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Effectiveness of Non-Thrust Posterior Glide Manipulation for Subjects with Temporomandibular Joint Dysfunction - An Experimental Study

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ABSTRACT

BACKGROUND OF THE STUDY: TMJ dysfunction is a disorder that affects the muscles, nerves, and tissues around the jaw joint. TMD manifests as pain, clicking, or restricted movement in the jaw. It causes sequel like bruxism, jaw injuries; stress and arthritis are also contributing factors. The purpose of this study is to determine the effectiveness of non-thrust posterior glide manipulation on TMJ dysfunction to reduce pain, clicking sound and jaw function limitation for subjects with TMJ dysfunction.

METHODS: A total of 80 participants were selected based on inclusion and exclusion criteria and divided into two groups. Posterior glide manipulation group (n=40) and conservative group (n=40). Total duration of study is four weeks. Visual analogue scale (VAS), TMJ Range of motion, Jaw & function limitation scale score and Fonseca's Questionnaire were used to evaluate the subjects.

RESULT: Study showed significant reduction in pain, increased ROM in both the groups but when comparing post-test values of both the groups has shown that there is significant improvement in posterior glide manipulation group with the p-value of < 0.0001.

CONCLUSION: This study demonstrates an improvement in non-thrust posterior glide manipulation along with ultrasound therapy. However, posterior glide manipulation group show statistically significant improvements than conservative group in reducing TMJ dysfunction symptoms, pain and jaw function limitation.

KEYWORDS: Fonseca's questionnaire, Non-thrust posterior glide manipulation, Rocabado's exercises, Temporo-mandibular joint dysfunction.

INTRODUCTION

A series of musculoskeletal conditions affecting the temporo-mandibular region are referred to as temporo-mandibular joint dysfunctions, or TMDs. Masticatory muscle pain, the temporo-mandibular joint (TMJ), or both of these locations is a defining feature of this disorders (1). TMD affects 20% to 85% of the population and affects women more frequently (6.3%) than males (2.8%). People in the age range of 20 to 40 years are more likely to experience these symptoms (2) The Intent of this investigation is to better understand the causes and underlying characteristics of tempero-mandibular joint dysfunctions. It is thought that the prevalence of both clinical and subjective symptoms of tempero-mandibular joint dysfunction is what makes this research significant to identify the solution (3).

The clinical manifestations of temporomandibular dysfunction included limited mandibular movement, mandibular locking or luxation, pain associated with mandibular movement, clicking sound and soreness in the muscles.(4) Tempero-mandibular joint pain is the most common symptom, which can be related to the neck or scalp, is frequently made worse by yawning, chewing, or prolonged talking. The multi-factorial aetiology of TMD is widely accepted. While some clinicians and researchers place high emphasis on dysfunction of joint, others are more concerned with muscular issues. When treating patients with TMD, functional relationships with spine dysfunction must be taken into consideration. (5) If the patient experiences orofacial pain that is not related to jaw movement, there may be another reason behind their symptoms (6).

Manual therapy typically relieves pain, relaxes surrounding muscles, realigns soft tissues, breaks down adhesions, enhances range of motion, decreases muscle spasm, improves jaw movements and reduces joint pain (7). Passive stretching, education, warm compresses, and soft foods are non-pharmacological treatments for TMD. Exercises can increase range of motion, but cognitive factors might cause pain to persist. For this reason, cognitive behavioral therapy is useful for managing pain in TMD patients both temporarily and over an extended period of time (8). The goal of non-thrust TMJ manipulation is to help restore normal joint range of motion (ROM) as well as to relieve tension in the soft tissues. Non-thrust TMJ manipulation effectively improves TMD by reducing pain and returning joint function to normal (9).

