

A Study to Compare the Effects of Rocabodo's Exercises with Combination Therapy and Rocabodo's Exercises in Temporomandibular Joint Disorders

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Abstract: **Background:** The International association for the study of pain defines Temporomandibular Joint Disorder as “aching in the muscles of mastication, sometimes with occasional brief severe pain on chewing, often associated with restricted jaw movement and clicking or popping sounds.” **AIM-** To compare the effects of Rocabodo's exercises with Combination Therapy (U.S + TENS) and Rocabodo's Exercise on Pain and Range of Motion in Temporomandibular Joint Disorders. **Methodology:** 60 subjects were conveniently taken and divided into two groups- Group A ,Rocabodo's exercise along with Combination Therapy (Ultrasound + T.E.N.S) and Group B (Rocabodo's Exercises alone) for 4 weeks with duration of each session being 30mins. Subjects with Age Criteria 18-45 Years, limitation of mouth opening due to pain with VAS of 2 and more than that out of 10, Type I TMD based on Laskin's Criteria (unilateral pain, muscular tenderness, clicking or popping sounds and limitation of mouth opening) and acute Pain less than 4 weeks were included in the study. Exclusion criteria includes patients with the history of oral tumor, History of trauma to the TM Joint, Other problems related to the Masticatory System, Patients on Temporomandibular Joint Disorder drug use and Metal Implants in the oral cavity. The outcome measures used were Vernier Calliper and Visual Analogue Scale. **RESULTS-** Group A ,Rocabodo's exercise along with Combination Therapy (Ultrasound + T.E.N.S) and Group B (Rocabodo's Exercises alone) both showed significant improvements But, Group A showed more significant improvement than Group B. **Conclusion:** Group A, Rocabodo's Exercises done for five days per week for four weeks along with Combination Therapy prove to be more effective when given to patients with Type I TMD as compared to the patients who were only given Rocabodo's Exercises as a home program alone in Group B.

Keywords: Combination therapy, Rocabodo's exercises, temporomandibular joint disorders

1. Introduction

The International association for the study of pain defines Temporomandibular Joint Disorder as “aching in the muscles of mastication, sometimes with occasional brief severe pain on chewing, often associated with restricted jaw movement and clicking or popping sounds.”⁽²⁾ TM Joint disorder is a collective term embracing a number of clinical problems that involve the masticatory musculature; the TM Joint associated structures or both. Studies have shown the prevalence of 20%-85% of population in India and most common in the age groups of 20-40 years⁽²³⁾.

TM Joint Disorders are classified into Specific and Non-Specific Disorders⁽³⁾. Non-Specific TM Joint Disorders fall into 3 main categories. Type I also called as Myofascial pain Dysfunction Syndrome (MPDS) is the most common form of TMD⁽⁴⁾. MPDS is psycho physiologic disease that primarily involves the muscles of mastication⁽²⁴⁾. This Condition is characterized by the presence of the hypersensitive spots called as the trigger points as the maxillofacial region is the higher frequency area for developing the same⁽²⁶⁾. The most common signs and symptoms of TMD are joint sounds, limited mouth opening and muscle and joint tenderness⁽⁶⁾. According to the studies 50% of patients complaining of the head and neck pain has primary diagnosis of MPDS⁽²¹⁾. Physiotherapy is chosen for

the treatment of dysfunctions in the orofacial region for several reasons⁽³⁾. Rocabodo's 6×6 exercises has been widely utilised clinically and is present in scientific literature both as a group and as individual exercises⁽²²⁾. Studies have found that the rocabodo's exercises found to have a significant role in the improvement of TM Joint disorder by reducing pain and improving function⁽²³⁾.

