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ORIGINAL RESEARCH

Therapeutic Evaluation of Cervical Dysfunction in Patients with Myofascial Pain Dysfunction Syndrome: A Prospective Study

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ABSTRACT

Aim: The aim of this study was to find out the therapeutic correlation between cervical dysfunction and myofascial pain dysfunction syndrome (MPDS).

Materials and methods: The study included 46 patients out of which 23 had MPDS with cervical pain (group I), and 23 patients had only MPDS (group II). Detailed history and examination of the patients were carried out, and the factors taken into consideration were pain and tenderness of muscles of mastication and neck muscles, maximum comfortable mouth opening, and cervical range of motion. All the patients were randomly divided and advised physical exercises, light amplification by stimulated emission of radiation (LASER) therapy, and the combination of both exercise and LASER. Patients were assessed for the relief of signs and symptoms of myofascial pain and cervical pain posttreatment, every month for 2 months.

Results: Both the groups showed a similar response to all the different treatment modalities. In group I, the patients also had relief in their cervical pain although the treatment was directed for MPDS. Patients from both the groups who were advised LASER and combination of both exercise and LASER showed better response in terms of reduction in visual analog scale, number of tender muscles, and increased maximum comfortable mouth opening posttreatment and during the follow-up, as compared with the patients who were advised only exercise.

Conclusion: Patients having cervical pain showed significant improvement comparable with patients having no cervical pain. Hence, the conclusion drawn was that there is a positive interrelationship between MPDS and cervical (neck) pain; MPDS may act as a catalyst for precipitating cervical pain.

Clinical significance: Cervical pain showed significant improvement to physiotherapy in the form of exercise, LASER, and combination treatment, though the effective modality was LASER and combination of exercise and LASER therapy.

Keywords: Cervical dysfunction, Exercises, Light amplification by stimulated emission of radiation, Myofascial pain dysfunction syndrome.

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INTRODUCTION

Temporomandibular joint (TMJ) cannot be looked at in isolation. It is a member of a complex system (stomatognathic) where it contributes to allow a myriad of vital functions to occur. That system includes bones (skull, mandible, hyoid clavicle, and sternum), joints, ligaments, and muscles (including the tongue) that stabilize and control these joints, vascular, lymphatic, and neurological system. All these structures need to work in tandem to allow an individual to speak, eat, swallow, breathe, smile, laugh, etc.[1,2]

Myofascial pain dysfunction syndrome (MPDS) is one of the most common causes of chronic pain in orofacial region.[1,2] It is the most common form of temporomandibular disorders that primarily involve the muscles of mastication. In case of referred pain, it involves different regions, e.g., ear, forehead, temples, back of the head, cervical spine, and shoulder girdle, as well as in the thoracic, lumbar, and sacral spine or legs.[3,4]

There is a documentation of interconnection between neuroanatomy and neurophysiology and its effects on orofacial area.[5,6] It is noted that change in craniocervical junction can alter the occlusion patterns and jaw position. It is also noted that the masticatory system can influence the position of the craniocervical junction. Thus, myofascial dysfunction may lead to compensatory changes in the craniocervical posture and develop the neck pain.[5]

The aim of this study was to find the therapeutic correlation between cervical dysfunction and MPDS and to check for the relief from the symptoms of cervical dysfunction by treating myofascial pain with three treatment modalities.

MATERIALS AND METHODS

This study was conducted in the Department of Oral Medicine and Radiology, Vidya Shikshan Prasarak Mandals (VSPM) Dental College and Research Center, Nagpur, in collaboration with VSPM's College of Physiotherapy and Department of Orthopedics, NKP Salve Institute of Medical Sciences and Research Center after obtaining permission from the Institutional Ethics Committee. The study included total 46 patients (28 females and 18 males) in the age range of 15 to 60 years, 23 having MPDS with cervical pain and the other 23 patients with only MPDS but no cervical pain (groups I and II). Again, they were divided into three subgroups according to treatment modalities (subgroups A, B, and C). In subgroup A, there were 6 patients; in subgroup B, 10 patients; in subgroup C, 7 patients.

Only those patients who fulfilled at least three out of five of the following criteria (Laskin's criteria) for MPDS were included in the study[7]:

- Unilateral or bilateral pain in preauricular region
- Tenderness of one or more muscles of mastication (Masseter, Temporalis, Medial Ptergyoid, and Lateral Ptergyoid) on palpation
- Limitation or deviation of mandible on opening
- Bruxism
- Clicking or popping noises in the TMJ

For cervical pain:[8]

- Pain and tenderness in muscles of neck (sternocleidomastoid, longus colli, splenius capitis, and upper trapezius),
- Presence of pain on following motions – flexion, extension, right and left rotation, and right and left flexion,
- Tenderness on base of skull, spinous processes.