A posterior glide propels a joint backward, whereas a non-thrust approach uses gradual, deliberate movements(10). Physical therapists and other medical professionals frequently employ a posterior glide mobilization to address musculoskeletal conditions(11). After studying TMD, Dr. Mariano Rocabado developed the 6x6 exercise program, which includes six daily sessions, six types of exercises, and six repetitions of each exercise. The Rocabado 6x6 exercise program has also been shown to be beneficial in reducing pain and enhancing the function of the masticatory muscles (12).

Moreover, studies have demonstrated that it can alleviate postural and functional limitations by enhancing muscle length, increase joint mobility, and reduce forward head posture. These techniques have also been shown to improve neuro-muscular control (13). The primary source of high-frequency acoustic pressure waves or imaging ultrasound that can penetrate the body is mechanical vibration at frequencies higher than those at which humans are able to perceive sound. Therapeutic ultrasound operates between 20 and 60 kHz in output frequency of 3.0 MHz in pulsed mode (14). Joint contracture is treated by stretching the extra capsular soft tissue, which increases the range of motion and produces deep heat production at the joints. Ultra sound therapy also lessens inflammation of the tendon, non-acute pain, and muscle

spasms, which makes soft tissue stretching easier (15). This study evaluated non-thrust posterior glide manipulation's effectiveness in reducing TMJ dysfunction symptoms like pain, clicking, and limited movement.

MATERIALS AND METHOD

Eighty TMJ dysfunction participants with symptoms spanning more than a year, ages 20 to 40, participated in the study. Random assignments were made to place participants in either the conservative treatment group or the posterior glide manipulation group. Fractures, metal braces, skin infections, dental pain, and recent symptoms were among the exclusion criteria. The study employed an experimental design that included random group allocation and convenient sampling.

STUDY PROCEDURE

The study lasted for 4 weeks. The posterior glide manipulation group received non-thrust posterior glide manipulation along with ultrasound therapy for 40 participants, while the conservative group received Rocabado's 6x6 exercise program along with ultrasound therapy for 40 participants. Both groups underwent these interventions 6 days per week. Subjects from both groups participated in the pre-test evaluation, and baseline characteristics were recorded according to selection criteria. At the end of the 24th session, scores were reassessed, and post-test results were reported. TMJ range of motion, Visual Analogue Scale (VAS), Jaw Functional Limitation Score, and Fonseca's Questionnaire were used to measure outcomes.

INTERVENTION:

Non- thrust posterior Glide Manipulation Group

Non-thrust posterior glide manipulation (n=40). Patient position: Patient is made to sit comfortably in a chair where his\her head is supported on a chair or wall with slight neck extension. Duration: 3 repetitions were given intermittently for 4 times and 6 days per week.

Non thrust posterior glide manipulation. Non-thrust posterior glide manipulation is a manual treatment used by physical therapists to address musculoskeletal disorders. Procedure: The patient sits comfortably in a chair with their head supported on a chair or wall, slightly extending the neck. The therapist stands between the patient's feet, holding the angle of the mandible with a gloved finger, while placing the thumb intraorally on the mandibular ramus and the index finger supporting the angle of the mandible externally. Then, a posterior glide manipulation is performed, gently pushing the joint backward with controlled effort. Duration: 3 repetitions were given intermittently for 4 times and 6 days per week

Conservative group

Rocabado's 6x6 Exercise Program:

Rocabado's 6x6 Exercise Program is done while seated and includes six key exercises that are done six times a day, six days a week. This program, created by Dr. Mariano Rocabado, improves neuromuscular control, masticatory muscle function, and discomfort in order to address TMJ disorders (16). It is a useful treatment for temporomandibular joint diseases because it restores restricted joint mobility, normalizes muscle length, corrects forward head posture, and addresses postural and functional limitations (17).

1. **Rest Position of the Tongue (Tongue Clucks):** This exercise reduces overactivity of surrounding muscles. Patients are instructed to keep lips closed, teeth slightly apart, and press the front third of the tongue to the roof of the mouth without touching the teeth. A "cluck" sound is made, followed by six diaphragmatic breaths through the nose.

