ISSN: 0975-3583,0976-2833 VOL13, ISSUE 10, 2022

Significance of Pulmonary function test in Oral Submucous Fibrosis: A need of the hour

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Abstract

Introduction:

The study aims to measure and compare pulmonary function tests (PFTs) in oral submucous fibrosis (OSMF) patients (smokers/nonsmokers) and normal individuals.

Materials and methods:

The study population included 180 participants that comprised 60 nonsmoker OSMF patients, 60 OSMF patients who smoke as well, and 60 patients with no deleterious habits. Spirometer was used to assess PFT.

Results:

Results showed that a significant *P* value was obtained for forced vital capacity (FVC), forced expiratory volume in 1 s (FEV1), FEV1/FVC, peak expiratory flow rate (PEFR), and maximum voluntary ventilation (MVV) and also for the predicted values of FEV, FEV1, FEV1/FVC, PEFR, and MVV in OSMF (smokers/nonsmokers) study groups.

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Conclusion:

Thus, the decrease in pulmonary function can be an alarming sign for restrictive type of pulmonary disease.

Keywords: Betel nut, oral submucous fibrosis, Spirometer, Pulmonary function test, Smokers

Introduction:

Oral submucous fibrosis (OSMF) is an insidious, chronic disease affecting any part of the oral cavity and sometimes the pharynx. This potentially malignant condition is characterized by submucosal fibrosis that affects mostly all the parts of the oral cavity, leading to progressive trismus and dysphagia.[1,2] OSMF is predominantly found in South East Asia, specifically in Indian subcontinent.[3] over the past few decades, there has been an increase in prevalence (>6%) of OSMF.[4] It is found more commonly in males (male:female ratio is 4.9:1), mostly in the age group of 20–40 years.[5]

Areca nut is available commercially as various freeze-dried products, for example, pan masala, gutka, and mawa (areca and lime); these products have a higher concentration of areca nut per chew.[6] Areca nut and gutka chewing are the principal risk factors for the development of OSMF.

The areca alkaloids result in fibroblast proliferation and inhibition of collagen phagocytosis.[7] Immunological factors and nutritional deficiency also play a critical role in pathogenesis of OSMF.[8]

The arecoline also causes aggravation of disease in asthmatics by increasing bronchoconstriction in a dose-dependent manner.[9]

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Pulmonary function test (PFT) serves as a vital tool in establishing diagnoses and also measuring the severity of various respiratory diseases and thus serves as a key adjuvant to the patient history, various noninvasive imaging modalities, and other invasive procedures. Spirometric values vary according to age, height, sex, and body size.[10,11]

This study was conducted to evaluate the changes in pulmonary function values among normal controls and OSMF patients with and without smoking habit.

Materials and Methods

The present cross-sectional study was conducted in a dental college in Kanpur city over a period of nearly two years. The sample size consisted of 180 participants between the age group 20 to 60 years and was further categorized into three groups:

Group I consisted of sixty participants who were clinically diagnosed with OSMF and had a habit of chewing betel nut but were non-smokers,

Group II comprised of sixty participants who were clinically diagnosed with OSMF and had a habit of chewing betel nut and smoking tobacco and

Group III consisted of sixty healthy participants with no deleterious habits (e.g. betel nut chewing/ tobacco smoking).

Spearman’s correlation test was performed to calculate the sample size, and mean/standard deviation was calculated for the analysis directly from the MedCalc statistical software version 20.026.

The inclusion criteria consisted of patients: not using any form of bronchodilators, non-smoker, has not performed any strenuous exercise at the day when the

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 10, 2022

spirometer test was conducted; non alcoholic and has not eaten a heavy meal before 4 hours of the procedure.

The exclusion criteria consisted of patients suffering from any acute and chronic systemic illness including respiratory diseases or allergy, those under any type of medical supervision and have been prescribed medicinal treatment for OSMF or any other systemic illness, and finally, patients who consume alcohol.

PFTs were measured using computerized spirometer model no. “SPIRO-232,” P.K. Morgan Medical Ltd. PFTs done were as follows: forced vital capacity (FVC) (L), forced expiratory volume in 1 s (FEV1) (L), FEV1/FVC%, peak expiratory flow rate (PEFR) (L/min), and maximum voluntary ventilation (MVV) (L/min).

Results

There was no significant difference between the mean ages of the three study groups, and majority of the OSMF patients were of age range 35–42 years. A significant P value (P = 0.0012) for OSMF (nonsmokers) in the age group of 18–26 years and P value (P = 0.0082) for OSMF (smokers) in the age group of 27–34 years were obtained [Table 1].

Furthermore, a significant P value was obtained for FVC, FEV1, FEV1/FVC, PEFR, and MVV and also for the predicted values of FEV, FEV1, FEV1/FVC, PEFR, and MVV in OSMF study groups [Table 2].

