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Research Article

COMPARATIVE EVALUATION OF EFFICACY OF AYURVEDIC THERAPY WITH CONVENTIONAL PHARMACOLOGICAL THERAPY IN MANAGEMENT OF OSMF: RCT

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A R T I C L E I N F O

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A B S T R A C T

To compare and evaluate the efficacy of Ayurvedic treatment (Aloe Vera and turmeric) with conventional Pharmacological therapy (Intralesional injection of Dexamethasone and hyaluronidase), along with Physiotherapy in the management of Oral Submucous Fibrosis. Study group comprised of 60 patients who reported to the department of Oral Medicine and Radiology diagnosed with Oral Submucous Fibrosis. All the 60 patients were divided into two groups A (Ayurvedic Therapy) & B (Pharmacologic Therapy) randomly. Result showed that the improvement in interincisal opening between 1st to 12th week is more in group B (31.31%) then group A (22.55%) whereas burning sensation reduction is more in group A (100%) than group B (99.60%). The study concluded that Ayurvedic treatment showed faster reduction in burning sensation and pharmacologic treatment showed faster increase in mouth opening.

INTRODUCTION

Oral submucous fibrosis is "a chronic, insidious disease affecting any part of oral cavity and may extend to the pharynx and the oesophagus and may be preceded or associated with vesicle formation.[1] It is always associated with juxta-epithelial inflammation and followed by fibro elastic change of the lamina propria with epithelial atrophy leading to stiffness.[2]

It was first described by Schwartz in 1952.[3,4,5,6] Numerous factors such as routine consumption of chili in food, areca nut chewing, nutritional deficiency, hereditary susceptibility, autoimmune and collagen disorders have been the etiologic factors concerned in the pathogenesis of this condition.[7,8,9] The potentially malignant nature of this condition with a transformation rate of 3% to 7.6% has been mentioned in literature.[10,11]

The prevalence of OSMF has increased over the past four decades from 0.03% to 6.42%. In 2002, the statistics of OSMF for India alone was 5 million people.[1,12] The pathogenesis of the disease is not well-established, but the cause of OSMF is believed to be multifactorial. Various mechanisms were suggested for the etiopathogenesis of OSMF.[13,14]

The treatment of patients with OSMF depends on the degree of clinical involvement. Treatment holds option of both non-surgical and surgical approach. Non-surgical management includes multivitamin supplements including lycopene and range of medicines (e.g. intra-lesional injections of steroids, hyaluronidase, human placental extracts, chymotrypsin, pentoxyfilline and collagenase).

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Also use of ayurvedic preparations of aloe vera, tulsi and turmeric has shown promising results.[15] Surgical intervention includes cutting of fibrous bands, which is used in more extreme cases.[9] Aloe vera It is a mannoprotein containing many amino acids called wound healing hormones.

Several studies have been successfully conducted on Aloe Vera as well as on turmeric. Curcumin (diferuloymethane) found in turmeric, a natural yellow pigment also exhibits anti-oxidant, antiinflammatory and anti-cancer properties. It was hypothesized that curcumin exerts anti-inflammatory activity by inhibiting a number of different molecules that participates in the process of inflammation. They also exhibit fibrinolytic property due to its ability to inhibit lipid peroxidation and check cellular proliferation, thereby reducing the rate of collagen synthesis.[16]

The literature supports the use of such several medical interventions. However, the numbers of reported randomized controlled trials are limited. Thus, this study is an effort to compare and evaluate the efficacy of Ayurvedic therapy [aloe vera & turmeric] with conventional pharmacological therapy [intralesional injection of dexamethasone and hyaluronidase] along with mouth opening exercises in the management of oral submucous fibrosis: a randomized controlled clinical study.

