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A comparative assessment of ultrasound heat therapy and low-level laser therapy in management of temporomandibular joint disorders

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ABSTRACT

Background: Temporomandibular disorders (TMD) are considered by the presence of temporomandibular joint (TMJ) and/or masticatory muscle dysfunction and pain. Present study aimed to comparatively evaluate ultrasound heat therapy and low-level laser therapy in management of temporomandibular joint disorders (TMDs). *Materials & Methods*: Sixty patients having temporomandibular joint disorders (TMDs) were divided into 2 groups. Group I was LLLT group with 30 patients and group II was TMDs with 30 patients. VAS scale was used for pain assessment and mouth opening was also measured before therapy and after therapy. *Results*: In group I LLLT and in group II ultrasound therapy was used. There were 16 males and 14 females in group I and 18 males and 12 females in group II. The mean pre-therapy mouth opening in group I was 3.89 cm and in group II was 4.15 cm. Post-therapy mouth opening in group I was 3.72 cm and in group II was 4.02 cm. The difference was non- significant (P> 0.05). The mean pre- therapy VAS in group I was 8.12 cm and in group II was 4.20. Post- therapy mouth opening in group I was 7.12 and in group II

was 5.24. The difference was significant (P< 0.05). *Conclusion*: Authors found that LLLT is effective method for treating TMDs in terms of achieving maximum mouth opening and reducing pain.

Keywords: Mouth opening, TMDs, LLLT

1. INTRODUCTION

Temporomandibular joint disorders (TMDs) encompass of numerous complaints concerning the masticatory muscles, the temporomandibular joint (TMJ) and the associated structures (Baker et al, 2001). There is restriction of mouth opening, asymmetrical jaw movements, and clicking TMJ sounds. Masseter and temporalis are frequently involved muscles of mastication however medial pterygoid and lateral pterygoid are least involved. Sensitivity over TMJ area and abnormality of mouth while opening and closing mouth limits normal activities such as speaking, eating, drinking and yawning etc., (Madani et al., 2014). Most of the patients need symptomatic treatment. Inadequate mouth opening, hot and cold fomentation and soft tissue diet is desirable. Other advantageous remedies are moist heat, ultrasound, exercises, laser, microwave, transcutaneous electrical nerve stimulation (TENS), and manual therapy. All these treatments help in decreasing pain by weakening musculoskeletal load. Inflammation around the joints is also decreased thus warranting regular joint function such as movement, strength, and resistance (Cairns, 2010).

Ultrasound heat treatment is very strong and competent in patients with TMDS. Heat of ultrasound therapy infiltrate into deeper tissues (Panga, 2011). This carries blood, oxygen and nutrients to the joint region. Low-level laser therapy (LLLT) is another technique that operates coherent and monochromatic light of a single wavelength. The mechanism of action is through photobiology or bio-stimulation leading to cell modification and tissue functions (Rashid, 2013). These low level lasers function on the mitochondria and decline cellular oxygen consumption by stimulating mitochondria to harvest more adenosine triphosphate (ATP). The reduction in intensity of pain is produced by reducing prostaglandin (PGE 2) and interleukin (IL-1) beta levels and elevating endorphin and serotonin levels (Singh, 2013). This study compared ultrasound heat therapy and low-level laser therapy in management of temporomandibular joint disorders (TMDs).

2. MATERIALS & METHODS

This study was conducted among 60 patients having temporomandibular joint disorders (TMDs) of both genders visiting to outpatient department from June 2019 to December 2019. Patients giving consent and not on any medication for TMDs were included. All included patients were informed and their consent was obtained. Ethical approval (Ethical approval code- BCDS/DEAN/2020/1846) was taken before hand.

Data pertaining to patients such as name, age, gender etc. was recorded. Patients were randomly divided into 2 groups. Group I was LLLT group with 30 patients and group II was TMDs with 30 patients. In group I patients LLLT (660-nm laser light) was used on TMJ region for 3 minutes at 2.2 Joules per minute. The beam was delivered through a handheld single probe. In group II, ultrasound therapy (Bionics Innovation Unit) for 10 minutes at 1.8 w/cm^2 with frequency of 1 MHz and wavelength of 1.5 mm in the continuous mode per session was used. All patients were taught to have soft diet and limited mouth opening. VAS scale was used for pain assessment where 0 was no pain and 10 was worst pain. Mouth opening was also measured before therapy and after therapy by measuring vertical distance between maxillary and mandibular incisors. Results were tabulated and analysed using chi- square test. P value less than 0.05 was considered significant.

