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Research Article

Study to find out the efficacy of 6 minute walk test in assessing response to medical intervention in chronic obstructive pulmonary disease patients

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ABSTRACT

Background: The accurate diagnosis of chronic obstructive pulmonary disease (COPD) has always been difficult due to the subjective nature of most investigations. Spirometry has been traditionally used as a method for diagnosis of COPD and also assessing the progression of disease and response to treatment. The 6 minute walk test (6MWT) is a newer testing modality recommended by American thoracic society for assessing the effect of treatment on patients with COPD. The study was to find out the efficacy of the 6MWT in assessing response to medical intervention in patients suffering from COPD.
Methods: Those patients admitted with a diagnosis of COPD on the basis of clinical or radiological findings were included in the study. The 6 minute walk test (6MWT) was performed in a secured 30 meter straight corridor, situated inside the hospital campus. Later spirometric evaluation was done for all participants, with measurement of forced expiratory volume in 1 second (FEV1) and forced vital capacity (FVC), before and after administration of an inhaled bronchodilatory agent.
Results: A total of 52 participants were enrolled into the study. Six minute walk distance had a significant positive correlation with forced expiratory volume in 1 second (FEV1) and body mass index. All the participants were reassessed after 4 months of medical management. Both males and females showed a significant improvement in 6MWD, and both the genders showed less breathlessness as measured using BORG dyspnea scale.
Conclusions: Six minute walk test (6MWT) is a cost-effective modality which can assess the lung function and response to treatment in patients suffering from chronic obstructive pulmonary disease. Also, it shows significant positive correlation with findings of a spirometry test. Therefore it can be recommended as a screening modality to assess pulmonary function in patients suffering from COPD, especially in low-resource settings.

Keywords: Six minute walk test, Chronic obstructive pulmonary disease, Spirometry, Breathlessness

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a lung condition which is a result of long term inflammation of the lung tissues, especially the airways. COPD manifests with respiratory symptoms like breathlessness, effort intolerance, cough with expectoration and in severe cases respiratory arrest, respiratory failure or heart failure. The pathognomonic feature of COPD is the irreversible airway inflammation which is represented by a forced expiratory volume in 1 second/forced vital capacity ratio of less than 0.7. COPD is mostly caused by excessive smoking and often results in deterioration of the quality of living of the patients.[1] Smoking cessation is the most important modality involved in control of COPD

symptoms. The mainstay of long term management is bronchodilators, and the choice between long acting adrenergic agents and anticholinergics depends on the patients' perception of improvement in symptoms. Inhaled corticosteriods are used as adjuvant therapy if the symptoms persist even after adequate use of bronchodilators. Pulmonary rehabilitation through behavioral changes and increase in exercise capacity is also a priority in management of chronic obstructive pulmonary disease.[2]

The accurate diagnosis of COPD has always been difficult due to the subjective nature of most investigations. Spirometry has been traditionally used as a method for diagnosis of COPD and also assessing the progression of disease and response to treatment. But American College of chest physicians and American thoracic society has recommended that spirometry should be used only in patients with respiratory systems and not for screening in apparently normal people.[3] Spirometry is also considered as a hugely subjective test with low reproducibility. The spirometry results depend heavily on the quality of the equipment, cooperation of the patient and also skill of the technician performing the test. Also, spirometry is a medical test and it may not indicate the patients' ability to perform activities of daily living and therefore, this test may not accurately reflect the improvement following treatment.[4] Other studies have shown that chronic obstructive pulmonary disease (COPD) is under diagnosed in primary care and the main reason is the under-utilization of spirometry. Cost of equipment, cumbersome testing procedure, lack of trained personnel and absence of a mobile testing equipment are cited as the main reasons for under-utilization of spirometry in primary care settings. All this results in a delay in diagnosing the condition, making an early and effective intervention impossible.[5]

