Oral Submucus Fibrosis
Surgical Treatment with CO2 Laser

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Abstract

Oral submucous fibrosis (OSMF) is a disease characterized by a severe progressive fibrosis of the oral cavity
resulting in dysphagia and a reduced ability to open the mouth. Clinical criteria for the diagnosis of OSMF is
difficulty in opening the mouth, soft palate movement restriction, inability to protrude tongue, and
associated blanched oral mucosa with palpable fibrous bands. OSMF is a well-recognized, potentially
premalignant condition.

The etiology of the disease is linked to the use of Areca Nut products. Pan Masal, a common product which
contains the Areca Nut as one of its constituents is used by the majority of OSMF patients. Tobacco use
alone or in combination with Areca Nut (found in the Betel Quid) product does not appear to play a
significant etiological roll in the production of OSMF.

In severe cases, fibrous bands from the palate fixate and reduce the mobility of the mandible. In these
cases, CO2 laser excision or lysis of the bands followed by mouth opening exercises has been found to be an
effective palliative treatment.
Introduction

Oral submucous fibrosis (OSMF) is a progressive fibrosis of the lamina propria of the oral mucosa and of the deeper connective tissues in the oral cavity. In the later stages, the oral soft tissues fibrose and stiffen, resulting in restriction on opening of the mouth and produces chronic inflammation, mucosal atypia and even malignant transformation.\(^1\)\(^2\) In the Indian subcontinent malignant transformation has been reported to be as high as 7.6% over a 17 year period.\(^3\)

The cause of this condition is strongly linked to the chewing of the Areca Nut. Sometimes areca nut is misnamed as betel nut. Below is a table of some of the various areca nut and tobacco chewing mixtures (modified from Gandhi et al.\(^4\)) All of these mixtures are addictive. Areca Nut is the main psychoactive component and is the fourth most commonly used addictive substance after alcohol, nicotine and caffeine.\(^5\)

<table>
<thead>
<tr>
<th>Name of Mixtures</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betel Quid</td>
<td>Areca Nut, Tobacco, Fresh Betel Leaf, Slaked Lime and Catechu</td>
</tr>
<tr>
<td>Pan Masala</td>
<td>Areca Nut, Slaked Lime, Catechu and Condiments.</td>
</tr>
<tr>
<td>Gutka (Gutkha)</td>
<td>Pan Masala and Tobacco</td>
</tr>
<tr>
<td>Mainpuri</td>
<td>Areca Nut, Tobacco, Slaked Lime, Camphor and Cloves</td>
</tr>
<tr>
<td>Mawa</td>
<td>Areca Nut, Tobacco and Slaked Lime</td>
</tr>
<tr>
<td>Khaini</td>
<td>Tobacco, Slaked Lime</td>
</tr>
</tbody>
</table>

Areca Nut has both tannins and alkaloids along with other components.\(^4\) This nut is felt to be a major factor in the development of oral submucous fibrosis.\(^4\) Lime and tobacco also cause mucosal irritation and inflammation. Tobacco free mixtures can still cause OSMF.\(^6\) However, tobacco use by itself, although carcinogenic and causes mucositis. However, it is unlikely to cause oral submucous fibrosis since this disease is virtually unheard of in the United States where chewing tobacco is relatively common and use of Areca Nut is rare.

Ahmad et al. reported on a group of patients who mainly chewed Gutkha (Gutka) and observed that in some patients where the chew (Gutka) was kept on one side, OSMF developed on that side only, the other side was normal.\(^7\)

Other causes of OSMF, such as autoimmunity, collagen disorders, genetic susceptibility and nutritional factors, have been postulated in the past but the Areca Nut appears to be the major etiology factor.\(^8\)

The disease occurs mainly in Asia but as migration of the population is occurring it is also starting to appear in other parts of the world. Similar to the marketing of Tobacco Products, Areca Nut products are starting to appear in attractive multicolored pouches to attract a younger generation of addicts.
Methods

A total 50 cases of oral submucous fibrosis (OSMF) were studied. Each patient was investigated in detail with respect to history, clinical examination, and histological examination. History of chewing pan masala, gutka and other areca nut mixtures with duration, frequency and style of chewing were recorded.

