WILL SUPRAHYOID MUSCLE RELEASE BE EFFECTIVE TO IMPROVE SWALLOWING IN PATIENTS WITH TEMPOROMANDIBULAR DISORDERS? A SINGLE GROUP EXPERIMENTAL STUDY

ABSTRACT

BACKGROUND*:* As for jaw opening force, hyoid resting position and hyoid dynamics are very important and are considered to be affected directly by the suprahyoid muscles. MFR is found to be effective in giving symptomatic relief and increasing jaw ROM in patients with myofascial TMD. The study will specify the importance of Suprahyoid MFR in improving swallowing & jaw function in TMD. **OBJECTIVES***:* The study aimed at finding out the effectiveness of suprahyoid muscle MFR on swallowing and jaw function in patients with TMD.**METHODS***:* 20 participants with myogenous TMD were included after fulfilling the selection criteria. Treatment strategies involved MFR to suprahyoid muscle for 3 sessions in a week for one week and home exercise program involving the tongue proprioception exercises. The outcome measures were evaluated through Sydney swallowing questionnaire (SSQ-17), LDF-TMD questionnaire and maximal interincisal opening (IIO). The data was analysed and inference was drawn through paired and unpaired t tests. **RESULTS:** The result of the present study showed that participants improved significantly ($p < 0.05$) at post one week on all the outcome measures (IIO, SSQ & LDF-TMD). **CONCLUSION***:* This study demonstrated that suprahyoid release is effective in improving swallowing in patients with TMD.

KEYWORDS: SUPRAHYOID, SWALLOWING, MFR, SSQ, LDF-TMDQ, IIO.

INTRODUCTION:

The Craniomandibular articulation or Temporomandibular joint (TMJ) is among the most frequently used joint in the body. In the functions of chewing, talking, yawning, swallowing, and sneezing, TMJ is estimated to move 1,500 to 2,000 times per day. Considering the motions, TMJ is like a hinge joint on a movable base[(1)]. The compromised integrity of the temporomandibular joint leads to temporomandibular disorders (TMDs) which mainly affects the muscles of mastication. Among which, problems of swallowing are the most common. Myofascial pain being the most common, presents as discomfort or pain in the muscles controlling jaw movements as well as the neck and shoulder muscles, pain over the orofacial structures, limited maximal mouth opening, swallowing issues, sense of stiffness and fatiguability in masticatory muscles with disc issues. These symptoms are followed in many cases by spasm of the masticatory muscles characterized by pain on movement of the joint during daily activities, especially during mastication[(3-5)]. Numerous epidemiologic studies reported the prevalence of temporomandibular disorders in certain population. Enrique et al. (2018) found that the prevalence of subjects with one or more current TMD signs was 29.7% [(6-8)]. James friction (2007) stated the repeated strain hypothesis in his study of Myogenous Temporomandibular Disorders. According to the repeated strain hypothesis, Micro or

macro traumatic events or continued muscle contractions leads to over activity of muscles which ultimately causes muscle fatigue, decreased levels of ATP and energy, & anaerobic muscle environment [38]. Noxious metabolic end products such as lactic acid gets accumulated & muscle nociceptors gets activated resulting into muscle nociception which leads to soreness and muscle tone becomes spastic, resulting into muscle tenderness and pain which further is a contributing factor for TMD and jaw dysfunction thereby affecting swallowing process[10]. EMG studies have also proved that activity of suprahyoid muscle is higher during maximal clenching in the edge-to-edge lateral contact position during mastication. It has been proved that EMG pattern of suprahyoid muscles is influenced by vestibular, ocular, and neck receptors, thus adjusting and maintaining a head-neck-posture in mastication & swallowing tasks. Therefore, it gives the elevator muscles mainly masseter and pterygoid, a fixed and stable insertion in the skull[12]. The study concluded that the classical role of the hyoid apparatus should be revised[13].Studies also indicate that there is a strong relationship between the activity of suprahyoid muscles and the strength exerted by the tongue against the palate during the swallowing[14].As for jaw opening force, hyoid resting position and hyoid dynamics are very important and are considered to be affected directly by the suprahyoid muscles. Thus, suprahyoid muscle dysfunction should be considered as an important contributing factor affecting swallowing & jaw function in TMD[15]. The DC/TMD has already estimated that masseter muscle is the commonest site of pain and has high specificity and sensitivity. Although, it also states that other masticatory muscles may be examined but their diagnostic sensitivity and specificity have not been established[18]. MFR is found to be effective in giving symptomatic relief and increasing jaw ROM in patients with myofascial TMD[16,19].

