

Relationship between Six-Minute Walk Test, Spirometry and COPD Assessment Test Scores in Chronic Obstructive Pulmonary DiseaseManish Kr Jha¹, Manashjyoti Saikia², Farjana Begum³, Basanta Hazarika⁴¹Postgraduate Trainee, Dept. of Pulmonary Medicine, Gauhati Medical College Hospital²Assistant Professor, Dept. of Pulmonary Medicine, Gauhati Medical College Hospital³Assistant Professor, Dept. of Pulmonary Medicine, Gauhati Medical College Hospital⁴Professor & HOD, Dept. of Pulmonary Medicine, Gauhati Medical College Hospital

Received: 18-04-2024 / Revised: 21-05-2024 / Accepted: 26-06-2024

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Conflict of interest: Nil

Abstract:

Background and Objectives: Spirometric measurement of post bronchodilator FEV1 is essential for assessment of severity in COPD. Six minute walk test (6MWT) is a simple, objective and reproducible test used to measure functional capacity of COPD patient. The COPD Assessment Test (CAT) score is a validated test for evaluation of COPD impact on health status. Our objective is to find relationship between Spirometry, 6MWT and CAT Scores in assessing COPD severity.

Methods: This is hospital based Observational study. Fifty patients of COPD were enrolled after applying inclusion and exclusion criteria. All patients underwent spirometric measurement of FEV1, FVC, and FEV1/FVC. 6MWT was done using ATS protocol of

Keywords: Chronic obstructive pulmonary disease (COPD), Spirometry, Six minute walk test (6MWT), COPD Assessment Test (CAT) Score.

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Introduction

Chronic obstructive pulmonary disease (COPD) is heterogeneous lung condition characterized by chronic respiratory symptoms (dyspnea, cough, sputum production) due to abnormalities of the airways (bronchitis, bronchiolitis) and/or alveoli (emphysema) that cause persistent, often progressive, airflows obstruction [2] COPD is a leading cause of mortality and morbidity worldwide with an economic and social burden that is both substantial and increasing [3].

COPD is characterised by persistent airflow restriction and a reduction in exercise tolerance. For chronic obstructive lung illnesses, spirometry assessment of post-bronchodilator FEV1 is critical for establishing the diagnosis, staging the disease, predicting the outcome, and planning treatment. Because of poor infrastructure, spirometry is not accessible in many parts of rural India [4,5].

The 6MWT is an endurance test used to evaluate functional status of patients with cardio pulmonary disorders is an easy, objective, low-cost, and reproducible test [6]. The 6MWT was approved as a standard test for clinical pulmonary function assessment by the American Thoracic Society (ATS) in 2002. In addition, the association between walking distance with time and the functional

ability of COPD patients has been examined in various researches. Furthermore, 6MWT measurement is more repeatable than FEV1 measurement [7].

The management of COPD patients necessitates a regular assessment of their functional state. The 6-minute walk test (6MWT) is considered an important marker of exercise tolerance in people with COPD [8] CAT score is a well-established tool for determining the impact of COPD on one's health. The CAT score is an easy-to-use, patient-completed quality-of-life instrument with eight questions [9].

Patients were diagnosed as COPD by GOLD diagnostic criteria. Patients with some comorbidity like Diabetes Mellitus, Systemic hypertension, pulmonary hypertension, Cor pulmonale, Coronary heart disease, Active pulmonary tuberculosis, Patients with acute exacerbation of COPD and Patients who use home Non-invasive ventilation were excluded from this study. This study aimed to find a correlation between spirometric indices FEV1, FVC, FEV1/FVC, 6MWT and CAT Scores in COPD patients.

The objective of the study was to see whether 6MWT and CAT score can be used as an alternative to spirometry in resource poor settings for assessing COPD severity.

Method

A total no. of 50 patients of COPD was included in this study. This was a hospital based observational study conducted in the Department of Pulmonary Medicine in Gauhati Medical College.