MATERIALS & METHODOLOGY

The study group comprised of 60 patients who reported to the department of Oral Medicine and Radiology diagnosed with OSMF. All the 60 patients were divided into two groups (A and B) randomly. Group A – Consisted of 30 patients who were given topical Aloe Vera gel (5mg/day) 3 times/day

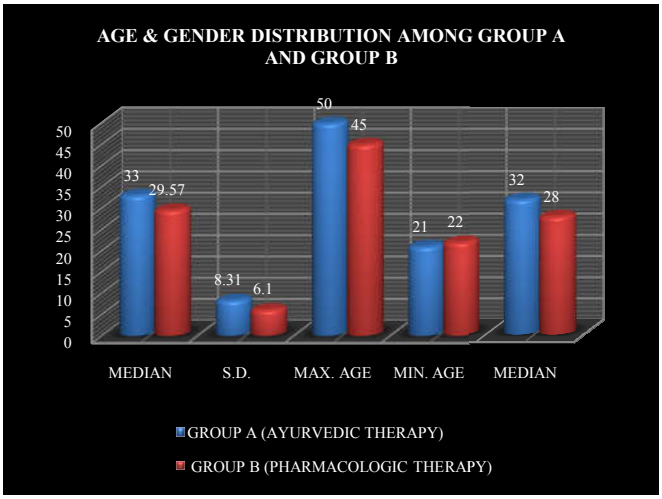
(Krishna's herbal & Ayurvedic) and orally turmeric capsule (300mg) (Sanat products Ltd.) twice daily for 3 months along with mouth opening exercises. Group B –Consisted of 30 patients who were given intralesional injections of Dexamethasone (Dexra zenilabs ethica Ltd.) (4mg/ml) & Hyaluronidase (Hynidase shreya life science pvt. Ltd) (1500 IU) with insulin syringe weekly for 3 months along with mouth opening exercises. The duration of treatment was for three months. All the patients were evaluated for mouth opening (Inter-incisal distance in mm) & severity of burning sensation (VAS scale) at baseline (First visit), and at the end of 1st, 2nd and 3rd month of treatment. All the parameters were measured & recorded in every visit. Medication diary was provided to all patients for home follow up. All the results obtained were statistically analyzed.

OBSERVATION AND RESULTS

The mean age of subjects suffering from OSMF in group A is 33 years and in Group B is 29.57 years respectively. Total numbers of male were 87% and female 13% in Group A and total numbers of male were 90% and female 10% in Group B. (Table 1 Graph 1).

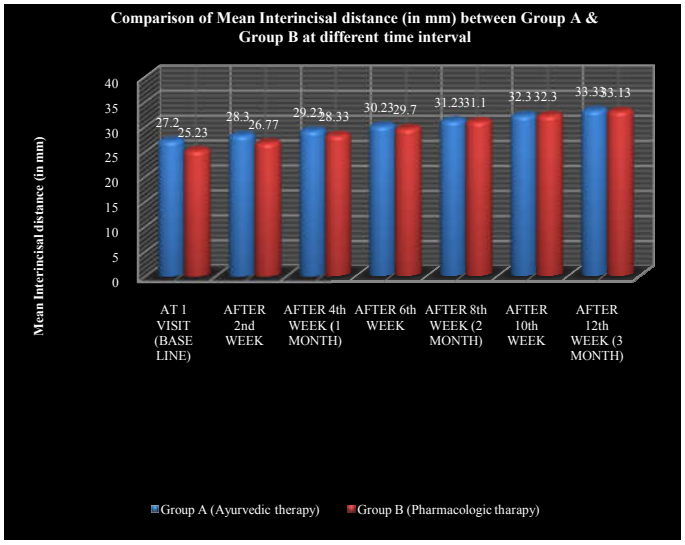
Table 1 Age and Gender Distribution among Group A and Group B

	Group A (Ayurvedic Therapy)		Group B (Pharmacological Theraphy)	
Mean Age	33		29.57	
Standard Deviation (S.D.)	8.31		6.1	
Maximum Age	50		45	
Minimum Age	21		22	
Median	32		28	
Total No. of Study Patient	30		30	
	n	%	n	%
Total No. of Male	26	87%	27	90%
Total No. of Female	4	13%	3	10%



Graph 1 Distribution of Study Subjects (Group A And Group B) In Mean, Standard Deviation Maximum Age, Minimum Age & Median.

