

# Effectiveness of Ultrasound Therapy on Oral Submucosal Fibrosis

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## Abstract

**Aim:** The aim is to find the effectiveness of ultrasound therapy on oral submucosal fibrosis.

**Objective:** To evaluate the efficacy of ultrasound therapy to increase level of mouth opening in oral submucosal fibrosis.

**Procedure:** The study procedure was explained to all the participants with an information sheet and a written informed consent was obtained. Assessment was done and 40 individuals with osmf were selected based on the inclusion and exclusion criteria following which participants were randomly allocated into groups, Group A and Group B. Group A individuals were treated jaw opening exercises. Group B individuals were treated with ultrasound and jaw opening exercises. Both the group participants were assessed for level of mouth opening using scale and divider. After two weeks of intervention, post period assessment same as of pretest was performed to ensure any differences.

**Outcome Measures:** Level of mouth opening.

**Result:** Statistical Analysis made with quantitative data revealed statistical significance between pre and post test values.

**Conclusion:** From the result it has been concluded that ultrasound therapy is effective in increasing the level of mouth opening in osmf individuals

**Keywords:** Oral submucosal fibrosis, mouth opening, ultrasound therapy, Physiotherapy.

## Introduction

Oral Submucous fibrosis is a chronic disease of insidious onset featuring the deposition of fibrous tissue in the juxta epithelial layer of mucous membrane

involving the pharynx, palate, fauces, cheek and lips, pharynx and oesophagus<sup>(1)</sup>. Although occasionally preceded and/or associated with vesicle formation, is always associated with juxtaepithelial inflammatory reaction followed by fibro elastic changes in lamina propria with epithelial atrophy leading to stiffness of oral cavity leading to trismus and inability to eat<sup>(2)</sup>. Oral sub mucous fibrosis has now become an Indian epidemic with an estimated 2.5 million people being affected with this disease. The rate varies from 0.2-2.3% in males and 1.2-4.57% in females in Indian communities. Oral sub mucous fibrosis also has a significant mortality rate because it can transform into Oral cancer, particularly squamous cell carcinoma, at a rate of 7.6%<sup>1</sup>. It is a

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pre-malignant condition with 15 % of all cases converted to malignancy<sup>(3)</sup>. Oral Submucous Fibrosis (OSF) is a lesion found among people who chew betel nut (Areca catechu) with or without tobacco and other ingredients. Gutka is the predominant form of areca nut (with or without tobacco) consumption in most parts of India, Gutka (also called gutkha,) is a powdery or granular preparation of areca nut, betel nut, tobacco, lime and savory flavorings. It is a popular product in India and available under several dozen names<sup>(4)</sup>. Presently, the etiology of OSMF is mainly attributed to the use of areca nut and quid chewing habit. Areca nuts contain alkaloids, of which arecoline seems to be a primary etiology factor<sup>(5)</sup>. Areca nut is available in processed and unprocessed forms. The processed areca nut products are available in a variety of commercial forms with and without tobacco such as plain arecanut (without tobacco) and Gutkha (with tobacco). Areca nut is taken as it is or wrapped in a betel leaf along with slaked lime and several condiments according to taste referred to as betel quid. Most important risk factor is chewing betel quid and this has been supported by epidemiological, case control, animal tissue culture studies as well. Also, it has been a part of religious, social, and cultural rituals. There is no definitive treatment for OSMF<sup>(6)</sup>. A common presenting symptom is a burning when eating hot and spicy food and a progressive decrease in the mouth opening, associated with difficulty in eating, changed gustatory sensation, dryness of mouth and nasal voice.

Oral submucous fibrosis is divided into four stages clinically graded OSMF into: Stage I: Faucial bands only., Stage II: Faucial bands and buccal bands., Stage III: Facial, buccal and labial bands and functionally graded OSF into, stage A : Mouth opening  $\geq 20$  mm, Stage B : Mouth opening 10-19 mm, Stage C : Mouth opening  $\leq 10$ mm The oral mucosa loses its resiliency and becomes blanched and stiffing its advanced stage. Other features of the disease include pigmentation and recurrent ulceration of oral mucosa, restricted movement of the soft palate, dryness of the mouth, burning sensation, decreased mouth opening, and tongue protrusion<sup>(7)</sup>.

