

Oral Submucous Fibrosis (OSMF) and its Impact on the Nasopharyngeal Airway**Yukti Panwar¹, Geetanjali Jaiswani², Priyanka Rastogi³**¹Associate Professor, Department of Dentistry, Saraswathi Institute of Medical Sciences, Ghaziabad, Uttar Pradesh²Assistant Professor, Department of ENT, Saraswathi Institute of Medical Sciences, Ghaziabad, Uttar Pradesh³Assistant Professor, Department of Dentistry, Saraswathi Institute of Medical Sciences, Ghaziabad, Uttar Pradesh

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Abstract**Background & Aim:** A premalignant condition known as oral submucous fibrosis (OSMF) results in fibrosis of the oral mucosa and surrounding structures, such as the pharynx, larynx, eustachian tube, and airway space. We postulated that OSMF might affect the pharyngeal airway as well.**Methods:** The Saraswathi Institute of Medical Sciences in Ghaziabad, Uttar Pradesh, hosted this retrospective observational study from January to August of 2025. The data was collected from OPD records of dental and ENT department. Patients with OSMF and those having full-field-of-view (FOV) CBCT scans for other dental procedures were the subjects of a cross-sectional study. The groups' three-dimensional airway spaces were measured and contrasted.**Result:** Patients with OSMF showed a statistically significant decrease in airway space (p-value <0.001). This implies that chewing areca nuts reduces the amount of space available for airways by affecting the mouth cavity and related structures.**Conclusion:** The results highlight the possible influence of fibrosis on airway dimensions and respiratory function by showing a substantial decrease in pharyngeal airway volume in OSMF patients.**Keywords:** Airway Resistance, Oral Submucous Fibrosis, Pharynx, Cone-Beam Computed Tomography.

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Introduction

The premalignant illness known as oral submucous fibrosis (OSMF) has drawn a lot of attention lately due to its persistently damaging and resistant nature. Patients most commonly present with a burning sensation while eating spicy meals and a progressive narrowing of the mouth due to the buildup of inelastic fibrous tissue in the juxta-epithelial region of the oral mucosa. Hypomobility of the soft palate and tongue, loss of gustatory sensibility, blanching of the oral mucosa, ulceration, and discomfort, and occasionally minor hearing impairment due to eustachian tube blockage are further clinical symptoms linked to this illness.[1]

One diagnostic criterion for OSMF is the presence of palpable fibrous bands, which are frequently found in the faucial pillars, retromolar regions, and buccal mucosa. In 90% of cases, the epithelium covering the fibrous condensation atrophies, and in 4.5% of individuals, it undergoes malignant transformation.[2]

OSMF affects roughly 0.5% (5 million individuals) of the population in the Indian subcontinent with most instances concentrated in central India where the habit of chewing areca nut coupled with tobacco is more frequent.[3] It affects people of all ages, both sexes, with a male preponderance, and alters the pharynx, which can alter the size of the airway. The pharyngeal orifice may become less functional due to the involvement of palatal and paratubal muscles like the levator veli palatini, tensor veli palatine, tensor tympani, and salpingopharyngeus. This can result in trismus, swallowing difficulties, taste changes, and hearing impairment.[2]

It has not been well investigated, but OSMF-induced structural and functional alterations in the pharynx may result in limited airway space. With its excellent spatial resolution and three-dimensional capacity, Cone Beam Computed Tomography (CBCT) provides a precise tool to evaluate airway alterations in patients with OSMF. Airway compromise in OSMF patients has been validated by

earlier research employing CBCT and cephalometric analysis. [3, 4]

Methods

The Saraswathi Institute of Medical Sciences in Ghaziabad, Uttar Pradesh, hosted this retrospective observational study from January to August of 2025. The data was collected from OPD records of dental and ENT department. The Declaration of Helsinki's (2013) tenets were followed in the study's execution. Informed permission was not required because this was a retrospective examination of anonymised imaging data. A 95% confidence level and 80% power were used to determine the sample size, which needed 70 patients—35 in each group—for statistical significance. Cone beam computed tomography (CBCT) scans of patients with and without oral submucous fibrosis (OSMF) were evaluated as part of the investigation. The study included 70 people in all, ranging in age from 20 to 50. 35 OSMF patients who needed CBCT imaging for endodontic, orthodontic, or oral surgical procedures made up the case group. For dental diagnostic purposes, 35 non-OSMF participants in the control group had full-field-of-view CBCT scans. Patients with a history of OSMF who had undergone CBCT for dental operations, were between the ages of 20 and 50, and had a full volume scan with visible airway space were the primary inclusion criteria.

Other reasons of hearing loss, including tympanic membrane perforation, cholesteatoma, prior surgery, and ear infections, were ruled out during an ENT department examination of the ear. In each of

the chosen cases, pure tone audiometry (PTA) was conducted.

Systemic disorders such generalized degenerative joint disease, congenital malformations (like cleft deformities), and a history of oral cavity cancers were the primary exclusion factors.

The Carestream CS 9600 dental imaging equipment was used to get CBCT scans. To guarantee consistent imaging settings, participants were told to keep their lips relaxed and their mandible in the middle position throughout scanning. The Carestream CS 9600 airway analysis instrument was used to measure the volume of airway space. For volumetric assessment, the approach outlined by El and Palomo [5] was used. In order to assess changes in the pharyngeal airway space, the airway volume was measured in cubic centimeters (cm³). IBM Inc.'s SPSS version 30 was used for data analysis. Tables and graphs were used to display descriptive data for each variable. The normality of the data distribution was evaluated using the Anderson-Darling test. For categorical variables, the Chi-square test was used to assess statistical significance.

