Section: TB and Chest

Research

CORRELATION BETWEEN SIX MINUTES WALK TEST AND SIT TO STAND TEST IN COPD PATIENTS

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Received : 19/11/2022
Received in revised form : 27/12/2022
Accepted : 10/01/2023

Keywords:
COPD, Pulmonary test, Smoking, Chronic bronchitis, Tuberculosis.

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DOI: 10.47009/jamp.2023.5.1.95

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (1); 456-460

Abstract

Background: Globally, COPD is one of the leading deaths. Over sixty-five million individuals are living with severe to moderate COPD. **Materials and Methods:** This Prospective observational study was conducted on 50 patients who presented to the department of TB and Respiratory Medicine from 2018 – 2019 at Saveetha medical college and hospital. After giving informed consent to explain the study's risk and benefit, COPD suspect patients will undergo a pulmonary function test (spirometry). Spirometry is done using a standard spirometer (flow-based spirometer). **Result:** Among 50 patients, 74% of the patients are males, and 26% of the patients are females. Most of the age group were 51-60 (30%) and the least in 30-40 (4%). In addition, 48% of the patients are smokers, 14% of the patients are Ex-smokers, 12% of the patients are Non-smokers, and 26% of the patients are affected by Bio-mass. The maximum number of patients was between a smoking index of 201-400, 11 (36%). A significant change in the Walk distance in 6 min, the STST in 30 sec and the Breath-holding test is observed ($p<0.0001$). A significant difference in the FVC, FEV1 and FEV1/FVC between the pre and post in pulmonary function test was observed, with a p-value of 0.004, <0.0001, and 0.002. **Conclusion:** When evaluating patients' functional ability in an environment with limited resources, STST can be performed instead of 6MWT for those with moderate to severe COPD. It is less demanding on the patient's hemodynamic system, simpler to implement, and more attuned to the patient's healthcare situation.

INTRODUCTION

Globally, COPD is one of the leading killers. According to the World Health Organization, about 65 million individuals worldwide have severe COPD. With almost 3 million fatalities in 2005 (5% of all deaths worldwide), chronic obstructive pulmonary disease is expected to overtake heart disease and cancer as the third biggest cause of death by 2030. High-income nations are the primary data source on COPD incidence, morbidity, and death. Collecting reliable epidemiologic data on chronic obstructive pulmonary disease (COPD) is challenging and costly, even in these nations. But it is known that poor and medium-income nations already bear a disproportionate share of the COPD burden, with approximately 90% of COPD fatalities occurring in all these nations.[1,2]

Smoking is the top of the many factors leading to chronic obstructive pulmonary disease. Many Indians also smoke unusual tobacco products, including hookahs, bidis, and chillums, as part of their smoking rituals. Chillum smoking has been shown to cause a far greater rise in end-tidal carbon monoxide amounts than cigarette smoking, attesting to its harmful potential, and hookah smokers have a roughly 6-fold higher risk of developing lung cancer compared to non-smokers. Using crop waste, wood, or animal waste as fuel is also quite common in India.[3] Fifty-one percent of all homes in the globe rely on biomass fuels for their heating needs. Most of the time, this occurs in settings where the wastewater is just dumped inside the house. Women are disproportionately impacted since they are the primary caregivers in the kitchens of rural homes. The usage of biomass fuels has recently come under scrutiny as a potential leading global cause of chronic obstructive pulmonary disease (COPD). Another form of exposure in Indian households is mosquito coils, which are burned at night to ward off insects and release particles into the air at a rate similar to 100 cigarettes.[4]

Chronic bronchitis and emphysema are the two most common forms of COPD. The clinical definition of chronic bronchitis is a productive cough lasting at

ISSN (O): 2687-5365; ISSN (P): 2753-6556

least three months each year for two years running, which cannot be attributed to any other condition. Distal airspaces (those further from the terminal bronchioles) expand abnormally and remain enlarged in patients with emphysema. This degradation of the airspaces' walls occurs without apparent fibrosis. Chronic bronchitis is a clinical definition, whereas emphysema is pathologically defined.[5]