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AGE	Group I (n=60)	Group II (n=60)	Group III (n=60)	P value
20-26	15	10	30	Non Smokers (0.0012)
27-34	5	10	12	Smokers (0.0080)
35-42	30	20	8	
43-50	10	10	10	
Mean	35.80	35.67	34.87	
SD	6.823	8.345	5.134	

SD=Standard deviation, OSMF=Oral submucous fibrosis

Table 1: Demographic Data of Patients

Pulmonary function test	Mean	SD	P Value
FVC OSMF (non smokers) OSMF (smokers) Normal	3.019 2.984 3.689	0.478 0.551 0.297	0.0001 0.0001
FEV1 OSMF (non smokers) OSMF (smokers) Normal	2.457 2.873 3.694	0.799 0.689 0.357	0.0001 0.0001
FEV1/FVC OSMF (non smokers) OSMF (smokers) Normal	92.874 96.547 88.474	4.128 3.791 5.886	0.0034 0.0038

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PEFR OSMF (non smokers) OSMF (smokers) Normal	7.995 7.228 8.965	1.658 1.547 1.449	0.0028 0.0037

Table 2: Pulmonary function test values for normal and OSMF patients

Discussion:

In the 1960s and 1970s, only sporadic cases of OSF were seen, more often in older females. The prevalence of OSF kept on increasing. In 1980, Pindborg[12] estimated about 250,000 cases of OSF in India which is now estimated to have increased to two million cases – an eight-fold increase in <15Years. [13]

PFTs are an important tool in the investigation and monitoring of patients with respiratory pathology. Spirometry is the most frequently used measure of lung function and is a measure of volume against time. It is a simple, least technique-sensitive, and quick procedure to perform: patients are asked to take a maximal inspiration and then to forcefully expel air for as long and as quickly as possible.[14]

Spirometry provides the following measurements:

• FVC is the maximal volume of air that can be forcibly expelled from the lungs from a position of maximal inhalation. It indicates lung volume

• FEV1 is the maximal volume of air exhaled in the 1st s of an FVC maneuver. In individuals with normal lung function, this is 75%–80% of FVC. FEV1 reflects the mechanical properties of the large- and medium-sized airways

• Forced expiratory ratio (FEV1/FVC or FER %) is the ratio of FEV1 to FVC, expressed as a percentage. It assists with distinguishing obstruction from possible

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restriction when FEV1 is reduced. If restriction is suspected, further testing with static lung volumes may be required.[15]

• PEFR is the maximum flow rate generated during a forceful exhalation, starting from full-lung inflation. PEFR primarily reflects large airway flow and depends on the voluntary effort and muscular strength of the patient.[16]

PEFR measures the airflow through the bronchi and thus the degree of obstruction in the airways. Peak expiratory flow is typically measured in units of liters per min (L/min). Peak flow readings are higher when patients are well and lower when the airways are constricted.[17]

In the present study, the sample size consisted of 180 participants which were subdivided into three groups. Group I consisted of 60 participants who were clinically diagnosed with OSMF and had a habit of chewing betel nut but were non-smokers, Group II comprised of 60 participants who were clinically diagnosed with OSMF and had a habit of chewing betel nut and smoking tobacco and Group III consisted of 60 healthy participants with no deleterious habits. For these study groups, PFT was performed using a spirometer.

Nivsarkar et al., conducted a study on 100 participants. Group 1 consisted of 50 patients with a habit of chewing betel nut and Group 2 consisted of participants with no deleterious habits. Pulmonary function test in this study were measured using computerized spirometer. [18] Nivsarkar et al. in their study found that there were a decrease in values of FVC, FEV1, PEFR, MVV, and their predicted values and an increase in FEV1/FVC ratio and its predicted value although this relation was not found to be significant. [18] The results obtained in the present study shows statistically significant changes in FVC, FEV1, FEV1/ FVC, PEFR, and MVV and

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their predicted values in Group I and Group II study subjects which are in contrast to the results obtained from the study mentioned above.

Datta and Yanga studied Melanesian males of age range 18–40 years and found that betel nut chewers had significantly reduced FVC and FEV1. The results of this study were similar to our study where significant reduction in values of FVC and FEV1 was observed in patients with OSMF[19]

Wang et al. study sample size consisted of 600 asthma patients and 1200 controls which were studied to investigate the connection between asthma and betel nut use. They found that a higher arecoline level was associated with worse lung function FEV1 (rho = −0.359, P = 0.004) and FVC (rho = −0.309, P = 0.02) in the male asthma group and concluded that betel nut chewing results in esophageal inflammation and fibrosis that may result in aggravation of asthma (an obstructive lung disease).[20,21] A similar result was obtained in our study too where lung function was compromised in patients with OSMF (smokers/nonsmokers).

Conclusion:

The addictive nature of areca nut is causing various oral and systemic problems in all age groups. Areca nut chewers are predisposed to asthma as it causes bronchoconstriction and decreased FEV. It is found in our study that the PFT is decreased in OSMF patients (smokers/nonsmokers) compared to normal controls. The decrease in pulmonary function can be a warning sign for obstructive and restrictive type of pulmonary disease.

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