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Analysis of impact of complete dentures on respiratory performance: An observational study

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Abstract---Background: The present study was conducted for analysing the impact of Complete Dentures on Respiratory Performance. Materials & methods: 20 subjects with presence complete edentulous arch and who had history of complete denture usage for atleast five years were enrolled. Spirometric testing was carried out at following steps: Phase 1: Testing in absence of denture, Phase 2: Testing in presence of both dentures, Phase 3: Testing in presence of maxillary denture only; and Phase 4: Testing in presence of mandibular dentures only. FVC value, PEF value, FEV1 value and FEF₂₅₋₇₅ value was recorded with the spirometric test. Analysis of all the results was done by SPSS software, followed by assessment of level of significant with chi-square test and student test. Results: While analysing statistically, it was seen that there was significant decrease in value of Spirometric variables in the presence of dentures. Conclusion: Denture wearer edentulous patients are subjected to risk of development of Spirometric alterations. Hence; these patients should be given timely instructions about various respiratory exercise protocols.

Keywords---spirometric, complete denture, respiratory performance.

Introduction

One of the debilitating states affecting a significant portion of the geriatric population is edentulism. It is often considered as the ultimate marker for predicting the pressure and burden on oral health. Respiration is also a routine vital function running continuously through the human body and most

commonly assessed by a spirometer.^{1, 2} Spirometry is a physiological test which measures the ability to inhale and exhale air in relation to time. Spirometry is a screening test of general respiratory health. The main results of spirometry are forced vital capacity (FVC) and forced expiratory volume (FEV). The procedure of spirometry has 3 phases: 1) maximal inspiration; 2) a “blast” of exhalation; 3) continued complete exhalation to the end of the test. There are within-maneuver acceptability and between-maneuver reproducibility criteria for Spirometry. Vital capacity (VC) is the volume of gas expelled from full inspiration to residual volume. The FVC is similar, but the patient is exhaling at maximal speed and effort.^{2, 3}

Bruna R Neves et al, in a previous meta-analysis, authors determined whether the use of complete dentures has an influence on the respiratory capacity, assessed by the spirometry examination. A search strategy was adapted for the PubMed/MEDLINE, The Cochrane Library, OpenGrey, Lilacs, Scopus, and Embase databases. Four studies were selected, totalizing the evaluation of 242 participants, aged ranging from 40 to 73 years old. Two studies concluded that the use of complete dentures can negatively affect the respiratory capacity. One study stated that it did not interfere regardless of its use during spirometric measurements, and the other reported that dental prosthesis was required in cases of evaluation of the extrathoracic airways. The use of complete dentures did not represent relevant changes from the reference values for pulmonary function in the spirometry test.⁴ Hence; under the light of above mentioned data, the present study was undertaken for analysing the impact of Complete Dentures on Respiratory Performance.

Materials & Methods

The present study was undertaken for analysing the impact of Complete Dentures on Respiratory Performance. 20 subjects with presence complete edentulous arch and who had history of complete denture usage for atleast five years were enrolled. Also, only those patients were enrolled that were complete satisfied with their dentures. All the spirometric procedures were performed by trained technicians. The diagnostic spirometer was employed for performing spirometric test. Testing was carried out at following steps: Phase 1: Testing in absence of denture, Phase 2: Testing in presence of both dentures, Phase 3: Testing in presence of maxillary denture only; and Phase 4: Testing in presence of mandibular dentures only. FVC value, PEF value, FEV1 value and FEF₂₅₋₇₅ value was recorded with the spirometric test. Analysis of all the results was done by SPSS software, followed by assessment of level of significant with chi-square test and student test.

Results

Mean age of the patients was 58.6 years. Majority proportion of the patients of the present study was males. Spirometric value of FVC, PEF, FEV1 and FEF₂₅₋₇₅ in the absence of both maxillary and mandibular dentures (phase 1) was found to be 3.85, 5.71, 2.12 and 2.67 respectively. Spirometric value of FVC, PEF, FEV1 and FEF₂₅₋₇₅ in the presence of both maxillary and mandibular dentures (phase 2) was found to be 3.01, 5.42, 2.23 and 2.41 respectively. Spirometric value of FVC, PEF,

FEV1 and FEF₂₅₋₇₅ in the presence of maxillary denture only (phase 3) was found to be 2.53, 5.21, 2.13 and 2.27 respectively. Spirometric value of FVC, PEF, FEV1 and FEF₂₅₋₇₅ in the presence of maxillary denture only (phase 4) was found to be 2.71, 5.23, 2.11 and 2.24 respectively. While analysing statistically, it was seen that there was significant decrease in value of Spirometric variables in the presence of dentures.