Another treatment for TMD is Ultrasound and TENS Therapy. US is one of the most commonly used physical therapy modality for treating TM Joint Disorders⁽⁷⁾. It is known to accelerate healing, decrease joint stiffness, alleviate pain and reduce muscle spasm. TENS Therapy is also being used for the reduction of pain when applied to the nervous system and it is relatively safe and non-invasive⁽²¹⁾. From the previous literature little is known about combination therapy using U.S and TENS together in the treatment of myofascial trigger point pain. The application of two therapeutic modalities simultaneously at the same site is reported in the literature and is known as combination therapy. With this there is enhancement in the effect of one therapy upon the other thus making the combination more effective than either of the therapy alone⁽²⁹⁾. As there are limited studies on the effect of Rocabodo's exercises in TMJ Disorders. The literature also elicits lack of studies of Combination Therapy (U.S+TENS) in TMJ Disorders as U.S and TENS has been studied individually and found to be

effective. Very few studies studied both effect of U.S + TENS on pain and range of motion. Hence the need of this study is to combine the effect of Rocabodo's Exercises and Combination Therapy (U.S + TENS) on Pain and Range of Motion in Temporomandibular Joint Disorders.

2. Methodology

- 1) Type of Study: Experimental Study.
- 2) Type of Sampling: Convenient Sampling.
- 3) Sample Size: 60
- 4) Duration of Intervention: 4 Weeks.
- 5) Duration of Each Session: 30 minutes.

Inclusion Criteria:

- 1) Age Criteria 18-45 Years.
- 2) Limitation of mouth opening due to pain with VAS of 2 and more than that out of 10.
- 3) Type 1 TMD based on Laskin's Criteria (unilateral pain, muscular tenderness, clicking or popping sounds and limitation of mouth opening).
- 4) Acute Pain less than 4 weeks.

Exclusion Criteria:

- 1) Patients with the history of oral tumor.
- 2) History of trauma to the TM Joint.
- 3) Other problems related to the Masticatory System.
- 4) Patients on Temporomandibular Joint Disorder drug use.
- 5) Metal Implants in the oral cavity

Outcome Measures

- 1) Vernier Calliper: Validity of Vernier Calliper is 0.75
- 2) Visual Analogue Scale: Reliability of VAS for disability is moderate to good with a validity of 0.99

3. Procedure

The study was conducted after the approval from the ethical committee. The individuals were recruited based on the inclusion criteria. The consent form was signed by the individuals. The individual were conveniently divided into 2 Groups, Group A and Group B. Individuals were counseled and given all information about Temporomandibular Joint Disorders. Both the groups were assessed individually. Group A consisted of patients receiving Rocabodo's Exercises in combination of Combo Therapy [Ultrasound Therapy (U.S.) + Transcutaneous Electrical Nerve Stimulation (T.E.N.S) Ultrasound Therapy was given at 0.8 W/cm², Pulsed with a frequency of 1 Mhz using a 2 cm diameter transducer head for 5-7 min to affected side of Temporomandibular Joint and Masticator Muscles for 5 sessions/week for 4 weeks. A 2 electrode T.E.N.S machine was used. Conventional type of T.E.N.S was used for 15 min. One electrode was placed at the back of the ear stimulating the facial nerve along with sternocleidomastoid muscle at C3 dermatome and the other electrode was placed on the masticatory muscle lateral to the lip at its C2 dermatome. Both Ultrasound Therapy and T.E.N.S. were given simultaneously.

Rocabodo's Exercises were performed for five days per week for four weeks which consisted of the following exercises;

- 1) Tongue 'Clucking' – making a 'clucking' sound positions the tongue against the hard palate in the correct resting position for appropriate nasal and diaphragmatic breathing. Once the activity is practiced, the patient is to attempt to maintain appropriate tongue / jaw resting position throughout normal activity.
- 2) Controlled TMJ Rotation on Opening – Patients are taught to maintain their tongue on the hard palate while opening and closing the jaw.
- 3) Mandibular Rhythmic Stabilization – Patients apply resistance to opening, closing, and lateral deviation with the jaw in a resting position.
- 4) Axial Extension of the Cervical Spine – Patients perform cervical retraction movements, effecting upper cervical flexion at the same time as lower cervical extension. The goal is to normalize forward head posture.
- 5) Shoulder Girdle Retraction – Patients perform retraction and depression of the scapulae in relation to the rib cage.
- 6) Stabilization of head flexion - The subject was asked to stabilize the upper cervical spine by clasp hands together behind the neck over the cervical vertebrae. The subject was then asked to keep the head straight and nod the head forward. Frequency of these exercises were six times per day for five days per week for four weeks.

