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Pulmonary Medicine

COMPARATIVE STUDY OF FEV1/FEV6 TO FEV1/FVC IN THE DIAGNOSIS OF COPD

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ABSTRACT

BACK GROUND: COPD is a major public health problem in people where smoking is common and it kills more than 3 million people every year making it the fourth largest cause of death world over. Even though COPD is non-curable early detection and treatment can slow the progress of the disease. Spirometry has become an essential tool in assessing the respiratory diseases and several studies emphasized its significance as a screening test for the early detection of COPD.

METHODS: we conducted spirometry test on 120 patients with chronic smoking history of several years who presented with symptoms and signs of COPD. The results were analysed statistically comparing FEV1/FEV6 ratio values with those of FEV1/FVC values as per GOLD guidelines for the diagnosis of COPD.

CONCLUSION: FEV6 is approximately 95% of FVC and as it is a fixed reproducible time.FEV6 can improve diagnostic accuracy by improving the comparability between patient and reference data. FEV6 is the minimum expiratory time that was fixed as acceptable by both ATS and ERS.

Abbreviations: COPD= Chronic Obstructive Pulmonary Disease, FVC= Forced Vital Capacity, FEV1=Forced Expiratory Volume in 1st second, FEV6= forced expiratory volume at 6 seconds, GOLD=Global initiative for chronic Obstructive Lung Disease, ATS= American thoracic society, ERS= European respiratory society.

KEYWORDS : COPD, spirometry, FEV1, FVC, FEV6.

INTRODUCTION

The GOLD defines COPD as "a common, preventable and treatable disease characterised by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in airways and lungs to noxious particles or gases. Exacerbations and co-morbidities contribute to the overall severity in individual patients.[1]" The World Health Organization says that COPD kills more people than HIV/AIDS, malaria and tuberculosis all put together in the South East Asian region. What is more worrying is the fact that mortality rates due to COPD are expected to increase by over 160% by next two decades.[2]

MATERIALS and METHODS:

The study was carried out on 120 patients of ≥40 years with smoking history of >2 decades who attended the out-patient department with symptoms suggestive of COPD and in-patients during 2016-2017 of the Govt Hospital for Chest and communicable diseases, a teaching hospital of Andhra Medical College, Visakhapatnam, Andhra Pradesh, India. The study fulfilled the acceptability and reproducibility criteria laid down by ATS/ERS for spirometric examination. Patients with acute exacerbation of COPD, COPD with complications like cor-pulmonale, pneumothorax etc and patients with history of thoracic or abdominal surgery in the past 6 months were excluded from the study.

A detailed general and systemic examination was carried out and following investigations were done on every patient: complete blood counts, chest x-ray, (PA and lateral views), ECG, spirometry (baseline and post bronchodilator).

RESULTS:

The study group consisted of 120 patients; out of them 95 were males and 25 were females. Among 120 patients, 106 (88.33%) were diagnosed as having COPD based on post bronchodilator FEV1/FVC ratio of < 0.70 whereas 104 (86.6%) patients were diagnosed as COPD cases based on FEV1/FEV6 ratio of < 0.70.

Table showing the features of the study group.

Variable	Mean ± SD
Age (yrs)	58 ± 9.42
FEV1 (L)	1.2 ± 0.42
FEV6 (L)	2.1 ± 0.54
FVC (L)	2.2 ± 0.58
FEV1/FVC	51.5 ± 10.2
FEV1/FEV6	54.3 ± 9.4

Among the 95 male patients, 80 were diagnosed as having COPD based on post-bronchodilator FEV1/FVC ratio of <0.70 as against 78 based on post-bronchodilator FEV1/FEV6 ratio of <0.70.

DISCUSSION:

COPD is a major cause of morbidity and mortality all over the world. The estimated prevalence of COPD in any country is low when only the respiratory symptoms are determined by questionnaire.[3] Objective measurement of the lung function by spirometry is needed to investigate the true prevalence of COPD, particularly in population based studies targeting high risk groups.

Spirometry is the most frequently performed investigation in suspected cases of obstructive and restrictive defects. Airway obstruction results in decreased FEV1/FVC. Frequently FVC is not obtained reliably in older people as they cannot do the manoeuvre satisfactorily. Belli et al reported that a reliable FVC measurement was obtained in less than 60% of spirometric measurements[4]. Glindmeyer et al suggested an end-of-test criteria based on a fixed duration of the FVC manoeuvre[5]. It was found that 6.64 seconds was sufficient to obtain 99% of FVC and FEV6 was obtained in more than 80% of tests. FEV6 measurements are more easily attained and more reproducible than FVC and the repeatability of both FEV6 and FVC were affected by gender and lower education. FEV6 is a valid alternative to FVC in the diagnosis of airways obstruction in elderly patients because the spiromertric manoeuvre is easy to perform and it satisfies the criteria for repeatability and diagnostic accuracy. Using FEV6 as an alternative of FVC, both obstructive and restrictive patients has many advantages:

1. It is easier for the patient and technician, particularly for older patients and those with severe respiratory diseases[6].
2. There is a more precise end-of-test definition[6].
3. Shorter manoeuvre reduce the risk of syncope and reduce the overall time to perform the test[6].
4. FEV6 is more reproducible than FVC[7].

It has been noticed that using a fixed cut-off method for diagnosing airway obstruction tends to under-estimate the disease and increases misclassification rate particularly in elder patients. Therefore, using lower limit of normality (LLN) values in place of fixed cut-off values has been recommended to reduce misclassification rate[8, 9]. We used fixed cut-off values in our study as LLN values for FEV1/FEV6 are not available in Indian population. The present study showed satisfactory results of FEV1/FEV6 regarding sensitivity and specificity in the diagnosis of COPD with a cut-off value of < 0.70 for FEV1/FEV6 when compared with FEV1/FVC. In our study FEV1/FEV6 showed a sensitivity of 92% and specificity of 100% and our study results matched well with many of the previous studies[7,10].

CONCLUSION:

FEV6 is the minimum expiratory time suggested as acceptable by both ATS and ERS. The reference data are presently available for FEV and FEV1/FEV6 ratio and not for other timed manoeuvres. Data from various studies showed that FEV1/FEV6 ratio is as good as FEV1/FVC ratio in predicting the decline in lung function in adult smokers during 5 years of follow-up.

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