3. RESULTS

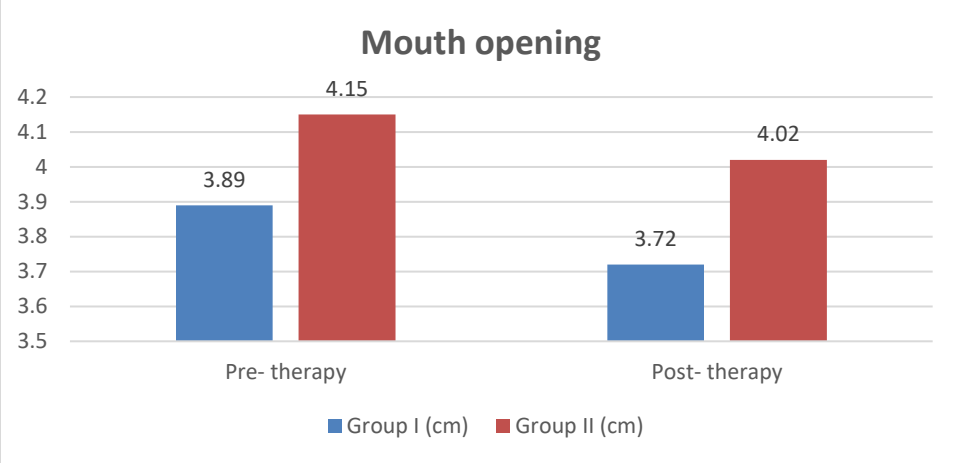
Table 1 Distribution of patients

Groups	Group I	Group II
Methods	LLLT	Ultrasound therapy
Female	16	18
Male	14	12

Table 1 shows that in group I LLLT and in group II ultrasound therapy was used. There were 16 males and 14 females in group I and 18 males and 12 females in group II. Table 2, graph 1 shows that mean pre- therapy mouth opening in group I was 3.89 cm and in group II was 4.15 cm. Post- therapy mouth opening in group I was 3.72 cm and in group II was 4.02 cm. The difference was non-significant (P> 0.05).

Table 2 Comparison of mouth opening in both groups

Groups	Group I (cm)	Group II (cm)	P value
Pre- therapy	3.89	4.15	0.88
Post- therapy	3.72	4.02	0.87
P value	0.91	0.84	

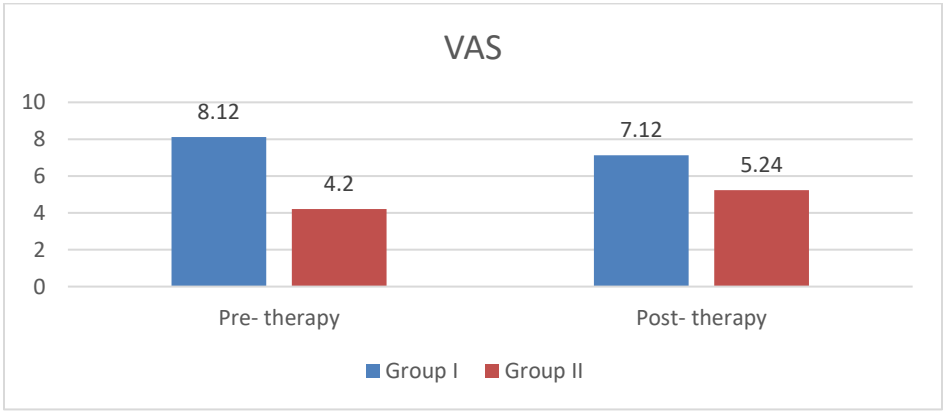


Graph 1 Comparison of mouth opening in both groups

Table 3 Comparison of VAS in both groups

Groups	Group I	Group II	P value
Pre- therapy	8.12	4.20	0.01
Post- therapy	7.12	5.24	0.04
P value	0.94	0.81	

Table 3, graph 2 shows that mean pre- therapy VAS in group I was 8.12 cm and in group II was 4.20. Post- therapy mouth opening in group I was 7.12 and in group II was 5.24. The difference was significant (P< 0.05).