Table 1: Comparison of Spirometric values

Comparison		p- value
Phase 1- FVC	Phase 2- FVC	0.03*
	Phase 3- FVC	0.00*
	Phase 4- FVC	0.01*
Phase 1- PEF	Phase 2- PEF	0.85
	Phase 3- PEF	0.01*
	Phase 4- PEF	0.36
Phase 1- FEV1	Phase 2- FEV1	0.01*
	Phase 3- FEV1	0.00*
	Phase 4- FEV1	0.01*
Phase 1- FEF ₂₅₋₇₅	Phase 2- FEF ₂₅₋₇₅	0.01*
	Phase 3- FEF ₂₅₋₇₅	0.85
	Phase 4- FEF ₂₅₋₇₅	0.00*

*: Significant

Discussion

Many variables can be attributed to the success of an artificial denture. Some of them may include technique sensitivity during procedures, the functional variables, and the role of esthetics, the biological factors and the psychological makeup of the patient. As yet, most data refer to the association between COPD and periodontal disease.^{5, 6} These studies have provided conflicting results and used different techniques, outcome measures or populations for the assessment of periodontitis. If there should be a relevant link between dental health and lung function, it would be reasonable to expect that oral bacteria and systemic inflammation lead to impaired respiratory function prior to the manifestation of COPD. Additionally it could be hypothesized that lung function is associated with other dimensions of dental health, e.g. caries and endodontic lesions.^{7- 10} Hence; under the light of above mentioned data, the present study was undertaken for analysing the impact of Complete Dentures on Respiratory Performance.

Mean age of the patients was 58.6 years. Majority proportion of the patients of the present study was males. Spirometric value of FVC, PEF, FEV1 and FEF₂₅₋₇₅ in the absence of both maxillary and mandibular dentures (phase 1) was found to be 3.85, 5.71, 2.12 and 2.67 respectively. Spirometric value of FVC, PEF, FEV1 and FEF₂₅₋₇₅ in the presence of both maxillary and mandibular dentures (phase 2) was found to be 3.01, 5.42, 2.23 and 2.41 respectively. Spirometric value of FVC, PEF, FEV1 and FEF₂₅₋₇₅ in the presence of maxillary denture only (phase 3) was found to be 2.53, 5.21, 2.13 and 2.27 respectively. Shah Bukhari JA et al assessed the effect of complete dentures on respiratory performance. Fifty patients with the

presence of complete edentulous arch and who had a history of complete denture usage for at least 5 years were enrolled. All the spirometric procedures were performed by trained technicians. A diagnostic spirometer was employed for performing the spirometric test. Testing was carried out in the following steps: Stage 1: testing in the absence of denture, Stage 2: testing in the presence of both dentures, Stage 3: testing in the presence of maxillary denture only, and Stage 4: testing in the presence of mandibular dentures only. Forced vital capacity (FVC) value, peak expiratory flow (PEF) value, forced expiratory volume in 1 s (FEV1) value, and forced expiratory flow 25%–75% (FEF25–75) value were recorded with the spirometric test. Analysis of all the results was done by SPSS software. The spirometric value of FVC, PEF, FEV1, and FEF25–75 in the absence of both maxillary and mandibular dentures (Stage 1) was found to be 3.18, 5.83, 2.44, and 2.80, respectively. The spirometric value of FVC, PEF, FEV1, and FEF25–75 in the presence of both maxillary and mandibular dentures (Stage 2) was found to be 3.09, 5.67, 2.41, and 2.67, respectively. While analyzing statistically, it was seen that there was a significant decrease in the value of spirometric variables in the presence of dentures.¹⁰

Spirometric value of FVC, PEF, FEV1 and FEF_{25–75} in the presence of maxillary denture only (phase 4) was found to be 2.71, 5.23, 2.11 and 2.24 respectively. While analysing statistically, it was seen that there was significant decrease in value of Spirometric variables in the presence of dentures. Piskin B et al determined influences of complete dentures on spirometric parameters in edentulous subjects. A total of 46 complete denture wearers were included in this study. Respiratory functions of the subjects were evaluated by spirometric tests that were performed in four different oral conditions: without dentures (WOD), with dentures, lower denture only and upper denture only. Forced vital capacity (FVC), peak expiratory flow, forced expiratory volume in 1 s and forced expiratory flow between 25% and 75% were evaluated. Significant differences were found between spirometric parameters in different oral conditions ($p < 0.05$). In all spirometric parameters, the most important significant differences were found between conditions WOD, FVC and with lower dentures (FVC), and WOD (forced expiratory volume in 1 s) and with upper dentures (forced expiratory volume in 1 s) ($p < 0.001$). It was observed that complete dentures may unfavourably affect spirometric values of edentulous subjects.¹¹

Conclusion

Denture wearer edentulous patients are subjected to risk of development of Spirometric alterations. Hence; these patients should be given timely instructions about various respiratory exercise protocols.

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