2. **Controlled TMJ Rotation:** Participants produce a cluck sound and place index fingers over the TMJ. They perform six controlled mouth opening and closing movements, monitoring the joint movement. The exercise ends with simulated chewing, maintaining the tongue's position against the palate.

3. **Mandibular Rhythmic Stabilization:** With the tongue on the palate, participants hold the chin and resist gentle side-to-side jaw movements. They repeat six repetitions of mouth opening and closing, each lasting six seconds, to improve stability without forceful exertion.

4. **Stabilized Head Flexion:** To correct forward head posture, subjects perform six repetitions of upper cervical flexion (nodding), promoting proper alignment of the cervical spine.

5. **Axial Cervical Extension:** This involves six cervical retractions to correct postural deviations by balancing cervical curvature, reducing strain on neck muscles like the sternocleidomastoid.

6. **Shoulder Girdle Retraction:** Patients retract and depress the scapula six times to correct shoulder protraction and improve posture.

Posterior glide manipulation group and conservative group

Both groups were provided with Ultrasound therapy.

Ultrasound Therapy: Ultrasound therapy with mode of pulsed and frequency of 3.0 MHz to temporomandibular joint bilaterally with duration for 5 minutes with intensity of 1 W\cm^2.

DATA ANALYSIS

TABLE:1 Comparison pre-test and post-test values of Posterior glide manipulation group.

POSTERIOR GLIDE MANIPULATION GROUP	PRE-TEST		POST-TEST		T VALUE	P-VALUE
	MEAN	SD	MEAN	SD		
Fonseca's Questionnaire Rating	76.75	8.13	16.25	6.67	35.8613	<0.0001
VAS in cm	7.83	1.15	2.70	0.97	23.1622	
Jaw and function limitation scale score	161.43	7.31	32.15	5.99	90.2053	
TMJ ROM in cm	2.353	0.396	4.248	0.301	21.4118	

GRAPH:1 Comparison pre-test and post-test values of Posterior glide manipulation group.

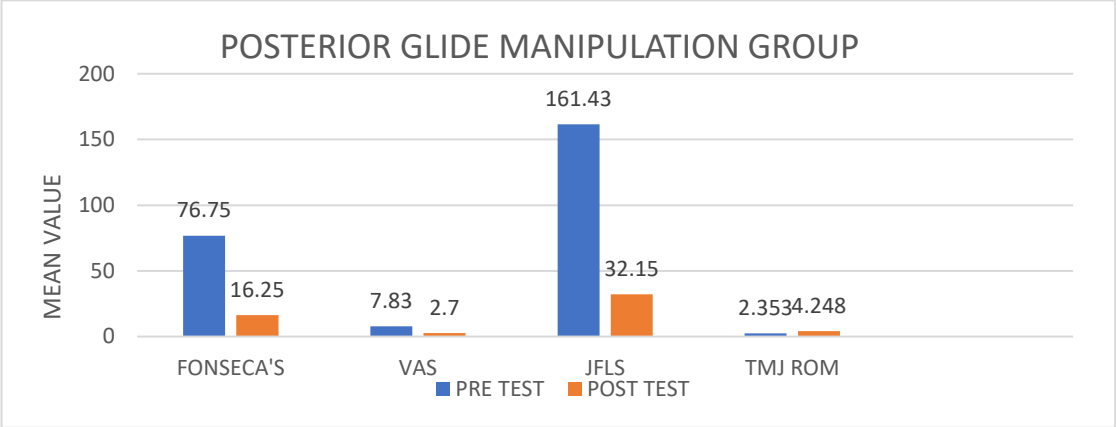


TABLE:2 Comparison pre-test and post-test values of Conservative group.

