Correlation Of Spirometry And Six Minute Walk Test (6MWT) In Patients Of Stable COPD

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Abstract: Background: Spirometry is the GOLD standard for the diagnosis of COPD. This test also grades the severity of the disease which helps in the management of patients. Many times Spirometry is not available in remote areas. In these situations 6MWT can be done. 6 minute walk test (6MWT) is a simple test to assess patient's functional capacity (ability for day to day activities). Material And Methods: A prospective study was conducted in the department of Respiratory Medicine, AMC MET MEDICAL COLLEGE, L.G. HOSPITAL, AHMEDABAD for 6 months from date of Confirmation of IRB. The patient who was a confirmed and stable case of COPD and who gave consent was taken for the study. Conclusion: The 6MWT plays a major role in measuring the functional status and disease tolerance of COPD patients. Also, it is observed that as severity of FEV1 increses 6MWD decreses. This suggests that in the absence of spirometry 6MWT is a reasonable tool for the assessment of disease severity and functional status in COPD Patients. [Shah A Natl J Integr Res Med, 2022; 13(2): 07-10 , Published on Dated:10/02/2022]

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Introduction: Chronic obstructive pulmonary disease (COPD) is a major cause of death and debility globally. It is a common,preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious stimulus or gases[1].

Spirometry is the GOLD standard for the diagnosis of COPD. This test also grades the severity of the disease which helps in the management of patients. Many times Spirometry is not available in remote areas. In these situations 6MWT can be done. 6 minute walk test (6MWT) is a simple test to assess patient's functional capacity (ability for day to day activities). The test is cost effective as it requires minimal equipment. In COPD the patient's lung function (FEV1) deteriorates. Improvement in patient's symptoms and quality of life is an important goal in the management of COPD. The management is guided by the severity of airways limitation (GOLD stages). It is important to know whether severity stages based on GOLD guideline correlate with functional capacity of patient. The present study was done to correlate the spirometric data with result of 6MWT and assess whether 6MWT can be an alternative to spirometry in predicting the disease severity of COPD.

Aims & Objectives: To Study The correlation between spirometric indices (forced expiratory volume in 1 s (FEV 1), forced vital capacity (FVC), and peak expiratory flow rate (PEFR))and 6-minute walk distance (6MWD) in Patients of Stable COPD.

Material & Methods: A prospective study was conducted in the department of Respiratory Medicine, AMC MET MEDICAL COLLEGE, L.G. HOSPITAL, AHMEDABAD for 6 months from date of Confirmation of IRB. The patient who was a confirmed and stable case of COPD and who gave consent was taken for the study. The patient was categorized According to GOLD Criteria. The Patient was asked to Stop Inhaled medication 48 hours before the start of study (washout).

The patient was allowed to take Asthalin MDI(SOS) during the washout phase if required, but should stop SABA 6 hours prior to Test.6MWT(explained below)and Spiromertry was performed using computerized spirometer(Medisoft hypair) according to ATS Guidelines at the start of study and were repeated after one month of optimized treatment.The best results of three attempts were selected for analysis. Initially 6MWT was

performed followed by Spirometry.Spirometry was repeated 15 minutes after administration of 200 microgram salbutamol(SABA). Spirometric indices FEV1, %FEV1, FVC, FEV1/FVC ratio and PEFR were recorded. Patients showing obstructive ventilatory defect were grouped as mild, moderate and severe and very severe as per GOLD guidelines. The Patient was asked to follow up after 1 month of Optimized Treatment.

Exclusion Criteria: Patients of Bronchial Asthma. Any severe co morbidity (CAD, Restrictive lung diseases, neurological diseases). Patients who cannot perform 6MWT and Spirometry.

6MWT: 6MWT was done on a 30 meter stretch (according to the ATS guidelineas follows: Patients were rested 10 minutes prior to the test. Baseline heart rate (HR), Blood pressure (BP), SpO2 and dyspnea status was recorded. These parameters were again recorded at the end of the test. Distance walked in 6 minutes was recorded in meters.

The test was discontinued if any of the following occurred: chest pain, severe dyspnea, spasm of lower extremity muscles or if the patient wanted to quit. Post-test the patients were be observed for 15 minutes for any adverse events[2-3].

Percent (%) 6MWD: This was calculated from published reference equations for Indian population[8]. The following equations were used:

6MWT and spirometry was performed during follow up visit.Spirometric indices including FEV1, FVC, FEV1/FVC and PEFR (before and after optimized treatment)were assessed in the study.

Inclusion Criteria: Stable COPD patients after giving consent to participate in Study. Stable COPD patients (FEV1/FVC<0.7).

Predicted 6MWD (For males) = 561.022 - (2.507 × age {years}) + (1.505 × weight {kg}) - (0.055 × height {cm}); and predicted 6MWD (for females) = 30.325 − (0.809 x age {years}) - (2.074xweight {kg}) + (4.235 x height {cm}).(4)

Statistical Analysis: Statistical analysis of the compiled data was done. The correlation was evaluated using Pearson's correlation coefficient 'r'. One way analysis of variance (ANOVA) was done to study significance of variation in 6MWD in different severity groups of COPD. The criteria for significant was set at $p < 0.05$ and very significant at $p < 0.001$.

Results: The study population is 25 Patients. Among them 15(60%) are males and 10(40%) are females. According to age of patients, they are grouped into 4 groups: 45-55 years,>55-65 years,>65-75 years and >75-85 years (Table 1). 6(24%)patients belong to age group 45-55. 10(40%) patients belong to age group >55-65.5 (20%)patients belong to age group >65-75.4(16%) patients belong to age group >75-85 years.