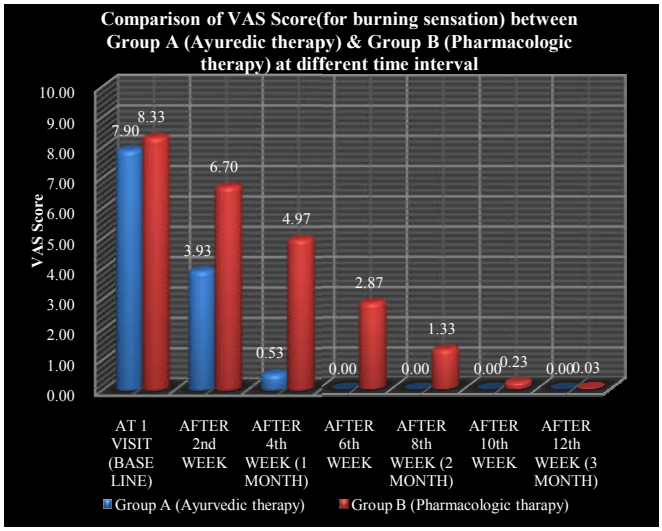
The Mean Interincisal Opening in Group A & Group B at first visit was 27.20mm & 25.23mm respectively which increased at the end of 12th week of therapy, the Mean for the two groups being 33.33mm & 33.13mm. The difference in mean between Group A & B at 1st visit was 1.97mm and the difference in Mean decreased subsequently in the following weeks, being the minimum after 9th week i.e. -0.13mm. (Table 2, Graph 2).



Graph 2 Comparisons of Mean Inter Incisal Distance (In Mm) Between 2 Groups At Different Time Interval.

Simultaneous comparison of Interincisal opening (in mm) among different time-points through ONE-WAY ANOVA for Group A shows F value is 49.171 which is greater than F crit value (1.744), and P value is 0.0001, whereas Simultaneous comparison of Interincisal opening (in mm) among different time-points through ONE-WAY ANOVA for Group B shows F value is 41.93 which is greater than F crit value (1.744) and p-value is 0.0001 shows a significant difference among successive time-points at .05 level of significance i.e. P<.05. (Table 3 & 4)

In 30 subjects the mean VAS Score decreased significantly i.e.7.90 to 0.00 for burning sensation in patients from Group A compared with VAS Score reduction in patient from Group B i.e. 8.33 to 0.33. In Group A the mean score for burning sensation is reduced from 7.90 to at the completion of 5 weeks of therapy. However Pharmacological therapy did not show much improvement after the same duration of therapy (i.e. after the completion of 5 weeks). (Table 5, Graph 3)



Graph 3 Comparison of mean VAS score between 2 Groups at different time interval

Table 2 Mean, Standard Deviation & Standard Error Of Mean (S.E.M.) of Interincisal Opening (In Mm) For In Group A (Ayurvedic Therapy) and Group B (Pharmacological Therapy) and Difference B/W In Group A And Group B