History and physical exam findings suggest COPD, and spirometry provides definitive proof. Chronic, progressive dyspnoea, chronic cough, chronic sputum secretion, wheezing, decreased exercise tolerance, weariness, malaise, and pedal oedema are some clinical signs of COPD. Central cyanosis, a barrel chest, respiratory accessory muscles, tachypnoea, aggressive lip breathing, etc., are all symptoms of severe COPD. However, no identified signs or discoveries unique to COPD have been identified.[6]

AIM

This study aims to evaluate the correlation between the 6-minute walk and sit-to-stand tests in COPD patients.

MATERIALS AND METHODS

This Prospective observational study was conducted on 50 patients who presented to the department of TB and Respiratory Medicine from 2018 – 2019 at Saveetha medical college and hospital. After giving informed consent to explain the study's risk and benefit, COPD suspect patients will undergo a pulmonary function test (spirometry). Spirometry is done using a standard spirometer (flow-based spirometer).

Inclusion Criteria

(FEV1/FVC < 0.7 with <12% FEV1 reversibility following a bronchodilator), Both male and female patients, and Patients with a history of smoking and biomass exposure. Age >35 years, no upper age limit was set, and Suggestive of COPD.

Exclusion Criteria

Asthma, Active haemoptysis, Patient unable to perform PFT, Presence of pleural disease, Active pulmonary Tuberculosis, Bronchiectasis, ILD, Lung cancer, Cor Pulmonale, Resting heart rate >120/ min, Systolic blood pressure > 180mm Hg, and Diastolic blood pressure > 100mm Hg.

A clinical diagnosis of COPD should be considered in any patient attending chest medicine OPD with progressive exertional dyspnea, chronic cough and sputum production and a history of exposure to risk factors such as smoking exposure to biomass gases. A chest x-ray is taken to exclude other exclusion criteria. Blood haemoglobin value is measured to remove the primary confounding factor in DLco. Each subject was asked to hold their breath as long as they could. Breath holding time can be noted. Normal breath holding time is 45 to 55 seconds.

Frequency and percentage calculations were made for the statistical analysis. In addition, the Chi-square test was used to examine the correlation between the categorical data.

RESULTS

Among 50 patients, 74% of the patients are males, and 26% of the patients are females. Most of the age group were 51-60 (30%) and the least in 30-40 (4%). In addition, 48% of the patients are smokers, 14% of the patients are Ex-smokers, 12% of the patients are Non-smokers, and 26% of the patients are affected by Bio-mass.

Table 1: Distribution of patient's characteristics

Variable		Number of patients	Percentage
Gender	Male	37	74.0
	Female	13	26.0
Age group	30-40	2	4%
	41-50	10	20%
	51-60	15	30%
	61-70	13	26%
	71-80	10	20%
Smoking habits	Smokers	24	48.0
	Ex-smokers	7	14.0
	Non-smokers	6	12.0
	Bio-mass	13	26.0

Table 2: Distribution of smoking index

Smoking index	Number of patients	Percentage
0-200	1	3%
201-400	11	36%
401-600	10	32%
601-800	2	7%
801-1000	5	16%
1001-1200	1	3%
1201-1400	0	0%
1401-1600	1	3%

ISSN (O): 2687-5365; ISSN (P): 2753-6556

In the smoking index, the maximum number of patients was 201-400, 11 (36%), and 401-600, 10 (32%).

Table 3: Comparison of Walk distance, STST and Breath-holding test

Parameters		Mean and Std Deviation	P-value
Walk distance In 6 min	Admission	367.60 ± 38.09	<0.0001
	Discharge	385.00 ± 35.64	
STST in 30 sec	Admission	9.62 ± 1.71	<0.0001
	Discharge	10.32 ± 1.54	
Breath-holding test	Admission	20.98 ± 10.13	<0.0001
	Discharge	24.16 ± 9.83	

A significant change in the Walk distance in 6 min and the STST in 30 sec is observed ($p<0.0001$), which shows that the patients have got improvement in walk distance in 6 min and STST in 30 sec while they are discharged. Furthermore, a significant change in the Breath-holding test is observed ($p<0.0001$).

