Journal of Cardiovascular Disease Research

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 02, 2023

Original research article

Results from the six minute walk test, spirometry, and the chronic obstructive pulmonary disease evaluation

[1]Dr. Sindhoora Rawul, [2]Mohammad Siddique Ahmed Khan

[1]Assistant Professor, Department of Pulmonology, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India

[2]Professor and HOD, Department of Biochemistry, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India

Corresponding Author:
Dr. Sindhoora Rawul

Abstract

Background: Both chronic bronchitis and emphysema are part of COPD. Having a productive cough at least three times a week for more than two years is diagnostic of chronic bronchitis.

Methods: Outpatients and inpatients at the Department of Pulmonology, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India, were the subjects of a prospective research conducted between June 2021 to May 2022. The research involves sixty participants.

Results: However, a diagnosis of COPD requires the use of spirometry. The effects of COPD on one's health and quality of life can be measured using a CAT score. Even in a rural situation where most COPD patients do not have access to spirometry, both the 6MWT and the CAT score may be employed.

Conclusion: The results of this study suggest that the 6-minute walk test can replace the FEV1 as a means of measuring COPD severity. Spirometry is not required in order to determine the severity of COPD every time.

Keywords: Six minute, walk test, spirometry, chronic obstructive pulmonary disease

Introduction

There are two conditions that make up COPD: chronic bronchitis and emphysema. A productive cough that lasts more than two years and occurs at least three times per week is the hallmark of chronic bronchitis [1]. Emphysema is a lung disorder characterised by aberrant, permanent expansion of airspaces distal to the terminal bronchiole, accompanied by disintegration of their walls, and without apparent fibrosis, as described in 1984 by the National Heart, Lung, and Blood Institute. This demonstrates that COPD is characterised by abnormalities in the airspace as well as the airways [2-4].

Prevalence rates of chronic obstructive pulmonary disease differ greatly depending on the criteria used to identify cases. Spirometry-based studies have found greater COPD prevalence than questionnaire-based research. People over the age of 40 are more likely to get COPD. The prevalence of chronic obstructive pulmonary disease rises with age [5, 6]. The following graphic demonstrates how the incidence rate rises with age. COPD affects around 9-10% of the world's population. There are 9.02 million males and 5.75 million women living with COPD in India, respectively, according to the INSEARCH research. The following table compiles data from many studies that looked at the incidence of COPD in India [7-9].

Spirometry-based studies on disease prevalence are quite few in India. The World Health Organization and the Government of India have formed a committee to authorize the use of the 6-minute walk test, the forced expiratory volume in one second, and questionnaire-based analysis to determine the severity of COPD. The social and economic lives of people with COPD are significantly impacted [10, 11]. Therefore, it is crucial to make a prompt diagnosis of COPD, evaluate the severity of the condition, and administer the right treatment. Spirometry following bronchodilator treatment is commonly used to evaluate the severity of COPD. However, there are certain drawbacks to using spirometry. It relies on the patient making an effort, therefore an inaccurate reading may result if they don't blow into the device adequately. An additional effort on the part of the patient is needed to complete the test. In most cases, they cannot fathom the scientific rationale [12-14]. The cost of a spirometry test is likewise high. Patients from lower socioeconomic backgrounds who are treated by general practitioners cannot afford it. Thus, the purpose of this research is to compare spirometric and clinical data in COPD patients with the results of the Six Minutes' Walk Test and the CAT. We also looked at whether the CAT score and the 6-minute walk test may be used to evaluate the severity of COPD. The purpose of this research was to see if there was a correlation between patients' Six Minute Walk Test, Spirometry, and COPD Assessment Test Scores [15-17].

Methods

This study was a prospective investigation conducted between June 2021 to May 2022 on both

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 02, 2023

outpatients and inpatients at the Department of Pulmonology, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India. The study makes use of 60 patients.

Inclusion Criteria: Patients that meet the GOLD criteria for the diagnosis of chronic obstructive pulmonary disease

Exclusion Criteria

1. Pulmonary tuberculosis in its active form.
2. Tended to patients with TB in the lungs and other organs.
3. Affected people who also have a neurological disorder.
4. The fourth group consists of those who also suffer
5. Patients experiencing a severe COPD exacerbation.

Inclusion and exclusion criteria were used to choose patients. Patients provide their signed permission after being fully informed about all risks and benefits. Everyone is given a thorough rundown of the process. We assessed the forced expiratory volume in one second, forced vital capacity, and FEV1/FVC ratio after administering a bronchodilator. The ATS protocol recommended a 6-minute walk test, which was carried out. Measurements of heart rate, blood pressure, and oxygen saturation were taken in advance of the test. In case of complications during the surgery, emergency resuscitation procedures were maintained available to treat the patients. The patients were instructed to walk a path that was 30 meters in length and had markers every one metre. They may go at their own pace if they wished. We permitted the patient to take a break from the test if they had chest discomfort, acute dyspnea, or leg pain of any kind. They were then given permission to proceed. Patients were urged to take the exam.

