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# EFFECT OF GOLDFISH EXERCISE ON PAIN, MOUTH OPENING AND TEMPOROMANDIBULAR JOINT DISABILITY IN ORAL SUBMUCOUS FIBROSIS- A RANDOMIZED CONTROLLED TRIAL

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## ABSTRACT

***Background**: Oral SubMucous Fibrosis (OSMF) consists of facial pain and limited mouth opening. Restriction in mouth opening affects individual's day-to-day activities and even his health. Few studies have been done on effect of different exercises on Temporomandibular Joint (TMJ) Disorders.This study focuses on treating OSMF with Goldfish exercises. **Aim:** To study the effect of Goldfish exercise on Pain, Mouth opening and TMJ disability index in OSMF. **Study Design:** Randomized Controlled Trial. **Method:** 16 Patients with OSMF selected and divided into 2 groups. Group1:Received Goldfish exercise + Conventional Therapy & Group2:Received Conventional Therapy for 2 weeks. Conventional Therapy included Therapeutic ultrasound and gentle stretching exercises. Visual Analogue Scale (VAS), Mouth Opening (MO) and TMJ Disability Index were taken Pre & Post Treatment. Thereby data analysis was done using appropriate tests. **Results:** There was significant improvement ($p<0.05$) in MO and TMJ Disability Index in group1 compared to group2.**Conclusion:** Goldfish Exercise when given along with conventional therapy improves mouth opening and function.*

*Key Words: Goldfish Exercise, OSMF, TMJ Disability Index, MO, VAS.*

## INTRODUCTION

Oral SubMucous Fibrosis (OSMF) is a chronic pre-malignant condition featuring the deposition of fibrous tissue in the juxta-epithelial layer of mucous membrane involving the pharynx, palate, faces, cheek, lips, oesophagus among tobacco chewers (Betel leaf & Betel nut, Areca Catechu & slaked Lime). [1, 2] Joshi (1953) coined the term Submucous fibrosis of the palate and pillars. Consumption of Areca nut or betel leaf with or without tobacco starts more commonly among adolescents or young children. Pindborg et al reported the prevalence of OSMF in India as 0.2-0.5% and prevalence by gender varying from 0.2-2.3% in males and 1.2-4.57% in females.[2] The occurrence of OSMF is wide ranging between 20 and 40 years of age. [2] It has been suggested that ingestion of chillies, genetic susceptibility, nutritional deficiencies, altered salivary constituents, autoimmunity and collagen disorders may be involved in the pathogenesis of this condition.

Common Presenting Symptoms are burning when eating hot & spicy food, dryness of mouth, nasal voice, decrease in mouth opening, difficulty in eating resulting in reduced oral intake, fibrous bands in affected areas, changed gustatory sensation and ulcerations & vesicles. [1]

**Haider SM (2000) Graded OSMF**

1. **Clinically**
   - Stage I : Facial Bands
   - Stage II : Facial Bands & Buccal Bands
   - Stage III : Facial, Buccal & Labial Bands
2. **Functionally**
   - Stage A : Mouth Opening ≥ 20mm
   - Stage B : Mouth Opening 10-19mm
   - Stage C : Mouth Opening ≤ 10mm

**Pathogenesis [1, 3]**

When Arecoline (from Areca Nut) mixes with Saliva there will be hydrolysis of Arecaidine. Arecaidine has direct effect on Fibroblasts which causes high amount

of collagen production. This results in formation of Fibrous tissue.

Moreover when Arecoline increases it causes cytotoxic effect on the cells. Thereby cells show detachment from culture surface. Following this there will be epithelial changes- either epithelial hyperplasia or atrophy and gradually leading to increased tendency for keratinizing metaplasia.

Goldfish Exercise was developed by Japanese Health Care Practitioner-SEIGO NISHI. This exercise was an outcome of inspiration on the concept of elegant swimming motion of the Goldfish. When this concept was put into practice, the Japanese realized its benefits at many levels. This newly found way of exercising became known in Japan as "KINGYO UNDO" or "GOLDFISH EXERCISE".

## PURPOSE OF THE STUDY

Oral Submucous Fibrosis (OSMF) is less explored condition and physiotherapy is subjected in form of ultrasound, kneading & stretching exercises. Few studies have been done on effects of mobilization & muscle energy techniques. Goldfish exercise is a new form of exercise which can be given in treating Temporomandibular dysfunctions.

This study may lead to new avenue for the research in improving the current treatment procedures.

