Comparative Analysis of Myofascial Release Versus Joint Play Technique Along with Postural Corrective Exercise on TMJ Dysfunctional Subjects with Upper Cross Syndrome Using Painchek AI and MB Ruler Software

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Abstract. Muscular imbalance disorders like upper crossing syndrome are related to numerous types of referred ailments, most particularly discomfort in the jaw. It includes difficulty in opening and closing the mouth. This is associated with temporomandibular dysfunction. Measuring and tracking elements on a computer screen is possible using the MB ruler, a measuring toolbox. Painchek AI is used for assessing pain levels. This program is affordable and readily accessible online. MMO is used to assess the range of motion of mouth. JFLS is a tool used to evaluate the masticatory system's overall functional limitations. Based on Selection Criteria, 50 subjects have been selected from Saveetha Medical College and Hospital using a convenient sampling technique. Pre and post test results were compared in two groups of 25 people each as part of the research design. The control group (MFR with postural corrective exercise) and experimental group (joint play technique with postural corrective exercise) for both groups pretest results from Painchek Ai, MMO, CVA and JFLS were documented. Treatment intervention consisted of 4 weeks of exercises (2 sets per session, 15 reps per, thrice in a week). Statistical analysis reveals that the Experimental group which received combination of joint play technique with postural corrective exercises showed significant improvement by means of Painchek Ai, CVA, MMO and JFLS in Comparison to control group that received myofascial release with postural corrective exercises. The study concluded that combination of joint play technique with postural corrective exercises was more effective than myofascial release with postural corrective exercises.

Keywords: Upper cross syndrome, Temporomandibular joint dysfunction, myofascial release, corrective exercise, mobilization, MB ruler software.

1 Introduction

A wide spectrum of disorders affecting the temporomandibular joints (TMJs) and periarticular musculoskeletal tissues are known as temporomandibular dysfunctions (TMDs).[1] The symptoms of temporomandibular disorders (TMD) include pain that can impact the jaw muscles and temporomandibular joints.[2] It include difficulty in opening and closing the mouth as well as pain in the face, ears, and jaw.[3] The most common indicator of a TMD is pain, which is followed by joint sounds during mandibular dynamics and restricted or limited jaw mobility. [4] The anterior position

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of the head in the sagittal plane about the line of gravity is known as forward head posture. FHP has been associated with complaints of shoulder and neck pain, fatigue, limited neck mobility, decreased proprioception, and dysfunction of the temporomandibular joint.[5] UCS is indicated by tension in the pectoralis major and minor in the front and the upper trapezius and levator scapulae in the back of the body. This syndrome also includes weakness in the middle and lower trapezius muscles in the back, as well as weakness in the deep cervical flexors in the front of the neck. The prevalence of an upper crossed syndrome was 30.43%.[6] The prevalence of UCS ranges from 11 to 60% in different populations and age groups.[7]. Dr. Janda introduced an intriguing idea in 1988 when he separated muscles into two categories: phasic and postural.[8] The problem is mostly caused by a muscular imbalance between weak and tonic muscles. Our body is composed of two types of muscles: postural muscles, which include the pectoralis major, upper trapezius, and sternocleidomastoid, and phasic muscles, which include the lower trapezius and deep-neck flexors.[9] Postural abnormalities are caused by opposite group muscle imbalances in upper crossed syndrome.[10] The upper cross syndrome is associated with temporomandibular dysfunction. Jaw pain is one among the several referred aches linked to upper crossed syndrome, a condition of muscle imbalance. Forward head posture and the mechanical head problems that accompany it are associated with complications such as temporomandibular joint (TMJ) osteoarthritis.[11] A basic assessment method for temporomandibular joint function involves measuring the joints' range of motion during maximum mouth opening (MMO).[12] The limits in the masticatory system's functions are referred to as jaw functional limitations.[13] The Jaw Functional Limitation Scale (JFLS), available in eight- and twenty-item (JFLS-20) forms, is a tool used to assess the overall functional limitation of the masticatory system.[14] Higher JFLS-20 scores indicate declining jaw function. The scores range from 1 to 200.[15] Measuring and tracking elements on a computer screen is possible using the MB ruler, a measuring toolbox. This program is affordable, user-friendly, and readily accessible online. The on-screen goniometer, which is a triangular ruler, aids in identifying angles on the image shown on the computer screen.[16] Painchek Ai is easy to use, rapid, and capable of detecting pain even when it is not immediately noticeable. The subject's face is captured by the smartphone camera using AI-powered facial recognition. It detects and captures automatic facial muscle movements that indicate discomfort. A numerical pain rating scale is combined with the pain check app to make pain assessment accessible for everyone.[17] A constrictive and fibrous adhesion that appears between layers of fascial tissue can be reduced with the use of John Barnes' Myofascial Release (MFR) therapy.[18] The direct method of myofascial release lasted for ten minutes in this case. After applying pressure for 60–90 seconds, the fascia was felt.[19] As a result, MTrPs may cause pain in muscles that maintain posture, including the SCM, which could limit the range of motion in the TMJ in addition to causing issues with cervical spine movements.[20] Joint mobilization and manipulation, soft tissue mobilization, various soft tissue procedures, and upper cervical spine treatments, such as articular upper cervical mobilization, are all included in manual therapy.[21] When the temporomandibular joint (TMJ) is restricted, mobility can be improved through joint mobilization in different ways. [22] This research uses the Painchek Ai and MB ruler software to compare the analysis of myofascial release vs joint play technique along