Results

There were 25 (71%) men and 10 (29%) women in the OSMF scans, compared to 19 (54%) men and 16 (46%) women in the control group. Male OSMF patients were 41.23 ± 5.92 years old, whereas female patients were 48.32 ± 1.52 years old. The average age of the males and females in the control group was 41.31 ± 6.82 and 39.57 ± 10.96 years, respectively (Table 1).

Table 1: Demographic parameters

Parameters	OSMF Subjects (N=35)		Non OSMF Subjects (N=35)		P-Value
	Male	Female	Male	Female	
Total Participants (N%)	25 (71%)	10 (29%)	19 (54%)	16 (46%)	0.78
Age (Years)	41.23 ± 5.92	48.32 ± 1.52	41.31 ± 6.82	39.57 ± 10.96	0.91

Clinical data showed that the mean mouth openness for OSMF patients was 26.05 ± 5.13 mm, while the control group's mouth opening was 37.04 ± 4.35 mm. (Table 2). A statistically significant difference between the groups was found using a one-way ANOVA test ($p < 0.05$). The mean airway volume in OSMF cases was statistically substantially lower (17.163 ± 2.4931 cm³) than in non-OSMF controls (22.042 ± 3.4179 cm³) ($p < 0.001$).

Table 2: Comparison of Airway Space Volume between OSMF and Non-OSMF subjects

Parameters	OSMF Subjects (N=35)	Non OSMF Subjects (N=35)	P-Value
Mean mouth opening (mm)	26.05 ± 5.13	37.04 ± 4.35	< 0.05
Mean airway volume (cm ³)	17.163 ± 2.4931	22.042 ± 3.4179	< 0.001

The airway volume of OSMF patients was significantly reduced, according to unadjusted calculations. Since all individuals were matched for sex and age, confounder-adjusted estimates were not used in this exploratory analysis.

Continuous variables were not subjected to category bounds. To evaluate the degree of airway obstruction, additional research might take OSMF stage classification into account.

Discussion

When compared to non-OSMF people (22.042 ± 3.4179 cm³, $p < 0.001$), this study reveals a significant decrease in airway capacity in OSMF patients (17.163 ± 2.4931 cm³), suggesting that airway constriction is a result of advancing fibrosis in OSMF. The airway may constrict as a result of changes in soft tissue structures, particularly the pharyngeal and palate muscles, which may make people more susceptible to diseases like obstructive

sleep apnea (OSA). Our findings are in line with those of Agrawal et al.'s study [3], which used cephalometric analysis to find that OSMF patients had less pharyngeal airway space. According to Singh et al. [4], the severity of OSMF was correlated with a progressive decrease in airway space, which supported the findings of our CBCT-based volumetric measures. Additionally, Bronoosh et al. [6] evaluated CBCT and cephalometric imaging for airway measurement and found that while both methods are helpful, CBCT offers greater dimensional accuracy and reliability for airway volume estimation. Previous research have highlighted the need of accuracy in airway volume interpretation using CBCT.[7]

The clinical utility of CBCT in diagnosing and monitoring airway involvement in OSMF patients is shown by the consistency between our results and those reported in the literature. This aligns with the more comprehensive view of OSMF as a progressive disorder that impacts the pharynx and mouth.[8]

A more accurate assessment of airway morphology is made possible by the three-dimensional examination provided by CBCT, which is crucial for identifying high-risk people and enabling prompt intervention. Better airway assessment is possible with CBCT than with other techniques.[9]

Our research demonstrates that OSMF considerably reduces airway width, which may raise the risk of obstructive sleep apnea because of fibrosis that affects important muscles. This is consistent with other studies that connected OSMF to functional deficits such as dysphagia and trismus.

Reduced mouth opening exacerbates airway impairment by further changing the position of the tongue and mandible. Our results demonstrate the advantage of three-dimensional imaging over cephalometry for airway assessment, which is in line with earlier CBCT research.

Furthermore, research on obstructive sleep apnea supports the connection between airway collapse and decreased pharyngeal space, highlighting the need for more research on sleep disorders linked to OSMF. OSA has also been linked to limited airway space and open-mouth breathing.[10] The limitations of this study include limited generalizability from a small sample size and possible selection bias as a result of its retrospective methodology. The need for longitudinal investigations is highlighted by the limitations of single-time-point airway examination in drawing conclusions about the course of the disease. The necessity for integrated sleep investigations is highlighted by the inability to confirm Obstructive Sleep Apnea due to a lack of polysomnographic data. With possible therapeutic ramifications, this study emphasizes how OSMF affects airway

dimensions. However, careful interpretation is required due to its retrospective methodology and small sample size. Although results are consistent with earlier research, generalizability may be impacted by environmental and genetic factors. To further establish OSMF's function in airway impairment and its clinical repercussions, larger, multi-population research with polysomnography and dynamic airway examinations are required. This study links structural alterations caused by fibrosis to airway narrowing and an increased risk of obstructive sleep apnea (OSA), highlighting a significant reduction in pharyngeal airway space in OSMF patients ($p < 0.001$). With its accurate three-dimensional airway assessment for early diagnosis and intervention, CBCT stands out as a great imaging tool. Clinically, breathing problems, speech impairment, and intubation difficulties can result from limited airway space in OSMF.

Conclusion

This study links structural alterations caused by fibrosis to airway narrowing and an increased risk of obstructive sleep apnea (OSA), highlighting a significant reduction in pharyngeal airway space in OSMF patients ($p < 0.001$). With its accurate three-dimensional airway assessment for early diagnosis and intervention, CBCT stands out as a great imaging tool. Clinically, breathing problems, speech impairment, and intubation difficulties can result from limited airway space in OSMF. Because of its progressive nature, serious airway impairment can only be avoided by early detection and care. Future studies should concentrate on therapy strategies and long-term assessments to improve airway function in OSMF patients.

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