### OBJECTIVES

- To study the effect of Goldfish Exercise along with conventional therapy on Pain, Mouth Opening & Temporomandibular Joint Disability Index in Oral Submucous Fibrosis.
- To study the effect of Conventional therapy on Pain, Mouth Opening & Temporomandibular Joint Disability Index in Oral Submucous Fibrosis.
- To compare the effect between the two.

## METHODOLOGY

1) **MATERIALS** used in the study were consent form, treatment couch, chair with backrest, Visual Analogue Scale (VAS), TMJ Disability Index, millimeter ruler, ice-cream sticks, Ultrasound machine, coupling gel & cotton and pen.
2) **SAMPLE SIZE:** 16 patients with OSMF. 8 patients in each group
3) **STUDY DESIGN:** Randomized Controlled Trial
4) **STUDY SETTING:** OPD of Government Physiotherapy College, Civil Hospital, Ahmedabad
5) **SAMPLING DESIGN:** simple random sampling
6) **STUDY DURATION:** 6 months
7) **INCLUSION CRITERIA**
   - Patients who were willing to participate in the study
   - Patients who were able to comprehend the commands
   - Age Group: 20-40yrs
   - Male Patients selected
   - Patients diagnosed with Stage 2 /B OSMF by Dental Surgeon or ENT Specialist
8) **EXCLUSION CRITERIA**
   - H/o Fracture around Temporomandibular Joint (TMJ)
   - Any surgical procedure around TMJ
   - Dislocation or subluxation of TMJ
   - Any neurological disorder
   - Malignancy or referred pain of cervical origin

### TECHNIQUE

Prior to the study, all patients were explained about the procedure, written informed consent was taken. The present study was approved by the Institutional Ethics committee, Government Spine Institute, Civil Hospital, Ahmedabad.

Pre-participation evaluation form consisted of the demographic data of the patient that includes age, chief complain, history, previous surgery, pain assessment, range of motion, manual muscle testing, any tightness or deformity. 16 patients having Oral Submucous Fibrosis (OSMF) were randomly taken from the out-patient department. They were randomly divided into 2 groups using the chit method such that the patients did not know about the group allocation.

- **Group1:** Received Goldfish Exercise + Conventional Therapy
- **Group2:** Received Conventional Therapy

**For 2 weeks duration, 5 times/week &** No. of patients in each group = **8.**

The patients were requested to continue normal activities, avoid spicy foods and avoid other forms of treatment for 2 weeks apart from routine physician treatment.

Visual Analogue Scale (VAS), Mouth Opening (MO) and Temporomandibular Joint (TMJ) Disability Index were taken Pre and Post treatment. Thereafter data analysis was done using appropriate statistical tests.

OUTCOME MEASURES:

1) **Visual Analogue Scale (VAS)** is a pain measurement scale where the patient is asked to place a mark on 10cm horizontal line to indicate how much severe the pain is. Left end represents no pain and right end represents severe, unbearable pain.
2) **Mouth Opening (MO)** [4] was measured using Millimeter Ruler. The subject in sitting position with his cervical spine in neutral position & stabilized. The patient asked to open his mouth as wide as possible even if pain is present. With millimeter ruler, vertical distance between the edge of upper central incisor and the corresponding edge of the lower central incisor was measured. Intertester and intratester reliability of mouth opening measurement using millimeter ruler is good (ICC=0.90-0.97).
3) **Temporomandibular Joint (TMJ) Disability Index**[5] assesses pain and routine functional skills requiring oral function. It has 10sections of pain and disability during various activities. The patient was asked to circle the number which describes his problem best. Total score out of 40 was calculated and converted into percentage.

**TREATMENT PROTOCOL**

**Ultrasound Therapy**[6]

- Pulsed mode
- 3MHz
- 0.5w/cm$^2$, 3-5min

**TMJ Mantra**

**Ice-Cream Sticks:** 20secs hold, 4-5reps

**Active-Passive Stretching Exercise:** 5secs hold followed by 5secs rest. 2-3times.

**Isometric Exercises**[7]**:** 3secs hold, 6 times in 4 directions.

**GOLDFISH EXERCISE** [8, 9]

- Place the tongue lightly on the top of the mouth.
- Open mouth as much as possible.
- Place 1 index finger on the TMJ.
- Place other on chin(for supported)/on other TMJ(for unsupported)
- Allow the jaw to drop down & raise back up with the help of index finger.
- Repeat 6 times.