Results

There were a total of 60 patients recruited in the trial, with just 13 (or 13.3%) of them being female.

Table 1: Comparison of Study Subjects by Age and Gender

Age Distribution (years)	Male	Female	Total
40-44	4	1	5
45-49	5	1	6
50-54	2	2	4
55-59	10	4	14
>60	29	2	31
Total	50	10	60

As can be observed, 86.7% of the study population was male, and the average patient age was above 60. Each of these sixty individuals was a good fit for our study. The GOLD guidelines were used to do the spirometry.

Table 2: Analysis of the Study Subjects GOLD Staging

Severity of symptoms	FEV_1	Patients
Mild	>80	6
Moderate	50-80	14
Severe	30-50	20
Very Severe	<30	10

Six patients are classified as having a light case, fourteen as having a moderate case, twenty as having a severe case, and ten as having a very severe case, as seen in the accompanying chart. These patients were all administered the CAT questionnaire, and their scores were averaged.

Table 3: Gold stage-CAT score correlation

	Gold I	Gold II	Gold III	Gold IV
Patients	6	14	20	10
CAT score	10.25±0.95	19.55±5.42	21.04±4.76	23.63±3.47

A six-minute walk test was carried out on all of these individuals. Patients' speed and distance travelled were assessed and associated with spirometry readings.

Table 4: The MWD of Patients at Various Stages

Severity of symptoms	FEV	P patients	6 MWD
Stage I	>80	4	447.5±10.7
Stage II	50-80	14	427.4±75.1

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 02, 2023

Stage III	30-50	20	359.0±79.2
Stage IV	<30	10	284.2±81.2

Table 5: Patient fractions among six distinct modes of MWD

6 MWD	I	II	III	IV	Total
101-200	0	0	2	2	6
201-300	0	1	1	4	6
301-400	0	2	15	2	19
>401	4	11	2	3	20
Total	4	14	20	11	60

A positive slope in the scatter plot demonstrates a significant relationship between 6 MWD and post-test forced expiratory volume in 1 second. Patients with a high CAT score, indicating severe illness, have a negative slope in the scatter plot, meaning they walk less.

Discussion

In our analysis, we found that 6MWD predicts post FEV1 and FVC positively. Among the 60 patients, 4 had a 6MWD of 482.5+11.9 metres, putting them in the first stage of the GOLD classification. The mean walk distance for 18 patients in stage II GOLD was 429.8 + 76.6 metres. Stage III 6MWD was 360.5 + 80.3 metres for 42 patients. The mean (6-minute) walk distance of 11 patients at Stage IV was 293.3+84.4 metres [18-20]. The 6MWD was compared to the FEV1 after taking a bronchodilator. With a P value less than 0.001, our Pearson correlation of 0.561 is statistically significant. FEV1 is positively correlated with 6MWD. FVC was also compared to 6MWD after bronchodilator treatment. The Pearson correlation between the two sets of data was 0.341, and the P value was 0.003. Both FVC and 6MWD are positively correlated. We also compared 6MWD to FEV1/FVC after bronchodilator treatment and found a correlation of 0.476 (P 0.001). It agrees with the findings of the chulmsky *et al*. investigation [20-22].

Hassan Ghobadi *et al*. found a favourable connection between CAT scores and disease severity in a group of stable COPD patients. Roughly 105 COPD patients in stable condition took part in this trial. Respondents were given the CAT questionnaire and scored accordingly. A high score on the CAT has been linked in several studies to worsening of symptoms [22, 23]. According to research conducted by Alfredochette *et al*., the CAT score may be used to assess COPD exacerbations as well. They observed that the CAT score rises during an exacerbation and falls after remission. In addition, Mackay *et al*., research supported this idea [24].

Patients with chronic obstructive pulmonary disease who were experiencing acute exacerbations were surveyed in a cross-sectional study by Sang- do lee *et al*. Patients with a high CAT score were more likely to experience exacerbations than those with a low CAT score. Patients at high risk of exacerbations can be identified using the CAT score, allowing for more targeted measures to be taken to keep them from worsening [25, 26].

Abhijit kundu *et al*. conducted a research project in West Bengal examining the correlation between the 6-minute walk distance test and spirometry. Eighty people took part in this study. In this case, spirometry was performed before the use of bronchodilators. Spirometric measurements, including forced expiratory volume in one second, forced vital capacity (FVC), peak expiratory flow rate (PEFR), and forced expiratory volume in one second (FEV1/FVC A second spirometry was performed after bronchodilation, and the aforementioned values were reported. There was a positive association between the 6 MWT and spirometer indices, and a statistically significant link between the 6 MWT and BODE index [27, 28].