NEED FOR THE STUDY

TMD consists of a group of pathologies affecting the masticatory muscle. According, to the EMG studies there is a greater demand on suprahyoid activation during mouth opening phase & is considered as one of the secondary masticatory muscles, playing a major role in swallowing and hyoid mobility. Several studies have been attempted to find out the usefulness of different masticatory muscle release on TMJ functions. For the best of researcher's knowledge none of those studies have been specifically targeted to investigate the benefit of suprahyoid muscle MFR in improving swallowing & jaw function in TMD.

AIM OF STUDY:

The aim of the study is to find out effectiveness of suprahyoid muscle release for improving swallowing and jaw function in patients with TMD.

OBJECTIVES :

- To Assess the swallowing function by using Sydney swallowing questionnaire
- To Assess the muscle tenderness by using pain pressure threshold measurement.
- To evaluate the jaw function by determining active mouth opening with intra-incisal measurement, and functional limitation using LDF-TMD questionnaire.

METHODOLOGY

A Single group experimental study evaluating the effectiveness of suprahyoid muscle MFR in improving swallowing & jaw function in TMD was conducted at Srinivas College of Physiotherapy and Research Centre, Srinivas College of Dental Science, A.J institute of Dental sciences and other Dental clinics in Mangalore.20 patients with myogenous TMD were screened according to the inclusion and exclusion criteria by convenient sampling and were explained about the study. The study began after getting approval from the ethical committee of the Srinivas college. All patients were asked to sign the written consent form stating the voluntary acceptance to participate in the study.The study duration was from the period of April 2019 to May 2020.Criteria for selection was Age between18-40 years, Chronic TMD ≥ 3 months duration, Myofascial TMD (According to RDC, 1a &1b), Sydney swallowing questionnaire score ≥ 200, Pain free unassisted mandibular opening of less than 40 mm, Maximal assisted opening (passive stretch) of ≥ 5mm, Pain on palpation on suprahyoid[10,16,19,20,22]. Exclusion criteria was Any cervical trauma, History of any surgery in the cranio-cervical region, Any systemic joint or muscle disease, Bleeding & metabolic disorders, Any neurological disorder, Have previously received myofascial release therapy in the cranio-cervical region or dry needling, acupuncture within past one month prior to the study[23].The 3 outcome measures were taken in the study to assess the efficacy of the treatment i.e. Sydney swallowing questionnaire (SSQ-17), maximal inter-incisal opening (IIO), LDF-TMD questionnaire [20,21,22].

PROCEDURE

Demographic data and Additional assessments (pain & functional difficulties) were collected from all selected patients. Instructions were given to avoid any pain killer or anti-inflammatory medication and any new form of treatment or therapy for chronic TMD till the duration of the study. Pre And Post assessment was taken using Sydney swallowing questionnaire (SSQ-17), LDF-TMD questionnaire and maximal interincisal opening (IIO). Muscle tenderness was measured using pain pressure threshold (PPT). 4 sessions of treatment were given in a week. Post treatment outcome measures was collected at baseline, the end of each session and at the end of one week. Home exercise program was also given.

The data were collected & noted into a tabular form following which it was entered & coded in SPSS version 21 for windows. All the variables & its characteristics were expressed as mean (±SD), median (interquartile range) using tables & graphs. The kolmogorov-smirnov test was used to find the normality. For the interferential statistics, the parametric (paired T test) & non parametric (Wilcoxon signed rank test) were selected based on the normal distribution of the descriptive data. The level of significance was kept (α= 0.05). The parametric test was done for the outcome measure of LDF-TMD & non parametric test was done for IIO & SSQ.

