

# Impact of Dentures Wearing on Spirometric Values; Data from Tertiary Rural Centre

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## ABSTRACT

**Introduction:** Spirometry is a common test routinely performed in chest outpatient department. Doing spirometry in edentulous COPD patients is a daunting task as many times they are not able to perform it correctly. Not many studies were attempted to evaluate the effect of wearing complete dentures in edentulous patients on spirometric readings. This study was undertaken to ascertain the role of complete dentures on spirometric values in edentulous patients wearing complete dentures.

**Material and Methods:** The 20 edentulous patients visiting the Department of respiratory medicine referred for spirometry were selected as subjects for this study. The same subjects were provided with dentures with acceptable vertical dimension of occlusion in department of prosthodontics and spirometric readings were compared with and without denture.

**Results:** Significant changes were observed with increase in peak inspiratory flow rates as compared to edentulous patients whereas no significant variations were found in FVC, FEV1 and FEV1% readings.

**Conclusion:** This study paves the way for doing further research for the consideration of using complete dentures to do spirometry in patients suspected with extrathoracic airway obstruction in view of significant increase in peak inspiratory flow rates.

**Keywords:** Denture, Spirometry, Extrathoracic Airway Obstruction

## INTRODUCTION

Edentulism patients referred for spirometry often find difficulty in doing procedure correctly which leads to results inappropriate in comparison to their disease severity. This is due to the fact that edentulism lead to loss of vertical dimension and rotation of mandible with decrease in posterior pharyngeal space. This is more true in patients suspected with extrathoracic airway obstruction like in cases of obstructive sleep apnea, paratracheal lymphadenopathy, etc. Edentulism also causes increase pharyngeal collapsibility with worsening of the cardio-respiratory symptoms.<sup>1</sup> Some authors suggest that denture should be in place while performing spirometry while other school of thought is in favor of removal of denture during procedure of spirometry.<sup>2,3,4</sup>

The aim of this study was to determine whether in edentulous subjects performing spirometry without dentures produces significant changes in lung volumes and airflow rates in comparison to after wearing dentures.

## MATERIAL AND METHODS

The 20 edentulous patients visiting the Department of

respiratory medicine referred for spirometry were evaluated with and without dentures in collaboration with department of prosthodontics. All these patients were informed about the nature of study and the level of cooperation needed from them. After obtaining written consent, they were used for this study. The approval from Institutional Ethic Committee was obtained before the start of this study. The study was performed as under-

**Spirometric Technique and Analysis:** Spirometry (Pulmonary Function Test) is a simple method of studying pulmonary ventilation by recording movements of air into and out of the lungs. Spirometry was done with spirometer with prior informed consent of patient (Fig-1). Acceptability criteria<sup>5</sup> included spirogram having good starts with extrapolated volume < 5% of FVC or 0.15 Lt and satisfactory exhalation of 6 seconds or a plateau in volume-time curve. After three acceptable spirograms were recorded, reproducibility criteria were applied. The two largest FVC values within 0.2 Lt of each other, and the two largest FEV1 values within 0.2 Lt of each other were taken. When both of these criteria were met, the session was concluded.

The test was performed as under:

For edentulous subjects (Without denture)

For same subjects with complete denture having acceptable vertical dimension of occlusion

Following variables were taken into consideration<sup>5</sup>:

1. FVC- It equals the amount of air that can be forcefully exhaled after complete inspiration.
2. FEV1- It equals the volume of air exhaled during the first second of expiration.
3. FEV1/FVC- Ratio is an invaluable indicator of respiratory disease and allows separation of ventilatory abnormalities into "restrictive" or "obstructive" patterns.
4. PIFR- Peak inspiratory flow rate during inspiration and represents extrathoracic airways.

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**How to cite this article:** Prachi Singhal, Sameer Singhal, Abinav Dagar. Impact of dentures wearing on spirometric values; data from tertiary rural centre. International Journal of Contemporary Medical Research 2018;5(4):D12-D14.

