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Original Research Article

Study to assess exercise capacity in patients with copd on pulmonary rehabilitation through six minute walk test

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Article Info

Received: 27th July, 2019

Accepted: 17th August, 2019

Published Online: 18th September, 2019

Keywords: COPD; FEV1; Pulmonary rehabilitation; Spirometry; 6MWT; 6MWTD.

Abstract

Background: To evaluate the efficacy of 6 minute walk test as an assessment tool in COPD patients after pulmonary rehabilitation and to correlate 6 minute walk test [6MWT] with spirometry indices. COPD [Chronic obstructive pulmonary disease] is the one of the leading cause of morbidity and mortality throughout the world. Pulmonary rehabilitation reduces the distress in patients. Spirometry and 6MWT are the tools used to assese the effect of pulmonary rehabilitation.

Methodology: The study was conducted at Rajarajeswari Medical College, Bengaluru, from April 2018 to March 2019 with 82 patients. Consent of patient and ethical committee clearance was taken. Patients were followed up for a period of 12 months with intervals of every 3 months with FEV1 and 6MWT(6 minute walk test).

Results: Out of the total 82 patients studied 46 patients continued till the end of 12 months, 3 people died. Female patients showed less improvement in 6MWT distance than male. Out of 10 cases of very severe COPD, 4(40%) cases showed significant improvement in 6MWTD(6 minute walk test distance) and out of 46 people studied 8[9.8%] were severe COPD, out of 8 severe COPD cases, 6[75%] showed improvement and 33[42%] people with moderate copd completed the study and showed improvement in 6MWT. The FEV1 and 6MWT were correlated significantly.

Conclusions: 6MWT was observed to be the best tool in evaluating the pulmonary rehabilitation and also a cost effective tool as compared to that of spirometry.

Introduction

Chronic obstructive pulmonary disease (COPD) is preventable and a treatable disease which is characterised by persistent respiratory symptoms and limitation of airflow due to airway and alveolar abnormalities usually caused by exposure to noxious particles or gases. The main risk factors for COPD are tobacco smoking, biomass fuel exposure and air pollution.

Chronic obstructive pulmonary disease (COPD) is one of the leading cause of death in the world, prevalence and consequent morbidity and mortality of the disease is expected to increase in the near future [1,2]. This is one of the most common reasons for hospitalization in India [3]. The disease is progressive, distressing and debilitating. It is difficult to predict the mortality and trajectory of disease [4]. Exercise testing and composite indexes such as the BODE index, have been used to predict mortality, but as it is time consuming, its often not utilized clinically [5-7]. The 6MWT is used to evaluate exercise capacity. 6MWT is easy to perform by the patient, it requires no special traning or special equipments.The test results correlates well with sophisticated tests requiring a treadmill or cycle ergometer [8,10]. Hence the distance walked in 6 minutes (6MWD) is frequently used as an outcome measure in evaluating the benefit of pulmonary rehabilitation (PR) [11-13].

Pulmonary rehabilitation is widely used to treat COPD patients with different degree of severity, thus bringing them benefits in terms of improvement in exercise capacity, symptoms and quality of life.

Materials and Methods

The study is a prospective and observational study conducted in the respiratory medicine department of Rajarajeswari Medical College, Bengaluru. The study period April 2018-March 2019.

A total of 82 patients who were diagnosed as COPD through spirometry with FEV1/FVC<_70 and FEV1-<80(GOLD-2-4-moderate-very severe COPD)-who were willing to give written consent and who were willing to undergo pulmonary rehabilitation were taken for the study. The ethical committee clearance was obtained. The patients were given pulmonary rehabilitation over a period of 3 months, 6months and 12 months. The rehabilitation consisted of endurance exercises, resistance exercises, counselling and cessation of smoking, optimal treatment and other encouraging psychotherapy. For all the patients, six minute

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http://doi.org/10.18231/j.ijirm.2019.040

walk test and spirometry was done using computerised spirometer, at the time of admission, after three months, six months and twelve months.after giving pulmonary rehabilitation. According to the ATS guidelines the six minute walk test was performed and the test was monitored throughout by a trained respiratory technician the clinically relevant signs and symptoms were recorded before performance of the test. All the patients were first given instructions to walk in their own pace, as far as they can in six minutes. The walking distance was 30 meter long and in a straight path in our hospital hall, the path was marked at two meters intervals, the patients were instructed to stop walking and sit down when they developed clinical symptoms like fatigue, muscle cramps, dyspnea, discomfort in chest and other symptoms.

