and skin over the zygoma, and temporal region signifies a successful mandibular nerve block.[9]

Hypothesis

Mandibular nerve trunk block serves both diagnostic and therapeutic purposes.

In *therapeutic* terms, mandibular nerve block induces muscle relaxation and interrupts the chronic pain cycle by inhibiting protective muscle contractions. Pain elimination not only improves mouth opening but also corrects mandibular deviation. On the *diagnostic* front, mandibular nerve block aids in distinguishing between MPDS and Temporomandibular joint (TMJ) internal derangements, for in cases of internal derangement mandibular nerve block will provide only pain relief without affecting mouth opening/deviation.

Follow-up

Assessment of clinical parameters-pain, mouth opening, deviation correction during mouth opening was performed before treatment, immediately after treatment, one week, and one-month post-treatment.

Pain assessment was performed by using a VAS (0–10). For mouth opening, the distance between the maxillary central incisor, the mandibular, central incisor was measured using a divider and metric scale. The amount of deviation during mouth opening was measured from the maxillary incisors contact point to the mandibular incisors contact point. All the parameters were assessed during each follow-up visit.

RESULTS

All participants enrolled in the study were successfully followed up, and there was no dropout.

Pain score

Data collection was completed using the 0–10 VAS scale, and on application of statistical analysis using paired difference at different intervals, a statistically significant difference was observed in all 6 pairs. Pain relief had significant improvement from baseline to 1 month (8.47 ± 0.78, $P < 0.001$), and this supports the fact that improvement in pain scores was likely attributable to lignocaine injection [Table 1 and Figure 1].

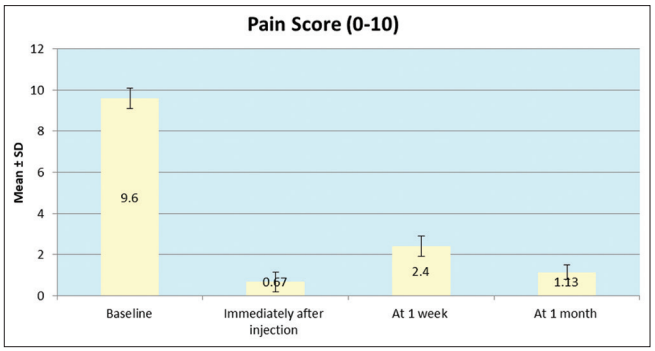

Figure 1: Assessment of pain score at different follow up appointments

Mouth opening

There was a significant improvement in mouth opening at all intervals. Comparing baseline values to one-month follow-up using paired *t*-test showed a highly statistically significant *P* value. (-23.03 ± 3.12, $P < 0.001$). The negative mean indicates the improvement in the severity of mouth opening. This outcome suggests that the improvement in mouth opening is due to the lignocaine injection being studied [Table 2 and Figure 2].

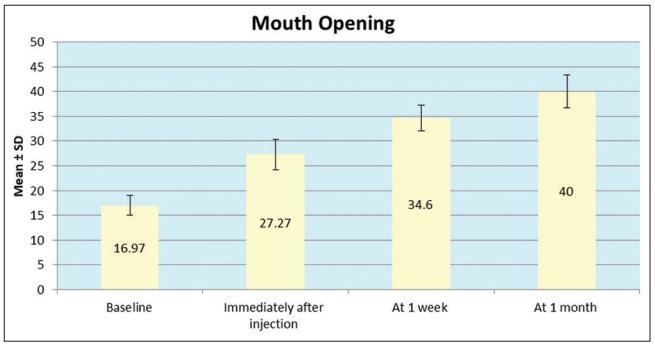

Figure 2: Assessment of mouth opening at different follow up appointment

Deviation

We also noted a statistically significant improvement in mandibular deviation in our patients. Table 3 exhibits paired differences and associated statistical values derived from comparisons of mandible deviation, made across different time points in our study [Table 3 and Figure 3].

