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Original Research Article

Helium-Neon Laser in Temporomandibular Myofascial Pain: Pre-Post Study

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ABSTRACT

Objective: To study the effect of helium-neon LASER on temporomandibular myofascial pain and function of TMJ when LASER used as a monotherapy.
Design: a pre-post study
Method: A convenient sample of 30 subjects was taken from SDM College of Dental Sciences, Dharwad. All subjects with temporomandibular myofascial pain were assessed using VAS and Global pain impact scale before and after they received LASER therapy for 5 days as per the appropriate calculated dose. The data was recorded and sent for analysis.
Results: The results showed that the mean age of subjects who participated in the study was (28.40) years. The masseter is most frequently involved muscle; the temporalis is next most commonly involved muscle. Masseter was involved in 25 subjects (M=11, F=14). Effect of treatment on VAS on 0 and 5th day was calculated. The mean of VAS on 0 day was 6.6667 and after 5 treatment sessions it reduced to 1.4333. There is highly significant decrease in pain score on VAS (p=0.0000). there was a statistically significant effect of treatment on GPI- the score on GPI reduced to 2.30 on the 5th day compared to the baseline.(p=0.0000)This improvement in function is correlated with reduction of pain.
Conclusion: We conclude that 5 treatment sessions of LASER as a monotherapy showed significant reduction in pain and improvement in function across patients with temporomandibular myofascial pain.

Key words: Temporomandibular myofascial pain, trigger point, helium-neon LASER

INTRODUCTION

Myofascial pain is a clinical syndrome of soft tissue pain arising from skeletal muscle. Although a specific criteria for diagnosis of Myofascial pain is evolving but it includes active trigger point on palpation, which is a discrete tenderness in a taut band of skeletal muscle and is associated with regional referred pain. [1]

Myofascial pain is the most common temporomandibular disorder (TMD). There are many synonyms for this condition namely- facial arthromyalgia, TMJ dysfunction syndrome, Myofascial pain dysfunction syndrome, craniomandibular dysfunction, pain dysfunction syndrome (PDS) and Myofascial pain dysfunction. [2]

Etiology of Myofascial pain is multifactorial and hence there are multiple therapies that are diverse in nature have been tried for the treatment. Different types of treatment include occlusal splints, physiotherapy, muscle relaxing appliances and pharmacological interventions. In physical therapy various exercise and electro therapy modalities have been used to treat Temporomandibular Myofascial pain. [3]

A comparative evaluation of four different physiotherapy treatment and placebo in management of TMJ PDS was done, and 4 methods namely SWD, mega pulse, US and soft LASER were used. There was no statistical difference in success rate between any of the four tested modality although each individual therapy was better than placebo. LASER therapy is widely used in treatment of all kinds of soft tissue injuries. LLLT has been clinically proven to be superior in all forms of pain therapy. In comparative application, it is better than medications, other electrotherapy modalities etc. and also does not have some of the severe side effects as do other forms of treatment. [4]

Considering theories of etiology of trigger points i.e., integrated hypothesis, [5] we feel that LASER might prove to be effective in Temporomandibular Myofascial pain cases.

The literature says minimally LLLT has to be given 2 times a week for a minimum of 2 weeks, but we wanted to find what is the effect of short term laser therapy when given continuously for 5 sessions without gap, as it is quoted in the literature that anti-inflammatory effect is highly significant after 5 days with daily laser treatment. [6]

It was reported in some trials that doses lower than 0.1J/cm^2 did not produce significant results, while doses in excess 4.5J/cm^2 and a power density higher than 10mw/cm produced inhibitory effect on fibroblast metabolism and collagen production. A dosage of 2-4 J/cm^2 is appropriate. [7]

Visual analogue scale has been proved to be reliable and valid across a large range of population, [8-11] Global Pain Impact scale has been used widely for assessment of impact of pain on global functional ability related to jaw movements. [12]

Hence, this study was undertaken to see the effect of helium-neon LASER on temporomandibular Myofascial pain and function across TMJ when LASER used as monotherapy.

MATERIALS AND METHODS

A convenient sample of 30 patients referred by S D M College of Dental Science with a complaint of Temporomandibular Myofascial pain was included in the study. Ethical clearance was obtained from the ethical clearance committee of SDM College of Medical Sciences and Hospital and Institute prior to the study.

Inclusion criteria; subjects of either sex referred by dentist for temporomandibular myofascial pain

Exclusion criteria: local- any neoplasm, hemorrhage, sensory affection, infection, neurological and vascular impairment. General- patients on medication for pain (analgesics and anti-inflammatory drugs)

All subjects with temporomandibular Myofascial pain were assessed and referred from dentist, and those who fulfilled inclusion criteria were selected and subjects were taken up for the study. The procedure was explained to all the subjects. A written consent of all the subjects was taken.

Masseter, temporalis and the pterygoid muscles were palpated for the trigger points. Before the start of the treatment the patients is instructed / explained about the nature of treatment and duration of treatment. Subjects were made to lie down on the plinth in side lying position.