Procedure

1. Patients were selected after applying inclusion and exclusion criteria. Entire procedure is explained to the patients clearly and informed written consent is obtained from them
2. In all patients, airflow limitation was measured as per ATS recommendation.
3. Spirometry was done and FEV1, FVC and ratio of FEV1/FVC were measured. Then the patient was given 400 microgram of salbutamol. After 15 minutes, Spirometry was again done. Post bronchodilator FEV1, FVC and FEV1/FV ratio was measured.
4. 6 minute walk test (6MWT) was performed according to ATS guidelines. Before test, heart rate, blood pressure, and SpO2 measurements were done. Emergency resuscitation measures

were kept ready to treat the patients, in case any complication occurs during the procedure. Patients were made to walk along a 30 meters long path marked at intervals of one meter each. They were allowed to walk at their own pace. If the patient developed any symptom of chest pain, severe dyspnea, or leg pain, they were allowed rest during the test. Then they were allowed to continue. The patients were encouraged to complete the test. The patients were asked to stop after 6 minutes. After the test was over, again heart rate, blood pressure and SpO2 measurements were done. Distance walked by the patient at the end of 6 minutes was recorded in meters

5. A CAT respiratory questionnaire was given to all patients and was asked to mark their symptoms scoring. The total CAT score of each patient was calculated and recorded.
6. For each patient, points obtained in CAT Score, Spirometric indices (FEV1, FVC, FEV1 / FVC) and the distance walked in Six minute walk test were compared and analysed

Results

In this study 50 patients were included comprising 32 (64%) males and 18 (36%) Females, resulting in a male-to-female ratio of 1.7: 1.

Table 1: Gender Distribution

Sex	No. of Patients	Percentage
Males	32	64 %
Females	18	36 %
Total	50	100 %

In present study age distribution of patients were from 40 – 78 years with maximum patients were between 61 - 70 years (40%) followed by 50 – 60 years (32%), > 70 years (20%) and < 50 years (8%)

Table 2: Age Distribution (years)

Age (years)	No. of patients	Percentage
< 50	4	8 %
50 - 60	16	32%
61 - 70	20	40%
>70	10	20 %

In our study the distribution of patients according to the GOLD stage of COPD showed that the majority of patients were in Stage 3 COPD (60%), followed by stage 2 (28%), stage 4 (8%), and stage 1 (4 %)

Table 3: Distribution according to GOLD staging of COPD

Gold Staging	No. of Patients	Percentage
Mild (1)	2	4 %
Moderate (2)	14	28 %
Severe (3)	30	60 %
Very Severe(4)	4	8 %
Total	50	100 %

This study show that most patients had a CAT score of 21–30 (54%), followed by a score of 10–20 (40%), Score of <10 (4%) and score of >30 (2%).

Table 4: Distribution according to CAT Score for COPD

CAT Score	No. of Patients	Percentage
< 10	2	4%
10 - 20	20	40 %
21 - 30	27	54 %
>30	1	2 %
Total	50	100%

On 6MWT Distance walked by each patient was measured and showed that most of the patients walked a distance of 301-400 metres (50%), followed metres (10%) and 100 – 200 metres (8%).

Table 5: Distribution according to 6MWT Distance

Distance (m)	No. of Patients	Percentage
100 – 200	4	8 %
201 – 300	16	32 %
301 – 400	25	50 %
>400	5	10 %
Total	50	100 %

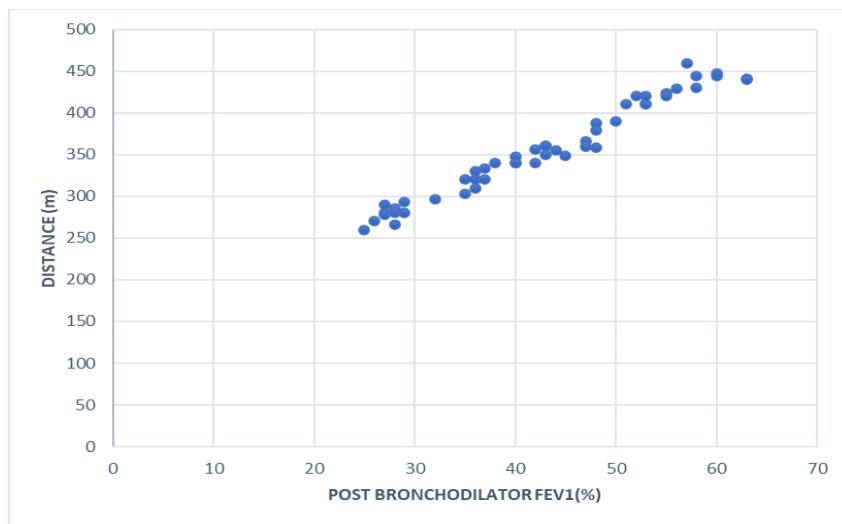


Figure 1: Correlation between FEV1 and 6MWT distance

The above graph shows Positive Correlation between Distance walked in 6MWT and Post bronchodilator FEV1. Indicating that more the obstruction on spirometry lesser the distance walked on 6MWT

