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ARTICLE

"Introducing Modified Dakkak and Bennett Grading System for Indian Food in Oral Submucous Fibrosis": A Dharwad Study

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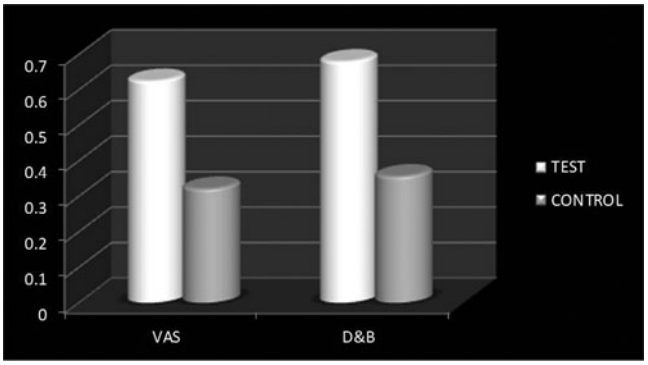
ABSTRACT

Oral submucous fibrosis (OSMF) is one of the "diseases of civilization" because of the large differences in prevalence among races, geographic areas, and individuals at different socioeconomic levels. It is a premalignant condition strongly associated with the habit of chewing areca nuts. This study is to compare the scoring system in relation to the burning sensation of mouth and dysphagia using the visual analog scale (VAS) and Dakkak and Bennett grading system for Indian food, respectively, in OSMF patients. This study was a randomized clinical trial incorporating a total of 50 cases of OSMF divided into a control group (antioxidant therapy) and pentoxifylline test cases. Values for burning sensation of the mouth using the VAS and modified Dakkak and Bennett grading system for Indian food were recorded. Statistical analyses were done using t test, Mann –Whitney U test, and one-way analysis of variance (ANOVA) test. Patients subjected to pentoxifylline when compared to the control group showed significant reduction in dysphagia for Indian food. Burning sensation was recorded according to the visual analogue scale. Significant reduction in burning sensation was seen in the pentoxifylline group when compared to the control group. This grading system provides quantitative and qualitative parameters in patients with OSMF.

KEYWORDS

antioxidant; modified DAKKAK and BENNETT grading system; oral submucous fibrosis; pentoxifylline

GRAPHICAL ABSTRACT



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Introduction

Oral submucous fibrosis (OSMF), which was categorized as a premalignant condition by WHO in 1978, is now categorized as a potentially malignant disorder (PMD). PMDs has the prevalence rate of 0.2% to 0.5%, with malignant transformation potential of 0.13% to 17.5% (Poorani et al., 2014). Oral submucous fibrosis is defined as "an insidious chronic 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 change of the lamina propria, with epithelial atrophy leading to stiffness of the oral mucosa and causing trismus and inability to eat" (Poorani et al., 2014, p. 11).

The etiologic factors can be conveniently divided into initiators and promoters of OSMF. Initiation is caused by mutagens. Promotion often entails the production of free radicals and the induction of "benign" lesions (Boyland, 1985). The initiators include chilies, areca nut, tobacco, and streptococcal infection; the promoters include anemia (iron deficiency), vitamin deficiencies (B complex and folate), malnutrition (protein), and immunologic derangements (Rajendran et al., 1989).

OSMF is now globally accepted as an Indian disease due to the popularity of chewing areca nut preparations and the uptake of this habit in young people (Ranganathan et al., 2004). Areca nuts are chewed with betel leaf for their effect as a mild central nervous system stimulant. The effect is thought to be due to one of its constituents, arecoline, which leads to alertness, increased stamina, a sense of well-being, and euphoria. It is known to stimulate salivation, thus aiding in digestion. According to traditional Ayurvedic medicine, chewing areca nut is a good remedy for worms, and along with betel leaf, it prevents halitosis (Prabhu et al., 2014)

A few reasons have been proposed for the increased incidence of OSMF in India:

- The low cost, easy availability, attractive packaging, and aggressive marketing have led to a substantial increase in the number of people initiating this habit and getting addicted to it.
- There is a lack of proper demarcation between the various products such as gutka, pan masala, and their contents.
- As smoking is considered a taboo in certain areas of the country, the majority of the women have taken to tobacco/betel quid chewing.