Group B consisted of patients doing only Rocabodo's Exercises only. Rocabodo's Exercises were same as explained in Group A. Frequency of these exercises were six times a day for five days per week for four weeks.

Rocabodo's Exercise



Mandibular Rhythmic Stabilization

Axial Extension of the Cervical Spine



Shoulder Girdle Retraction Stabilization of Head Flexion

Combination Therapy (Ultrasound+ T.E. N) given to TMJ and the Masticatory muscles

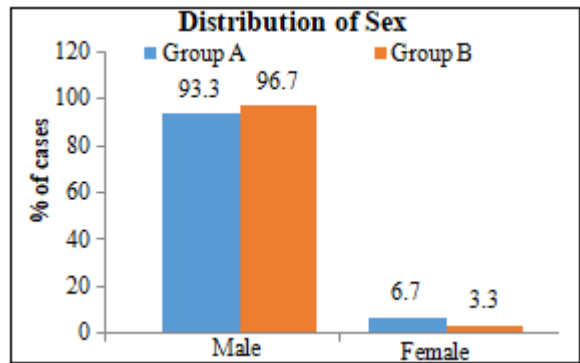


Figure 1 (a): The distribution of sex across two intervention groups (n=60)

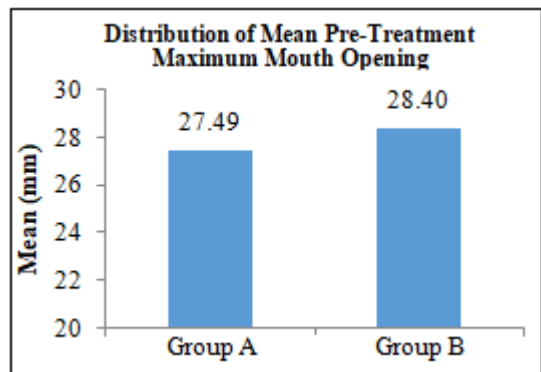


Figure 1 (b): The distribution of mean pre-treatment maximum mouth opening across two intervention groups (n=60)

4. Statistical Analysis and Results

Table 1: The comparison of baseline characteristics of the cases studied across two intervention groups (n=60).

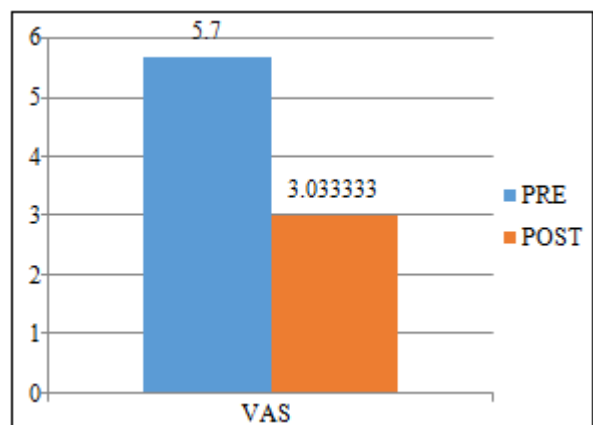
Characteristics	Group A (n=30)	Group B (n=30)	T-value / Chi-Square value	P-value
Age (years)	41.1 ± 4.5	37.3 ± 6.9	2.553	0.014*
Sex	Male	28 (93.3)	0.351	0.999 ^{NS}
	Female	2 (6.7)		
Pre-Treatment Pain Score (VAS)	5.70 ± 1.34	5.83 ± 1.37	-0.381	0.704 ^{NS}
Pre-Treatment Maximal Mouth Opening (mm)	27.49 ± 3.72	28.40 ± 3.30	-1.006	0.319 ^{NS}