CONSERVATIVE GROUP	PRE-TEST		POST-TEST		T-VALUE	P-VALUE
	MEAN	SD	MEAN	SD		
Fonseca's Questionnaire Rating	73.25	7.03	22.88	7.24	28.2245	<0.0001
VAS in cm	7.78	1.10	3.68	0.92	70.4704	
Jaw and function limitation scale score	164.95	9.72	44.05	4.49	16.9199	
TMJ ROM in cm	2.375	0.361	3.975	0.341	18.0190	

GRAPH:2 Comparison pre-test and post-test values of Conservative group.

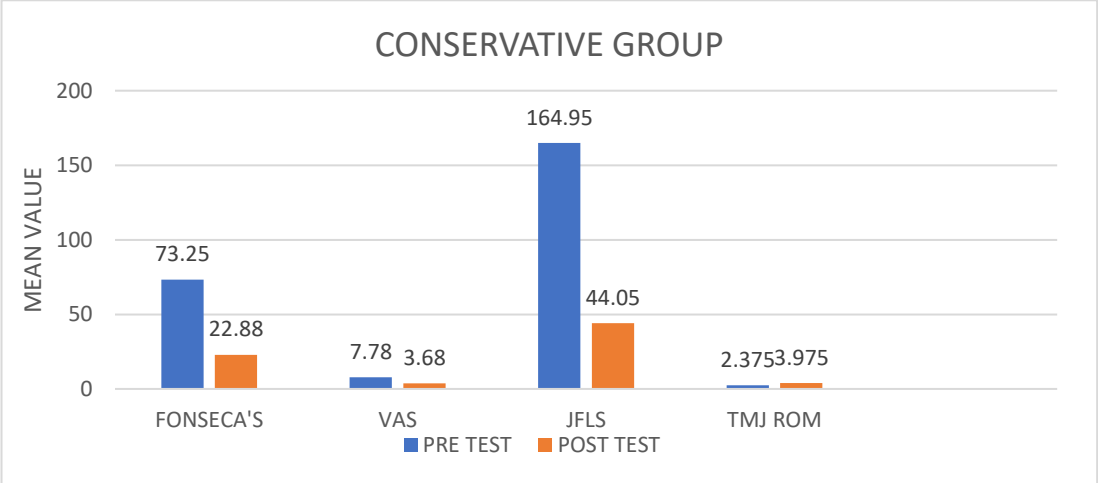
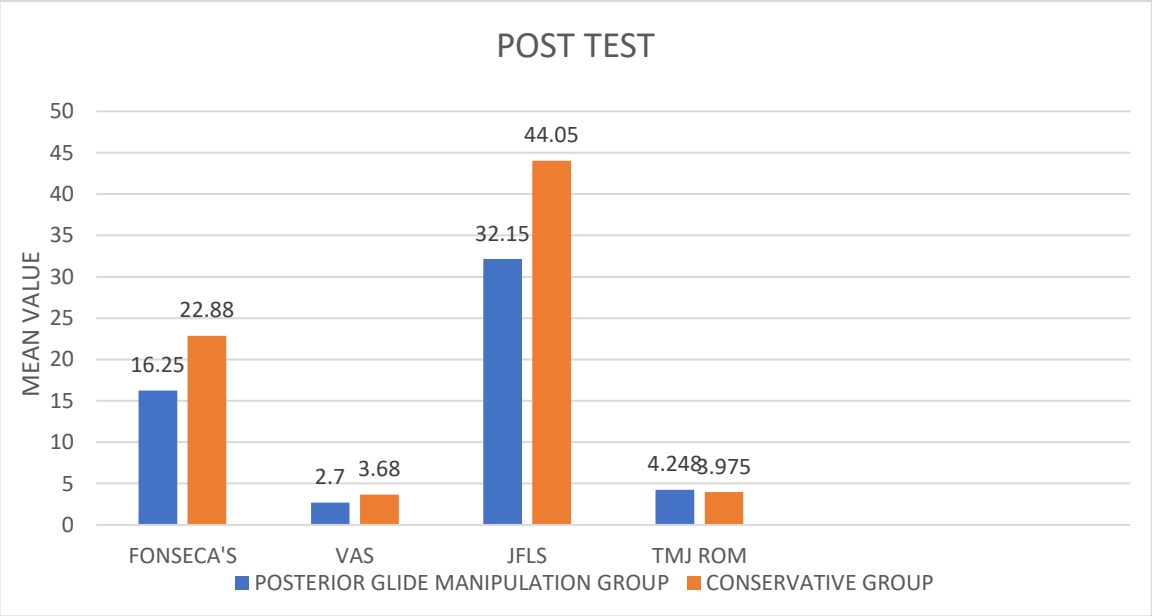