There could be a lower reporting of the incidence of OSMF due to minimal symptoms in the early stages and a lack of awareness regarding the same (Hebbar et al., 2014) (Figure 1 and Figure 2).

Patients with OSMF initially present with a blanched or marble-like pale mucosa, vesiculations, and intolerance to hot and spicy food. Gradually, the patient may develop fibrous bands in the buccal and labial mucosa that cause a restriction in opening the mouth. The various components of this syndrome have been enumerated as follows:

- ➢ Gutka facies: sunken and stiff cheeks, pseudo proptosis, multiple perioral skin folds
- ➢ Gutka mouth: whitening of the oral mucosa, still oral aperture, poor oral hygiene, bald tongue, chronic nonhealing ulcers, retracted soft palate and uvula, unhealthy gingival melanosis, and reduced salivary output
- ➢ Gutka speech: peculiar due to lack of mobility of tongue and cheeks
- ➢ Gutka swallowing: suck and swallow, dysphagia, and avoidance of eating in public
- ➢ Gutka hearing: hearing changes in advanced stages (Hebbar et al., 2014)

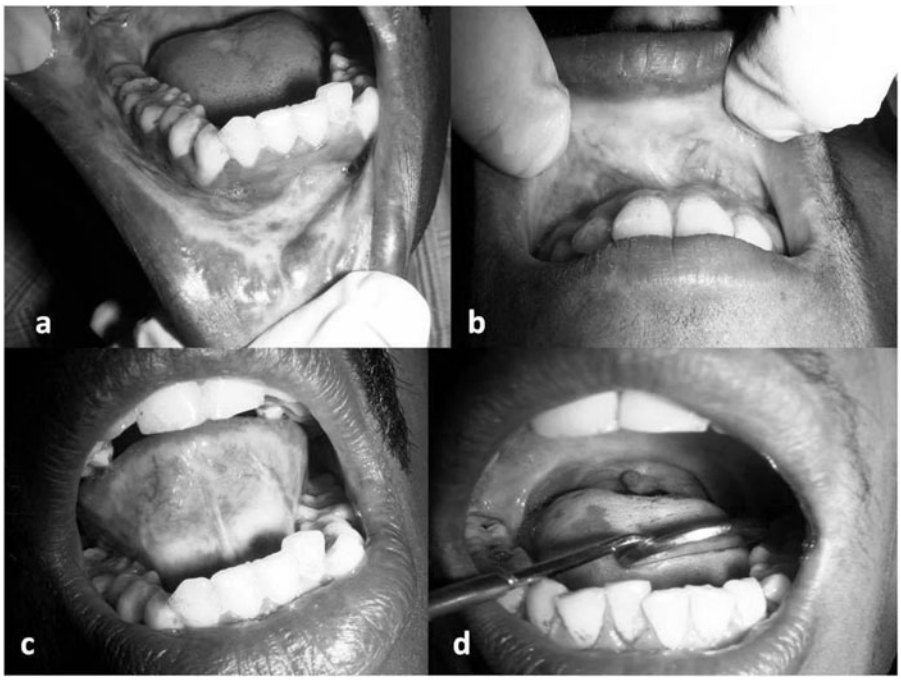

Figure 1. (a) Intraoral photograph showing extensive blanching and fibrosis of the lower labial mucosa in OSMF patient. (b) Extensive blanching and fibrosis of the upper labial mucosa. (c) Extensive blanching and fibrosis of the ventral surface of the tongue. (d) Fibrosed and deformed uvula (hockey stick deformity).

