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RESEARCH ARTICLE

COMPREHENSIVE INSIGHT INTO MANAGEMENT OF OSMF.

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Abstract

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Introduction:-

Oral submucous fibrosis is known since ancient times. Initially it was termed as 'Vidhari' in Indian medical literature by Sushruta, a renowned Indian physician who lived in the era 600 B.C. It was first described in the modern literature by Schwartz in 1952 who coined the term "atrophica idiopathica mucosa oris" to describe an oral fibrosing disease, which he discovered in 5 Indian women residing in Kenya. Joshi subsequently coined the term oral submucous fibrosis (OSMF) for the condition in 1953.¹

Oral submucous fibrosis is defined as "a chronic insidious, disease affecting any part of the oral cavity and sometimes the pharynx. Although occasionally preceded by and/or associated with vesicle formation, it is always associated with juxta epithelial inflammatory reaction followed by fibro elastic changes of the lamina propria, with epithelial atrophy leading to stiffness of the oral mucosa causing trismus and inability to eat."²

The disease primarily affects the people from Indian subcontinent and emigrants from these countries to other regions. It affects about 0.2 %-0.5% population of India with a slight male predilection.³ Malignant transformation rate is 7.6% with median 10 yrs follow up period. This condition is prevalent between the age group of 11-60 years.

OSMF has a multifactorial etiology. Several factors such as nutritional deficiency states, areca nut chewing, genetic susceptibility, autoimmunity & collagen disorders have been suggested to be involved in the pathogenesis of the condition.²

The reasons for the rapid increase of the disease are reported to be due to an upsurge in the popularity of commercially prepared areca nut preparations (pan masala) in India and to an increased uptake of this habit by young people due to easy access, effective pricing and aggressive marketing strategies.²

Clinical features of OSMF which are primarily debilitating and adversely affect the quality of the life starts with blanching and progressive fibrosis of oral mucosa, burning sensation on taking spicy food, mucosal atrophy, dryness

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of the mouth, defective gustatory sensation, progressive restriction of mouth opening and protrusion of the tongue, difficulty in swallowing.^{2,5}

Till date there has been no universally accepted cure reported in the scientific literature for the disease process, however various treatment modalities like corticosteroids, immunomodulators, antioxidants, biogenic stimulants like placental extracts, peripheral vasodilators, hyaluronidase, nutritional supplements, etc are being used with varying success rates.⁶

Management Strategies Of OSMF:-

The etiology of OSMF is multifactorial since the exact causative factor for OSMF is a matter of conflict, the failure to achieve proper or specific treatment for it may be the reason for its incomplete regression or abolition. Therefore, the mainstay in the management of OSMF is to relieve the symptoms like pain, burning sensation of mouth and improve the mouth opening. The various modalities can be discussed under following headings:

1. Preventive and prophylactic measures.
2. General measures.
3. Symptomatic treatment.
4. Treatment per se.
5. Nutritional supplements, physical therapy and rehabilitation.

1. Patient Counselling And Prophylactic Measures:-

The objective of prophylactic measure consists of disease prevention, as opposed to disease treatment. Just as health encompasses a variety of physical and mental states, so do disease, which are affected by environmental factors, genetic predisposition, disease agents, and lifestyle choices. In general reduction or elimination of the habit of areca nut chewing, life style modification, relaxation techniques and avoid tobacco-using peer-group network are some important preventive measure. Various studies have quoted the direct association of stress with habit acquisition.⁴⁰ Thus significant psychiatric morbidity in patients with OSMF suggests the need for mandatory psychological assessment and treatment of patients with the condition along with the routine management.

Therefore tobacco cessation and underlying cause should be the first step towards a successful management plan in OSMF patients. These include self-help materials to explain ill effects of quid and tobacco on health, motivational approach, cognitive-behavioural strategies the addition of pharmacotherapy, including nicotine replacement therapy (NRT) and psychological counselling may be required in extreme cases.

Johnson, in 2004, recommended the use of the five A's in tobacco cessation as follows:⁴¹

Ask—identify tobacco users.

Advise—advise them to quit.

Assess—evaluate the patient's readiness to quit.

Assist—offer assistance in cessation.