TABLE:3 Comparison between the post-test values of posterior glide manipulation and conservative group.

	POSTERIOR GLIDE MANIPULATION GROUP (POST TEST)		CONSERVATIVE GROUP (POST TEST)		T-VALUE	P-VALUE
	MEAN	SD	MEAN	SD		
Fonseca's Questionnaire Rating	16.25	6.67	22.88	7.24	4.2550	<0.0001
VAS in cm	2.70	0.97	3.68	0.92	4.6301	
Jaw and function limitation scale score	32.15	5.99	44.05	4.49	10.0504	
TMJ ROM in cm	4.248	0.301	3.975	0.341	3.7876	

GRAPH:3 Comparison between the post-test values of posterior glide manipulation and conservative group.



OUTCOME MEASURE:

The Fonseca questionnaire: The Fonseca questionnaire offers a comprehensive assessment tool for TMJ dysfunction, allowing patients to evaluate their symptoms through ten questions. It assesses functional routines, movement limitations, clicking sounds, malocclusion impressions, and emotional strain. Its aim is to categorize TMD symptoms as mild, moderate, or severe (18)

TMJ range of motion: A measuring scale was used to measure the TMJ's mobility, or mouth opening range of motion. The mouth opening was measured in compliance with a predetermined protocol (19).

Visual analogue scale (VAS): Using a visual analogue scale of 10 cm, the degree of pain was assessed. The statement clarifies the extent to which a patient experiences pain. The distance between "no pain" and "worst possible pain," measured on a 10-cm line, was used to calculate the score (20).

Jaw functional limitations scale score (JFLS): Using this scale, the TMJ's functional limitations were measured. It provides scores and details for a wide range of disabilities that patients with TMJ disorder may experience. The patient had to rate their disability on a scale of 0 to 10 for each of the 20 tasks on the list (21).This 8-item test approached the requirements for evaluative and discriminative instruments due to its exceptional validity, sensitivity to change, and reliability (22).

RESULT:

Each group has forty participants, aged 20 to 40, who were split equally into two groups according to the selection criteria.

TABLE: 1: Pre-test and Post-test of Mean ± SD values of Posterior glide manipulation group using Fonseca's questionnaire: Pre-test (76.75±8.13) and Post-test (16.25±6.67), VAS: Pre-test (7.83±1.15) and Post-test (2.70±0.97), JFLS: Pre-test (161.43±7.31) and Post-test (32.15±5.99), TMJ ROM : Pre-test (2.353±0.396) and Post-test (4.248±0.301). As a result, the P-value of less than 0.0001 indicates that the results are statistically significant.

TABLE: 2: Pre-test and Post-test of Mean ± SD values of Conservative group using Fonseca's questionnaire: Pre-test (73.25±7.03) and Post-test (22.88±7.24), VAS: Pre-test (7.78±1.10) and Post-test (3.68±0.92), JFLS: Pre-test (164.95±9.72) and Post-test (44.05±4.49), TMJ ROM: Pre-test (2.375±0.361) and Post-test (3.975±0.341). As a result, the P-value of less than 0.0001 indicates that the results are statistically significant.