Values on sex are n (% of cases), p-value for which is calculated using Chi-Square test. The rest of the values are Mean ± standard deviation (SD) and P-values for these characteristics are calculated using unpaired 't' test. P-value<0.05 is considered to be statistically significant. *P-value<0.05, **P-value<0.01, ***P-value<0.001, NS-Statistically Non-Significant

Table 2: Pre and Post Mean, SD and t- test paired pre and post 4 weeks of VAS and Maximal Mouth Opening in Group A

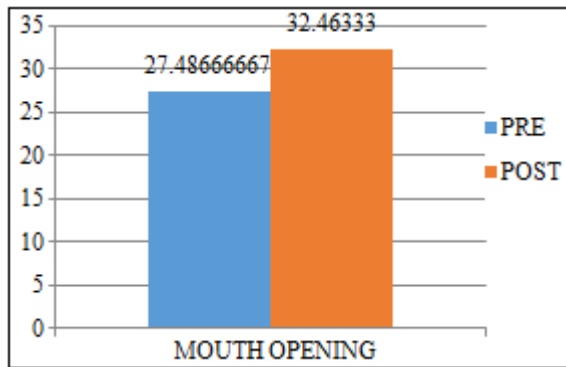
		Group A			interpretation of p value
	t-test paired two samples for mean	mean and SD	t-value	p value	
VAS	Pre	5.7	18.20	1.03E-17	Significant
	Post 4 Weeks	3.03			
MMO	Pre	27.48	-5.27	5.92E-06	Significant
	Post 4 Weeks	32.46			

There is a significant difference between VAS and MMO which were taken pre and post four weeks of intervention of Group A.



Graph 5: Pre and Post Mean of Visual Analogue Scale in Group A

In above graph pre intervention mean of VAS is 5.7 and post 4weeks intervention mean is 3.03. The graph shows significant improvement in VAS from pre and post 4 weeks of intervention in Group A.



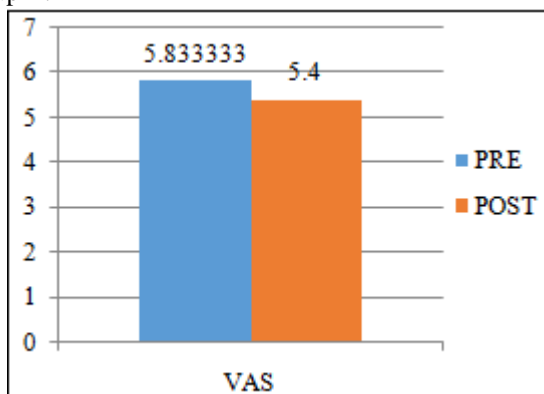
Graph 6: Pre and Post Mean of Maximal Mouth Opening (MMO) in Group A.

In above graph pre intervention mean of MMO is 27.487 and post 4weeks intervention mean is 32.46333. The graph shows significant improvement in MMO from pre and post 4 weeks of intervention in Group A.

Table 3: Pre and Post Mean of Visual analogue Scale and Maximal Mouth Opening and paired t- test pre and post 4 weeks of intervention in Group B.

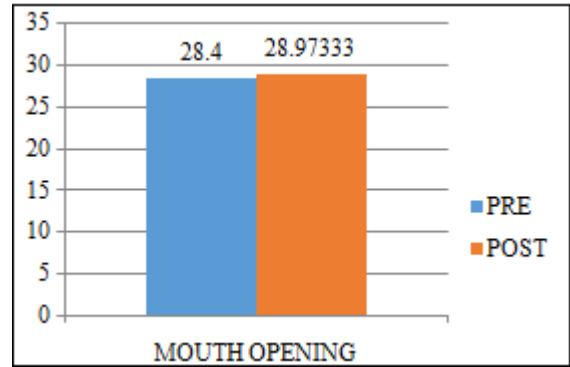
Group B					
	t-test paired 2 samples for mean	mean and SD	t-value	p value	interpretation of p value
VAS	Pre	5.83	4.7	2.84E-05	Significant
	Post 4 Weeks	5.4			
MMO	Pre	28.4	-13.45	2.65E-14	Significant
	Post 4 Weeks	28.97			

There is a significant difference between VAS and MMO which were taken pre and post four weeks of intervention of Group B.