Graph 2 Comparison of VAS in both groups

4. DISCUSSION

TMDs entail variety of disorders affecting TMJ, masticatory muscles, or both (Sellani, 2016). Chronic TMD-related pain is frequently poorly localized to the TMJ and masticatory muscles and may be transferred to neighboring oral, cranial, facial and cervical regions (Koneru et al., 2012). Most commonly, TMD causes piercing pain, inflammation of the adjoining muscles, posterior fibers and synovial fluid. Frequently one joint is involved. Occlusal in stabilities and psychological reasons such as stress and anxiety are factors contributing to TMD (Emshoff et al., 2008). This study compared ultrasound heat therapy and low-level laser therapy in management of temporomandibular joint disorders (TMDs).

In present study, in group I, LLLT and in group II ultrasound therapy was used. There were 16 males and 14 females in group I and 18 males and 12 females in group II. Khairnar et al. (2019) compared low-level laser therapy (LLLT) and ultrasound heat therapy in TMD-related pain in 42 patients of both genders. All patients were given NSAIDS twice a day for 5 days. Fifteen sessions of LLLT (Group A) or ultrasound therapy (Group B) were directed to the affected side. It was found that the mean visual analog scale score was 4.81 for group A and 6.19 for group B post therapy respectively. It was evident that the mean mouth opening for group A and group B was 3.99 and 3.65 respectively; the difference was statistically significant and supporting the LLLT group.

We found that mean pre- therapy mouth opening in group I was 3.89 cm and in group II was 4.15 cm. Post-therapy mouth opening in group I was 3.72 cm and in group II was 4.02 cm. Shukla & Muthusekhar, (2016) revealed that there is prompt recovery, less pain and regular healing with LLLT and consequently, it is a valuable treatment modality in patients with TMDs. We found that mean pre-therapy VAS in group I was 8.12 cm and in group II was 4.20. Post- therapy mouth opening in group I was 7.12 and in group II was 5.24. Sayed et al. (2014) evaluated pain, tender points, joint sounds and jaw movements in TMD patients. The effectiveness of low level laser therapy (LLLT) in the treatment of temporomandibular disorders (TMD) in patients was checked with 6 sessions of LLLT with semiconductive diode laser (gallium arsenide; 904 nm, 0.6 W, 60 s, 4 J/cm^2) which was recorded before and immediately after each session and after 1, 2 weeks, 1, 3 and 6 months. Authors found that statistically significant results were achieved in all study parameters. Authors concluded that LLLT encouraged acceptable results in decreasing the pain intensity, joint sounds, number of tender points, and progress in the range of jaw motion. Hence it is an effective treatment method for TMDs.

The treatment of TMDs should be focused on severity of the disease, if it is localized to muscles, then muscle relaxant is effective in reducing pain while in patients with clicking or popping sound, use of LLLT and ultrasound is valuable. The short coming of the study is small sample size. The long follow up was not adopted.

5. CONCLUSION

Low-level laser therapy is effective method for treating TMDs for attaining maximum mouth opening and reducing pain. Nonetheless, careful assessment is suggested while adjudicating the results due to the self-limiting phase of musculoskeletal conditions such as TMD. Further long-term multicenter randomized controlled trial should be conducted which will help substantiate our findings more effectively.

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Authors' contribution

Dr Rashmi Kiran Ekka-: Research conceptualization and manuscript writing.
Dr Siddharth Saurabh: Study design and data analysis, manuscript writing.
Dr Suyash Vyas & Dr.Sandeep Thakur: Study design and Manuscript writing.
Dr.Shikha Rajput & Dr.Surabhi Chetana: Study design, statistical analysis and Manuscript writing

Conflict of Interest

The authors declare that they have no conflict of interest.

Informed Consent

Appropriate oral and signed consent was taken from the patient before writing this research paper.

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Data and materials availability

All data associated with this study are present in the paper.

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General Note

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