TABLE:3: Post-test values of Posterior glide manipulation using Fonseca's questionnaire: Post-test (16.25±6.67), VAS: Post-test (2.70±0.97), JFLS: Post-test (32.15±5.99), TMJ ROM: Post-test (4.248±0.301) and Conservative group using Fonseca's questionnaire: Post-test (22.88±7.24), VAS: Post-test (3.68±0.92), JFLS: Post-test (44.05±4.49), TMJ ROM: Post-test (3.975±0.341). As a result, the P-value of less than 0.0001 indicates that the results are statistically significant.

Although all groups made progress, the group that used ultrasound to manipulate the posterior glide exhibited noticeably more gains than the group that received conservative treatment.

DISCUSSION

The non-thrust posterior glide manipulation group had the largest improvement in TMJ ROM, VAS, jaw function, and Fonseca's ratings, according to statistical analysis (23). According to Yigit gursoy et.al., (2020) The aim of the research was to investigate the effects of manual therapy (MT) on ROM, pain, and quality of life in patients with temporomandibular joint disorders. The sample consisted of 15 adults, aged 21 to 54, with 4 men and 11 women (24). The VAS for pain and the SF-36 for quality of life were among the outcome measures, demonstrating that manual therapy successfully lowers TMJ pain and enhances jaw range of motion. In comparison to traditional workouts.

Vinod Babu K et al. (2015) discovered that Rocabado's approach dramatically improved TMJ ROM, discomfort, Fonseca's score, and jaw function in 30 participants with TMJ dysfunction (25). Both groups showed improvements in outcome measures, yet the posterior glide manipulation group exhibited superior improvement compared to the conservative group. This could be attributed to the added effect of non-thrust posterior glide manipulation alongside ultrasound treatment (26). Manipulation aids pain relief by reducing muscle tension, increasing joint mobility, and inducing relaxation, particularly beneficial for musculoskeletal pain like TMJ dysfunction. Joint mobilization and manipulation methods can enhance joint range of motion, especially useful for conditions involving inflammation or tissue damage (27). Although the 4-week trial period might have affected the outcomes, the null hypothesis was refuted by the notable gains in TMJ ROM, VAS, jaw function, and Fonseca's ratings.

CONCLUSION:

Both groups showed improvements in TMJ ROM, VAS, jaw function, and Fonseca's ratings, according to statistical analysis. However, the group that did not use thrust for posterior glide adjustment showed more progress. This group underwent ultrasonic therapy in addition to manipulation. It worked better than Rocabado's 6x6 ultrasound-assisted exercise regimen. Clicking, muscle tension, functional restrictions, and TMJ pain were all resolved by the approach. Ultrasound therapy is therefore advised for the rehabilitation of TMJ dysfunction.

LIMITATION:

TMD also affected due to psychological or psychosocial factors which is not included in this study. Symptoms such as clicking sounds and pain is main factor but other symptoms are not considered in this study and long time follow up is not done in this study.

RECOMMENDATION FOR FUTURE RESEARCH:

To develop a consistent procedure for the dosage of non-thrust posterior glide manipulation and evaluate its long-term impacts, more investigation is required. In order to properly target various temporomandibular diseases, studies should also take into account the psychological and psychosocial elements that contribute to TMJ dysfunction and investigate how well it works for symptoms other than pain and clicking.

ETHICAL CLEARANCE: Taken from the institutional ethical committee

Institutional Scientific Review Board Number: 04/010/2023/ISRB/SR/SCPT

FUNDING: This study is self-funded

CONFLICT OF INTEREST: Nil

AUTHOR'S CONTRIBUTIONS:

The offered notion was created by SS and DD. DD worked on the calculations and created the hypothesis. SS confirmed the analytical procedures. In addition to supervising the results of this effort, SS encouraged DD to do research [Jaw function limitation, Non-thrust posterior glide manipulation and Rocabado's exercises]. The writers collaborated on the final outlook of the manuscript and talked about the findings. It was SS and DD's experiment. SS helped DD with the manuscript's writing.

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