The 6 minute walk test (6MWT) is a test recommended by American thoracic society for assessing the effect of treatment on patients with COPD. The primary measurement of this test is the 6 minute walk distance, but we can also measure other parameters like oxygen saturation, heart rate, perception of breathless and sentence completion. The patients are supposed to walk alone, without any sort of encouragement from the person conducting the test. Also, the patient is not supposed to walk on an oval or circular track.[6] Studies have shown that the 6 MWT has good correlation with spirometric parameters in patients with chronic obstructive pulmonary disease (COPD). The correlation is marked in patients with severe and very severe illness and 6MWT can be a used as a good indicator in assessing the changes in pulmonary function in these patients.[7] The 6 minute walk test can also be used to predict morbidity and mortality in patients with COPD. Reduction in the 6 minute walk distance (6MWD) over a period of one year is a sensitive indicator to predict probability of hospitalization and death in those patients. Studies have demonstrated that a reduction of 30m in 6MWD over a period of 1 year has a hazard ratio of 1.93 (95% CI- 1.29 to 2.90) for death.[8] The 6 MWT can also be used to assess the functional status of the elderly in out-patient settings. The test is efficacious in measuring the cumulative impact of multiple co-morbidities like cardiovascular illness, respiratory problems, arthritis etc, on the quality of life of the elderly population.[9]

The aim was to find out the correlation of 6 minute walk test (6MWT) with spirometry values, in patients who are on treatment for chronic obstructive pulmonary disease, also to study the efficacy of the 6 MWT in assessing response to medical intervention in patients suffering from COPD. This was undertaken with an objective to study whether 6 MWT can be recommended for a primary care setting in resource-constrained countries in effective management of COPD.

METHODS

The study was conducted at the department of tuberculosis and chest diseases of Government medical college, Kottayam, Kerala, India. The patient recruitment was done over a period of 18 months in the years of 2006-07. Those patients admitted with a diagnosis of chronic obstructive pulmonary disease (COPD) on the basis of clinical or radiological findings were included in the study. Those patients with cor pulmonale, unstable angina, osteoarticular impairment, recent respiratory tract infection and those who require supplementary oxygen therapy were excluded from the study.

The 6 minute walk test (6 MWT) was performed in a secured 30 meter straight corridor, situated inside the hospital campus. The patients were instructed to walk from end to end at their own pace, attempting to cover as much distance as possible. The 6 minute walk distance (6 MWD) was the primary measurement during the test, and dyspnea as measured using modified BORG scale was the secondary measurement. Later spirometric evaluation was done for all participants, with measurement of forced expiratory volume in 1 second (FEV1) and forced vital capacity (FVC), before and after administration of an inhaled bronchodilatory agent. The respiratory health and health linked quality of life of the patients were assessed using St. George's respiratory questionnaire (SGRQ), an international accepted tool designed for this specific purpose.

The data was digitized using a data entry platform created using Epi-Info, free statistical software brought out by centers for disease control, Atlanta, USA. The data analysis was done using SPSS 12.0, a statistical package by IBM Inc., USA.

RESULTS

A total of 52 patients admitted with primary diagnosis of chronic obstructive pulmonary disease (COPD) were included in the study. A majority (63.5%) of the

participants were aged 60 years and above, and around 94% were males. A vast majority (96.1%) of the patients were known smokers, although some of them had quit the habit after the respiratory symptoms started. Around 25% of the participants suffered from diabetes mellitus and hypertension, and 15.3% had benign prostatic hypertrophy (Table 1).

Table 1: Baseline demographic and clinical characteristics.

Characteristics	Frequency (n=52)	Percentage
Age		
Upto 59 years	19	36.5%
60 and above	33	63.5%
Sex		
Male	49	94.2%
Female	3	5.8%
Smoking status		
Smoker	50	96.1%
Non-smoker	2	3.9%
Comorbidity		
Diabetes mellitus	14	26.9%
Hypertension	12	23.1%
Benign prostatic hypertrophy	8	15.3%

The 6 minute walk distance (6MWD) of the patients were assessed once the health status of the patients have been stabilized. This was done under strict monitoring, just before discharge of the patient from the hospital. Participants aged less than 60 years had a 6MWD of 347 m while those aged above 60 years clocked 294 m. (p <0.001) With regards to gender, males had significantly higher 6 MWD when compared to females. Also, patients with a BMI of less than 23.5 had significantly higher 6MWD when compared to participants who were overweight (Table 2).