Arrange—follow up on the patient's cessation efforts.⁴¹

NRT is supplied as a gum, skin patch, nasal spray, or inhaler. It works by providing a substitute source of nicotine, eliminate the withdrawal symptoms, without the other harmful components of cigarette smoke. Varenicline, bupropion are medications primarily used as a de-addiction aid.

Usage: ZYBAN, WELLBUTRIN (bupropion hydrochloride) 100-300 mg/day for 7-12 weeks.

CHANTIX, CHAMPIX (varenicline) 1mg for 6 weeks.⁴³

2. General Measures:-

General measures include minimizing consumption of hot and spicy foods, including chillies and maintaining proper oral hygiene. Quid chewing leads to multiple oral problems in OSMF patients like staining of teeth, dentinal hypersensitivity due to wasting disease of teeth like attrition, fractures in teeth, dental caries and traumatic ulcers due to impingement of sharp cusps on leathery mucosa. Tobacco produces harmful effects not only on dentition and periodontium which may manifest as gingivitis, halitosis and periodontitis but also on TMJ in form of fibrotic involvement of the oral musculature that may contribute to limitation of mouth opening in chronic chewers.⁴⁵

These include extraction of teeth with poor prognosis like grossly carious teeth and root stumps if any, selective coronoplasty of sharp cusps if any, restoration of teeth, scaling of teeth, desensitising tooth paste containing active compounds like potassium nitrate, strontium chloride, strontium acetate, arginine, calcium carbonate, hydroxyapatite

and calcium sodium phosphosilicate. Sodium monofluorophosphate, sodium fluoride, sodium fluoride/stannous fluoride combinations.⁴⁶

Oral prophylaxis in form of scaling supplemented by use of mouthwash and gum paints containing astringents like tannic acid, antiseptics like chlorhexidine or iodine and analgesics like choline salicylate.

These measures thus aim at achieving complete oral health and building a positive self esteem in the patients.

3. Symptomatic Treatment:-

Symptomatic treatment aims at relieving the symptoms caused due to OSMF like xerostomia, burning sensation in mouth, dysguesia and oral ulcers. Vesiculation accompanied by ulcers, traumatic ulcers and pain in the oral cavity are common in OSMF patients. These include chewing of sugar-free chewing gums to keep mouth moist. Topical anesthetic agents in form of mouth paints or mouthwashes. Systemic analgesics like diclofenac sodium, ibuprofen, paracetamol may be given in case of severe pain.

Currently used topical agents such as anesthetics like lignocaine 1%, antiinflammatory like amlexanox 5%, antimicrobials like tetracycline, steroids like triamcinolone acetonide 0.1%.

4. Treatment per se:-

Medical treatment: topical and systemic(table-1):-

Surgical treatment:-

Medical Treatment:-

Topical medications are prescribed in almost all stages of OSMF. These agents provide localized action without systemic adverse effects. These may be associated with bad taste and smell, nausea, dry mouth, candidiasis, mucosal atrophy, delayed healing, allergy/contact dermatitis to medication itself, preservatives, other ingredients in vehicles. Systemic medications are usually reserved for severe and refractory cases as these medications are associated with many adverse effects when compared to topical medications.

Saravana KB et al in their review discussed the treatment protocol depends on the grading of the disease as follows:

Grade I:-

Antioxidants and multivitamins 1 tab once daily 10 weeks orally, iron supplements 1 tab once daily 10 weeks orally, ointment triamcinolone acetonide 0.10% 4 weeks topically.

Grade II:-

Antioxidants and multivitamins 1 tab once daily 10 weeks orally, iron supplements 1 tab once daily 10 weeks orally, ointment triamcinolone acetonide 0.10% 8 weeks topically, Inj.Hyaluronidase 1500 IU biweekly for 10 weeks intra lesionally in combination Inj.Dexamethasone 2 ml biweekly for 10 weeks with local anaesthetic 1 ml 2% without adrenaline biweekly for 10 weeks.

Grade III:-

Antioxidants and multivitamins 1 tab once daily 10 weeks orally, iron supplements 1 tab once daily 10 weeks orally, Inj. Placentrex 2 ml weekly once for 4 weeks intra lesionally, topical ointment triamcinolone acetonide 0.10% for 4 weeks, Inj.Hyaluronidase 1500 IU biweekly for 10 weeks.