None of our patients had any neurological deficit.

The patients with congenital anomalies of TMJ, history of trauma, and any other diseases causing TMJ pain, congenital or degenerative changes of the spine were excluded from the study.

All patients in group I were also examined by an orthopedician to rule out any cervical deformity.

The patients were evaluated for the following parameters before, during, and after treatment – intensity of pain, palpation of muscles, maximum mouth opening (MMO).

- Observation of pain intensity at rest, on movement of jaw was assessed by visual analog scale (VAS) on 1st, 30th, and 60th day
- Measurement of MMO on 1st, 30th, and 60th day by digital vernier caliper.

Grade of tenderness in various muscles at 1st, 30th, and 60th day.[7] Palpation of muscle (grading based on scale for grades of tenderness):

Grade 0: No pain
Grade 1: Mild pain
Grade 2: Moderate pain
Grade 3: Severe pain

All the muscles of mastication and muscles of the neck and back were examined for tenderness by pressing on a specific site for the particular muscle using the fingertips of the index and third fingers or the spade-like pad of the distal phalanx of the index finger only with standardized pressure. Resistance testing and bitestick testing were also done.[7]

All the patients were randomly divided to receive therapy from one of the three modalities, i.e., physical exercises, light amplification by stimulated emission of radiation (LASER), and combination of both. Patients were assessed for the relief of signs and symptoms of myofascial pain post treatment, every month for 2 months.

- *Subgroup I*: Patients were advised to do TMJ exercises for 30 days. The TMJ exercises included opening, protrusion, and lateral excursion movement against resistance. For neck pain, exercises included were for strengthening of the neck and upper back muscles. Patients were advised to perform each type of exercise 10 times twice a daily. All the patients were guided and taught exercises.
- *Subgroup II*: In this group, the patients were treated with LASER therapy, which was given in 10 sessions for 30 days, 3 sessions/week (alternate day), and each session for 9 minutes. A LASER device with a wavelength of 632.8 nm used at output of 4 J/cm^2 was used.
- *Subgroup III*: In these patients, combination of both exercise and LASER therapy as mentioned for groups I and II patients was given.

Statistical Analysis

Statistical analysis was performed using Wilcoxon signed-rank test, paired t-test, and *Z*-test.

RESULTS

Out of 46 patients in this study, 28 (60.87%) were females and 18 (39.13%) were males. The maximum number of symptomatic patients was found in the age range of 20 to 29 (43.48%) years.

The data relating to extent of pain and grade of tenderness were generated on ordinal scale, while range of mouth opening was obtained on real scale. Accordingly, statistical tests were applied to evaluate the objectives stated above. As regards intensity of pain, nonparametric Wilcoxon signed-rank test was used to determine the significance of difference in the extent of pain at time point's 30th and 60th day with reference to the 1st day in all treatment modalities in both the groups. The same test was applied to determine the significance of change in the grade of tenderness with time. The significance of difference in read-only memory (ROM; measured in millimeters) was determined using paired t-test.

Z-test was used to determine the association between regional involvement of pain in patients at 1st and 60th day and groupwise.

The scores on VAS [mean and standard deviation (SD)] on 30th, 60th day as compared with that of 1st day for pain at rest and on movement showed a significant reduction in all the three treatment modalities in both the groups, which is statistically significant (p-value <0.01) (Tables 1 and 2). It was observed that pain reduction was more in those patients who received LASER therapy as compared with those who received only exercise therapy. Furthermore, combination of exercise and LASER therapy was found to be better than exercise and LASER therapy when used independently (the difference was statistically significant) in both the groups. During the intergroup comparison, it was statistically not significant (Table 3).

Table 4 shows statistical significance of difference in the proportion of patients with particular region involvement at 1st and 60th day of treatment obtained by using *Z*-test. The results showed significant reduction in involvement of region as indicated by $p < 0.05$. As seen in Table 4, all 46 patients had pain in preauricular region, whereas 44, 35, and 23 patients had pain in temporal, cheek, and neck region respectively.

In this study, reduction in muscle tenderness was observed in all groups. The mean score at the time of diagnosis in groups I and II was 1.33, 1.50, 1.29 and 1.83, 1.50, 1.57 respectively. At the 60th day, in group I 0.41, 0.32, 00 and in group II 0 in all the three treatment modalities. It showed that combination of exercise and LASER therapy was better than exercise alone and LASER therapy alone (the difference was statistically significant) in both the groups.