Table 1: Number Of Patients In Various Age Groups

Age	Male	Female	Total
45-55	4	2	6(24%)
>55-65	6	4	10(40%)
>65-75	3	2	5(20%)
>75-85	2	2	4(16%)
Total Patients	15	10	25(100%)

Table 2 shows the number of patients in different severity groups of COPD(Gold Stages).10(40%) patients are in Stage 1,6 (24%) patients are in

STAGE 2,5 (20%) patients are in Stage 3 and 4(16%) are in Stage 4.

Table 2: Number Of Patients In Various Stages Of Severity

Severity(Gold Stage)	Male	Female	Total/Percentage
Stage 1(Mild)FEV1:>80%	6	4	10(40%)
Stage2(Moderate)FEV1:≥50 %TO <80%	4	2	6(24%)
Stage 3(Severe) FEV1:≥30% TO <50%	3	2	5(20%)
Stage 4(Very Severe)FEV1<30%	2	2	4(16%)
Total Patients	15	10	25(100%)

Table 3 signifies Correlation of 6MWD with Spirometry (FEV1). Distances in meters walked by

Patients are in stage 2 i.e. Moderate: 236 + 26.24; 5 Patients are in stage 3 i.e Severe: 166 + 18.54 and 4 Patients are in stage 4 i.e. Very severe: 75 + 18.02 (Table-3). The differences in 6MWD of different severity groups with spirometric

different severity groups were as follows: 10 Patients are in stage 1 i.e. Mild: 342 + 27.49; 6 parameter FEV1 were significant according to ANOVA test. (F ratio 5.98; p <.01). It is observed that as severity of FEV1 increases, 6MWD decreases.

Table 3: Correlation Of 6MWD With Spirometry(FEV1)

Gold Stage	FEV1	No. Of Patients (N=25)	6MWD (m) (Mean±SD)	% Predicted 6MWD
Stage 1	>80% (Mild)	10	342±27.49	474.054
Stage 2	≥50 - <80% (Moderate)	6	236±26.24	463.051
Stage 3	≥30-<50% (Severe)	5	166±18.54	468.25
Stage 4	<30% (Very Severe)	4	75±18.02	460.23

Table 4 co relates correlation of 6MWT with the spirometric parameters of Patients. There was significant positive correlation of 6MWD and spirometric parameters PEFR, FEV1, % predicted

FEV1, FVC. 6MWD also significantly correlated with FEV1/FVC. Also it is observed that as severity of FEV1 increases 6MWD decreases.

Table 4: Correlation Of 6MWT With Spirometric Parameters Of Patients

Parameters	6 Minute Walk Distance "r" Value (Pearson's Coefficient)	"p" value
FVC	0.83	<0.001
FEV1	0.937	<0.001
FEV1/FVC	0.854	<0.001
PEFR	0.429	<0.001

Correlation With 6MWT With Spirometric Parameters:

- FVC: The current study shows positive correlation of FVC with 6MWT(r=0.83, p<0.001).
- FEV1: The present study shows significant correlation between FEV1 and 6MWD(r=0.937, p<0.001).
- FEV1/FVC: In the current study, significant co relation was found between FEV1/FVC and 6MWD(r=0.854,p<0.001).
- PEFR: The present study show correlation between PEFR with 6MWD(r=0.429, p<0.001).

Discussion: The correlation of 6MWT and pulmonary function test, in patients with chronic pulmonary diseases, makes this test easy and a simple tool for assessing the disease status. It was observed; such tests have been underutilized in patients with severe respiratory disability, in whom the lung function test may be an insensitive tool for measuring functional status[5-7]. The present study showed that FEV1(r=0.937,

p<0.001) and FVC(r=0.83,p<0.001). Have significant correlation with absolute 6MWD.This signifies that fall in FVC or FEV1 are associated with significant fall in 6MWD. These results are in consistent with kundu(r=0.478,p<0.001), Al ameri (r=0.31 p<0.001 and r=0.46, p<0.001 respectively)[9], Naghshin R et al, Mehta A et al studies[8] which shows similar results. One study

by kodawala et al and patel A found no such correlation. It is also observed that FEV1/FVC (r=0.854,p<0.001) also significantly and positively correlates with 6MWD.

Chulmsky (r=0.476,p<0.001)(11), satishchandra (r=0.357, p<0.001)(12)study also found similar results. Kundu et al study and Nagshin et al did not find any correlation between 6MWD and FEV1/FVC[9].

The study also signifies positive correlation between PEFR(r=0.429, p<0.001) and 6MWD. These findings are in conformity withkundu(p=0.408,p<0.001)[10],satishchandra(r=0.5565,p<0.001) and Nagshin et al which

demonstrated similar correlation between PEFR and 6MWD[9].

Assessment of disease severity is important in the management of COPD. Presently severity is assessed by post-bronchodilator FEV1 as per GOLD guidelines. 6MWT can be a helpful tool in assessing severity of disease and disease tolerance where spirometry is not available. The present study showed significant correlation of 6MWD and spirometric and clinical indices (PEFR, FEV1, FVC, and FEV1/FVC).

Conclusion: The present study identified significant correlation of 6MWD with spirometric parameters FEV1 and FVC. The FEV1 have been used to grade severity of COPD. The 6MWT plays a major role in measuring the functional status and disease tolerance of these patients. Also, it is observed that as severity of FEV1 increases 6MWD decreases. This suggests that in the absence of spirometry 6MWT is a reasonable tool for the assessment of disease severity and functional status in COPD Patients.

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