The association of the development of OSMF with duration of addiction of the chewing habit and quantity of betel nut consumption per day was studied.

Diagnostic criteria for OSMF were: 1) restricted movement of a blanched mucosa overlying the soft palate, 2) palpable submucosal fibrous bands extending along the region of the anterior tonsillar pillar and over the anterior body of the mandible which restricts mandibular movement and the opening of the mouth, 3) reduced ability to protrude the tongue. Other causes of restriction of opening of the mouth, caused by inflammation (i.e. dental or tonsillar) were excluded from the study. We adopted Vikas Sinha's classification of oral submucous fibrosis.

Category I: No restriction on mouth opening and complains of burning sensation of the oral cavity during food consumption especially chilly.
Category II: Ulceration in oral cavity with few fibrous bands.
Category III: Multiple fibrous bands inside the oral cavity and difficulty in mouth opening. Mouth opening more than two fingers.
Category IV: Mouth opening just two or less than two fingers and severe restriction of mouth opening.

The category I and II patients were given antioxidant tablet for minimum three months.

Category III patients were managed using a 26G needle to perform a local injection of a solution designed to decrease inflammation and pain along with dissolving the fibrous bands. The solution had the following composition, one ml of hydrocortisone acetate, one ml hyluronidase and one ml of 2% Xylocaine combined in one syringe. The solution was injected into the fibrous bands at multiple sites. The patients were also given oral multivitamins and antioxidant and iron tablets. The injections were repeated after ten days.

Category IV patients were advised to undergo laser surgery to release the fibrotic bands. We used a CO₂ laser in these cases. All the cases of laser excision were performed under local anesthesia. The assistant depresses the tongue forcefully with the tongue depressor and laser probe was passed to release the fibrotic bands. Patients were advised to start mouth opening exercises (Fig I) irrespective of the medical or surgical treatment. Biopsies were taken only in those cases where there was suspicion of malignancy otherwise it was avoided as it may cause further fibrosis. View Enlarged Pictures at End of Manuscript.

Figure 1: Opening Exercises

View Surgery Video:
https://youtu.be/OLiHz5QileY
Results

Out of the 50 cases studied, 40 were males and 10 female, aged from 11 to 60 years. The male and female ratio was 4:1. The disease was more common in the 3rd decade of life. Most of the OSMF patients 60% (n=30) belonged to the lower middle socioeconomic group, 30% (n=15) belonged to the middle class and the rest, 10%, were from the high socioeconomic group.

Out of 50 patients, 30 patients (60%) of OSMF were addicted to pan masala. Five patients (10%) consumed betel nut. The habit of betel quid chewing was noted in 15 of patients (15%) and the rest, 10 patients (15%), had mixed habits.

In our study, we observed that the mean duration of the habit in those who chewed betel quid was seven years while it was five years for betel nut chewers and four years for pan masala chewers. At the same time 70% of OSMF cases were using pan masala and other products 2-10 pouches per day.

The most common presenting complain was burning sensation of the mouth and intolerance to spicy foods. There were repeated ulceration and vesication in the mouths in all 50 patients (100%). Difficulty or decrease opening of the mouth and dysphagia was found in 10% of patients. The most common site to be involved by OSMF was the soft palate. This was present in all 50 patients (100%), followed by the buccal mucosa in 95%, retro molar region in 75% and tongue in 10%.

Biopsies were was taken only 10 cases (20%), taking care to remove only a very small piece of tissue from the fibrotic band. The histological examination in all of these patients revealed varying degrees of sub epithelial fibrosis. However, although we observed epithelial dysplasia in all cases, there were not any cases of OSMF that developed malignant transformation. View Enlarged Pictures at End of Manuscript.