Table 1: Comparison of parameters between 1st and 30th day according to treatments in MPDS + cervical and MPDS groups

			1st day	*30th day*		
Parameter	*Group*	*Type of treatment*	*Mean ± SD*	*Mean ± SD*	*p-value*	*Significance*
Pain in rest condition	MPDS+cervical	Exercise	5.00 ± 1.79	2.67 ± 2.50	0.0340	S
		LASER	5.20 ± 0.92	2.10 ± 1.52	0.0055	S
		Exercise + LASER	5.43 ± 1.27	2.00 ± 1.53	0.0201	S
Pain on VAS on movement		Exercise	6.33 ± 1.51	3.50 ± 2.88	0.0335	S
		LASER	6.80 ± 1.14	3.60 ± 1.43	0.0056	S
		Exercise + LASER	6.57 ± 1.72	3.14 ± 1.68	0.0220	S
ROM of mouth opening		Exercise	34.50 ± 4.32	35.33 ± 3.44	0.3711	NS
		LASER	28.60 ± 6.77	32.60 ± 5.87	0.0142	S
		Exercise + LASER	24.00 ± 4.58	28.57 ± 3.05	0.0215	S
Grade of tenderness		Exercise	1.33 ± 0.52	0.17 ± 0.41	0.0263	S
		LASER	1.50 ± 0.53	0.10 ± 0.32	0.0046	S
		Exercise + LASER	1.29 ± 0.76	0.00 ± 0.00	0.0147	S
Pain in rest condition	MPDS	Exercise	4.83 ± 1.94	2.17 ± 2.23	0.0350	S
		LASER	4.90 ± 1.79	1.90 ± 0.74	0.0087	S
		Exercise + LASER	1.79 ± 0.76	2.29 ± 0.76	0.0179	S
Pain on movement		Exercise	7.33 ± 0.82	3.17 ± 2.32	0.0355	S
		LASER	6.90 ± 1.66	3.40 ± 2.01	0.0092	S
		Exercise + LASER	6.86 ± 1.07	3.00 ± 1.00	0.0211	S
ROM of mouth opening		Exercise	26.17 ± 8.04	27.50 ± 7.01	0.1975	NS
		LASER	27.00 ± 5.83	29.30 ± 4.57	0.0240	S
		Exercise + LASER	25.86 ± 11.52	27.14 ± 9.89	0.2837	NS
Grade of tenderness		Exercise	1.83 ± 0.41	0.17 ± 0.41	0.0305	S
		LASER	1.40 ± 0.52	0.10 ± 0.32	0.0074	S
		Exercise + LASER	1.57 ± 0.53	0.00 ± 0.00	0.0192	S

NS: Non significant; S: Significant

Table 2: Comparison of parameters between 1st and 60th day according to treatments in MPDS + cervical and MPDS groups

Parameter	*Group*	*Type of treatment*	*1st day mean ± SD*	*60th day mean ± SD*	*p-value*	*Significance*
Pain in rest condition	MPDS + cervical	Exercise	5.00 ± 1.79	1.67 ± 2.66	0.0355	S
		LASER	5.20 ± 0.92	0.70 ± 1.34	0.0054	S
		Exercise + LASER	5.43 ± 1.27	0.71 ± 1.50	0.0206	S
Pain on VAS on movement		Exercise	6.33 ± 1.51	2.50 ± 3.08	0.0350	S
		LASER	6.80 ± 1.14	0.90 ± 1.37	0.0056	S
		Exercise + LASER	6.57 ± 1.72	0.86 ± 1.46	0.0220	S
ROM of mouth opening		Exercise	34.50 ± 4.32	35.17 ± 4.07	0.1736	NS
		LASER	28.60 ± 6.77	32.50 ± 7.37	0.0574	NS
		Exercise + LASER	24.00 ± 4.58	29.14 ± 3.67	0.0223	S
Grade of tenderness		Exercise	1.33 ± 0.52	0.17 ± 0.41	0.0263	S
		LASER	1.50 ± 0.53	0.10 ± 0.32	0.0046	S
		Exercise + LASER	1.29 ± 0.76	0.00 ± 0.00	0.0147	S
Pain in rest condition	MPDS	Exercise	4.83 ± 1.94	1.50 ± 1.97	0.0340	S
		LASER	4.90 ± 1.79	1.00 ± 1.15	0.0057	S
		Exercise + LASER	1.79 ± 0.76	0.71 ± 0.95	0.0213	S
Pain on movement		Exercise	7.33 ± 0.82	2.17 ± 2.04	0.0355	S
		LASER	6.90 ± 1.66	1.40 ± 1.78	0.0057	S
		Exercise + LASER	6.86 ± 1.07	1.00 ± 1.41	0.0218	S
ROM of mouth opening		Exercise	26.17 ± 8.04	28.50 ± 7.64	0.0579	NS
		LASER	27.00 ± 5.83	30.20 ± 5.43	0.0247	S
		Exercise+LASER	25.86 ± 11.52	28.71 ± 9.84	0.0545	NS
Grade of tenderness		Exercise	1.83 ± 0.41	0.00 ± 0.00	0.0263	S
		LASER	1.40 ± 0.52	0.00 ± 0.00	0.0074	S
		Exercise+LASER	1.57 ± 0.53	0.32 ± 0.00	0.0192	S