The management of OSMF is mainly followed by two major strategies—medical and surgical; however, the question of improving the elasticity of oral mucosa and thus increasing the mouth opening is prevailing. Considering the above facts, apart from medical and surgical management, physiotherapy is offering the third dimension to the management of OSMF. Basic physiotherapy techniques, viz., active jaw movements

and stretching have been tried postsurgically as a supportive therapy. Apart from this, ultrasound (US) is conventionally being used for fibrous and scar tissues, however, it has not been extensively used for oral mucosa. Ultrasound is defined as a form of acoustic vibration with frequencies so high that it can't be perceived by human ear. Thus frequencies less than 17000 Hz are usually sound and those above are defined as ultrasound. Ultrasound used for therapeutic purpose has a frequency of about 0.8-1 MHz and an intensity of 0.5-3 w/cm<sup>2</sup><sup>(8)</sup>.

Ultrasonic treatment: ultrasonic waves produce tissue heating at a deeper level than moist heat; this increase in local tissue temperature leads to increase in blood flow and removal of metabolic byproducts responsible for pain and may help decrease adhesions. The physiotherapy is third dimension of treatment in oral sub mucous fibrosis, which include disrupting collagen cross-linkage.

Stretching exercises: Physical therapy using muscle-stretching exercises for the mouth may be helpful in preventing further limitation of mouth movements. This is often combined with medical and surgical therapy. Muscle stretching exercises for the mouth may be helpful to prevent further limitation of mouth movements. This includes forceful mouth opening with the help of sticks, ballooning of mouth, hot water gargling. This is thought to put pressure on fibrous bands. Forceful mouth opening have been tried with mouth gag & acrylic surgical screw. Hence, this study is designed to evaluate the adjuvant effects of therapeutic ultrasound and physiotherapy in OSMF patients<sup>(9)</sup>.

## Methodology

Study design: experimental study. Study setting: saveetha medical college and hospital, saveetha institute of medical and technical sciences, thandalam, chennai. Sampling method: convenient sampling technique sample size: 40 individuals. Inclusion criteria: gender: both males and females, age group: 20 -50 years, eligibility: less than 30-35 mm and subjects: mouth opening level less than 30 mm using pan or other substance for more than 6 months. Exclusion criteria: mouth opening level more than 30-35mm, using pan or other substance for less than 6 months, any fracture in the oral cavity, surgeries done in oral cavity and established cancer cases

**Procedure:** Following the Institutional Scientific Review Board approval the study was initiated with participants chosen from Saveetha Medical College and

Hospital, Saveetha Institute of Medical and Technical Sciences, Thandalam.

The study was approved by institutional human ethical committee and ethical clearance was obtained from Saveetha Medical College and Hospital, Saveetha Institute of Medical and Technical Sciences, Thandalam. The study procedure was explained to all the participants with an information sheet and a informed consent was obtained. Assessment was done and 40 individuals with oral submucous fibrosis were selected based on the inclusion and exclusion criteria following which participants were randomly allocated into groups, Group A and Group B. Group A individuals were treated with ultrasound and jaw opening exercises. Group B individuals were treated with jaw opening exercises. Both the group participants were assessed for the level of mouth opening using scale and divider. After Preliminary Evaluation, the participants in Group A and group B were made to proceed into a 2-week treatment program. After two weeks of intervention, post period assessment same as of pretest was performed to ensure any differences.

#### Group A:

Group A individuals were treated with jaw opening exercises.

The participants were asked to perform the following exercises

- Wide mouth opening and maintaining it for five seconds- 10 repetitions
- Lateral deviation of mandible to right and left side -10 repetitions
- Protrusion of mandible-10 repetitions
- Gradual mouth stretching by placing the left thumb over the lower incisor and right index finger over the lower incisor and maintain it for 5 seconds-10 repetition

These exercises are done two times a day for five days per week for two week

#### Group B:

Group B individuals were treated with ultrasound and jaw opening exercises

The participants were made to lie down in supine position comfortably.

Ultrasound is applied to the affected side cheek .The parameters of ultrasound therapy are

It is followed by jaw opening exercises

- Wide mouth opening and maintaining it for five seconds- 10 repetitions
- Lateral deviation of mandible to right and left side -10 repetitions
- Protrusion of mandible-10 repetitions
- Gradual mouth stretching by placing the left thumb over the lower incisor and right index finger over the lower incisor and maintain it for 5 seconds-10 repetition

These exercises are done two times a day for five days per week for two weeks

#### Outcome Measures:



Figure 1: Level of mouth opening measurement



Figure 2: Level of mouth opening

**Statistical Analysis:** The collected data was tabulated and analyzed using descriptive and inferential statistics. To all parameters mean and standard deviation (SD) was calculated. Paired t-test was used to analyze significant changes between pre-test

and post-test measurements. Unpaired t-test was used to determine significant difference between the groups. A p-value less than 0.0001 were considered as statistically significant.