Table 2: Factors affecting 6 minute walk distance (6MWD).

Factors	Mean 6MWD (n=52)	P value#
Age		
Upto 59 years	347m	<0.001
60 and above	294m	
Sex		
Male	310m	<0.001
Female	250m	
Body mass index		
More than 23.5	260m	<0.001
Less than 23.5	311m	

#- Mann Whitney U test

Correlation of the 6 MWD with other factors were assessed using Pearson's correlation coefficient. Six minute walk distance had a significant positive correlation with forced expiratory volume in 1 second (FEV1) and body mass index. At the same time, it had a significant negative correlation with respiratory health status as measured using St George Respiratory Questionnaire (SGRQ) Score (Table 3).

Table 3: Correlation between 6 minute walk distance (6MWD) and other findings.

Characteristics	Pearson's correlation coefficient (r)	P-value
6MWD and forced expiratory volume in 1 second (FEV1)	0.31	<0.05
6MWD and body mass index (BMI)	0.40	<0.01
6MWD and St. George respiratory questionnaire (SGRQ) score	-0.58	<0.01

The patients were maintained on optimal medical management using a combination of inhaled long acting beta agonists, steroids and anticholinergics. All the participants were reassessed after 4 months of medical management. Both males and females showed a significant improvement in 6 MWD, and both the genders showed less breathlessness as measured using BORG dyspnea scale. The forced expiratory volume in 1 sec (FEV1) and St George respiratory questionnaire (SGRQ) score also improved significantly during the 4 months of follow-up (Table 4).

Table 4: Changes observed after 4 months of optimal medical management.

Characteristic	Pre-intervention	Post-intervention	P value#
6 minute walk distance			
Male	310 m	390 m	<0.001
Female	250 m	322 m	<0.001
BORG dyspnea scale			
Male	8	5	<0.001
Female	5	3	<0.001
Forced expiratory volume in 1 second (FEV1)			
Male	750 ml	962ml	<0.001
Female	990 ml	1173 ml	<0.001
St George respiratory questionnaire (SGRQ) Score	45.4	37.0	<0.001

DISCUSSION

The study was done on patients with chronic obstructive pulmonary disease (COPD) who had achieved cardiopulmonary stability. The 6 minute walk distance (6MWD) was the primary modality which was measured. Age was a significant factor which determined the 6 MWD, with participants below 60 years of age

performing significantly better than those aged 60 or above. A similar trend was observed in other studies also, with a report from Japan showing poor performance indicators as age progress.[10] Body mass index (BMI) was also significantly associated with 6 MWD, with overweight participants walking a lessor distance, than their normal counterparts. A study done in Turkey also showed similar findings with obese participants having lesser 6 MWD, mostly due to obesity hypoventilation syndrome (OHS).[11]

A significant positive correlation was observed between 6 MWD and forced expiratory volume in 1 second (FEV1), though a Pearson's correlation coefficient of 0.31 cannot be considered clinically relevant in some cases. Other studies have shown that 6 MWD is a valid indicator for finding the severity of COPD, and has significant positive correlation with forced expiratory volume in 1 second (FEV1), forced vital capacity (FVC), FEV1/FVC ratio and maximal voluntary ventilation.[12] In our study, the 6 MWD improved significantly following optimal medical management using National institute of health and care (NICE) guidelines. The 6 MWD improved as much as 25% in males and 28% in females, over a follow-up period of 4 months. In other studies also, it is shown that 6 MWD is a sensitive indicator to measure the response to treatment with inhaled medication and pulmonary rehabilitation.[13]

In conclusion, 6 minute walk test (6MWT) is a cost-effective modality which can assess the lung function and response to treatment in patients suffering from chronic obstructive pulmonary disease. Also, it shows significant positive correlation with findings of a spirometry test. Therefore it can be recommended as a screening modality to assess pulmonary function in patients suffering from COPD, especially in low-resource settings.

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