with postural corrective exercise on tmj dysfunction participants with upper cross syndrome.

2 Methodology

Based on inclusion and exclusion criteria, a convenient sampling technique procedure was used to select 50 participants from Saveetha Medical College and Hospital. Patients were given a thorough explanation of the study procedures, and their signed written consent was acquired. The research design involved a comparison of pre and post testing in a group. The 25 individuals in each group into two groups. Control group (MFR with postural corrective exercise) and Experimental Group (joint play technique with postural corrective exercise) for both groups pretest results from Painchek Ai, MMO, CVA and JFLS were documented. Treatment intervention consisted of 4 weeks of exercises (2 sets per session, 15 reps per, thrice in a week).

2.1 Inclusion Criteria: Age between 20 to 60 years, Both genders were included, All subjects having FHP (CVA less than 49 degree), Presence of TMJ dysfunction and UCS symptoms for at least 3 months, Participants must be physically able to perform the exercises and attend regular treatment sessions.

2.2 Exclusion Criteria: Open wound in and around cervical region, Recent trauma to temporomandibular joint and cervical region, Past history of surgery in cervical region, Any inflammatory condition, participants with disc degeneration, participants with radiating pain, non-cooperative participants.

2.3. Outcomes measures:
Primary outcome: Painchek Ai and craniovertebral angle using MB ruler software
Secondary outcome: Maximal mouth opening, jaw functional limitation scale.

3 Procedure

Patients are divided into 2 groups of experimental group and Control group. Whereas Comparative group(n=25) will be receiving myofascial release therapy with postural corrective exercise for four weeks, three times a week for forty-five minutes each all under the researcher's supervision. There was a cross-hand MRF. In the anterior chest, the method targeted the sternocleidomastoid, levator scapulae, and pectoralis major and minor muscles; in the posterior chest, it targeted the masseter muscle and upper trapezius. Cross-hand technique was used to release the hold for 90–120 seconds while applying mild pressure. As a result, MFR therapy was administered to the specified areas twice, for a duration of 90 seconds each time. The initial course of treatment involved teaching the patient about bad posture and applying a hot pack for seven minutes to the upper back and anterior chest.

Whereas the experimental group(n=25) will be receiving joint play technique with postural corrective exercise Patients were instructed to lie on their sides with their

mouths slightly open. TMJ mobilization was carried out in both anterior-posterior and medial directions in the current investigation. Patients were instructed to open and close their mouth for ten times prior to receiving manual therapy. The mandibular condyle was mobilized medially by placing the therapist's palm over the thumb digit of another hand. Anterior-posterior mobilization was another technique used through the auditory canal. One oscillation every two seconds was the mobilization frequency. For a total of seven minutes, mobilization in each direction was performed in three sets of two minutes each, separated by thirty seconds of rest. Patients were positioned in a supine position with a neutral cervical spine. The therapist applied an anterior to posterior push with the other hand while supporting the patient's occipital area or posteriorly directed force, to the patient's frontal region. Under the physical therapist's supervision, mobilization was carried out slowly, at a rate of roughly one oscillation per two seconds. For a total of seven minutes, mobilization was carried out in three sets of two minutes each, with a 30-second break in between, for four weeks, three times a week. The therapist selected the technique's intensity based on the patient's tissue resistance. Then both groups in common have been receiving corrective exercises.

3.1 Stretching:

Upper trapezius: Relax your shoulders and sit or stand up straight. Move your ear toward your shoulder by gently tilting your head to one side. Hold the stretch while taking deep breaths for 20 to 30 seconds. Go over the opposite side.