## RESULTS

- Data analysis was done using SPSS version 16.0 & Microsoft Excel 2007. The data collected by Mouth Opening were analyzed using parametric tests- Paired t-test was used for pre-post analysis & Unpaired t-test was used for between the group analysis; as the data is interval in nature. The data collected by Visual Analogue Scale & TMJ Disability Index were analyzed using non- parametric tests- Wilcoxon signed rank test was used for pre-post & Mann Whitney U- test for between the groups; as the data is ordinal in nature.
- The level of statistical significance was fixed at $p<0.05$.
- Mean ± Standard Deviation (SD):- Age in years- Group1: 29.12 ± 4.64; Group2: 28.87 ± 4.94. At baseline both the groups were similar with no statistical significant difference. ($p>0.05$)
- Within group analysis for Group 1 (Goldfish exercise + Conventional Therapy) showed statistical significant difference in VAS, Mouth opening and TMJ disability. ($p<0.05$) (Table I). Within group analysis for Group 2 (Conventional Therapy) showed statistical significant difference in VAS and TMJ disability ($p<0.05$) but not for mouth opening ($p>0.05$) (Table II). Between groups analysis showed statistical significant difference in Mouth opening and TMJ disability ($p<0.05$) but there was no statistical significant difference in VAS ($p>0.05$) (Table III).

Table I: Comparison of Pre and Post Treatment in Group1 (*p<0.05- statistically significant)

| | Pre-treatment Mean±SD (Median) | Post-treatment Mean±SD (Median) | | p-value |
|---|---|---|---|---|
| **VAS** | 5.88 ± 1.24 (6) | 3 ± 0.75 (3) | Z-value= -2.54 | 0.01* |
| **TMJ Disability Index** | 48.75 ± 6.94 (47.5) | 30.31 ± 4.27 (30) | Z-value= -2.53 | 0.01* |
| **MO** | 14.75 ± 3.01 | 26.75 ± 3.45 | t-value= 2.64 | <0.05* |

**Table II: Comparison of Pre and Post Treatment in Group2 (*p<0.05- statistically significant)**

| | Pre-treatment Mean±SD (Median) | Post-treatment Mean±SD (Median) | | p-value |
|---|---|---|---|---|
| **VAS** | **5.5 ± 1.41 (5)** | **3.25 ± 1.03 (3)** | **Z-value= -2.64** | **0.008*** |
| **TMJ Disability Index** | **51.56 ± 6.39 (51.25)** | **46.25± 6.54 (46.25)** | **Z-value= -2.55** | **0.01*** |
| **MO** | **15.5 ± 2.87** | **21.13 ± 3.39** | **t-value= 2.20** | **>0.05** |

**Table III: Difference between the Group1 and Group2 (*p<0.05- statistically significant)**

| | Group1 | Group2 | | p-value |
|---|---|---|---|---|
| VAS | 3 | 2 | Z-value=-1.65 | 0.09 |
| TMJ Disability Index | 17.5 | 5 | Z-value=-3.93 | 0.001* |
| MO | 12 | 5.63 | t-value= 2.65 | <0.05* |

## DISCUSSION

This study shows that Goldfish Exercise along with conventional therapy, results in statistically significant reduction of pain, TMJ Disability & increase in mouth opening ($p<0.05$). Conventional therapy showed statistical reduction of Pain & TMJ Disability while Mouth opening had no statistical significant difference. However there was some observable improvement in mouth opening which can be thought due to the therapeutic effect of ultrasound and active-passive stretching exercises and ice-cream sticks. Ultrasound accelerates the healing process, increases the extensibility of the collagen fibers and thereby breaks the fibrous bands and also causes pain relief. Isometric exercise prevents or minimizes muscle atrophy and maintains static strength.

When both the groups were compared, Goldfish Exercise shows statistical improvement in Mouth opening & TMJ Disability & no difference in Pain. This may indicate that Goldfish Exercise does not individually have role on reduction of pain, but it does improve overall oral function & thereby oral intake of the patient by increasing mouth opening and reducing the disability.

Goldfish Exercise works on the principle of pulsatile motion of Goldfish in water & thereby imitating the same motion for health benefits. It can be thought of stretching the fibrous bands, reducing TMJ stiffness & resulting in improvement of mouth opening. It would be beneficial to use this technique on daily basis and as far there are no contraindications of this exercise because it's done within the pain limits & further progression depends on the mouth opening of the patient. Goldfish Exercise can be given to the patients having jaw problems and even taught for home exercise program.

Thus Goldfish exercises should be included as a part of Conventional protocol, in order to get better results.

## CONCLUSION

Goldfish exercise when given along with conventional therapy has been found to be effective in improving the OSMF patients' oral functions by reducing pain & increasing the mouth opening.

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**Conflict of Interest:** None

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