![Mouth Opening Pre Operation](image1)

![Mouth Opening Pre Operation](image2)
Discussion

Out of the 50 cases of OSMF we studied, 40 cases (80%) were males and 10 cases (20%) were females with male: female 4:1. Similar male predominance in OSMF cases was found in India by Kumar K.K.et al.\textsuperscript{10} Half of our study population was in the age group of 25-35 years. This observation is similar to that of others\textsuperscript{10} who reported the maximum number of OSMF cases in the age group of 20-29 years in their study. Most of the patients in our study were belonged to lower middle class socioeconomic group followed by middle class people.

The higher predominance in Areca Nut usage by males may be due to the ease and places in which they can by the product as compared to females. In addition females are more health conscious and chewing in females has a negative aesthetic value. The decrease incidence in the higher socioeconomic group may be due to a higher education level and being more health consciousness. In addition, the lower socioeconomic group has a poorer diet and may suffer from nutritional deficiencies.

The time it takes to develop OSMF has been observed to vary with the products used. Most studies have found that it takes longer to develop with Betel Quid Users.

<table>
<thead>
<tr>
<th>Product</th>
<th>Present Study</th>
<th>Kumar et al.\textsuperscript{10}</th>
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</thead>
<tbody>
<tr>
<td>Betel Quid</td>
<td>7 Years</td>
<td>10 Years</td>
</tr>
<tr>
<td>Betel Nut</td>
<td>5 Years</td>
<td>6 Years</td>
</tr>
<tr>
<td>Pan Masala</td>
<td>4 Years</td>
<td>5 Years</td>
</tr>
</tbody>
</table>

Shah and Sharma\textsuperscript{11} also reported that Pan Masala produced OSMF in a shorter period of time than chewing Betel Quid.\textsuperscript{11} Another study by Babu et al. found that OSMF takes longer to, develop in Betel Quid users than pan masala/gutkha users.\textsuperscript{12} He postulated this was due to a protective effect of the Betel Leaf (found
Kumar et al.\textsuperscript{10} postulates that this is because the total daily consumption and concentration of the product is more important than the duration of consumption.

In our study as in the one published by Shah and Sharna\textsuperscript{11} Pan Marsala was the Areca Nut was used by the majority of patients studied. It also appears to be the product which is the most toxic to the oral cavity and produces OSMF the quickest.

It may also be possible that the tobacco in the product results in a lower usage and exposure to the Betel Nut. Tobacco chewing alone has not been associated with OSMF.

The main histopathological feature of OSMF is atrophy of the mucosal lining with atypia and collagen formation in the dermis and deep facial tissues. Kumar et al.\textsuperscript{10} observed epithelial dysplasia in varying degrees: Mild in 50\%, Moderate in 52\% and Sever in 2.0\%. Our study observed varying degrees of atypia in all 10 specimens biopsied and not patient demonstrated malignant transformation.

All patients were given proper counseling to stop areca nut and tobacco chewing. However Nalgundar et al.\textsuperscript{13}, in a study of tobacco chewers, found that only 18.1\% of 204 patients were successful in quitting the habit of tobacco consumption. The reasons for not quitting the habit is a sense of mental relaxation after tobacco consumption (45\%) and tobacco addiction (32.5\%). It is also interesting to note that 14.7\% (all women) had the belief that chewing tobacco was a sign of liberation for women and 15.6\% of the patients believed that tobacco usage is fashionable. Similar factors may also play a role in the usage of Areca Nut products.

\textbf{Conclusion}

OSMF was found to occur in a relatively young Indian population ages 25 to 35 years. Males were affected four times as often as females and may represent the higher incidence of chewing areca nut mixtures in the Indian male population. Chewing areca nut mixtures is more common in the lower socioeconomic groups as is the development of OSMF. OSMF is the most least common in higher socio-economic groups. The number of patients with the Pan Masala chewing habit was six times higher than that of chewing betel nut and twice as high as chewing betel quid. The development of OSMF was higher in the pan masala mixtures as compared to betel nut chewing which indicates the importance of the other cofactors in the mixture. However, the presence of Betel Nut in the mixture is the most important requirement for the development of OSMF. None of the studied patients developed malignant transformation although varying degrees of dysplasia was seen on biopsy.

\textbf{References}


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