Visit/Time -Points	Group A (Ayurvedic Therapy) Interincisal Opening (In Mm)			Group B (Pharmacological Therapy) Interincisal Opening (In Mm)			Difference B/W Group A & Group B		
	MEAN	S.D.	S.E.M.	MEAN	S.D.	S.E.M.	MEAN	S.D.	S.E.M.
AT 1 VISIT (BASELINE)	27.20	1.81	.330	25.23	2.42	.441	1.97	3.00	.562
AFTER 1st WEEK	27.33	1.75	.319	25.90	2.55	.465	1.43	3.28	.594
AFTER 2nd WEEK	28.30	1.64	.300	26.77	2.37	.433	1.53	3.00	.548
AFTER 3rd WEEK	28.37	1.67	.305	27.57	2.33	.425	.80	3.00	.547
AFTER 4th WEEK (1 MONTH)	29.23	1.70	.309	28.33	2.20	.402	.90	2.96	.541
AFTER 5th WEEK	29.47	1.68	.306	29.20	2.23	.408	.27	3.00	.548
AFTER 6th WEEK	30.23	1.68	.306	29.70	2.15	.393	.53	2.96	.539
AFTER 7th WEEK	30.50	1.70	.310	30.47	2.24	.409	.03	3.05	.556
AFTER 8th WEEK (2 MONTH)	31.23	1.68	.306	31.10	2.34	.427	.13	3.10	.566
AFTER 9th WEEK	31.60	1.59	.290	31.93	2.23	.406	-.13	2.86	.522
AFTER 10th WEEK	32.30	1.62	.296	32.30	2.26	.413	.00	2.89	.527
AFTER 11st WEEK	32.67	1.52	.277	32.67	2.35	.430	.00	2.88	.525
AFTER 12th WEEK (3 MONTH)	33.33	1.58	.289	33.13	2.18	.397	.20	2.68	.490

Table 3 One-Way Anova –F Table for Simultaneous Comparsion Among Different Time-Points In Interincisal Opening (In Mm) For Group A (Ayurvedic Therapy)

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1755.96	13	135.074	49.171	.0000*	1.744
Within Groups	1115.30	406	2.747		P<.05 (SIG.)	
Total	2871.26	419				

*shows a significant difference among successive time-points at .05 level of significance. i.e. P<.05

Table 4 One-Way Anova –F Table for Simultaneous Comparsion Among Different Time-Points In Interincisal Opening (In Mm) For Group B (Pharmacological Therapy)

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2860.10	13	220.01	41.93	.0000*	1.744
Within Groups	2130.50	406	5.25		P<.05 (SIG.)	
Total	4990.60	419				

*shows a significant difference among successive time-points at .05 level of significance. i.e. P<.05

Table 5 Mean, Standard Deviation & Standard Error of Mean (S.E.M.) of Vas Score For Burning Sensation For Group A (Ayurvedic Therapy) And Group B (Pharmacological Theraphy) And Difference B/W Group A & Group B.

Visit/Time -Points	Group A (Ayurvedic Therapy) (Vas Score For Burning Sensation)			Group B (Pharmacological Theraphy) (Vas Score For Burning Sensation)			Difference B/W Group A & Group B		
	MEAN	S.D.	S.E.M.	MEAN	S.D.	S.E.M.	MEAN	S.D.	S.E.M.
AT 1 VISIT (BASELINE)	7.90	1.094	.200	8.33	.922	.168	.433	1.357	.248
AFTER 1st WEEK	5.90	1.213	.221	7.67	1.028	.188	1.767	1.547	.282
AFTER 2nd WEEK	3.933	1.258	.230	6.70	.988	.180	2.767	1.591	.290
AFTER 3rd WEEK	2.033	1.098	.201	6.00	1.114	.203	3.967	1.542	.281
AFTER 4th WEEK (1 MONTH)	.533	.629	.115	4.97	1.245	.227	4.433	1.406	.257
AFTER 5th WEEK	0.00	0.00	0.00	3.83	1.533	.280	3.833	1.533	.280
AFTER 6th WEEK	0.00	0.00	0.00	2.87	1.697	.310	2.867	1.697	.310
AFTER 7th WEEK	0.00	0.00	0.00	1.93	1.363	.249	1.933	1.363	.249
AFTER 8th WEEK (2 MONTH)	0.00	0.00	0.00	1.33	1.061	.194	1.333	1.061	.194
AFTER 9th WEEK	0.00	0.00	0.00	.700	.837	.153	.700	.837	.153
AFTER 10th WEEK	0.00	0.00	0.00	.233	.504	.092	.233	.504	.092
AFTER 11st WEEK	0.00	0.00	0.00	.133	.434	.079	.133	.434	.079
AFTER 12th WEEK (3 MONTH)	0.00	0.00	0.00	.033	.183	.033	.033	.183	.033