Dakkak and Bennett grading system

This system measures the severity of symptoms and is based on a quantitative dysphagia. Different liquid and solid foods of increasing consistency are evaluated concerning their ability to induce pain or bleeding in the following manner:

- 1 point if pain/bleeding always occurred
- 0.5 points if pain/bleeding occurred sometimes
- 0 points if the patient never experienced problems during the last observation period

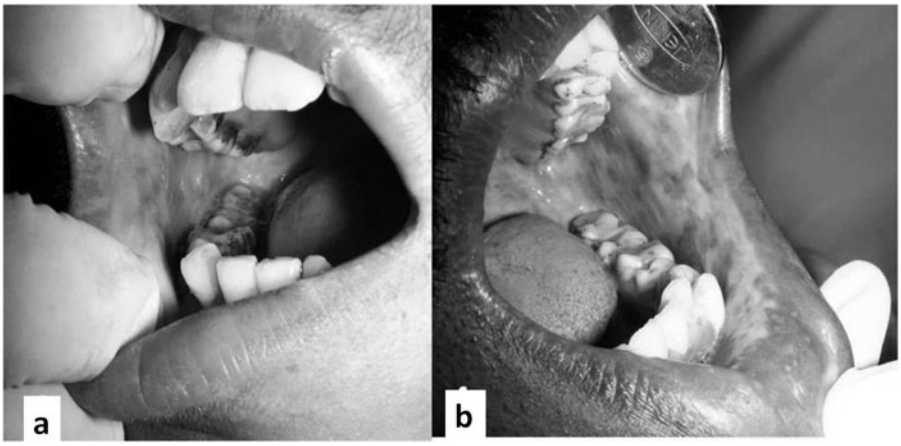

Figure 2. (a) Intraoral photograph of the right buccal mucosa showing blanching and fibrosis of the oral mucosa. (b) Left buccal mucosa showing blanched oral mucosa with erosion.

- If a particular food cannot be eaten at all, that food and all others listed below are rated 1 point. The score is then calculated by multiplying each point with a food specific value and adding the products, the total ranging from 0 (no symptoms) to 45 (severe symptoms). The total oral mucosa score is 0–45, describing the severity of the condition (Pfütze et al., 2007; Dakkak & Bennett, 1992).

Modified Dakkak and Bennett grading system for Indian food

Saraswat & Kumar (2003) proposed a compound scoring system based on discomfort related to ingestion of defined liquid or solid food, which is mostly increased according to the severity of oral involvement in bullous skin disorders. Here the list of Indian food equivalents for some categories to make the score applicable to Indian patients. These scoring system represent both the extent and severity of oral lesions (Pfütze et al., 2007; Saraswat & Kumar, 2003).

The aim of this study is to compare the scoring system in relation to the burning sensation of mouth and dysphagia using the visual analog scale (VAS) and modified Dakkak and Bennett grading system for Indian food, respectively, in OSMF patients.

Participants and methods

The present study was conducted at the outpatient Department of Oral Medicine and Radiology, S D M College of Dental Sciences, Dharwad, Karnataka, India, after obtaining informed consent from the patients. The study consisted of a prospective clinical analysis of 50 randomly selected OSMF patients, graded as clinically advanced, judged by established clinicopathologic parameters, and evaluated in randomized clinical trial. All the patients recruited in the study were of comparable disease progression and shared the common demographic features of ethnicity, geographic location, and socioeconomic status. A structured format was used to collect relevant information from each patient. Before commencing the treatment, patients were counseled to quit habits such as areca nut, pan masala, gutkha chewing, and tobacco use.

