

A Comparative Study of Three Min Respiratory Exercise Test & Six Min Walk Test as a Means to Score Breathlessness in COPD Patients and Normal Healthy Individuals

Shweta A. Panchbudhe¹, Umanjali Damke², Anjalee Chiwhane³

¹Assistant Professor, Dept of Cardio Respiratory Sciences Datta Meghe College of Physiotherapy, Nagpur; ²Principal of P.T. School and centre at Government medical College, Nagpur; ³Professor Dept. of Medicine Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Sawangi Wardha Maharashtra-442001

Abstract

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2011 update recommends that the management and treatment of COPD be made to combine the impact of disease and future risk of exacerbation.

Objectives: The aim of the study was to compare 3MRET & 6MWT as a means to score breathlessness in COPD patients & normal healthy individuals along with to analyse and compare POD index of 3MRET & walking POD index of 6MWT in COPD patients, normal healthy individuals and to analyse whether POD index of 3MRET or walking POD index of 6MWT is a better means to score breathlessness in COPD patients when compared with normal healthy individuals.

Material and Method: It was observational comparative study conducted in respiratory Physiotherapy set up on 45 Normal healthy individuals and 45 COPD patients between the age group 30-50 years.

Results: Study found that there is a statistically highly significant difference between POD index of 3MRET and walking pod index of 6MWT in COPD patients. There is a statistically highly significant difference between the POD index of 3 MRET and walking pod index of 6MWT in normal healthy individuals. MRET is a better means to score breathlessness in COPD patients as compared to normal healthy individuals. It was found that 3MRET is a better means to score breathlessness as compared to 6 min walk test.

Keywords: Perception of dyspnoea, COPD, Normal subjects, Incentive spirometry, 6 min walk test.

Introduction

COPD represents a major social & economic burden for worldwide health system, patients with COPD experience period of dyspnoea, fatigue & disability which impact on their life. COPD is highly prevalent. Usually progressive illness associated with disability and early

death (WHO2008).¹ According to Donald A Mohler 2015, Dyspnoea is the most prevalent symptoms among patients with respiratory disease. It is an independent predictor of mortality in patients with heart disease, COPD & elderly. In 2012 American thoracic society recommended that dyspnoea can be considered across three different constructs sensory intensity, affective (distress) & impact on daily activity. In 2013, Gold (Global initiative for chronic obstructive lung disease) recommended a treatment for patients with COPD based on medical research council Dyspnoea score.² Various exercise tests are used to evaluate the problem of dyspnoea and provide an opportunity to measure the severity of dyspnoea. According to LoL C, Jayaram

Corresponding Author:

Dr. Shweta A. Panchbudhe

Assistant Professor, Dept of Cardiorespiratory Sciences
Datta Meghe College of Physiotherapy, Nagpur
e-mail: shweta12panchbudhe@gmail.com

et al, measurement of disability and breathlessness is important so, he developed 3MRET (3 min respiratory exercise test) by using an incentive spirometer to score MBC (maximal breathing capacity) & POD (Perception of dyspnoea) for a period of 3 min³.

Methodology

1. Study design: Observational comparative study.

It is an observational comparative study in which 3 min respiratory exercise test & 6 min walk test will be administered to COPD patients & normal healthy individuals and the results will be compared.

2. Study set up- Respiratory Physiotherapy set up

3. Selection criteria: COPD patients and the normal healthy relatives accompanying them to the respiratory OPD of the hospital will form the sample population for the experimental & control group. g

Inclusion criteria:

- (a) COPD patients and normal healthy individuals in the age group of 35-50 yrs

Exclusion criteria:

(A) For normal healthy individuals:

Any acute or chronic respiratory conditions

(B) For COPD

- Any acute exacerbation

(C) Common for both groups are:

- Any musculoskeletal conditions
- Neurological disorder
- Cardiac conditions
- Psychological conditions

Materials used: -Incentive spirometry, Measuring tape, stopwatch, staws and cone

Procedure: Approval has been obtained from the ethical committee. The subjects who fulfill the inclusion criteria were explained about the study in detail, inform consent was taken in consent form in a language they understand. The subjects were explained about 3 MRET & 6MWT until they mastered the test technique. In a random allocation by chit system the order of the two tests were decided for each subjects. Both the groups of subjects underwent either 3min respiratory exercise test or 6 min walk test as per the chit picked After completion

of one test, the subjects were made to rest for a period of 30 mins, so as to recover from any after effect of the previous test, and he asked to rate the POD and after that POD index were calculated, then the subjects were made to perform the next test .

3 min respiratory exercise test (3MRET): The subject is asked to hold the mouthpiece of the incentive spirometry in his mouth and inhale as deep as possible with maximum inspiratory effort to score MBC (maximal breathing capacity),so that all the three balls reach the top of the coloumn & hold it for 3 seconds and release.

6 min walk test (6MWT): The subjects were asked to perform a 6min walk test. The subject was asked to walk on a flat, long &, hard surface as fast as possible in the departmental corridor which is a 100 ft hallway with turn around points at each end clearly marked with cones for a period of 6 min. The distance covered during 6 min is measured & recorded as walking distance, after that the subject is made to score POD (perception of dyspnoea) by VAS(visual analogue scale).