Table 6 One-Way Anova –F Table For Simultaneous Comparsion Among Different Time-Points In Vas Score For Burning Sensation For Group A (Ayurvedic Therapy)

Source Of Variation	SS	df	MS	F	P-value	F crit
Between groups	2630.25	13	202.33	484.06	.0000*	1.744
Within groups	169.7	406	0.42		P<.05 (SIG.)	
Total	2799.95	419				

*shows a significant difference among successive time-points at .05 level of significance. i.e. P<.05

Simultaneous comparison of VAS Score for burning sensation among different time-points through ONE-WAY ANOVA for Group A shows F value is 484.06 which is greater than F crit value (1.744), and p-value is 0.0001, whereas Simultaneous comparison of VAS Score for burning sensation among different time-points through ONE-WAY ANOVA for Group B shows F value is 255.988 which is greater than F crit value (1.744), and p-value is 0.0001 which shows a significant difference among successive time-points at .05 level of significance i.e. P<.05. (Table 6 & 7)

Table 7 One-Way Anova –F Table For Simultaneous Comparsion Among Different Time-Points In Vas Score For Burning Sensation For Group B (Pharmacological Therapy)

Source of variation	SS	df	MS	F	P-value	F crit
Between groups	3588.76	13	276.059	255.988	.0000*	1.744
Within groups	437.83	406	1.078		P<.05 (SIG.)	
Total	4026.60	419				

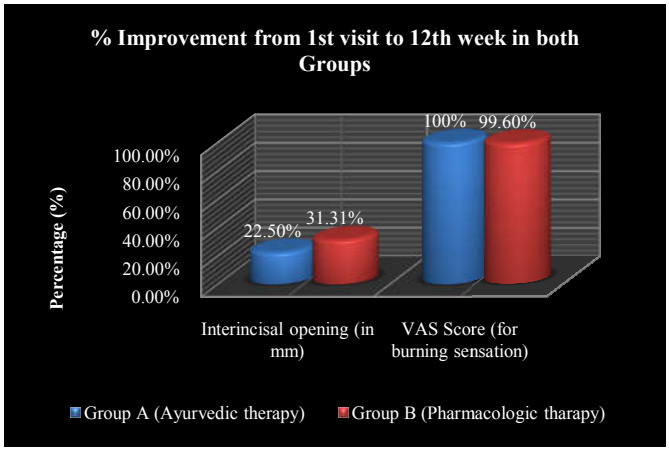
*shows a significant difference among successive time-points at .05 level of significance. i.e. P<.05

Table 8 Percentage % Improvement From 1st Visit To 12th Week In Group A (Ayurvedic Therapy) And Group B (Pharmacological Theraphy)

S.No.	Parameters	% Improvement From 1 ST Visit----12th week IN	
		Group a (Ayurvedic Therapy)	Group B (Pharmacological Theraphy)
1	Interincisal Opening (In mm)	22.55%	31.31% [(a)]
2	Vas Score For Burning Sensation	100 % [(b)]	99.60 %

[(a)] Interincisal Opening (In Mm) Is Better In Pharmacological Therapy While Vas Score For Burning Sensation Is Better In Ayurvedic Theraphy. [(b)]

The improvement in interincisal opening between 1st to 12th week is more in group B (31.31%) then group A (22.55%) whereas burning sensation reduction is more in group A (100%) than group B (99.60%). (Table 8, graph 4)



Graph 8a Percentage (%) Improvement In Ayurvedic Therapy And Pharmacologic Therapy