Inclusion criteria

Inclusion criteria were as follows:

- Patients who were not on any medication for OSMF
- Patients who agreed to biopsy and blood investigations and clinically and histopathologically diagnosed OSMF cases

Exclusion criteria

Exclusion criteria were as follows:

- OSMF patients with systemic diseases
- Patients who were allergic to the study drug

All participants were informed of the need for and design of the study, the pharmacological therapy, possible adverse effects, and the need for undergoing a through clinical examination and investigations before the start of the study. The study sample included 50 OSMF patients divided into two groups. The experimental drug group included 30 patients where the active treatment option was pentoxifylline (Trental, 400 mg tablets) and the standard drug group included 20 patients managed with antioxidant capsules (Lycored, one capsule before sleep

Table 1. Modified Dakkak and Bennett grading system for Indian food.

No.	Food article	Indian food equivalents (without chilies, spices, or lemon juice)	
1	Water	—	(1*X)
2	Milk	Thin buttermilk	(2*X)
3	Custard (or yogurt or pureed fruit)	Boiled, mashed, dehusked pulses/lentils	(3*X)
4	Jelly	Porridge, boiled sago/pulses	(4*X)
5	Scrambled egg (or baked beans or mashed potato)	Steamed gram/corn	(5*X)
6	Baked fish (or steamed potato or cooked carrot)	Baked/lightly fried, well-cooked vegetables	(6*X)
7	Bread (or pastry)	Chapatis	(7*X)
8	Apple (or raw carrot)	—	(8*X)
9	Steak (or pork or lamb chop)	Mutton or chicken, pear, peanut, almond.	(9*X)

Severity score: 0–45 points. X represents the factor of discomfort: 1 point if pain/bleeding always occurred; 0.5 points if pain/bleeding occurred sometimes; 0 points if the patient never experienced problems.

daily).The patients before administration of pentoxifylline underwent detailed hematological and clinical tests to rule out systemic ailments of hypertension, diabetes mellitus, cardiac diseases, malignant ulcers, duodenal and gastric ulcers, bleeding diatheses, and the like. The hematological work-up included recording of total leukocyte count (TC), differential count (DC), hemoglobin values (Hb), platelet count (PC), clotting and bleeding times (CT, BT), and recordings of blood pressure and pulse characters of the patients. No reportable complications or side effects were recorded from any of the patients included in the study design and the clinical trial was carried out further for three more months. Clinical follow-up and review of all the patients was carried out at 30-day intervals for the trial period of three months.

All cases were clinically categorized according to Khanna and Andrade's classification (Khanna & Andrade, 1995; Prabhu et al., 2014).

During each visit, the patient's burning sensation on VAS and dysphagia score using a modified Dakkak and Bennett grading system were recorded. To prevent bias due to interpersonal variability, the same investigator measured all the patients during each visit.

Statistical analysis

Statistical analyses were done using *t* test, Mann–Whitney U test, and ANOVA test.

Results

A total of 50 patients were divided into two groups. The pentoxifylline group consisted of 29 males and 1 female, where 4 patients were Grade 1 OSMF, 10 patients were Grade 2 OSMF, and 16 patients were Grade 3 OSMF. The control group consisted of 20 males, where 2 patients were Grade 1 OSMF, 4 patients were Grade 2 OSMF, and 14 patients were Grade 3 OSMF. The treatment period was 3 months. In this study, dysphagia scores were recorded using a modification of the Dakkak and Bennett scoring system (Table 1).

Comparison of symptom improvement was made at each visit between test and control groups. Patients in the pentoxifylline group (66%) when compared to the control group (50%) showed significant reduction in dysphagia for Indian food. According to *t* tests, the comparisons were highly significant at all visits (Table 2).

Table 2. Assessment of oral mucosa severity score according to *t* test.

Dakkak & Bennett	Test Mean	SD	Control Mean	SD	*t* value	*p* value
First visit	13.0750	7.4078	16.0250	6.3422	− 1.3529	.1841
Second visit	9.5000	6.7998	14.0750	7.2061	− 2.0650	.0458
Third visit	6.4000	5.6022	12.7750	7.2484	− 3.1121	.0035

SD = standard deviation.

Burning sensation was recorded according to the visual analogue scale. Significant reduction in burning sensation was seen in the pentoxifylline group (63%) when compared to the control group (40%) according to the Mann–Whitney U test (Table 3).