NS: Non significant; S: Significant

There was significant increase in mouth opening (mean and SD value) with reference to 1st day in group I (MPDS with cervical pain) in all the three treatment modalities, but the difference was statistically significant in combination of exercise and LASER therapy (24.00–29.14 mm) and in group II (MPDS) only LASER 27.00 to 30.20 mm was statistically significant. On intergroup comparison, it was statistically not significant.

DISCUSSION

The term MPDS is used to describe a condition with dull aching, radiating pain associated with tenderness of muscles as well as TMJ. Myofascial pain dysfunction syndrome causes mandibular dysfunction that generally leads to limitation in jaw opening along with deviation, presence of trigger points, and clicking or popping noises in the joints.[3]

The intimate relationship between cervical spine and the masticatory system through joint articulations, muscle attachments, and neural and vascular innervations is very well known.

According to Nicolakis et al,[9,10] it is postulated that posture of cervical spine and electromyographic activity of the masseter and temporalis muscles is interrelated.

Shrinivas et al[8] found 12 (50%) MPDS patients suffering from craniocervical dysfunction. According to them, MPDS in TMJ region can be caused by craniocervical dysfunction and alternatively crániocervical dysfunction can be caused by MPDS in TMJ region.

Study done by Okade et al[4] showed that cervical dysfunction may be one of the extrinsic etiologic factors for MPDS where they advised various physiotherapy modalities to the patients. The finding of this study is not in accordance with that of Okade et al. This study was based on the above assumption; therefore, in the two groups, one with cervical pain and the other without cervical pain, the treatment was directed to treat the regional symptoms of MPDS and no other specific treatment was given for cervical pain.

In this study, three treatment modalities were used for both the groups: Exercise, LASER, combination of two. Both the groups showed a significant improvement in all the parameters, although better response was seen when LASER was used either alone or in combination with exercise.

When intergroup comparison was done, it was found that for all the treatment modalities, there was no statistically significant (Table 3) difference between two groups, all the patients having cervical pain also had significant relief.

The efficacy of exercise therapy in reducing pain in MPDS and cervical (neck) pain in, MPDS observed in this study is similar to the observations made by Nicolakis et al[8-13] and Michelotti et al.[14,15]

Table 3: Comparison of parameters between MPDS + cervical and MPDS groups according to treatments at 1st, 30th, and 60th day