DISCUSSION

Oral submucous fibrosis still remains a dilemma to the clinicians due to elusive pathogenesis and less well-defined classification systems. This disease is always associated with juxta-epithelial inflammation and followed by fibro-elastic change of the lamina propria with epithelial atrophy leading to stiffness[17]. The most common initial symptom is burning sensation of oral mucosa which is aggravated by spicy food. This is followed by blanching, stiffness of buccal mucosa and progressive reduced mouth opening[18]. Yang assessed the prevalence, gender distribution, age, income, and urbanization status of OSF patients in Taiwan and concluded that men had a significantly higher OSMF prevalence than women[19]. Sinor *et al.* in India found male predominance in OSMF cases[20]. Similarly in a study by Srivastava R, 860 patients were in the age range of 15–60 years, with a peak incidence in 30--40 years (34.88%), followed by 20–30 years (30.23%)[21]. Nigam also reported that the maximum number of OSMF cases found in their study was in the age group of 36--40 years[22]. Yadav *et al*. compared the Curcumin capsule (Turmix) with intralesional steroid injection in the treatment of OSMF and showed significant improvement in burning sensation in patients treated with curcumin tablets[23].

Sudarshan R *et al* (2012) in his study found that Aloe vera group showed a better treatment response compared to the antioxidants group in reducing the burning sensation and improving mouth opening thereby enhancing the patients compliance[24]. Similar study by Anuradha A *et al* (2017) showed that aloe vera can be an alternative, safe, and effective treatment regime in the management of oral submucous fibrosis[25]. Our study is also in concurrence with the above studies and shows that VAS score for burning sensation was reduced in Ayurvedic treatment compared to Pharmacological group.

In 30 subjects the mean VAS Score decreased significantly i.e.7.90 to 0.00 for burning sensation in patients treated with Group A compared with VAS Score reduction in patient treated with Group B i.e. 8.33 to 0.33. In Group A the mean score for burning sensation is reduced from 7.90 to 0.00 at the completion of 5th week of therapy. However Pharmacological therapy showed less improvement in the mean score (8.33 to 3.83) after the same duration of therapy (i.e. after the completion of 5th week). This could be attributed to mechanism of action of Ayurvedic drugs. Curcumin inhibits the products of inflammation such as prostaglandin and leukotreines [26].

On the other hand, the polysaccharides contained in the gel of Aloe Vera leaves, induce the promotion of wound healing, and also have anti-inflammatory, immunomodulatory, and antioxidant properties. Further, sterols in the Aloe vera have strong ability to inhibit inflammation similar to the action of cortisone without any side effects[27]. Anuradha A evaluated efficiency of Aloe vera in treatment of OSMF in 74 patients and found the clinical response to aloe vera was comparable to that of intralesional injections of hydrocortisone and hyaluronidase with antioxidant supplementation. This study concluded that aloe vera can be an alternative, safe, and effective treatment regime in the management of oral

submucous fibrosis. Long-term follow-up studies with larger sample size are recommended[24,25]. Our study also used combination of hyaluronidase (1500 IU) and dexamethasone (4 mg), weekly submucosal injections for 12 weeks. Like other studies, our study also shows significant improvement in inter incisional mouth opening in Group B using Intralesional injections. The mean interincisal opening in Group A & Group B at first visit was 27.20mm & 25.23mm respectively which increased at the end of 12th week of therapy, the mean for the two groups being 33.33mm & 33.13mm. The improvement in interincisal opening between 1st to 12th week is more in group B (31.31%) then group A (22.55%) whereas burning sensation reduction is more in group A (100%) than group B (99.60%) the drawback of intralesional injection of steroids is the local discomfort caused by injection. Although Group B showed better results as compared to group A, however the positive improvements encountered with Ayurvedic group were also quite encouraging and significant. In the present study Aloe Vera was found to be effective in reducing burning sensation and to a certain extent improvement in mouth opening in OSMF patients. Sudarshan R et al., found similar results that aloevera when compared with antioxidant, had a better response in oral submucous fibrosis (OSMF) patients in all the parameters assessed and in the entire clinicohistopathological stages particularly in those with mild stage clinically and early-stage Histopathological[24]. Alam S et al., also conducted similar study in which they found that the group receiving aloe vera had a significant improvement (during treatment and follow up period) in most symptoms of OSMF like burning sensation, mouth opening, tongue protrusion, cheek flexibility compared with the non–aloe vera group[28]. Thus, the findings in this study suggest a need for the further investigation on Aloevera & curcumin to have a fibrinolytic action in OSMF patients. Another limitation of our study was a less sample size. The bioavailability of curcumin is poor as curcumin is lipophilic compound so the maximum effectiveness of curcumin is not attained in the study group. Lack of Histopathological confirmation of the improvement at the end of the study is also a limitation observed in the present study. Thus our study highlights that Ayurveda therapy using aloe vera and turmeric shows promising results in treatment of OSMF. However, more high-quality, multi-centre randomized controlled trials with larger samples are needed to further assess the efficacy of these medicines in comparison to conventional pharmacological therapies.