The LASER dose was calculated by marking the trigger point area , across a transparent sheet and number of squares of 1 cm X 1cm were noted by placing the transparent sheet across a graph paper and an appropriate dose of 2-4 J /cm^2 [13,14] was calculated by using the formula, [14]

$D = I \times t$ (J/CM^2)

$I = P/A$ (W/cm^2)

D= dose, I= intensity= time (seconds), P=power in watts, A=area in cm^2

A pulsed mode of 30-40 HZ was used, [13] The patient received continuous LASER therapy for 5 days treatment session. [6] Pre and post treatment VAS and GPI were noted.

RESULTS

Statistical analysis: after collection of data, it was analyzed using statistical package SPSS and paired t-test

Table 1: Distribution of the study subjects by age and gender

GENDER	NUMBER	MEAN AGE IN YEARS (SD)
Males	12	30±(5.54)
Females	18	27.33±(5.63)
Total	30	28.40±(5.65)

Table 2: Distribution of study subjects by muscle involved

Muscle Involved	TOTAL	%
MASSETER	25	83.33%
TEMPORALIS	5	16.67%
TOTAL	30	100

TABLE 3: Mean and standard deviation values of effect of treatment on vas on 0 and 5 thday

Period	MEAN(SD)	t-value	p-value	Significance
0 DAY	6.6667±(1.6046)			
5th DAY	1.4333±(1.5466)	20.3802	0.0000	S

TABLE 4: Mean and Standard Deviation Value of Effect of Treatment on GPI Scale On 0 and 5th Day

Period	MEAN(SD)	t-value	p-value	Significance
0 DAY	3.2000±(0.8052)			
5th DAY	2.3000±(0.8367)	8.1154	0.0000	S

DISCUSSION

Table 1 shows demographic data of subjects who participated in the study. The mean age of subjects who participated in the study was (28.40) years.

The masseter is most frequently involved muscle; the temporalis is next most commonly involved muscle. Table 2 shows distribution of study subjects by muscle involved, out of which masseter was involved in 25 subjects (M=11, F=14) which correlates with statement as quoted above.

Table 3 shows mean and standard deviation values of effect of treatment on VAS on 0 and 5th day. The mean of VAS on 0 day was 6.6667 and after 5 treatment sessions it reduced to 1.4333. There is highly significant decrease in pain score on VAS (p=0.0000).

It has been shown that low level LASER therapy improves microcirculation and it can also improve oxygen supply to hypoxic cell in trigger point area and at the same item it can remove the collected waste products. The normalization of microcirculation obtained due to LASER application interrupting the 'circulus vitiosus" of the origin of the pain and its development. [15]

Walker in her previously reported study on chronic pain patients, found an increase in urinary excretion of 5-hydroxy indoleacetic acid (5-HIAA), a metabolite of 5-HT in those patients experiencing pain relief s a result of LASER treatment (walker, 1983). Altered serotonin metabolism would apparently represent one potential neuropharmacological substrate of LASER mediated analgesia.

Substance which has been closely associated with pain modulation is serotonin (5HT) as endogenous amino acid which has also been implicated in regulations of temperature, mood and particularly depression, increase in levels of 5HT in brain have been correlated with pain relief (Mannheimer and Lampe). [13]

According to motor end plate hypothesis, the motor nerve synapse with a muscle cell at motor endplate. Needle EMG studies have found that each trigger point contains minute loci that produce characteristic electrical activity (Hubbard and Breakoff, 1993). The loci are predominantly located at the motor end plate (Simon 2001; Simoni et al 2002).
The endplate noise seen on EMG is thought to represent an increased release of acetylcholine (Ach) from the nerve terminals.

A small amount of activity at the motor end plate is not enough to cause muscle contraction but can result in action potential being propagated to a small distance along the muscle cell membrane. This small amount of propagation may be enough to cause activation of few contractile elements and can be responsible for some degree of muscle shortening. [16]

Acetylcholine is widely distributed through the central and the particularly the PNS notably at NMJ of parasympathetic nervous system. ACH has been recognized as a potent algesic agent in experimental studies. A number of animal studies have shown significant effects on cholinergic system after low power LASER irradiation.

Lupyr and Sergienko (1986) found increased acetylcholine esterase activity in the spinal cord after irradiation with He-Ne system. Interestingly direct irradiation of the organs involved, produced no such change in metabolism, neither were these seen in blood erythrocytes during LASER treatment. This provide evidence of the capacity of LASER to produce significant neurochemical effects at sites and distant to point of irradiation. [13]

"LLLT is effective in treatment of Myofascial trigger point in neck, upper trunk and cervical region". [17] This study shows LLLT is effective in treatment of trigger points in temporomandibular region also.

Table 4 shows mean and standard deviation values of effect of treatment on GPI scale on 0 and 5th day which shows 0 day (3.20) which reduce to (2.30) on 5th day. This improvement in function is correlated with reduction of pain.

CONCLUSION

We conclude that 5 treatment sessions of LASER as a monotherapy showed significant reduction in pain and improvement in function across patients with temporomandibular myofascial pain.

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