**Table: 1 Comparison of pre test and post test values of Group A**

Outcome Measure	Pre Test		Post Test		t-Value	p-Value
	Mean	S.D	Mean	S.D		
Level of Mouth Opening	24.70	1.92	25.55	1.73	6.4743	<0.0001

**Table:2 Comparison of pre test and post test values of Group B**

Outcome Measure	Pre Test		Post Test		t-Value	p-Value
	Mean	S.D	Mean	S.D		
Level of Mouth Opening	24.50	1.85	30.20	1.64	17.9777	<0.0001

**Table:3 Comparison of post test values between group A and group B**

Outcome Measure	Group A		Group B		t-Value	p-Value
	Mean	S.D	Mean	S.D		
Level of mouth opening	25.55	1.73	30.20	1.64	8.7163	<0.0001

**Results**

From statistical analysis made with quantitative data revealed statistically significant between pre and post test value the post test mean value of group a (jaw opening exercises) is 25.55 and group b (ultrasound and jaw opening exercise) is 30.20. Pre test and post test values of group a (jaw opening exercises). The paired t value shows that there is extremely statistically significant change at  $p < 0.0001$  and t value 6.4743 (Table 1). Pre test and post test values of group b (ultrasound and jaw opening exercises). The paired t value shows that there is extremely statistically significant change at  $p < 0.0001$  and t value 17.9777 (Table 2). Post test values of group a and b. the paired t value shows that there is extremely statistically significant change at  $p < 0.0001$  and t value 8.7163 (Table 3).

**Discussion**

OSMF is a commonly occurring and widely spread premalignant condition increasingly affecting the youth. The occurrence of OSMF in gutkha chewers is far more faster and more severe as compared in other forms of

areca nut products chewers. The easy availability and promotions of these areca nut products specially gutkha and pan masala outside the schools colleges and social places has impacted younger population in India which has led to the increased occurrence of OSMF. Causation of OSMF is multifactorial but in present study pan masala was the commonest product used

According to this study our dual therapy of local ultrasound and jaw opening exercise has led to significant improvement in mouth opening when compared to the group treated with only jaw opening exercises.

The purpose of this study was to determine the effectiveness of ultrasound in osmf patients. This improvement could be explained on the basis of effect of pulsed ultrasound due to mechanical effect which causes loosening of adherent fibrous tissue probably due to the separation of collagen fibres from each other and softening leading to pliability jaw opening exercises include opening of the mouth, gradual stretch to the mouth .

The two treatment modalities definitely show a

significant improvement in the patient's condition with no reported side effects, hence should be included in the treatment protocol for patients with OSMF before a more invasive surgical intervention is sought<sup>(10,11)</sup>. Reduction in pain and improvement in maximal mouth opening was appreciably significant in both the groups. The results indicated that ultrasound when given along with exercise resulted in significantly better subjective and objective outcome. Therapeutic ultrasound when used as an adjuvant shows a significant improvement in the patient's condition with no reported side effects, hence, should be incorporated in the treatment protocol for patients with OSMF<sup>(12)</sup>. There was significant improvement in mouth opening in both the groups, that is, exercise alone and the ultrasound along with exercise in patients with OSMF. However ultrasound in combination with exercise gives more improvement in mouth opening compared to exercise alone<sup>(13,14)</sup>.

### Conclusion

Ultrasound therapy followed by jaw opening exercises can be alternate mode of treatment for OSMF to improve mouth opening level. The subjects treated with ultrasound followed by jaw opening exercises were more satisfied with the outcome than the subjects treated with jaw opening exercises only. Patients with OSMF suffer a lot because of pain and limited mouth opening level several techniques such as cortisone injections are used. Study is required in physiotherapy method since it is a non invasive method which will be fruitful to the patients.

**Ethical Clearance:** IHEC approval was obtained before subject enrolment from SIMATS, Chennai.

**Source of Funding:** Self

**Conflict of Interest:** Nil

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