Original article:

Effect of Pulmonary Rehabilitation on Six-Minute Walk Distance in Patients with Chronic Obstructive Pulmonary Disease or Interstitial Lung Disease

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Abstract:

Introduction: Pulmonary rehabilitation is a multidisciplinary, comprehensive and individualised programme designed for patients with chronic respiratory diseases. 6-minute walk test (6MWT) one of the patient centred outcome measures used in clinical setting. With this background, the current study aimed to assess the six-minute walk distance (6MWD) after comprehensive pulmonary rehabilitation in patients with chronic respiratory diseases.

Materials and methods: Study participants in this experimental study included 22 patients diagnosed with Chronic Obstructive Pulmonary Disease (COPD) or Interstitial Lung Disease (ILD). Baseline 6MWD was measured following which the patients underwent a twelve weeks comprehensive pulmonary rehabilitation programme. At the end of twelve weeks 6MWD was repeated and compared to the baseline.

Results: A Total of 22 patients (11 COPD patients and 11 ILD patients) were enrolled. After 12 weeks of pulmonary rehabilitation, the mean 6MWD increased significantly from 310.90±63.59 m to 367.72±73.27 m in the COPD patients ($p<0.001$) and from 262.27±70.43 to 294.54±71.04 m in ILD patients ($p<0.001$). Thus, the mean increase in 6MWD in COPD patients was 56.82 m and in ILD patients was 32.27 m.

Conclusion: There is improvement in 6MWD in both COPD and ILD patients after comprehensive pulmonary rehabilitation programme.

Keywords: Pulmonary rehabilitation, 6MWT, 6MWD, COPD, ILD, Six Minute Walk Distance, Six Minute Walk Test

Introduction:

Pulmonary rehabilitation is a multidisciplinary, comprehensive and individualised programme designed for patients with chronic respiratory diseases (CRD) to decrease the associated disability and to improve the overall health related quality of life.(1) Pulmonary Rehabilitation has demonstrated to have beneficial effects on exercise capacity, symptoms, and/or health- related quality of life in Chronic Obstructive Pulmonary Disease (COPD), interstitial lung disease (ILD), bronchiectasis, asthma, cystic fibrosis, lung transplantation, lung cancer, and pulmonary hypertension.(2)

Patients with chronic respiratory disease usually have associated depression along with reduced functional activities and exercise intolerance.(3) Walking is one of the most important activity of daily living but patients with CRD are usually dyspnoeic and frequently stop after few minutes of walking, for rest and breathing before

resuming to walk.(4) So assessing the distance walked by CRD patient before and after pulmonary rehabilitation can be a patient centred outcome measure.

Six-minute walk test (6MWT) is a simple, inexpensive valid and reliable test to measure the functional capacity of patients. It is also one of the outcome measures used to evaluate the effect of pulmonary rehabilitation programme. Distance achieved with 6MWT is submaximal because it is self-paced and not externally paced test.(5) Timed walking tests such as the 6MWT have gained popularity for use in clinical practice and research setting to assess changes in functional capacity following pulmonary rehabilitation intervention.(4) With this background, the current study aimed to assess the six-minute walk distance (6MWD) after comprehensive pulmonary rehabilitation in patients with chronic respiratory diseases.

Methodology:

The experimental study was conducted during the period from July 2015 to January 2016 at a tertiary care institute. The study was approved by the institutional ethical committee from research institute and a written informed consent was obtained from all the study participants. Study participants included diagnosed cases of COPD & ILD. Patients with cognitive, walking disabilities and unstable hemodynamic condition were excluded. Thus, a total of 22 study participants were included in the study during the study period.

Six-minute test (6MWT) : The 6MWT was performed as per American Thoracic Society (ATS) guidelines in compliance with the ATS/ European Respiratory Society (ERS) technical standards.(6,7) Corridor, marked at both ends with a distance of 10 meter was used and laps was of 20 meters. Additional marking was also marked at 100 cm. The procedure was explained to participants and they were instructed to cover a distance, as much as possible within six minutes and were also told that they could stop at any time if they wanted to stop due to dyspnoea, leg pain or any other problem. Periodic notifications of covered and remaining time were provided to the patients.(8) Six-minute walk distance was noted and thereafter participants were enrolled for comprehensive pulmonary rehabilitation program.