The patients were asked to resume walking after rest and this resting time was also noted in the given six minutes time. The patient who did not wish to continue were allowed to stop and the distance and time walked noted. If there were any symptoms it was treated accordingly. All the vital parameters like heart rate, blood pressure and oxygen saturation (SPO2) was recorded before and after the test. Spirometry was done using a standard protocol a day after the 6MWT and the grading was done accordingly.

Results

Among the 82 cases, 63[75.9%] were males and 19[24.1%] were females with the age group of 45 to 75.

72[87.8%] patients were followed up for a period of 3 months, 66[80.4%] patients were followed up for a period of 6 months with 6[7%] patients dropping out, out of 82 patients total of 46 [56%]patients were followed up for 12 months.

There were 3 deaths (3.6%); 10(12%) hospital admissions with acute exacerbations of COPD and 4[5%] developed other diseases, 19 people opted out of study.

Out of 46 people who continued till the end of study, 4 were very severe COPD, they showed significant recovery and improvement in 6MWTD. Out of 46 people studied 8[9.8%] were severe COPD, out of 8 severe COPD cases, 6[75%] showed improvement and 33[42%] people with moderate copd completed the study showed improvement in 6MWT.

6MWT and spirometry was performed over the follow up period. The median FEV1 of the patient over the follow up period of 0,3 months, 6 months and 12 months being 38,39,40,43 respectively.

6MWTD (6 minute walk test distance) at the beginning of rehabilitation was 306.76, which showed significant change after 12 months of pulmonary rehabilitation - 396.61 m. The mean change in 6MWTD was 16.613 after 3 months of pulmonary rehabilitation, 89.97 from base line after 12 months of rehabilitation. Details of results are represented in tables from 1-5 and in Fig. 1

Statistical Analysis

Statistical analysis was done using SPSS version 20.Wherever required suitable test was done. Pearson's correlation was used for normally distributed variables and Spearman's sign rank test was used for non normallydistributed variables.

Table 1: Demographic characteristics of study population

Age	63.0±7.7	62.8±6.8	61.9±8.7
Height	165±7.5	169±5.4*	157±4.9
Weight	65.1±15.4	63.7±14.4*	50.4±16.4
BMI	21.1±1.7	22.1±1.8*	19.0±1.6
Smoking history (pack-year)	66.4_+30.9	66.4±30.9*	00

Table 2: Vital statistics of study population

	Mean value
Systolic blood pressure	130
Diastolic blood pressure	78
Respiratory Rate	82
Oxygen saturation	96
FEV1	42

Table 3: Distance walked by study population during 6MWT

Mean± SD of the distance covered in 6 min walk test			
SMWD0	**SMWD3**	**SMWD6**	**SMWD12**
306.68	322.08	354.60	396.81
92.64	75.21	77.803	93.74

SMWD0, SMWD3, SMWD6, SMWD12-6 minute walk test distance at 0, 3, 6 and 12 months of pulmonary rehabilitation respectively.

Table 4: Change in distance of 6 MWT

Mean± SD-Change from baseline in walking distance in SMWT		
SMWD0	**SMWD3**	**SMWD6**
24.58	33.15	37.87
7.1	9.5	6.5