RESULTS:

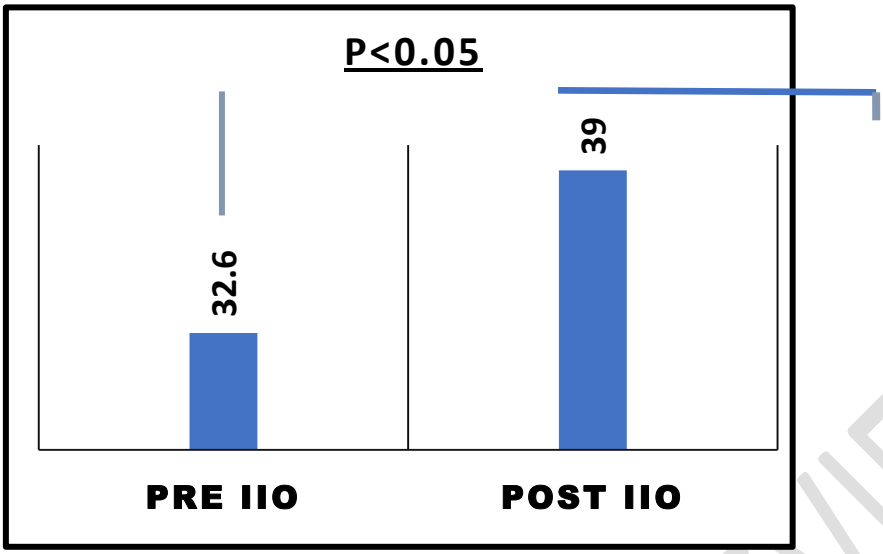
The result of the present study showed that participants improved significantly ($p < 0.05$) at post one week on all the outcome measures (IIO, SSQ & LDF-TMD).

TABLE 1 (Descriptive Statistics): Shows the descriptive values of all the demographic variables expressed in mean (±SD), median (IQR). The variables weight, IIO, & SSQ did not follow normal distribution. Others (height, BMI, LDF-TMD) followed the normal distribution.

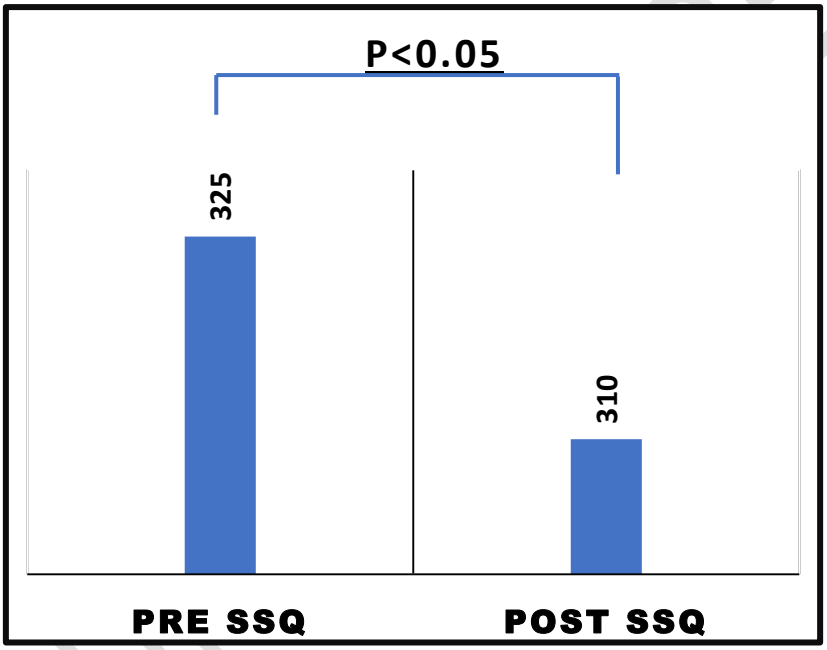
OUTCOMES	MEAN(±SD)	MEDIAN	MINIMUM	MAXIMUM	INTERQUARTILE RANGE (IQR)	P value
HEIGHT	1.61 (± 0.5)	1.60	1.51	1.71	.09	.11
WEIGHT	64.7 (±5.8)	65.5	55	75	8.50	.03
BMI	24.8 (±2.8)	25.35	20.7	32.0	3.88	.20
PRE-IIO	33 (±9.4)	32	20	50	14.5	.03
POST-IIO	40.8 (±6.4)	39.0	30	50	10	.01
PRE-LDF TMD	27.35 (±4.1)	27.5	19	35	6.75	.20
POST-LDF TMD	21.35 (±4.1)	21.0	15	35	4.50	.06
PRE-SSQ	346 (±87.14)	325	200	500	140	.03
POST-SSQ	328 (±84.11)	310	200	480	120	.20

TABLE 2 (interferential statistics) Shows the comparison of outcomes expressed in mean, median, minimum, maximum values.