Table 4: Comparison of Parameters

Parameters		Mean and Std Deviation	P-value
Heart rate	Initial	87.10 ± 6.63	<0.0001
	Walk distance in 6 min	98.26 ± 7.77	
Heart rate	Initial	87.10 ± 6.63	<0.0001
	STST in 30 sec	102.26 ± 9.16	
SPO2	Initial	96.84 ± 1.13	<0.0001
	Walk distance in 6 min	95.14 ± 1.77	
SPO2	Initial	96.84 ± 1.13	<0.0001
	STST in 30 sec	94.54 ± 2.14	
BP-Systolic	Initial	119.20 ± 6.33	0.855
	Walk distance in 6 min	119.00 ± 6.77	
BP-Systolic	Initial	119.20 ± 6.33	0.868
	STST in 30 sec	119.40 ± 6.82	
BP-Diastolic	Initial	76.40 ± 5.25	0.674
	Walk distance in 6 min	76.00 ± 4.94	
BP-Diastolic	Initial	76.40 ± 5.25	0.341
	STST in 30 sec	75.40 ± 5.42	
Respiratory rate	Initial	19.18 ± 1.11	<0.0001
	Walk distance in 6 min	21.14 ± 1.22	
Respiratory rate	Initial	19.18 ± 1.11	<0.0001
	STST in 30 sec	21.88 ± 1.39	

A significant change in the Heart rate is observed ($p<0.0001$), showing that the patients have increased Respiratory rate after the Walk distance in 6 min test. Furthermore, a significant change in the Heart rate is observed ($p<0.0001$), which shows that the patients have increased respiratory rate after the STST in 30 sec.
A significant change in the SPO2 is observed in both walk distance in the 6 min test and STST in 30 sec ($p<0.0001$). However, no significant difference in BP-Systolic and Diastolic is observed in both walk distance in the 6 min test and the STST in 30 sec.
A significant change in the respiratory rate is observed ($p<0.0001$), which shows that the patient increased respiratory rate after the Walk distance in the 6 min test and the STST in 30 sec.

Table 5: Comparison of Pulmonary Function Test

Pulmonary Function Test		Mean Std. Deviation	P-value
FVC	Pre	60.74 ± 14.18	0.004
	Post	62.50 ± 14.22	
FEV1	Pre	51.66 ± 14.38	<0.0001
	Post	55.24 ± 16.18	
FEV1/FVC	Pre	84.58 ± 13.97	0.002
	Post	86.98 ± 14.33	

A significant change in the FVC, FEV1 and FEV1/FVC between the pre and post in pulmonary function test was observed, with a p-value of 0.004, <0.0001, and 0.002.

DISCUSSION

According to the study by Meriem M et al,[7] individuals with stable COPD showed a correlation between 6MWT and STST. Compared to pre-exercise levels, significant increases in systolic blood pressure, heart rate, and dyspnea severity were seen during both the 6MWT and the STST. In contrast to 6MWT, STST resulted in much less cardiorespiratory stress. A favourable association was found when comparing 6MWT distance to forced vital capacity. STST can assess functional status in COPD based on findings from the 6-minute walk test (6MWT). Compared to 6MWT, it takes less time and causes less hemodynamic strain. In Patients, STST may be substituted with 6MWT.[7]

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Tabish S et al. studied a total of one hundred individuals with varying degrees of chronic obstructive pulmonary disease (COPD) enrolled in the study. The results of the 6-minute walk test were shown to have a moderately favourable connection with the sit-to-stand test results. In addition, a moderate positive relationship was discovered between STST and COPD individuals. Considering those results, STST can be used to evaluate functional capacity in place of the more time-consuming and expensive 6 MW Test.[8]