Graph 7: Pre and Post Mean of Visual Analogue Scale in Group B.

In above graph pre intervention mean of VAS is 5.83333 and post 4weeks intervention mean is 5.4. The graph shows significant improvement in VAS from pre and post 4 weeks of intervention in Group B.



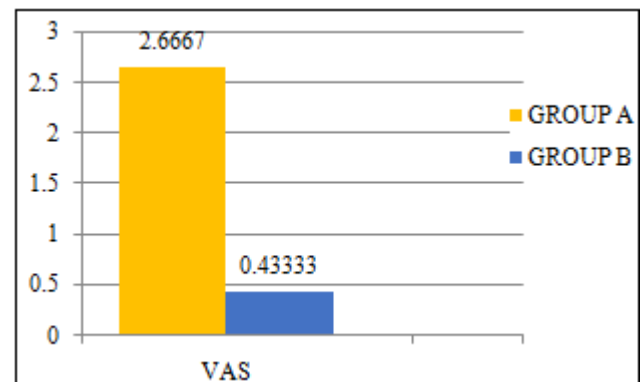
Graph 8: Pre and Post Mean of maximal Mouth Opening in Group B.

In above graph pre intervention mean of MMO is 28.4 and post 4 weeks intervention mean is 28.97. The graph shows significant improvement in MMO from pre and post 4 weeks of intervention in Group B.

Table 4: Unpaired t-test comparing the difference between the Mean of group A and Group B

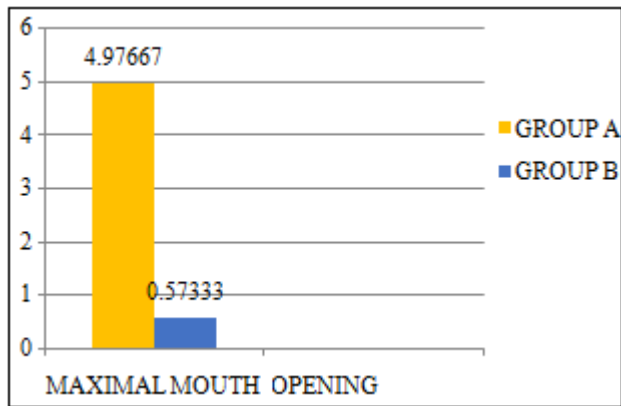
Comparison of Group A and Group B						
Mean Difference of Group A and Group B						
	unpaired t-Test: Two Sample Assuming Unequal variance	Group A	Group B	t value	p value	Interpretation of p value
VAS	Pre to Post 4 Weeks	0.43	2.66	-12.91	1.09E-17	Significant
MMO	Pre to Post 4 Weeks	0.57	4.97	-4.66	3.25E-05	Significant

Group A showed significantly greater improvement as compared to Group B after four weeks of intervention.



Graph 9: Graph of unpaired t-test comparing the difference between the Mean of Visual Analogue Scale in group A and Group B

Group A has showed greater significant improvement in VAS than in Group B



Graph 10: Graph of unpaired t-test comparing the difference between the Mean of Maximal Mouth Opening in group A and Group B.

Group A has showed greater significant improvement in MMO than in Group B.

5. Result

Group A, Rocabodo's exercise along with Combination Therapy (Ultrasound + T.E.N.S) and Group B (Rocabodo's Exercises alone) both showed significant improvements as shown in Table 2 and 3 and in Graph 5, 6, 7 and 8. But, Group A showed more significant improvement than Group B as showed in table 4 and in Graph 9 and 10.