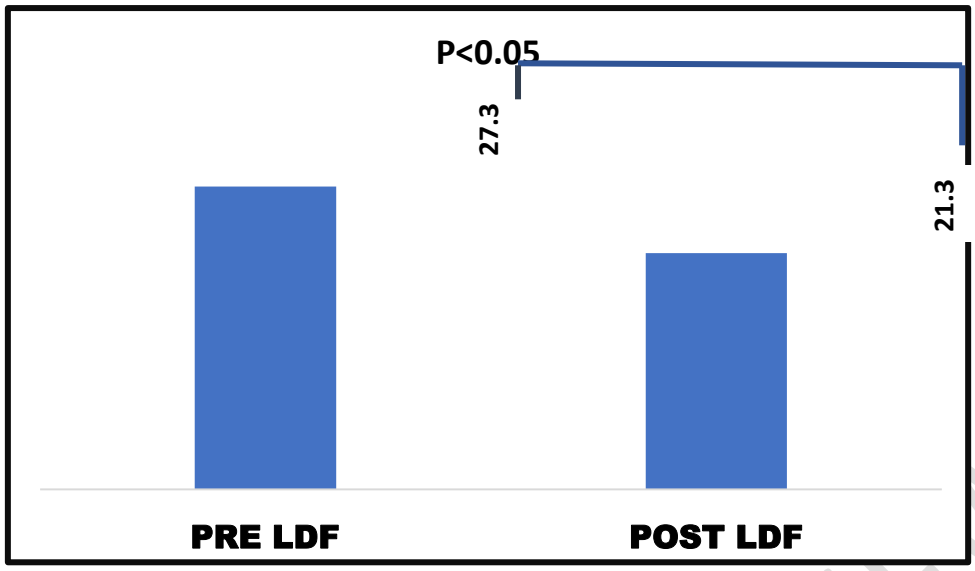
OUTCOMES	MEAN (± SD)	MEDIAN	MINIMUM	MAXIMUM	P VALUE
PRE IIO	33 (± 9.40)	32.6	20	50	.00
POST IIO	40 (± 6.46)	39.0	30	50	
PRE SSQ	346 (± 87.14)	325	200	500	.00
POST SSQ	328 (± 84.11)	310	200	480	
PRE LDF	27.35 ± 4.14	-----	-----	-----	.00
POST LDF	21.35 ± 4.18				



GRAPH 1 (a): Shows The Interferential Statistics For Inter-Incisional Opening (IIO)



GRAPH 1 (b): Shows The Interferential Statistics For Sydney Swallowing Questionnaire (SSQ)



GRAPH 1 (c): Shows The Interferential Statistics For Limitations Of Daily Function In TMD- Questionnaire (LDF)

DISCUSSION:

The most important function of TMJ is mastication. Several muscles come into play, often synergistically. The primary muscles (the masseter, temporalis, medial pterygoid, and lateral pterygoid) work together in a relatively complex fashion in opening & closing of the mouth. The suprahyoid and infrahyoid being the secondary muscles of mastication, are involved with depression of the mandible, tongue movement & most importantly swallowing.[7] TMJ dysfunction has been one of the most confounding condition that has dwindling effect on quality of life. Among which, swallowing problems mainly occur because of poor hyoid/laryngeal elevation. This study investigated the effect of suprahyoid muscle release on swallowing & jaw function in patients with TMD. The result demonstrated that there was a significant improvement in all the outcome measures following 4 sessions of intervention. To the best of our knowledge, this is the first study to examine the effect of suprahyoid muscle release on swallowing & jaw function in TMD.