Grade IV:-

Antioxidants and multivitamins 1 tab once daily 10 weeks orally, iron supplements 1 tab once daily 10 weeks orally, Inj. Placentrex 2 ml weekly once for 4 weeks intralesionally, ointment triamcinolone acetonide 0.10% 4 weeks topically, local injection of corticosteroids and placental extracts have been tried in addition to hyaluronidase, collagenase and similar substance that breakdown intercellular substances and reduces collagen formation. Intralesional injection of hyaluronidase mixed with hydrocortisone resulted in better results. Intralesional injections of IFN-gamma which is also known as antifibrotic cytokine is another key factor to the treatment of OSMF. IFN-gamma can alter collagen synthesis. Local and systemic application of glucocorticoids and placental extracts are commonly used which prevents mucosal damage because of its anti inflammatory effects. Advanced treatment options include administration of pentoxifylline and nutritional supplements like lycopene which have satisfactory effects on treating moderate to severe stages of OSMF.⁵⁰

Mehrotra D et al suggested a clinical grading of the disease and treatment methods as follows:

Grade I:-

Stomatitis and burning sensation in the buccal mucosa with no detection of fibres. Suggested treatment for this group is abstinence from habit and medicinal management.

Grade II:-

Symptoms of grade I, palpable fibrous bands, involvement of soft palate, and maximum mouth opening 26-35 mm. Suggested treatment: abstinence from habit and medicinal management.

Grade III:-

Symptoms of grade II, blanched oral mucosa, involvement of tongue, and maximal mouth opening 6-25 mm. Suggested treatment: abstinence from habit and surgical management.

Grade IV:-

Symptoms of grade III, fibrosis of lips, and mouth opening >5 mm. Suggested treatment: abstinence from habit and surgical management.⁵¹

Table-1:- Medications prescribed in OSMF:

TOPICAL	SYSTEMIC
1. Corticosteroids • Hydrocortisone • Dexamethasone • Triamcinolone acetonide	1. Vasodilators: Pentoxifylline, Nylidrin hydrochloride, Buflomedial hydrochloride.
2. Enzymes • Chymotrypsin • Hyaluronidase • Collagenase	2. Immunomodulators: Levamisole, Immune milk.
3. Placental extracts	3. Combination regimen
4. Turmeric	
5. Aloe vera	
6. Interferon gamma	
7. Oral mucoadhesive drug delivery	

TOPICAL:-

1. Corticosteroids:-

Steroids are most commonly used in the management of OSMF because of their anti-inflammatory properties. Cytokines and growth factors produced by the inflammatory cells can promote the fibrosis by inducing a proliferation of fibroblast, subregulating collagen synthesis and down regulation collagenase production. Steroids exert their anti-inflammatory action by inhibiting the apoptosis of inflammatory cells.¹⁹

Short acting drugs: Hydrocortisone intralesional injection 1.5cc given once a week for a duration of 12 weeks have proven to be beneficial. Systemic corticosteroids were found to be useful in only early and mild cases.

Intermediate acting drugs: Topical triamcinolone acetonide 0.1% and local injection of triamcinolone acetonide can be used in very early and early cases.

Long acting drugs: Dexamethasone 4mg intralesional injections, is given biweekly. It can be given in combination with hyaluronidase for better long term results. Betamethasone can be given as 4mg/ml intralesional injections biweekly.

Usage:

Topical:-

Triamcinolone acetonide 0.1% (KENACORT)

Betametasone – 0.5% (BETNESOL)⁴²

Intralesional:-

Dexamethasone – 4mg/ml (Inj DEXONA)
Triamcinolone -40 mg/ml (Inj KENACORT)
Hydrocortisone – 25 mg/ml (Inj WYCORT) ⁴²

Systemic:-

Prednisolone – 20 mg/day (WYSOLONE)
Dexamethasone – 4mg/day (DEXONA)
Triamcinolone – 12mg/day (KENACORT) ⁴²

2.Enzymes:-

Chymotrypsin:-

It is an endopeptidase, hydrolyses ester and peptide bonds, thus acting as a proteolytic and anti-inflammatory agent.¹⁹

Usage:-

Chymotrypsin (5000 IU), twice weekly submucosal injections for 10 weeks.⁵³

Hyaluronidase:-

It breaks down hyaluronic acid (ground substance of connective tissue), lowers the viscosity of intracellular cement substance i.e hyaluronidase decreases cell formation by virtue of its action on hyaluronic acid, which plays an important role in collagen formation. The use of topical hyaluronidase has been shown to improve symptoms more quickly than steroids alone. The combination of steroids and topical hyaluronidase shows better long-term results than either agent used alone.^{22,52}

Usage:-

Hyaluronidase (1500 IU) twice weekly submucosal injections for 10 weeks.