			MPDS + cervical			*MPDS*				
Day	*Parameter*	*Type of treatment*	*Mean*	*Median*	*SD*	*Mean*	*Median*	*SD*	*p-value**	*Significance*
1st	Pain in rest condition	Exercise	5.00	4.50	1.79	4.83	4.50	1.94	1.0000	NS
		LASER	5.20	5.00	0.92	4.90	5.00	1.79	0.6690	NS
		Exercise + LASER	5.43	5.43	1.27	1.79	6.00	0.76	0.5827	NS
	Pain on VAS on movement	Exercise	6.33	6.00	1.51	7.33	7.50	0.82	0.4902	NS
		LASER	6.80	7.00	1.14	6.90	7.00	1.66	0.8286	NS
		Exercise + LASER	6.57	7.00	1.72	6.86	7.00	1.07	1.0000	NS
	ROM of mouth opening	Exercise	34.50	34.50	4.32	26.17	28.00	8.04	0.1563	NS
		LASER	28.60	28.50	6.77	27.00	25.00	5.83	0.6740	NS
		Exercise + LASER	24.00	25.00	4.58	25.86	22.00	11.52	1.0000	NS
	Grade of tenderness	Exercise	1.33	1.00	0.52	1.83	2.00	0.41	0.2330	NS
		LASER	1.50	1.50	0.53	1.40	1.00	0.52	0.7656	NS
		Exercise + LASER	1.29	1.00	0.76	1.57	2.00	0.53	0.4237	NS
30th	Pain in rest condition	Exercise	2.67	2.00	2.50	2.17	1.00	2.23	1.0000	NS
		LASER	2.10	2.50	1.52	1.90	2.00	0.74	0.7150	NS
		Exercise + LASER	2.00	2.00	1.53	2.29	2.00	0.76	0.6653	NS
	Pain on movement	Exercise	3.50	3.50	2.88	3.17	3.50	2.32	1.0000	NS
		LASER	3.60	3.50	1.43	3.40	3.00	2.01	0.7865	NS
		Exercise + LASER	3.14	4.00	1.68	3.00	3.00	1.00	0.6707	NS
	ROM of mouth opening	Exercise	35.33	35.50	3.44	27.50	27.50	7.01	0.0926	NS
		LASER	32.60	33.50	5.87	29.30	27.50	4.57	0.2065	NS
		Exercise + LASER	28.57	28.00	3.05	27.14	24.00	9.89	0.5534	NS
	Grade of tenderness	Exercise	0.17	0.00	0.41	0.17	0.00	0.41	1.0000	NS
		LASER	0.10	0.00	0.32	0.10	0.00	0.32	1.0000	NS
		Exercise+LASER	0.00	0.00	0.00	0.00	0.00	0.00	–	–
60th	Pain in rest condition	Exercise	1.67	1.00	2.66	1.50	0.50	1.97	1.0000	NS
		LASER	0.70	0.00	1.34	1.00	0.50	1.15	0.7463	NS
		Exercise + LASER	0.71	0.00	1.50	0.71	0.00	0.95	0.8539	NS
	Pain on movement	Exercise	2.50	1.50	3.08	2.17	2.00	2.04	1.0000	NS
		LASER	0.90	0.00	1.37	1.40	0.50	1.78	0.5992	NS
		Exercise + LASER	0.86	0.00	1.46	1.00	0.00	1.41	1.0000	NS
	ROM of mouth opening	Exercise	35.17	36	4.07	28.50	30	7.64	0.1411	NS
		LASER	32.50	34.50	7.37	30.20	28.50	5.43	0.4409	NS
		Exercise + LASER	29.14	2.00	3.67	28.71	2.00	9.84	1.0000	NS
	Grade of tenderness	Exercise	0.17	0.00	0.41	0.00	0.00	0.00	1.0000	NS
		LASER	0.10	0.00	0.32	0.00	0.10	0.00	1.0000	NS
		Exercise + LASER	0.00	0.00	0.00	0.32	0.00	0.00	–	–

Table 4: Number of patients with different regions at 1st and 60th day of treatment and significance of difference between the proportions for regional involvement

	Region			
Time	*Temporal*	*Preauricular*	*Cheek*	*Neck*
1st day	44	46	35	23
60th day	13	16	6	6
p-value*	<0.0001	<0.0001	<0.0001	<0.0013

*$p < 0.05$, thereby indicating statistically significant difference in proportion of patients getting relief

Azizi et al[2] observed highly significant reduction in pain in TMJ but not in the neck muscles with laser therapy, and they also recommended that, if there is no relief from pain and tenderness in the neck region, a longer duration of treatment and correction of head and neck position may be required.

But in our study, we found a significant improvement in neck muscle pain along with TMJ muscles. Santos et al,[16] Kogawa et al,[17] Kato et al,[18] Emshoff et al,[19] Venancio Rde et al[20] observed significant pain reduction using LASER therapy. The present study gives some evidence that by treating TMJ muscle we can eliminate cervical pain as well. The study needs to be carried out using a large sample size so as to form a proper treatment protocol.

CONCLUSION

This study was undertaken with the objective of therapeutic evaluation of cervical dysfunction in MPDS. Cervical pain showed significant improvement to physiotherapy

in the form of exercise, LASER, and combination treatment, though the effective modality was LASER and combination of exercise and LASER therapy. Hence, the conclusion drawn was that there is a positive interrelationship between MPDS and cervical (neck) pain. It has been found that MPDS acts as a catalyst for precipitating cervical pain.

CLINICAL SIGNIFICANCE

Cervical pain showed significant improvement to physiotherapy when it is given only for MPDS. It suggests that there is a positive interrelationship between MPDS and cervical (neck) pain.

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