Outcome Measures:

- POD index of 3 MRET is:** The POD was calculated by dividing POD VAS score with the MBC (maximal breathing capacity) ant then multiplying it by 1000.To standardize, POD VAS score zero was replaced by a standard value of 0.125,to enable the calculation of POD index The formula for MBC (MAXIMAL BREATHING CAPACITY) is as follows:

MBC= (number of times that all three ball reach the top of column) X 2+(no of times that two ball reached the top of column) X1.5+(no of times that one ball reach the top of column)X1

The formula for POD index is as follows:

POD index = POD VAS X1000/MBC

- Walking POD index of 6 MWT was:** The walking POD index will be calculated by dividing POD VAS score with the walking distance and multiplying it by 1000.To standardize, POD VAS score zero was replaced by a standard value of 0.125, to enable the calculation of POD index.

The formula for walking POD index is as follows:

Walking POD index = POD VAS x 1000/Walking Distance

Results

45 COPD and 45 normal healthy individuals were taken who volunteered to participate in our study according to inclusion and exclusion criteria. Out of 45 COPD patients 29 were male and 16 were female and the relatives accompanying them to respiratory department were taken as normal healthy individuals of the same sample size i.e 45 out of which 23 were male and 22 were female 3MRET and 6MWT were performed in normal healthy individuals and COPD patients, the variables taken in both the test groups were MBC (maximal breathing capacity), walking distance, and POD index (perception of dyspnoea), the MBC and POD index of 3 min respiratory exercise test was considered as equivalent to walking distance & walking POD index of 6 MWT in both the test groups. The POD index of both the test were compared for strength of association and significance. Out of 45 COPD patients 29 were male and 16 were female and the relatives accompanying them to respiratory department were taken as normal healthy individuals of the same sample size i.e 45 out of which 23 were male and 22 were female 3MRET and 6MWT were performed in normal healthy individuals

and COPD patients. Mean MBC score in normal healthy individuals is 151(108-194) and in COPD patients 109.8(66-149), we found that mean MBC score was highest in normal healthy individuals and it was very lowest in COPD patients, there is statistically significant difference between normal subjects and COPD patients.

Table No. 1: Shows mean maximal breathing capacity MBC (109.8) and walking distance (381.33) in COPD patients

Parameters	MBC	Walking distance
Mean	109.8	381.33
SD	19.69	58.83
Median	112	360
Ranges	66-149	240-480

Table no 1 shows that mean MBC score in normal healthy individuals is 151(108-194) and in COPD patients 109.8(66-149), we found that mean MBC score was highest in normal healthy individuals and it was very lowest in COPD patients, there is statistically significant difference between normal subjects and COPD patient.

Table No. 2: Shows correlation of MBC and walking distance in walking distance normal subjects.

	r s-value	p-value	Significance
Normal subjects	0.1349	0.3771	Not significant
COPD patients	0.4958	0.0005	Highly significant

Table no 2 shows correlation of MBC with the walking distance in normal healthy individuals and in COPD patients, we also found that there is not significant difference between mean MBC 151.26 (108-194) and mean walking distance 432 (300-540) in normal healthy

individuals (p value) (0.3771) but there is statistically highly significant difference between mean MBC 109.8(66-149) and mean walking distance 381.33 (240-480) in COPD patients(p value) (0.005).

Table No. 3: Shows comparisons of mean POD index of 3MRET and mean POD index of 6 MWT in normal healthy individual

	3 MRET	6MWT	t-value	p-value
Mean	23.0	4.81	22.0954	<0.0001, HS
SD	6.38	2.20		
Median	22.38	4.16		
Range	12 – 35.7	2.08-11.11		

Table no 3 shows that comparisons of POD index of 3 min respiratory exercise test with the POD index of 6 min walk test in normal healthy individuals and in COPD patients, observed that mean POD index of 3 min respiratory exercise test was highest as compared

to POD index of 6 min walk test in normal healthy individuals and COPD patients, we found that there is statistically highly significant difference between POD index of 3MRET and POD index of 6 min walk test in normal healthy individuals and COPD patients.

Table No. 4: Shows comparisons of mean POD of 3 MRET and mean POD index of 6MWT in COPD patients

	3 MRET	6MWT	t-value	p-value
Mean	45.56	8.48	32.8903	<0.0001, HS
SD	8.68	2.96		
Median	45.8	8.3		
Range	29.4-66.03	2.7-16.6		

Table no 4 shows that comparisons of POD index of 3 min respiratory exercise test with the POD index of 6 min walk test in normal healthy individuals and in COPD patients, observed that mean POD index of 3 min respiratory exercise test was highest as compared

to POD index of 6 min walk test in normal healthy individuals and COPD patients, we found that there is statistically highly significant difference between POD index of 3MRET and POD index of 6 min walk test in normal healthy individuals and COPD patients.