Collagenase:-

It is a lysosomal enzyme, capable of degrading phosphate esters, proteins, polysaccharides, glycosides and sulphate esters. Reduced content of functional collagenase observed in OSMF patients is one of the mechanisms accountable for collagen accumulation. Lin and Lin found that intra-lesional collagenase injections not only results in a noteworthy improvement of mouth opening, but also experience a striking decline in symptoms.

Usage: 2mg of collagenase materials dissolved in 1ml of distilled water for injection.⁵⁴

Adverse reactions: pain, swelling and trismus may be seen after injections of collagenase which is considered to be allergic reaction of this agent.⁴²

3. Placental Extracts:-

Placental extract is an aqueous extract of human placenta that contains nucleotides, enzymes, vitamins, amino acids, and steroids. Its action is essentially "biogenic stimulation." It is suggested that it stimulates the pituitary and the adrenal cortex, and regulates the metabolism of tissues. Its use is based on the tissue therapy method. According to this theory when animal and vegetable tissues are severed from the parent body and exposed to unfavourable conditions, but not mortal to their existence, undergo biogenic readjustment leading to development of substance in the state of their survival to ensure their vitality biogenic stimulators. Such tissues or their extract when implanted or injected into the body after resistance of pathogenic factors stimulates metabolic or regenerative process thereby favouring recovery. The intra-lesional injection of human placental extract had been shown to be effective, lasting, and safe. There was significant improvement in mouth opening and associated symptoms.^{19,10}

Usage:-

Injection of Placenta extract (Inj. PLACENTREX) 2 ml was given locally in the predetermined areas, once a week for total duration of one month or more.

4.Turmeric:-

Turmeric has been found to inhibit many disease processes through their anti-inflammatory, antioxidant and anticancer properties. In addition, Curcuminoids isolated from turmeric, has been found to have effective

antioxidant, DNA-protectant and antimutagen action.⁶ Turmeric oil & turmeric oleoresin both act synergistically in vivo to offer protection against DNA damage.^{19,6}

Usage:-

Topical application of alcoholic extracts of turmeric (3 g), turmeric oil (600 mg), turmeric oleoresin (600 mg) daily for 3 months.⁵⁵

5. Aloe Vera:-

Aloe vera foliage, extract and resin present antimicrobial, anti-inflammatory and healing properties. It is easily available, safe to use, cost effective, non-invasive and effective treatment modality for OSMF. Thus it can be an adjuvant therapy in treatment of OSMF.²¹

Usage:- Aloe vera can be applied topically (approx. 5mg 2-3 times a day) and/or systemic (30 ml juice twice daily).

6. Interferon Gamma:-

It plays an important role in the treatment of patients with OSMF because of its immuno-regulatory effect. IFN-gamma is a known anti-fibrotic cytokine. Patients treated with an intra-lesional injection of IFN-gamma experienced improvement of symptoms. IFN gamma, through its effect of altering collagen synthesis, appears to be a key factor to the treatment of patients with OSMF, and intralesional injections of the cytokine may have a significant therapeutic effect on OSMF.^{19,16}

Usage:-

Intralesional injection of interferon gamma (0.01- 10.0 U/mL) 3 times a day for 6 months.

7. Oral Mucoadhesive Drug Delivery:-

Oral mucoadhesive drug delivery is very efficient therapeutic targeted drug approach than systemic delivery, as smaller amounts of drug can be easily dispersed at the site of the disease, thereby reducing its side effects. Mucoadhesive systems for oral local drug delivery include adhesive tablets, adhesive patches, adhesive films or pellicles, adhesive semisolid systems (gels, ointments), and adhesive liquid systems (sprays, mouthwashes).

Kumar NS et al reported semisolid mucoadhesive curcumin gel having antitumorigenic and antimutagenic property can be used for the treatment of OSMF which provides effect for extended periods of time.