Sternocleidomastoid: Maintain proper posture and relaxed shoulders while sitting or standing up straight. Look in one direction. To gaze up and away from the side you are extending, slightly tilt your head back. The front and side of your neck should feel somewhat stretched. Breathe deeply while holding the stretch for 20 to 30 seconds. Repeat on the opposite side.

Pectoralis stretch: Place your feet apart when you stand at a doorway. With your elbows at a 90-degree angle, position your forearms on each side of the doorway at shoulder height or just above. Lean forward into the doorway gently until your shoulders and chest start to expand. Breathe deeply while holding the stretch for 20 to 30 seconds. Go back to the beginning and do it two or three times.

Passive stretching exercise for jaw: Five times, repeat these steps. In the center of your jaw, place your thumb on your upper teeth. In the center of your jaw, place the index finger of your other hand on your bottom teeth. As wide as you can, open your mouth. To prevent it from shutting, apply further pressure with your fingertips. A slight stretch should occur, but no discomfort. Hold this position for a few seconds.

Active range of motion and stretching exercises: When you feel an adequate stretch but no discomfort, open your mouth as wide as you can. Move the lower portion of your jaw to the left and hold this position for ten seconds. Move the lower portion of your jaw to the right and hold this position for three seconds.

3.2 strengthening exercises:

Chin tuck: The chin tuck exercise above explains how to tuck your chin. Try to squeeze your shoulder blades together as firmly as you can. For three seconds, hold this posture. Execute 15 repetitions.

Scapular Retractions: With your arms out in front of you, gripping a resistance band or small dumbbells, stand or sit. Try pinching a pencil between your shoulder blades by pulling them down and together. Hold for a couple of seconds, then let go. Do fifteen repetitions.

Serratus Punch: With your feet flat on the floor and your knees bent, lie on your back. Extend your arms toward the ceiling while holding a light dumbbell in each hand. Raise your shoulder blades off the ground by punching your arms straight up. Hold for two to three seconds, then release. Do 15 repetitions

4 Statistical analysis

The data was collected later tabling and analyzing the data was done, the mean as well as the standard deviation (SD) were calculated for each parameter. A paired t-test was used to examine significant differences between the pre-test and post-test measures(table.1), (fig.1). An unpaired t-test was used to look at any statistically significant variation between the two groups. It is considered statistically significant when the P-value was less than 0.001.

Table 1. Comparing clinical outcomes post-test values between groups.

Outcome Measures	Control Group		Experimental Group		P Value
	Mean	Sd	Mean	Sd	
Painchek AI	5.92	1.08	2.76	1.33	<0.0001
CVA	35.40	4.55	41.40	5.31	<0.0001
MMO	22.96	2.28	27.36	1.80	<0.0001
JFLS	13.28	1.70	16.76	1.59	<0.0001

5 Result

Post-test assessments revealed notable differences in craniovertebral angle, maximal mouth opening and jaw functional limitation scale among participants with tmj dysfunction correlated with upper cross syndrome receiving joint play technique along with postural corrective exercise. The mean post values of paincheck Ai for control group and experimental groups are 5.92 and 2.76, craniovertebral angle for control group and experimental groups are 35.40 and 41.40 and mean post values of maximal mouth opening for control group and experimental group are 22.96 and 27.36 and mean post values for jaw functional limitation scale for control group and experimental group are 13.28 and 16.76 respectively and detailed result were tabulated in tables with respective for each outcome measure.

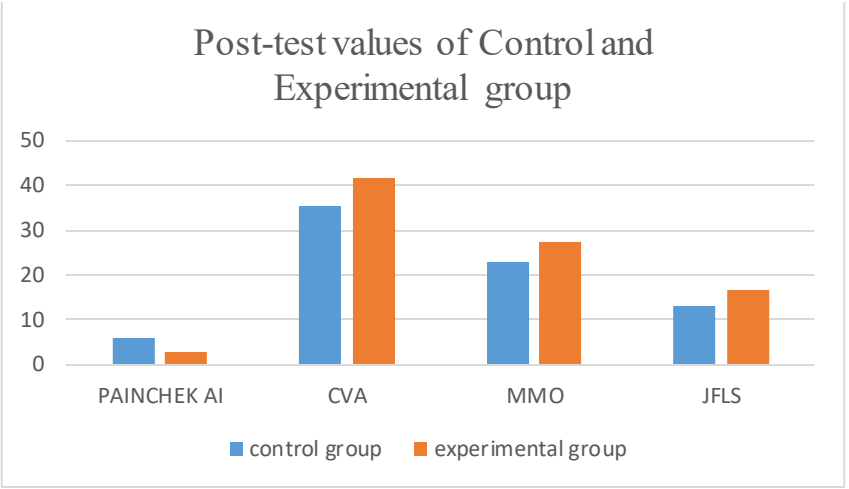

Fig. 1. Posttest comparison between the groups for Painchek AI, Cva, MMO, JFLS.