Table No. 5: Shows correlation of POD index of 3 MRET and POD index of 6 MWT in normal healthy individuals & in COPD patients

	rs-value	p-value	Significance
Normal subjects	0.5314	0.0002	Highly significant
COPD patients	0.5641	0.0001	Highly significant

Table no 5 shows Correlation of POD index of 3MRET & POD index of 6MWT in COPD patients and Normal subjects. it shows that there is statistically highly significant difference between POD index of 3 MRET and POD index of 6 min walk test.

Table no 6 shows the comparisons between normal healthy individuals and COPD patients by 3 min respiratory exercise test, as comparisons was made between two tests we came to know that 3min respiratory exercise test is superior as compared to 6 min walk test, then we compared 3 MRET between normal subjects and COPD patients. We come to know our conclusion that 3 min respiratory exercise test is a better means to score breathlessness in COPD patients as compared to normal healthy individuals.

Table No. 6: Comparisons between normal subjects and COPD patients by 3MRET

Groups	3MRET (Min Respiratory Exercise Test)
	Mean Value
Normal Healthy Individuals	23.0
COPD Patients	45.56
t-value	114.0481
p-value	<0.0001.HS

Discussion

As 3MRET and 6MWT were performed in normal healthy individuals and COPD patients, the variables taken in both the test groups were MBC (maximal breathing capacity), walking distance, and POD index (perception of Dysnpoea),the MBC and POD index

of 3 min respiratory exercise test was considered as equivalent to walking distance and walking POD index of 6 MWT in both the test groups. The result of study, shows mean MBC score in normal healthy individuals is 151 (108-194) and in COPD patients 109.8(66-149), we found that mean MBC score was highest in normal health individuals and it was very lowest in COPD patients, there is an highly statistically significant difference between normal subjects and COPD patients. This is supported by **LI-Cher loh, Pek-Ngor the 2005³** Correlation of MBC with the walking distance in normal healthy individuals and in COPD patients, it was found that there is not significant difference mean MBC 151.26(108-194) and mean walking distance 432 (300-540) in normal healthy individuals p value (0.3771) but there is statistically highly significant difference between mean MBC 109.8 (66-149) and mean walking distance 381.33 (240-480) in COPD patients (p value)(0.005). This is supported by the study **Amorim, Stelmach et al 2014⁴**.

The current study shown comparisons of POD index of 3 min respiratory exercise test with the POD index of 6 min walk test in normal healthy individuals and in COPD patients we observed that mean POD index of 3 min respiratory exercise test was highest as compared to POD index of 6 min walk test in normal healthy individuals and in COPD patients, We found that there is statistically highly significant difference between POD index of 3 MRET & POD index of 6b min walk test in normal healthy individuals and COPD patients. This result is supported by **American thoracic society guidelines⁵ & Li-cherloh,pek-ngor et al⁶**.

We had compared POD index of 6MWT between normal healthy individuals and COPD patients. The result of our present study shows that POD index was lowest in normal healthy individuals and it was highest in COPD patients by 6 min walk test, we found that there is statistically highly significant difference between normal healthy individuals and COPD patients by 6 min walk test. This result is supported by **Golpe R1,Perez-de 2013⁷**.

Therefore, from the above all discussion it is clear that 3 min respiratory exercise test as superior as compared to 6 min walk test in COPD patients and in normal healthy individuals. We come to know that 3 min respiratory exercise is a better means to score breathlessness as compared to 6 min walk test in normal

subject and in COPD patients. Comparisons between normal healthy individuals and COPD patients by 3 min respiratory exercise test conclude that 3 min respiratory exercise test is a better means to score breathlessness in COPD patients as compared to normal healthy individuals.

Conclusion

There is statistically highly significant difference between POD index of 3MRET and walking POD index of 6MWT in COPD patients & normal healthy individuals as well as 3MRET is a better means to score breathlessness in COPD patients as compared to normal healthy individuals

Ethical Clearance: Taken from institutional ethics committee.

Source of Funding: Self.

Conflict of Interest: Nil.

Reference

1. Pauwels R, Buist A et al 'Global strategy for diagnosis, management & prevention of COPD' Am J Respir crit care med 2001 Apr,163(5): page no 1256-76.
2. Donald. A Mahler, Denis .E.o Donnell et al 'Recent advances in dyspnoea' chest 2015 Jan;147 (1): page no 232-241.
3. Li-cher-Loh,Ser-hon Puah et al' Disability & Breathlessness in Asthmatic Patients-A scoring method by repetitive inspiratory effort'J Asthma 2005 Dec; 42(10):853-8.
4. Amorim, Stelmach et al 'Barrier associated with reduced physical activity in COPD patients J bras Pneumon Vol 45 (5) page no 504-512,2014.
5. American journal of Respiratory & critical care medicine' ATS statement guidelines for 6 Min walk test Vol 166, 2002.
6. Li-cher loh, Pek-Ngor Teh et al 'Incentive spirometry as a means to score breathlessness' Malays. J med SCI Vol 12 (1) page no 39-50,2005.
7. Golpe R et al 'Prognostic value of walk distance, work,oxygen saturation and dyspnoea during 6 min walk test in COPD patients' Respiratory care August 2013,58(8) page no 1329-1334.