Averineni RK et al conducted a preliminary study to develop mucoadhesive buccal films of valdecoxib a novel COX-2 inhibitor for the treatment of oral sub-mucous fibrosis.²¹

SYSTEMIC:-**1. Vasodilators:-**

Occlusive blood vessels encountered in OSMF restrict nutrients and therapeutic substances from reaching the affected tissue, which may be one of the reasons for the unsatisfactory therapeutic effect of drug treatment of OSMF. Thus vasodilators are used in the therapy of OSMF.¹⁹

Pentoxifylline is a tri-substituted methylxanthine derivative, which increases red cell deformability, leukocyte chemotaxis, antithrombin and anti-plasmin activities, and more importantly to the present context, its fibrinolytic activity. Pentoxifylline decreases red cell and platelet aggregation, granulocyte adhesion, fibrinogen levels, and whole blood viscosity.^{13,17}

Usage: 400-800 mg twice/thrice daily.

Nylidrin hydrochloride a peripheral vasodilator affects the tissues in diffuse fibrosis to a noticeable degree by relieving the local ischemic effect and also helps the nutritional and therapeutic substances to reach the affected tissues.⁴²

Usage: 3 to 12 mg 3-4 times a day.

Bufloamedial hydrochloride a vasoactive agent, acts on the microcirculation, relieves the ischemic effect and thus helps the nutritional and therapeutic substances reach the affected tissues. It can be used as effective adjunct drug both in early and advanced cases of OSMF

Usage: 450mg/day⁴²

2.Immunomodulators:-

Immunomodulators act by opposing the action of soluble factors released by sensitized lymphocytes following activation by specific antigens or by immunosuppressive action. These agents also prevent or suppress inflammatory reactions.⁵⁷

Levamisole is an antihelminthic immunomodulator drug which modifies both cellular and humoral immunity. Levamisole may be given alone/combined with other modalities.

Usage: Levamisole 50 mg, three times daily, for three consecutive days in a week for three alternate weeks.

Immune milk: It is a kind of skimmed milk produced from cows immunized with multiple human intestinal bacteria. It has good anti-inflammatory effect and contains moderate amounts of Vit. A, C, B1, B2, B6, B12, nicotinic acid, pantothenic acid, folic acid, iron, copper and zinc and it contains 20-30% higher concentration of IgG type I antibody. It may suppress the inflammatory reaction and modulate cytokine production.¹⁹

Usage: 45 g milk powder twice a day for 3 months.⁵⁸

3.Combination Regimen:-

Various combinations of topical and systemic medication in different combination yield good results in OSMF. Combination regime which have been tried are:^{19,53}

1. Steroid, vitamins, minerals and enzymes
2. Hyaluronidase and steroids
3. Chymotrypsin and steroids
4. Enzymes, chymotrypsin and steroids
5. Placental extracts and steroids
6. Steroids, peripheral vasodilator, vitamins and enzymes
7. Levamisole and vitamin A.
8. Steroids and antihistaminics

Surgical Treatment:-

It is the technique of choice in patients with limited mouth opening and/or biopsy showing dysplastic or neoplastic changes.²⁷ It includes:

1. Fibrotomy.
2. Fibrotomy with grafts.
3. Laser treatment.
4. Mononuclear Stem Cell Therapy.

Fibrotomy:-

The surgical treatment involves excision of fibrous bands and forceful mouth opening resulting in a raw wound surface. Relapse is a common complication that occurs after surgical release of the oral trismus caused by OSMF.²⁷

Fibrotomy with grafts:-

Initially surgeons aimed at surgical elimination of the fibrotic bands which showed further scar formation and recurrence of trismus, to prevent which, they started using various inter positional graft materials. The principle behind is incision (incorrectly termed as excision) or surgical release of fibrous bands followed by forceful opening of the mouth (widening of the incised tissue or region), and covering of surgical defects using various flaps or synthetic biological material.²⁷

Extra-oral flaps:-

1. Split thickness skin graft.
2. Superficial temporal fascia pedicled flap.
3. Nasolabial flap.
4. Platysma myocutaneous muscle flap.