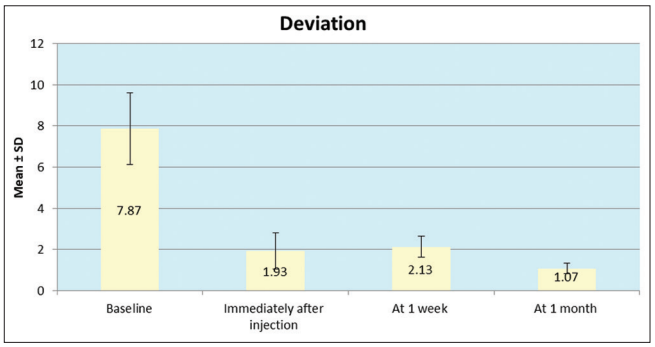

Figure 3: Assessment of mandible deviation at different follow up appointments

DISCUSSION

Our study aimed to evaluate the role of mandibular nerve block with lignocaine in the diagnosis and management of MPDS by assessing clinical parameters such as pain, mouth opening, and deviation at different time points during pre- and post-intervention periods.

MPDS, a type of temporomandibular disorder (TMD), is a localized pain condition that can impact individuals of all ages and defined by the presence of TrPs within muscles or fascia.[1] However, in clinical situations, the diagnosis is not straightforward. TMDs are an umbrella diagnosis of disorders involving temporomandibular joint and masticatory muscles. In MPDS, the clinical features are as complex as their etiology. Multiple etiological factors such as trauma, stress, and parafunctional habits such as teeth clenching, grinding, and head and neck posture have been implicated with MPDS. The role of TrPs in MPDS has been a topic of controversy for many years, but it is now widely accepted as a major diagnostic criterion.[7,10] However, it is also not uncommon for patients to present with headache as a chief complaint without any cue of TrPs.

Muscle trigger points

These are localized, discrete, firm/taut bands/nodules within the muscle that may/may not be painful. Clinical palpation remains the single most commonly used method for identifying these TrPs. Clinical palpation of TrPs is essential as it can evoke referred pain and present as a temporal headache.

However, these TrPs are confusing in many ways: 1) a universally accepted palpation pressure cutoff value is not yet established making the clinical palpation method more

Table 1: Paired analysis of pain score at different time intervals

Pain Score (0-10)		Paired difference						
		Mean	SD	95% Confidence Interval of the Difference		*Z*	df	*P*
				Lower	Upper			
Pair 1	Baseline - immediately after injection	8.93	0.78	8.64	9.23	-4.851	29	<0.001
Pair 2	Baseline - At 1 week	7.20	0.76	6.92	7.48	-4.861	29	<0.001
Pair 3	Baseline - At 1 month	8.47	0.51	8.28	8.66	-4.932	29	<0.001
Pair 4	immediately after injection - At 1 week	-1.73	0.58	-1.95	-1.52	-4.932	29	<0.001
Pair 5	immediately after - At 1 month	-0.47	0.63	-0.70	-0.23	-3.276	29	0.001
Pair 6	At 1 week – At 1 month	1.27	0.45	1.10	1.43	-5.035	29	<0.001

Table 2: Paired analysis of Mouth opening at different time intervals

Mouth opening		Paired difference						
		Mean	SD	95% Confidence Interval of the Difference		*Z*	df	*P*
				Lower	Upper			
Pair 1	Baseline - immediately after injection	-10.30	2.64	-11.29	-9.31	-4.806	29	<0.001
Pair 2	Baseline - At 1 week	-17.63	2.16	-18.44	-16.83	-4.794	29	<0.001
Pair 3	Baseline - At 1 month	-23.03	3.12	-24.20	-21.87	-4.813	29	<0.001
Pair 4	immediately after injection - At 1 week	-7.33	3.25	-8.55	-6.12	-4.799	29	<0.001
Pair 5	immediately after - At 1 month	-12.73	4.45	-14.39	-11.07	-4.79	29	<0.001
Pair 6	At 1 week – At 1 month	-5.40	2.09	-6.18	-4.62	-4.73	29	<0.001