CONCLUSION

The prevalence of OSMF was found to be more in males. Both Ayurvedic group and Pharmacological group showed marked increase in interincisal distance and reduction in burning sensation. Rate of increase in Inter-incisal distance was faster in Pharmacological group whereas rate of decrease in burning sensation in Ayurvedic treatment was faster. Comparing the two parameters mouth opening & the severity of burning sensation Conventional Pharmacologic therapy is more beneficial in improving the mouth opening in and Ayurvedic treatment benefits more in reducing the intensity of burning sensation. The clinical response to Aloe-vera & Turmix was comparable to intralesional injections of dexamethasone, hyaluronidase. No serious side effects were reported. Easy of availability, safety of use, cost effectiveness and non-invasiveness attributes of Aloe-vera & Turmix make it an alternative, effective choice of treatment regime in the management of OSMF. Limitation is that lack of Histopathological confirmation of the improvement at the beginning and end of the study. Further studies involving a larger sample size with longer period of treatment follow up are recommended.

Reference

1. Pindborg JJ, Metha FS, Gupta PC, Daftary DK. Prevalence of oral submucous fibrosis among 50,915 Indian villagers. *Br J Cancer*. 1968;22(4):646–654.
2. Gupta D., Sharma S.C. Oral submucous fibrosis – A new treatment regimen. *J Oral Maxillofac Surg*, 1988;46:830-833.
3. Rajendran R. Oral submucous fibrosis: etiology, pathogenesis, and future research. Bull *World Health* Organ 1994;72(6):985- 996.
4. Ranganathan K, Mishra G. An overview of classification schemes for oral submucous fibrosis. J Oral Maxillofac Pathol. 2006;10(2):55-58.
5. Prabhu SR, Wilson DF, Daftary DK, Johnson NW. Oral Diseases in the Tropics. Oxford Uni Press 1993;42(2):417-422.
6. Taneja L, Bagewadi A, Keluskar V. Haemoglobin patients with oral submucous fibrosis. *J Indian Acad Oro Med and Radiol* 2007;19(2):329-333.
7. Koneru A, Hunasgi S, Patil AM. A systematic review of various treatment modalities for oral submucous fibrosis. *J Adv Clin & Research Insights* 2014;2(5):64–72.
8. Borle R, Nimonkar P, Rajan R. Extended nasolabial flaps in the management of oral submucous fibrosis. Br *J Oral Maxillofac Surg*. 2009;47(5):382-385.
9. Agarwal M, Gupta DK, Tiwari AD. Extended nasolabial flaps in the management of oral submucous fibrosis. *J Oral Maxillofac Surg*. 2011;10(3):216-219.
10. Agarwal R, Kaushal A, Singh RK, Upadhyay Y. Management of oral submucous fibrosis by different surgical approaches: report of three cases. BMJ case reports. 2013;25(6):235-38.
11. Rajalalitha P & Valli S. Molecular pathogenesis of oral submucous fibrosis- a collagen metabolic disorder. *J Oral Pathol Med* 2005;34(3):321-328.
12. Hazarey VK, Erlewad DM, Mundhe KA, Ughade SN. Oral submucous fibrosis: study of 1000 cases from central India. *J Oral Pathology & Medicine* 2006;36(1):12-7.
13. Tilakaratne WM, Klinikowski MF, Saku T, Peters TJ, Warnakulasuriya S. Oral submucous fibrosis: Review on aetiology and pathogenesis. Oral oncology 2006; 42(6):561-68.
14. Dayanarayana U, Doggalli N, Patil K, Shankar J, Mahesh K.P, Sanjay. Non surgical approaches in treatment of OSF. *Journal of Dental and Medical Sciences* 2014;13(2)63-9
15. Johar N, Chaurasia S, Phulambrikar T, Management of oral submucous fibrosis: A Review. *International Journal of Oral Health Dentistry* 2017;3(3):154-157
16. Alok A. Curcumin – Pharmacological Actions And its Role in Oral Submucous Fibrosis: A Review. *Journal of Clinical and Diagnostic Research* 2015;9(10): ZE01-ZE03.
17. Passi D, Bhanot P, Kacker D, Chahal D, Atri M, Panwar Y. Oral submucous fibrosis: Newer proposed