Intraoral flaps:-

1. Tongue flap
2. Palatal island flap
3. Buccal fat pad

Microvascular free flaps :-

1. Radial forearm free flap
2. Anterolateral thigh flap

Alloplasts:-

1. Collagen membrane
2. Artificial dermis

Laser treatment:-

Lasers offer oral surgeons with a new modality for treating OSMF. The erbium chromium yttrium scandium gallium garnet (Er Cr: YSGG) laser has a wavelength of 2780 nm, well absorbed by water and is used on oral soft tissue without creating thermal damage. The overall advantage of laser surgery include a bloodless operative field and thus outstanding visibility, reduced need for local anesthesia, less probability of bacterial infection, reduced mechanical tissue trauma, fewer sutures, quicker healing, reduced post-operative edema, scarring and tissue shrinkage.²⁷

Mononuclear Stem Cell Therapy:-

Stem cell therapy is primarily aimed at neoangiogenesis by releasing cytokines and growth factors.

1. This may result in increased free radical scavenging by antioxidants.
2. Neoangiogenesis may also facilitate the removal of senescent cells from the lesions by supplying more number of scavenging defense cells and reversal of hypoxia in the diseased tissue.

Stem cell therapy may help to stimulate resident tissue stem cells to transform into new fibroblasts, which may help in the removal of disintegrated biochemically and morphologically altered collagen fibers.⁵⁶

Usage: 0.5-1 ml of bone marrow-derived stem cell concentrate into labial and buccal mucosa and tongue under local anesthesia.

Nutritional Supplements, Physical Therapy And Rehabilitation:-**a.Nutritional support:-****b.Physical therapy:-****c.Rehabilitation:-****a.Nutritional supplements:-**

Vitamins, iron and mineral rich diet should be advised to patients with OSMF. Intake of red tomatoes, fresh fruits and green leafy vegetables should be included in the regular diet. Intake of green tea should be included in the diet chart. Various studies have implicated deficiency of iron both as a cause and effect in etiopathogenesis of OSMF. Iron deficiency anemia in patients with OSMF could be related to the precancerous and esophageal carcinoma.⁶⁴ Thus iron supplements should be included in treatment plan.¹⁹ Borle RM et al advocated the usage of systemic ferrous fumarate in regime and recorded successful treatment with oral iron in OSMF patients.⁶⁶

Vitamins, minerals and antioxidants:-

Usually prescribed are vit.A, vit.E, vit.C, zinc copper, manganese. Vitamin "E" acting as antioxidant prevents the formation of toxic substances and enhances the indigenous concentration of vitamin "A". The functional and structural ingredients of epithelial cells are dependent on adequate concentration of vitamin "A". It plays a major role in induction and control of epithelial differentiation and invasive malignant potential is slowed, delayed, arrested or even reversed.¹⁹

Martin H et al considered vitamin B deficiency to be important in the etiology of degenerative changes in oral mucosa before malignant transformation.⁶⁵

Thus vitamin B complex administration may relieve glossitis, inflammation of tongue and cheilosis in OSMF patients. Several studies have confirmed the cancer preventive nature of antioxidants.⁶⁵

ANTOXID tablet (containing beta-carotene 50 mg, Vitamin A palmitate 2500 IU, Vitamin E acetate 10 IU along with vitamin C, zinc, manganese, selenium and copper) given thrice daily for 6 weeks has been shown to cause significant clinical improvement in patients with OSMF. It has been found that these micronutrients have antioxidant properties and enhance cellular immunity.^{42,62}

Spirulina:-

Spirulina is a microalgae which contains phenolic acid, tocopherols, beta carotene and have potent antioxidant properties. It can be used as an adjuvant therapy in the initial management of OSMF.³⁴

Usage: 500 mg spirulina twice daily.

Green Tea:-

The antioxidant and anticarcinogenic potential of green tea polyphenols mainly EGCG (epigallocatechin-3-gallate) result into binding and neutralization of free radicals by the hydroxyl groups. Therefore, tea pigments improve microcirculation and hemorrheology.

Li and Tang found an overall effective rate and believed that tea pigment's acts by decreasing high blood viscosity, improving microcirculation, and increasing the activity of superoxide dismutase.²¹

Oxitarid:-

Oxitarid contains the extracts of *Magnifera indica*, *Withania somnifera*, *Daucus carota*, *Glycyrrhiza glabra*, *Vitis vinifera*, *Syzygium aromaticum*, powders of *Embllica officinalis* and *Yashada bhasma*; and oils of *Triticum sativum*. Singh *et al* used Oxitarid capsule and concluded that there was significant increase in mouth opening along with decrease in pain.