Follow-up data at each visit with respect to both scoring systems were calibrated using ANOVA test. The pentoxifylline group reported more improvement in dysphagia and burning sensation than did the control group (Graph 1).

Patients in the pentoxifylline group when compared to the control group showed significant reduction in dysphagia for Indian food. Burning sensation was recorded according to the visual analogue scale. Significant reduction was seen in burning sensation in the pentoxifylline group when compared to the control group.

Discussion

Dysphagia in oral submucous fibrosis signifies difficulty with swallowing. Typically, the patient will describe food "sticking" or "holding up," either retrosternally or in the neck, but at times the presenting symptoms may be atypical. Atypical symptoms of dysphagia include meal-related regurgitation (often reported as vomiting), a sense of fullness or filling up retrosternally, or hiccup during meals.

One of the more common causes of oral burning in oral submucous fibrosis is dry mouth, which may be either an objective finding due to hyposalivation or a subjective sensation termed *xerostomia*. Dry mouth is frequently accompanied by dysphagia and is a common symptom in oral submucous fibrosis. Dysphagia is attributed to loss of both an important swallow stimulus and the lubricating qualities of saliva (Cook, 2008).

Fibrosis and hyalinization in and around the minor salivary gland due to oral submucous fibrosis leads to reduction in the secretion of saliva. This causes less availability and expression of membrane-associated mucin (MAM) on the tips of microplicae, resulting in reduction of salivary mucous gel (SMG) formation at the local areas.

Table 3. Statistical analysis using Mann–Whitney U test to assess burning sensation according to visual analogue scale.

		Test Mean	SD	Control Mean	SD	U value	Z value	*p* value
VA Score	First visit	5.8000	2.2384	5.8500	2.0590	198.0000	− 0.0541	.9569
	Second visit	4.4000	1.9574	5.8000	2.0673	115.0000	− 2.2993	.0215
	Third visit	3.3000	1.8382	5.1000	2.2455	105.5000	− 2.5562	.106

VA = visual analogue; SD = standard deviation.

This SMG barrier loss may cause the following consequences:

1. It may hamper the "protective diffusion membrane" function of SMG causing less protection against irritation from food substances (e.g., spicy and hot food). This mechanism could be mainly responsible for the burning sensation of the oral cavity.
2. Less protection for superficial cells of the oral epithelium causing their rapid exfoliation even by normal physiologic friction leads to epithelial atrophy.
3. Epithelial atrophy reduces the distance of intraepithelial nerve endings from the surface, making it more sensitive to burning sensation. Decreased protective diffusion membrane function of SMG leads to easy diffusion of spicy food elements toward intraepithelial nerve endings, causing more burning sensation (Sarode & Sarode, 2013).

Several studies have introduced different grading systems for bullous skin disorders and oralmucosal lesions. Agarwal et al. and Mahajan et al. scoring systems for psoriasis (Agarwal et al., 1998; Mahajan et al., 2005). Herbst and Bystryn introduces a clinical disease severity in pemphigus scoring system (Herbst and Bystryn, 2000).

The present study revealed that significant reduction in burning sensation was seen in the pentoxifylline group when compared to the control group. VAS score and modification of Dakkak and Bennett scoring system comparisons were highly significant. The newly introduced modified Dakkak and Bennett grading system for Indian food provides quantitative and qualitative parameters in patients with oral submucous fibrosis.

Conclusions

The modified Dakkak and Bennett grading system for Indian food is a compound scoring system based on discomfort related to ingestion of defined liquid or solid food. Scoring systems, which have been introduced mainly to compare interindividual differences in disease activity, are easy to use and simple to record. Using more comprehensive assessment methods will increase our understanding about oral submucous fibrosis. Patients in the pentoxifylline group when compared to the control group showed significant reduction in dysphagia for Indian food.

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Declaration of interest

The authors declare no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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