**DOI:** 10.21276/ijcmr.2018.5.4.12

		Range (Min.-Max. value)	Mean value	Percentage increase in comparison to control group
FVC in % predicted	Edentulous subjects (control group)	54-98	76.75	0%
	Denture group	63-98	77.35	0.78%
Fev1 in % predicted	Edentulous subjects (control group)	54-101	76.30	0%
	Denture group	48-103	77.40	1.44%
Fev1% in % predicted	Edentulous subjects (control group)	59-114	94.40	0%
	Denture group	62-111	94.80	0.42%
PIFR in L/sec	Edentulous subjects (control group)	1.43-3.75	2.39	0%
	Denture group	1.51-4.84	2.93	22.59%

**Table-1:** Spirometric Values in edentulous and with dentures in same subject

	One-way ANOVA (p value)	Dunnnett 'D' test A= p value between control group and first interventional group B= p value between control group and second interventional group	paired 't' test (p value)
FVC	0.335 **NS	0.862 NS	0.769 NS
Fev1	0.775 NS	0.762 NS	0.998 NS
Fev1%	0.889 NS	0.921 NS	0.914 NS
PIFR	0.000 S	0.002 S	0.031 S

NS nonsignificant S significant

**Table-2:** Statistical Analysis of Spirometric Values with and without dentures



**Figure-1:** Patient performing spirometry

**STATISTICAL ANALYSIS**

Statistical analysis was done by applying ANOVA (analysis of variance), Dunnnett 'D' test and paired 't' test in control group and interventional group using SPSS software and 'p' value was obtained. 'p' value less than 0.05 was considered as significant.

**RESULTS**

Applying One-way ANOVA, Dunnnett 'D' test and paired 't'

test, significant variations were found in peak inspiratory flow rates (PIFR) between control and denture group whereas no significant variations were seen in FVC, Fev1 and Fev1%. There was around 22.59% increase in PIFR in intervention group (with dentures) in comparison to edentulous group (control group). There was 0.78% increase in FVC, 1.44% increase in FEV1 and 0.42% increase in FEV1% in intervention group (with dentures) in comparison to control group (edentulous patients). Percentage increase in PIFR group was significant in term of 'p' value in comparison to FVC, FEV1 and FEV1%. (TABLE I and II)

**DISCUSSION**

Loss or absence of teeth (edentulism) produces anatomical changes that may influence upper airway size and function due to reduction of the lower face height and mandible rotation.<sup>6</sup> Rehabilitation of edentulous patient with complete dentures is an integral part of prosthodontic treatment modality. A denture not only provides esthetics and improves the phonetics but also restores the desired function of mastication and also provides adequate support to oro-facial structures by restoring altered vertical dimension of face and also improve the conditions like OSA/hypoapnoea.

Very few studies were carried out to evaluate the effect of wearing complete dentures in edentulous patients on spirometric readings.<sup>7</sup> The subjects selected for this study were normal edentulous patients and the fabrication of complete dentures using standard conventional method and routine materials provided a homogenous and representative sample. The clinical material used in study consisted of both male and female patients. The present study was done to ascertain whether spirometry should be done with or without denture in edentulous patients.

The spirometric values were assessed with the wearing of complete denture with acceptable vertical dimension of occlusion. It was observed that peak inspiratory flow rates (PIFR) were increased significantly in intervention group (with dentures) as compared with the values in edentulous state of the subjects (control group). However, there were no significant changes in forced vital capacity, forced expiratory volume in 1 second and FEV1% in intervention groups in comparison to edentulous subjects. This suggested that wearing dentures with acceptable vertical dimension of occlusion has significant effect on extrathoracic airways including retropharyngeal space. The increase in mean PIFR might be due to increase in retropharyngeal space after wearing complete dentures and are in agreement with the findings of previous studies.<sup>7,8</sup>

Pellegrino R, Viegi G, Brusasco V, et al have also concluded that maximum inspiratory flow (PIF) is largely decreased with an extrathoracic airway obstruction, because the pressure surrounding the airways (which is almost equal to atmospheric) cannot oppose the negative intraluminal pressure generated with the inspiratory effort.<sup>9</sup> In contrast, it is little affected by an intrathoracic airway obstruction.

Thus, edentulous patients with obstructive sleep apnea may or may not use dentures during spirometric analysis of lung function test for assessment of intrathoracic airways (like for differentiating obstructive from restrictive lung diseases) but should always use dentures for assessment of extrathoracic airways (like in cases of obstructive sleep apnea patients, para tracheal tumours, paratracheal lymphadenopathy and laryngeal inflammation).

Therefore, this study can provide a breakthrough for further evaluation of the effect of increasing the vertical dimension of occlusion within acceptable limits in edentulous patients with obstructive sleep apnea and on spirometric parameters in future studies.

## CONCLUSION

There are improvement in spirometric values FVC, FEV1, FEV1% and PIFR when the patient is wearing denture in comparison to their edentulous state but significant results were found in PIFR readings only. This suggest that patients should always wear their dentures while performing spirometry keeping in mind that denture should be clean and properly fitted.

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**Source of Support:** Nil; **Conflict of Interest:** None

**Submitted:** 19-03-2018; **Accepted:** 20-04-2018; **Published:** 01-05-2018