Comprehensive pulmonary rehabilitation program: The comprehensive pulmonary rehabilitation program was designed to include patient education, inspiratory muscle training, exercise training (strength training, endurance training, interval training) flexibility training, oxygen therapy and breathing exercises planned individually for each participant. Total duration of programme was twelve weeks with a visit frequency of four times per week. After twelve weeks, the six-minute walk test was repeated with measurement of six-minute walk distance.

Results:

A total of 22 patients with chronic respiratory diseases were enrolled in the study and underwent the comprehensive pulmonary rehabilitation program. The age wise distribution of the study subjects is depicted in table no. Mean age of the patients was 61.90 ± 9.18 years. The study population comprised of 14 (63.64%) male patients and 8 (36.36%) female patients. Out of the 22 study patients diagnosed with chronic respiratory diseases, 11 (50%) patients were diagnosed with COPD and 11(50%) patients were diagnosed with ILD. Table 2 shows a statistically significant improvement in mean 6MWD after twelve weeks of comprehensive pulmonary rehabilitation program in both COPD as well as ILD patients.

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Table 1- Age wise distribution of the patients enrolled in the comprehensive pulmonary rehabilitation program.

Age (years)	Number of patients (%)
45-50	4 (18.18 %)
51-55	3 (13.63 %)
56-60	4 (18.18 %)
61-65	3 (13.63 %)
66-70	4 (18.18 %)
71-75	1 (4.55 %)
76-80	3 (13.63 %)

Table 2 - Comparison of 6MWD preintervention and postintervention in ILD and COPD patients

Chronic Respiratory Disease (number of patients (%))	6MWD		P Value
	Pre-intervention*	Post-intervention*	
	MEAN ± SD (meters)	MEAN ±SD (meters)	
COPD (11(50%))	310.90±63.59	367.72±73.27	<0.001**
ILD (11(50%))	262.27±70.43	294.54±71.04	<0.001**

*Intervention: Twelve weeks comprehensive pulmonary rehabilitation program

**Statistically significant

Discussion:

The present study showed a significant improvement in 6 MWD after pulmonary rehabilitation in COPD and ILD patients. The probable reasons for improvement in 6 MWD could be due to:

1. Decreased perception of dyspnoea sensation after pulmonary rehabilitation leading to improved exercise tolerance and thus increased 6 MWD.
2. Improvement in muscle physiology leading to less accumulation of lactic acid, muscle hypertrophy and improvement in neural recruitment patterns is one of the causes for the muscle strength improvement.
3. Various cardiac adaptation.
4. Decreases in dynamic hyperinflation leading to improvement in 6 MWD.

The mean 6MWD in the COPD patients in the current study increased by 57 m following pulmonary rehabilitation. Our findings are similar to the previous study results by Redelmeyer et al, who in their study on COPD patients demonstrated an increase of 54 m in 6MWD following pulmonary rehabilitation and considered it as significant improvement in functional capacity.(9) Another study done by Troosters T et al also concluded that six month of pulmonary rehabilitation resulted in improvement in exercise performance , respiratory muscle strength and 6MWD.(10) The current study highlights similar finding of improvement in 6MWD even with a lesser duration of pulmonary rehabilitation program i.e. Twelve weeks. Similarly Rejbi et al in their study have also reported an improvement in 6MWD in COPD patients following pulmonary rehabilitation programme and

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postulated it to be due to muscle hypertrophy and improved neural recruitment patterns resulting in improvement in muscle strength.(4)

Various previous studies including a Cochrane review have shown the average improvement of 29-54m in 6MWD following pulmonary rehabilitation in patients with ILD.(11–16) In the present study the mean 6MWD improvement was 32 m in patients with ILD following pulmonary rehabilitation, which is statistically significant and in concordance with previous studies. Thus, there is improvement in 6MWD in both COPD and ILD patients following their participation in a comprehensive pulmonary rehabilitation programme. The current Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines recommend pulmonary rehabilitation as an integral part of COPD management strategy.(17) Considering the limited therapeutic options in ILD's like idiopathic pulmonary fibrosis, pulmonary rehabilitation may offer the patients a viable option especially when improved exercise tolerance is considered an outcome variable in addition to the existing parameters.(18)

Conclusion:

6MWD improves in both COPD and ILD patients after comprehensive pulmonary rehabilitation programme and thus highlights the potentially beneficial role of pulmonary rehabilitation in patients with these chronic respiratory disorders.

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