Table 3: Paired analysis of deviation of mandible at different time intervals

Deviation		Paired difference						
		Mean	SD	95% Confidence Interval of the Difference		*Z*	df	*P*
				Lower	Upper			
Pair 1	Baseline - Immediately after injection	5.93	2.18	5.12	6.75	-4.793	29	<0.001
Pair 2	Baseline - At 1 week	5.73	1.80	5.06	6.41	-4.81	29	<0.001
Pair 3	Baseline - At 1 month	6.80	1.75	6.15	7.45	-4.808	29	<0.001
Pair 4	Immediately after injection - At 1 week	-0.20	1.00	-0.57	0.17	-1.105	29	0.269
Pair 5	Immediately after injection - At 1 month	0.87	0.97	0.50	1.23	-3.615	29	<0.001
Pair 6	At 1 week – At 1 month	1.07	0.45	0.90	1.23	-5.013	29	<0.001

subjective and less reliable and 2) sometimes these TrPs remain latent not eliciting pain upon palpation (the actual trigger for pain cycle remains unknown). Electromyographic studies have a useful role in identifying both latent and active TrPs.[11]

Muscle TrPs are the common target in the management of MPDS. As there is no universally accepted treatment protocol clinicians can start with noninvasive approaches such as physiotherapy, diet modification, splint therapy, pharmacotherapy, and transcutaneous electrical stimulation and upgrade to invasive treatment options such as TrP injections, which include dry needling, saline, local anesthetic, corticosteroid, and/botulinum toxin injections.[12-16] Studies comparing the efficacy of these methods have proved that combined therapy often provides better results than any single modality.[17] Although numerous studies have been conducted on TrPs needling, there remain controversy on whether the pain relief is due to the injection *per se* or because of the drugs injected.[18] Hyperstimulation analgesia is the most widely accepted mechanism of TrP needling therapy.[19] Drug injections into TrPs cause vasodilation and dilution of nociceptive substances, which then leads to muscle relaxation and lengthening. However, how these TrP injections will provide relief from referred pain is not mentioned in the literature.[20]

Although TrP injections have been widely accepted, it is associated with complications such as bleeding, infection, hematoma formation, multiple needle penetrations, intravascular injection, and muscle and nerve injury. However, it is a blind procedure that prevents newly trained residents/general dentists from practicing it. We believe that mandibular nerve block will be more comfortable for general dentists as they are more accustomed to it in their day-to-day practice.

Peripheral nerve blocks have a well-established role in the management of chronic pain. The mandibular nerve provides

motor innervation to the masticatory muscles. It is believed that local anesthesia temporarily blocks both sensory and motor components, offers muscle relaxation, switches off all TrPs, and provides analgesia, which helps in breaking the vicious pain cycle.[21]

Quek *et al*. have conducted a series of studies evaluating the efficacy of nerve blocks in MPDS management. Their study showed that muscle nerve blocks offer immediate and sustained pain relief when compared to TrP injections. They also introduced a new technique to block both masseteric and temporal nerves using a single extraoral approach termed the "twin block technique".[22,23] Following the study conducted by Quek *et al*.,[21] Elrefaie *et al*.[24] also conducted a similar study comparing masseteric nerve block with TrPs injections. They found both techniques equally effective in pain management. The above-mentioned studies employed extraoral nerve blocks, which work out well in experienced hands. Again, a general dentist might hesitate to attempt this, which leads to a delay in treatment or no treatment at all. Such situations altogether increase the fear and stress of patients, which then continues to aggravate the pain cycle. In this study, we employed the widely practiced mandibular nerve block technique with the most commonly used local anesthetic drug lignocaine hydrochloride. Various local anesthetics such as lidocaine, bupivacaine, and ropivacaine are being used however, no studies comparing their efficacy have been conducted yet.

Our study results show a statistically significant improvement in symptoms such as pain, deviation, and mouth opening that proves the efficacy of mandibular nerve block in MPDS management. We also found that in all our patients mandibular deviation improved with mandibular nerve block suggesting a muscular cause, thereby differentiating it from internal derangement.

CONCLUSION

In conclusion, the comprehensive analysis of pain scores, mouth opening measurements, and deviation correction outcomes consistently supports the efficacy and effectiveness of mandibular nerve block using lignocaine in MPDS treatment. These findings collectively highlight the promising outcomes associated with the intervention and are encouraging for general dentists to include this technique as a part of their diagnosis and treatment protocol for TMDs.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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