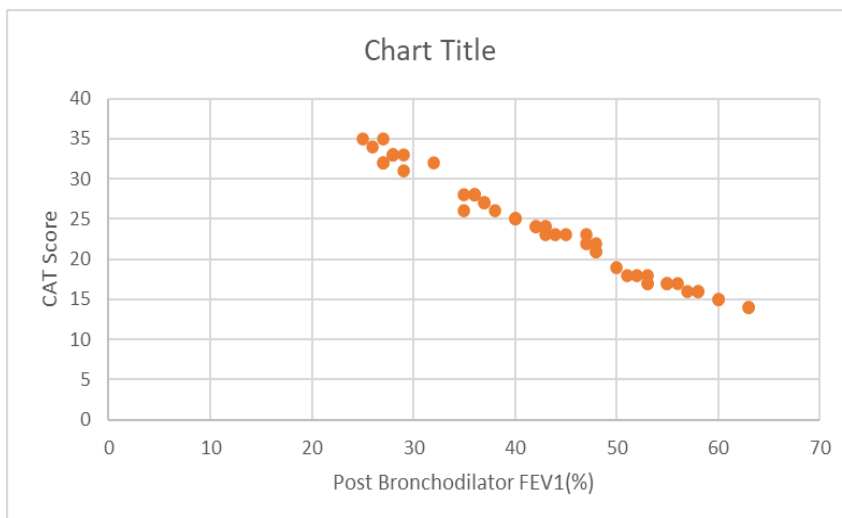


Figure 2: Correlation between FEV1 and CAT Score

It Shows Negative correlation between spirometric indices FEV1 and CAT score on CAT Questionnaire indicating that as severity of obstruction increases (i.e. FEV1 decreases) the CAT score increases

Discussion

COPD is one of the leading causes of mortality worldwide, with significant social and economic implications. It is now among one of the top three causes of death worldwide and 90% of these deaths occur in low- and middle-income countries (LMICs). Therefore, it is important to assess the disease's severity and treat it appropriately [10]

The GOLD guidelines had recommended the spirometric evaluation of post bronchodilator FEV1 to diagnose and determine the severity of COPD and, as a result, to stage the disease and treat it accordingly. Spirometry is an expensive test and it is difficult to make it available in rural areas especially in a resource poor country like India.[11] 6MWT is a simple, inexpensive and effective way of assessing exercise tolerance. This study aimed to find a correlation between spirometric indices FEV1, FVC, FEV1/FVC, 6MWT and CAT Scores in COPD patients.

The distribution of patients according to the GOLD stage of COPD showed that the majority of patients were in Stage 3 COPD (60%) , followed by stage 2 (28%), stage 4 (8%), and stage 1 (4%) . Most patients had a CAT score of 21–30 (54%), followed by a score of 10–20 (40%) . Most of the patients walked a distance of 301-400 metres (50%), followed by 201 -300 metres (32%) The 6MWT and spirometry parameters among patients show a strong positive correlation of FEV1, FVC, and FEV1/FVC with distance walked in 6MWT. These results were consistent with previous studies by Krishnaraj VSP et al [12] Ameri HF et al [13]. Which were also suggestive of a positive correlation between 6MWT and spirometry indices (FEV1 and FVC).

The present study showed a strong negative correlation between CAT scores and spirometry parameters (FEV1 and FVC). These results were consistent with previous studies by Mehta et al. [14] which were also suggestive of negative correlation between CAT scores and spirometry indices

As this study shows correlation between pulmonary function test and 6MWT in patients with chronic lung diseases, this test is an easy and simple way to monitor and assess the disease status. However, it was discovered that such tests were not utilized in our local research and clinical institutes, particularly for assessing severity of illness. Spirometry is not a sensitive method for assessing the functional status of individuals with severe

respiratory disabilities who, in certain cases, cannot perform spirometry at all. This study showed 6MWT can be performed even in patients with advanced respiratory problems. 6MWT can be quite useful in determining the functional status of these patients. There are definite conclusions about the validity of 6MWT in various chronic pulmonary diseases. Furthermore, it also supports its use as an incremental tool in conjunction with other physiological measures in measuring lung function.

Conclusion

Spirometry is required for diagnosis and assessing severity of COPD, but according to the findings of this study the 6MWT can be used as an effective alternative to determine the severity of COPD. The CAT score can be used to determine how COPD affects the individual health and quality of life. In rural areas where spirometry facility is not easily available the 6MWT and the CAT score can be used as an effective alternatives tool to assess COPD severity

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