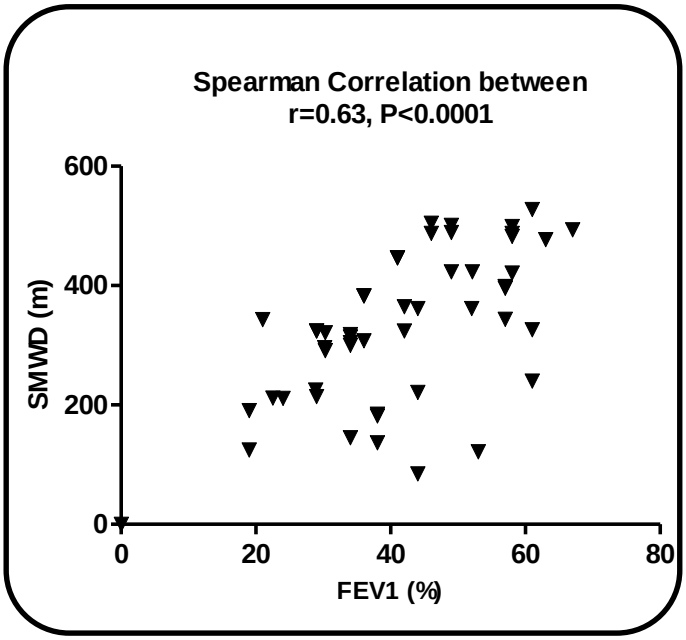
SMWD0, SMWD3, SMWD6-6 minute walk test distance at 0,3and 6 months of pulmonary rehabilitation respectively.

Table 5: ANOVA test comparison for the tests

One way non parametric Friedman's repeated measures ANOVA followed by Dunn's Multiple Comparison of change from baseline walking distance		
SMWT	P < 0.004	Significant
Change@3months vs. Change@6months	No	**NS**
Change@3 vs. Change@12months	YesP<0.01	**S**
Change@6 vs. Change@12months	No	**NS**

S-statistically significant**, NS**-statistically non significant

Fig. 1: Spearman correlation for spirometer and 6MWT



Discussion

COPD is the one of the leading cause of Morbidity and Mortality in the world which has definite social and economic impact.

Pulmonary rehabilitation has proved to improve the quality of life of COPD patients and also their survival rate The patient's exercise capacity can be assessed easily by the distance walked in 6 minutes.

Spirometry is expensive and is not available in many remote and rural health centres, where resources are limited. The 6 minute walk test is practical, simple and can also be performed easily even by illiterate patients. It measures the functional capacity in COPD patients and can also be used to monitor the response to therapy and pulmonary rehabilitation. ATS has approved the 6MWT as a standard test for clinical pulmonary function laboratories [6]. pulmonary rehabilitation has improved the quality of life in COPD patients.

Many studies conducted world wide showed definite co-relation between 6MWT and Spirometry indices [1-14].

The present study was a prospective study conducted over a period of 12 months on COPD patients with moderate-very severe obstruction who were given pulmonary rehabilitation. This study showed positive linear correlation of 6MWT with absolute values of pulmonary function tests (Fig. 1) and also predicted the severity of COPD and also improvement in 6MWT distance after pulmonary Rehabilitation (Table 3,4), Which were similar to Study done by Abhijeet Kunda et al., which proved that 6MWT can be a useful replacement of spirometer in assessment of severity of COPD [1] and Study done by MB. agarwal et al. that showed a correlation between 6minute walk test and spirometry indices [13].

Exercise tolerance improved especially in patients of younger age group and in non–smokers. Study by Celli et al., showed that 6MWT can be used to stratify patients with

COPD for clinical trials, Interventions aimed at modifying exacerbation and Hospitalisation.

In our study pulmonary rehabilitation showed improvement in the distance walked in 6 minutes, which were parallel to the Study done by Pradhan and Aillani that showed physical activity is an important parameter related to improvement of morbidity in COPD patients.

Conclusion

6 minute walk test (6MWT) can be used to assess the improvement or severity of COPD after pulmonary rehabilitation and also in general 6MWT can be used instead of spirometer to assess the Degree of COPD as it is cost effective, easily available and easy to perform even in illiterate patients.

Conflict of interest

None.

Aknowledgement

None.

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How to cite this article: Vinod K, Prashanth K, Rao KNM, Chandran RR, Thirthashree K. Study to assess exercise capacity in patients with copd on pulmonary rehabilitation through six minute walk test. *Indian J Immunol Respir Med*. 2019;4(3):181-4.