Usage: 2 capsules twice daily.³⁵

Lycopene:-

Lycopene is a bright red carotene and carotenoid pigment and phytochemical found in tomatoes and other red fruits and vegetables. It has been shown to have several potent anti-carcinogenic and antioxidant properties. Lycopene exhibits the highest physical quenching rate constant with singlet oxygen. The role of lycopene in OSMF is inhibition of abnormal fibroblast, increase resistance to stress, decrease in inflammatory response. It has found to improve mouth opening and reduces burning sensation – singly or in combination of intralesional steroids.^{22,63}

Usage: 8 mg twice a day for 2 months.

Alpha- Lipoic Acid:-

It has a good potential action of scavenging free radicals and also it has excellent property, it can dissolve in both water and fat. It has shown reduction in burning sensation and improved mouth opening.⁶⁷

Usage: 100 mg, 1 capsule per day for 30 days

b.Physical therapy:-

Physiotherapy is thought to put pressure on fibrous bands. Forceful mouth opening have been tried with mouth gag & acrylic surgical screw. The use of microwave diathermy is one of the physiotherapeutic modality in the management of OSMF.¹⁹

Kneading is an effective form of massage therapy in form of gentle soft tissue manipulation helps in improving the elasticity of fibrous tissues and mobilizing scar tissues.

Muscle stretching exercises can be performed using mouth gag, acrylic surgical stent, ballooning of mouth, hot water gargling, inter positioning spatula between the teeth and adding a new spatula every 5-10 days.⁶

Heat –Short wave/Micro wave diathermy: Heat has been used in the form of lukewarm water, hot rinses or selective deep heating therapies like short wave or micro wave diathermy. Microwave diathermy seems superior to short wave, because selective heating of juxta epithelial connective tissue, thereby limiting the area treated.

Gupta D et al advocated use of microwave diathermy at 2450 MC/s daily for 20 mins at each site of the lesion with 20 to 25 watts of energy in 15 sittings.⁴²

Ultrasound is a form of acoustic vibration with frequencies so high that it can't be perceived by human ear. Ultrasound used for therapeutic purpose has a frequency of about 0.8-1 MHz and an intensity of 0.5-3 w/cm². Ultrasound selectively raises the temperature in some well circumscribed areas. Ultrasound thus proves to be an efficient deep heating modality.⁵⁹

c.Rehabilitation:-

Rehabilitation includes post surgical rehabilitation, oral physiotherapy and also prosthodontic rehabilitation wherever required after endodontic treatment that is placement of crown and bridge also crown for severely attrited teeth. This is important step in restoration of proper form and function for esthetic and functional harmony.

Conclusion:-

OSMF is one of the most poorly understood and unsatisfactorily treated diseases. Despite elaborate researches on the etiology, pathogenesis and management protocol of the disease, there has been no universally accepted cure reported in the scientific literature. All available treatments provide symptomatic relief, which is short lived. This is mainly due to the fact that the etiology of the disease is not fully understood and the disease is progressive in nature. Based upon above mentioned treatment modalities and our experience we can conclude that management of OSMF depends on the degree of clinical involvement (table-2). If the disease is detected at a very early stage, cessation of the habit is sufficient. Most patients with OSMF present with moderate-to-severe disease which is irreversible. A combined therapy with holistic approach can help our patient care though it still is the field requiring extensive research.

Table 2:- Treatment Suggested According To The Grade Of OSMF:

GRADE OF OSMF	TREATMENT SUGGESTED
GRADE-1	PREVENTIVE+MEDICAL (eg. antioxidants/mutivitamins, topical medication)
GRADE-2	PREVENTIVE+MEDICAL (eg. antioxidants/mutivitamins, topical medication, intralesional injections)
GRADE-3	PREVENTIVE+MEDICAL/SURGICAL (eg. antioxidants/mutivitamins, topical medication, intralesional injections, systemic medications) If not responding: SURGICAL
GRADE-4	PREVENTIVE+SURGICAL

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