Previous research in the field of TMD has most commonly evaluated the effect of myofascial release of the primary muscles of mastication in order to improve the jaw function. A study compared the effect of Intra-oral myofascial therapy (IMT) versus education and self-care (ESC) in the treatment of chronic myogenous TMD showed evidence of superiority of IMT compared to ESC & significant improvement in interincisal mouth opening measurements.[29] We suspect the possible mechanism may be because myofascial therapy relieves muscle tension and increases range of motion. MFR has also proved to be clinically effective along with PNF & home exercises on TMJ pain and jaw function in patients with bruxism.[28]

Myofascial therapy results in breaking the pain-spasm cycle by releasing muscle spasms and decreasing adhesions, thus restoring normal homeostasis to connective tissue.[30]

Also, a study compared the effectiveness of Myofascial Release Technique, Positional Release Technique & Conventional Therapy on pain, Mouth opening & functional status in TMD patients. JFLS-20 was used as an important outcome measure to assess jaw function. However, MFR was found to be superior to PRT and remarkably better than the

conventional therapy in the management of TMD.[31]It is believed that Pressure applied activates the autonomic nervous system by stimulating interstitial type III and IV receptors which respond to a light touch; the Ruffini endings in the fascia respond to deep sustained pressure. Stimulating these receptors lowers the overall sympathetic tone, increases gamma motor neuron activity and promotes the relaxation of intra-fascial smooth muscle cells. In addition, the autonomic nervous system promotes vasodilation and local fluid dynamics which alter the viscosity of fascia by changing the ground substance to a more gel-like state.[30]All of these combined effects were hypothesized to yield a palpable release of the suprahyoid tender points and improve jaw function & swallowing in this study.

However, DC/TMD has already estimated that primary muscles of mastication are the commonest site of pain and has high specificity and sensitivity. It also states that other masticatory muscles should also be examined.[16] Although, many studies have evaluated the effect of primary muscles of mastication along with suprahyoid, but no study evaluated suprahyoid alone to improve swallowing & jaw function in TMD.

In a previous study, a video fluorographic evaluation of eight patients with swallowing disorders showed significant improvement in the upward movement of the hyoid bone, the pharyngo-oesophageal sphincter (PES) opening, and the time for the pharynx passage after the jaw opening exercise intervention targeting suprahyoid muscles. The findings indicated that suprahyoid muscle strength is an important indicator of swallowing strength.[32]Also, a study evaluated the movement of the hyoid apparatus showed that no time during the chewing & swallowing cycle, the hyoid is fixed.[13] However, EMG studies have proved that for jaw opening force, hyoid resting position and hyoid dynamics are very important and are considered to be affected directly by the suprahyoid muscles.[14] A number of studies related to various aspects of Temporomandibular joint problems were reported[33-37]. The present study considered suprahyoid muscle dysfunction as an important contributing factor, may be because of which mandibular depression & swallowing function improved showing significant results ($p<0.05$) in the outcome measures of IIO & SSQ. Amelioration in the outcome measures of IIO & SSQ could be the main reason because of which jaw function (LDF-TMD) also showed significant improvement as a whole ($p<0.05$).

LIMITATIONS:

The study has several limitations like the duration was short, only 1 week and the results apply to short term effects. No long-term follow-up was done to ascertain the differences in long term gains in the protocol. Sample size was small and thus the result of the study cannot be generalisable. Another limitation was no objective assessment tools were used to assess swallowing function. Although, the positive short-term results should encourage further more comprehensive research to study the effect of suprahyoid muscle to improve swallowing & jaw function in TMD.

CONCLUSION:

This study demonstrated that suprahyoid release is effective in improving swallowing in patients with TMD. In addition, the results of this study provide further evidence of the effects of suprahyoid myofascial release on improving interincisal mouth opening, jaw function & increased well-being. Significant results were found for all the outcome measures used in the study. Therefore, Suprahyoid release can be used as a treatment option to improve swallowing function in myogenous TMD. Though, in light of these findings, we suggest that any further research to study the effect of suprahyoid release to

improve swallowing function and self-care strategies for TMDs (of any type) use trials of at least one-year duration to assess potential benefit.

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