6 Discussion

The purpose of this study was to compare the efficacy of joint play technique and postural corrective exercise with myofascial release in tmj dysfunction for upper cross syndrome subjects to improve pain, forward head posture and maximal mouth opening.

Khaled Rezaie et al; (2022) The results indicated that including upper cervical spine and TMJ manual therapy into standard care could be a successful strategy for TMD patients.

BASEM M et al; (2019) Individuals with persistent mechanical neck pain experienced an instant reduction in the severity of their discomfort after undergoing posterior anterior-anterior mobilization; however, when comparing the two different techniques, posterior anterior mobilization proved to be the most successful in reducing pain.

Komal Ahmed et al; (2023) The results of the study showed that both myofascial release therapy alone and in conjunction with corrective exercises were effective in increasing cervical range of motion, reducing discomfort and functional impairment, and improving posture.

Kreshnik Hoti et al; (2021) We proved that the Pain Chek Infant has good-to-excellent reliability, validity, and inner consistency when compared to the NFCS-R and the ObsVAS. It only took three seconds to complete, the elimination of observer bias linked to prolonged exposure to pain-related facial expressions, and the automation of pain assessment, we think Pain Chek Infant is a significant advancement in the evaluation and tracking of procedural pain in young children.

Dipti Vilas Kadu et al; (2022) By evaluating the CV angle, the MB ruler may be used to evaluate posture in photos with good intra- and inter-rater reliability.

Khalid H. Zawaw et al; (2003) These results strongly indicate that a useful index for determining normal MMO during dental exams is the patient's capacity to place three fingers in the mouth.

Nazım Tolgahan Yıldız et al; (2024) This study demonstrated the validity, reliability, ease of use, and usefulness of the JFLS-20-TR as a tool for assessing jaw functional limits in Turkish-speaking TMD patients.

Mahan Mansouri et al; (2023) These results suggest that corrective exercises are beneficial in the treatment of referred pain resulting from muscle imbalance in the jaw joint. Corrective exercises are advised as a successful method for treating transferred jaw pain because of its advantages as a non-pharmacological intervention.

7 Conclusion

The present study concluded that both joint play technique and myofascial release with postural corrective exercises significantly improve Painchek AI is used for assessing pain levels, craniovertebral angle (CVA) for forward head posture, maximal mouth opening (MMO), and jaw function limitation scale (JFLS) scores over a 4-week period. However, the joint play technique along with postural corrective exercises shows greater improvement compared to myofascial release along with postural corrective exercises.

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References

1. Craciun M, Geman O, Leuciuc FV, Holubiac IS, Gheorghita D, Filip F. Effectiveness of physiotherapy in the treatment of temporomandibular joint dysfunction and the relationship with cervical spine. Biomedicines.;10(11):2962. doi:10.3390/biomedicines10112962. 2022.
2. Fernandez-Carnero J, La Touche R, Ortega-Santiago R, Galan-del-Rio F, Pesquera J, Ge HY, Fernandez-de-Las-Penas C. Short-term effects of dry needling of active myofascial trigger points in the masseter muscle in patients with temporomandibular disorders. J Orofac Pain. Winter;24(1):106-12. PMID: 20213036. 2010.
3. Minervini G, Franco R, Marrapodi MM, Ronsivalle V, Shapira I, Cicciù M. Prevalence of temporomandibular disorders in subjects affected by Parkinson disease: a systematic review and meta-analysis. J Oral Rehabil. May 14. doi: 10.1111/joor.13496. 2023.
4. Budu V, Țănculescu O, Sava A, Beldiman MA, Pavăl D, Stan CI. Screening of temporomandibular disorders. Romanian J Oral Rehabil. Apr-Jun;16(2):134. doi: 10.6261/RJOR.2024.2.16.14. 2024.