Marius-Gabriel et al. studied the 6MWT resulted in a greater rise in dyspnea and a more significant decrease in SpO2 saturation than the STST resulted in a group of 46 COPD patients (32 men). In addition, there was a correlation between the number of liftings at SSTS, and the distance walked at 6MWT. Results suggest that 6MWT is more challenging than STST, although both tests have been used in assessing activity levels in patients with COPD.[9]

A study by Beaumont M. et al. found that, in contrast to 6MWT, no instruction was required before STST. When comparing the 6MWT to the STST, there were notable differences in the heart rate ranges and pulsed oxygen saturation. In addition, both assessments indicated comparable variability in dyspnea and tiredness in the lower limbs. The study suggests that the sit-to-stand test can be used as a substitute for the 6MWT in estimating exercise performance in COPD patients.[10]

According to the study by Gurses HN et al., the 6MWT and STS tests were marginally linked with the number of calories burned during regular exercise. There was a moderate correlation between 6MWT duration and the 30sSTS and 60sSTS tests and a poor correlation between the 10sSTS and 6MWT. Although the 10sSTS test correlates similarly to the 6MWT, no major discrepancies exist. The results showed a poor correlation between the 10s STS test and the 6MWT, with the 30s and 60s STS tests showing a strong correlation.[11]

According to Reychler G et al., a correlation between 6MWD (441 ± 104 m) and the number of times a person sat down and stood up (19 ± 6). STST and 6MWT showed high levels of reproducibility. In addition, STST was shown to have a high degree of dependability. There was a notable contrast between the two tests in terms of heart rate as well as pulsed oxygen saturation fluctuations from 6MWT to STST. Based on the results, the 1-minute sit-to-stand test is a valuable treatment to the 6-minute walk test for determining patients' physical performance tolerance while dealing with COPD.[12]

A study by Rehman ST et al., using the Correlation analysis test, identified a moderately favourable relationship between the Sit to stand test results and the 6-minute walk test results. This revealed that the Sit to stand the test and chronic obstructive lung disease had a mild positive link in these individuals. Furthermore, COPD was also associated with a somewhat shorter 6-minute walk test distance. Therefore, the results show that COPD patients' characteristics may be evaluated using the STST instead of the 6 MW Test.[13]

Fernandes AL et al. found a significant relationship between the 6MWD and the total number of 1STST. In addition, both measurements of lowest possible oxygen saturation (SpO2) demonstrated high degrees of agreement and correlation. Based on the results, 1STST appears to help identify exercise-induced oxygen desaturation in COPD.[14]

Bhattacharyya P et al. studied that when comparing the two variables (PR and SpO2), the p values remained non-significant. As the primary component analysis demonstrates, there is a total overlap between the variables. Furthermore, the 6-minute walk test distance was uncorrelated with post-exercise variations. Therefore, the suggested 2CT looks repeatable and has a post-exercise impact on pulse rate and systolic blood pressure similar to 6MWT.[15]

Hansen H et al. study found that the 6MWT had inter-rater reliability of 0.96and intra-rater reliability of 0.98. Test day 2 saw a 7.9-meter improvement in the mean walking distance despite no difference in 6MWT distances. In patients whose, 6-minute walk distance (6MWT) was less than 350 metres. No significant learning effect was observed in the 30-second STS that would be useful in clinical practice. Individuals with high and very severe COPD had high inter- and intra-rater reliability levels and reasonable agreement on the 6MWT and the 30-second short-term spirometry test (STS).[16]

CONCLUSION

We conclude that STST, which is less hemodynamically stressful, simpler to use, and more responsive to the patient's clinical status than 6MWT, accurately assesses the functional state like 6MWT in patients with moderate-to-severe COPD. Based on these results, we decided to employ STST instead of 6MWT to evaluate the active status of patients with moderate-to-severe COPD in settings where the availability of resources is restricted.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556

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ISSN (O): 2687-5365; ISSN (P): 2753-6556