classification with critical updates in pathogenesis and management strategies. *Natl J Maxillofac Surg*. 2017; 8(2): 89–94.
18. Rawson K, Prasad RK, Nair AK, Josephine J. Oral submucous fibrosis–The Indian scenario: Review and report of three treated cases. *Journal of Indian Academy of Oral Medicine and Radiology*. 2017 Oct 1;29(4):354.
19. Yang SF, Wang YH, Su NY, Yu HC, Wei CY, Yu CH, Chang YC. Changes in prevalence of precancerous oral submucous fibrosis from 1996 to 2013 in Taiwan: A nationwide population-based retrospective study. *Journal of the Formosan Medical Association*. 2018 Feb 1;117(2):147-52.
20. Sinor PN, Gupta PC, Murti PR, Bhonsle RB, Daftary DK, Mehta FS, Pindborg JJ. A case-control study of oral submucous fibrosis with special reference to the etiologic role of areca nut. *Journal of oral pathology & medicine*. 1990 Feb;19(2):94-8.
21. Srivastava R, Jyoti B, Pradhan D, Siddiqui Z. Prevalence of oral submucous fibrosis in patients visiting dental OPD of a dental college in Kanpur: A demographic study. *Journal of family medicine and primary care*. 2019 Aug;8(8):261-2.
22. Nigam NK, Aravinda K, Dhillon M, Gupta S, Reddy S, Raju MS. Prevalence of oral submucous fibrosis among habitual gutkha and areca nut chewers in Moradabad district. *Journal of oral biology and craniofacial research*. 2014 Jan 1;4(1):8-13.
23. Yadav M, Aravinda K, Saxena VS, Srinivas K, Ratnakar P, Gupta J, Sachdev AS, Shivhare P. Comparison of curcumin with intralesional steroid injections in Oral Submucous Fibrosis–A randomized, open-label interventional study. *Journal of oral biology and craniofacial research*. 2014 Sep 1;4(3):169-73.
24. Sudarshan R, Annigeri RG, Vijaybala GS. Aloe vera in the treatment for oral submucous fibrosis – a preliminary study. *J Oral Pathology & Medicine* 2012;41(10):755-61.
25. Anuradha A, Patil B, Asha VR. Evaluation of efficacy of Aloe vera in the treatment of oral submucous fibrosis–a clinical study. *Journal of Oral Pathology & Medicine*. 2017;46(1):50-5.
26. Rao CV, Janakiram NB, Mohammed A. Lipoxygenase and cyclooxygenase pathways and colorectal cancer prevention. Current colorectal cancer reports. 2012 Dec;8(4):316-24.
27. Hamman JH. Composition and applications of Aloe vera leaf gel. Molecules. 2008 Aug;13(8):1599-616.
28. Alam S, Ali I, Giri KY, Gokkulakrishnan S, Natu SS, Faisal M, Agarwal A, Sharma H. Efficacy of aloe vera gel as an adjuvant treatment of oral submucous fibrosis. Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology. 2013 Dec 1;116(6):717-24.

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