6. Discussion

The present study was done to compare the effects of Rocabodo's Exercises with Combination Therapy and Rocabodo's Exercises in Temporomandibular Joint Disorders for 5 days per week for 4 weeks. In general terms, combination therapy involves the simultaneous application of Ultrasound with an Electrical Stimulation therapy. During Combination Therapy, exposure of a peripheral nerve to Ultrasound reduces the resting membrane potential by increasing its permeability to various ions especially Sodium and Calcium ions. By virtue of this adjusted permeability, the nerve membrane is taken closer to its threshold (the point where it depolarizes) though doesn't make the nerve to fire. The simultaneous application of TENS through the nerve induces the depolarization potential though it will take a smaller current than usual to achieve this due to the potentiation effect of Ultrasound Therapy. It has also been suggested that a greater effective treatment depth can be achieved with the Ultrasound and TENS Combination. It would appear that by combining the two treatment modalities, none of the individual effect of the treatment are lost, but the benefit is that lower treatment intensity can be used to achieve the same results and there are potential benefits in terms of diagnosis and treatment⁽³¹⁾. A comparison was done between pre and post 4 weeks of intervention for group B. Rocabodo's proposes that 6 x 6 exercise program shown to have effect in decreasing pain and improving function of the masticator muscles, and correct forward head posture. These exercises are designed to improve muscular co-ordination, relax tense muscles, increase TMJ ROM, alter the jaw closure pattern and muscle strength. The Rocabodo's postural exercises restore and optimize the alignment of TMJ and reduces the abnormal

compressive forces on it. The resting position of the tongue explained in the Rocabodo's exercises help in maintaining normal posture of the mandible, axial spine and reduction of bruxism. Isometric contraction of the muscles in TMJ rhythmic stabilization exercises promote the neuro-muscular relaxation of primary closing muscles of the mandible through the reciprocal inhibition. These exercises also strengthen the jaw muscles and balance the strength and function of right and left temporomandibular joint. It also controls the excessive translation of the joint and establishes a normal jaw opening at rest and during mouth opening. It also strengthens the neck extensors and shoulder retractors, thereby improving the movement pattern of TMJ. TMJ isometric exercises increase the intra-muscular pressure in proportion to the muscle tension, which helps the muscle to relax. There is also an increase in the synthesis of actin and myosin of the muscle, leading to an increase in cellular ATP which in turn increases the muscle metabolism and muscle strength while washing out the metabolites and increasing the blood flow to the muscles, further this leads to muscle relaxation. The isometric exercises are designed for the group of muscles and not for a single or isolated muscle; hence, contraction of one muscle group automatically causes its antagonist muscle group to stretch, leading to pain reduction by reciprocal inhibition⁽²³⁾.

7. Conclusion

Group A, Rocabodo's Exercises done for five days per week for four weeks along with Combination Therapy (Ultrasound + T.E.N.S) prove to be more effective when given to patients with Type I TMD as compared to the patients who were only given Rocabodo's Exercises as a home program alone in Group B.

Ultrasound was given at $0.7W/cm^2$, pulsed 1:2 with a duty cycle of 33.3% for 5-7 min with a 2 cm transducer head over the affected TMJ and Masticator Muscle with a frequency of 1 Mhz along with Conventional TENS, one electrode placed on C2 and other one on the C3 dermatome for 15 minutes for five days per week for four weeks.

8. Limitations

- 1) Radiological Findings were not observed in the study.
- 2) Patients with the forward head posture and protracted shoulder were not assessed.

9. Recommendations

- 1) Studies are needed to find the effect of the Rocabodo's technique on specific type of Temporomandibular Joint disorders.
- 2) Implementation of Rocabodo's technique along with the conventional techniques in rehabilitation of Temporomandibular Joint dysfunction is recommended if treatment is aiming to address the TMJ pain, TMJ mobility, functional limitation and restore normal muscle length, strength, function, and coordination

• Ethical clearance:

The study was reviewed before the authorised ethical committee of the M. A ragoonwalla college of physiotherapy before commencement of the study.

• Source of funding - Self

• Conflict of interest -nil

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