5. Abdollahzade Z, Shadmehr A, Malmir K, Ghotbi N. Effects of 4-week postural corrective exercise on correcting forward head posture. Journal of modern rehabilitation,;11:85-92. 2017.
6. Dhage P, Anap D. Prevalence of upper crossed syndrome in physiotherapy college students: a cross-sectional study. VIMS Health Sci J.;6(1):10-13. 2019.
7. Murali S, Abraham M. Prevalence of upper crossed syndrome among software professionals. Int J Med Allied Sci. Sep;7(3):1061-1071. ISSN: 2455-0159. 2021.
8. Pathan H, Pawar A, Rao R, Phansopkar P, Chitale N, Arora S. A structured exercise program for upper cross syndrome. J Med Pharm Allied Sci.;11:259-63. 2022.
9. Mujawar JC, Sagar JH. Prevalence of upper cross syndrome in laundry workers. Indian J Occup Environ Med. Jan-Apr;23(1):54-56. doi: 10.4103/ijoem.IJOEM_169_18. PMID: 31040591; PMCID: PMC6477943. 2019.
10. P. V, C., Vishwanath S. Prevalence of upper-cross syndrome in college going students: a cross-sectional study. Int J Res Med Sci. Dec;11(1):284-288. doi: 10.18203/2320-6012.ijrms20223652. 2022.
11. Mansouri M, Sokhanguei Y, Sohaily S. The effect of corrective exercise on pain referred to the jaw joint (TMJ) in elderly women with upper crossed syndrome. Health Technol Assess Action.;7(3):14210. doi: 10.18502/htaa.v7i3.14210. 2023.
12. Zawawi KH, Al-Badawi EA, Lobo SL, Melis M, Mehta NR. An index for the measurement of normal maximum mouth opening. J Can Dent Assoc. Dec;69(11):737-41. PMID: 14653940. 2003.
13. Kliangkaeo W, Tangpothitham S, Mitrirattanakul S, Wachiralarpphaithoon C. The effect of different pain characteristics on jaw functional limitations in patients with temporomandibular disorders. J Oral Rehabil. 2024 Jun;51(6):998-1004. doi: 10.1111/joor.13674. Epub Mar 7. PMID: 38450596. 2024.
14. Yıldız NT, Kocaman H, Bingöl H. Validity and reliability of the Turkish version of the 20-item jaw functional limitation scale. Physiother Theory Pract. Mar 14:1-13. doi: 10.1080/09593985.2024.2329959. Epub ahead of print. PMID: 38482884. 2024.
15. Ekici Ö. The relationship of functional limitations and disability with clinical symptoms in patients with temporomandibular disorder: a cross-sectional clinical study. Turkiye Klinikleri J Dent Sci.;30:175-83. doi: 10.5336/dentalsci.2024-101184. 2024.
16. Kadu D, Shetye J. Reliability of “MB-Ruler Software” to measure craniovertebral angle using the photographic method. J Health Allied Sci NU.;12:10.1055/s-0041-1741415. 2022.
17. Hoti K, Chivers PT, Hughes JD. Assessing procedural pain in infants: a feasibility study evaluating a point-of-care mobile solution based on automated facial analysis. Lancet Reg Health Eur. Oct;3:100053. doi: 10.1016/S2589-7500(21)00129-1. 2021.
18. Ahmed K, Shaukat A, Noor, Khalid S, Tahir S. Longitudinal effects of myofascial release with and without 8-week corrective exercises in correctingupper cross syndrome. Ann Med Health Sci Res.;12:141-7. 2022.
19. Parab M, Bedekar N, Ashok S, Sancheti P. Immediate effects of myofascial release and cryo-stretching in management of upper trapezius trigger points – a comparative study. J Soc Indian Physiother.;4:74-8. doi: 10.18231/j.jsip.2020.011. 2020.
20. Bae Y. Change the myofascial pain and range of motion of the temporomandibular joint following kinesio taping of latent myofascial trigger points in the sternocleidomastoid muscle. J Phys Ther Sci. 2014 Sep;26(9):1321-4. doi: 10.1589/jpts.26.1321. Epub Sep 17. PMID: 25276008; PMCID: PMC4175229. 2014.
21. Sarfraz S, Anwar N, Tauqeer S, Asif T, Ain NU, Shakeel H. Comparison of effects of manual physical therapy and exercise therapy for patients with temporomandibular

disorders. J Pak Med Assoc. Jan;73(1):129-30. doi: 10.47391/JPMA.3594. PMID: 36842021. 2023.

22. Pundkar S, Patil D, Naqvi W. A comparative study on effectiveness of Rocabado approach and conventional physiotherapy on pain, ROM and QOL in patients with TMJ dysfunction. J Pharm Res Int.;33(58B):201-9. doi: 10.9734/jpri/2021/v33i58B34192. 2021.

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