Manoj kumar Khandelwal *et al*., conducted a study along these lines in Jaipur, Rajasthan. In this study, 65 people with COPD were evaluated based on their dyspnea, GOLD criteria, and spirometer indices. There was a negative association between 6MWD and dyspnea, and a linear link between 6MWD and the spirometer indices. Nighttime desaturation was linked to 6MWT in a research by Sinem ilaz *et al*., They examined 55 individuals with chronic obstructive pulmonary disease. Patients who desaturated during 6MWT were also observed to desaturate during sleep. Individuals with more severe COPD than patients with mild COPD showed this association [27-29].

Our findings are consistent with those from studies by Roozbeh *et al*., Mehta and Kumari, and Carter *et al*., all of which found a correlation between 6MWT and ejection fraction in COPD. Our research shows that the higher the CAT score, the more severe the COPD. Patients with more advanced stages of COPD also had higher CAT scores. According to Jones PW *et al*., analysis of the CAT Score's qualities in a European cross-sectional survey, this finding is consistent [26-29].

Conclusion

The results of this study suggest that the 6 minute walk test can replace the FEV1 as a means of measuring COPD severity. Spirometry is not required in order to determine the severity of COPD every time. However, a diagnosis of COPD requires the use of spirometry. The effects of COPD on one's health and quality of life can be measured using a CAT score. Even in a rural situation where most

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 02, 2023

COPD patients do not have access to spirometry, both the 6MWT and the CAT score may be employed.

Conflict of Interest: None

Funding Support: Nil

References

1. American Thoracic Society. Definitions and classification of chronic bronchitis, asthma and pulmonary emphysema. Am Rev Respir Dis. 1962;85:762-7.
2. Snider GL, Kleinerman J, Thurlbeck WM, Bengali ZH. The definition of emphysema: report of a National Heart, Lung and Blood Institute, Division of lung Diseases, workshop. Am Rev Respir Dis. 1985;132:182-5.
3. McDonough JE, Yuan R, Suzuki M, Seyednejad N, Elliott WM, Sanchez PG, *et al*. Small-airway obstruction and emphysema in chronic obstructive pulmonary disease. N Engl J Med. 2011;365:1567-75.
4. Mitzer W. Emphysema - a disease of small airways or lung parenchyma N Engl J Med. 2011;365:1637-9.
5. European Community Respiratory Health Survey (ECRHS) Study Group. Variations in the prevalence across countries of chronic bronchitis and smoking habits in young adults. Eur Respir J. 2001;18:85-92.
6. Halbert RJ, Natoli JL, Gano A, Badamgarav E, Buist AS, Mannino DM. Global burden of COPD: systematic review and meta-analysis. Eur Respir J. 2006;28:523-32.
7. Mahesh PA, Jayaraj BS, Prahlad ST, Chaya SK, Prabhakar AK, Agarwal AN, *et al*. Validation of a structured questionnaire for COPD and prevalence of COPD in rural area of Mysore: A pilot study. Lung India. 2009;26:63-9.
8. Salvi S, Juvekar S, Londhe J, Brashier B, Madas S, Barnes PJ. Prevalence of COPD in a rural population in India. Eur Respir J. 2011. p. 2954
9. Buist AS, McBurnie MA, Vollmer WM, Gillespie S, Burney P, Mannino DM, *et al*. BOLD Collaborative Research Group. International variation in the prevalence of COPD (the BOLD Study): a population-based prevalence study. Lancet. 2007;370:741-50.
10. Jindal SK, Gupta D, Agarwal AN. Guidelines for management of Chronic Obstructive Pulmonary Disease in India: A guide for physicians; c2003.
11. Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global Strategy for the Diagnosis, Management and Prevention of COPD; c2015
12. Fore y BA, Thornton AJ, Lee PN. Systematic review with meta-analysis of the epidemiological evidence relating smoking to COPD, chronic bronchitis and emphysema. BMC Pulm Med. 2011;11:36.
13. Lindberg A, Eriksson B, Larsson LG, Rönmark E, Sandström T, Lundbäck B, *et al*. Seven-year cumulative incidence of COPD in an age-stratified general population sample. Chest. 2006;129:879-85.
14. Chhabra SK, Chhabra P, Rajpal S, Gupta RK. Ambient air pollution and chronic respiratory morbidity in Delhi. Arch Environ Health. 2001;56:58-64.
15. Traffic exposure and lung function in adults: the Atherosclerosis Risk in Communities study. Thorax. 2007;62:873-9.
16. Decramer M, Janssens W, Miravitlles M. Chronic obstructive Pulmonary disease. Lancet. 2012;379:1341-51.
17. Cardoso WV, Sekhon HS, Hyde DM, *et al*. Collagen and elastin in human pulmonary emphysema. Am Rev Respir Dis. 1993;147:975-981.
18. Site and nature of airway obstruction in chronic obstructive lung disease Hogg JC, Macklem PT, Thurlbeck WM N Engl J Med. 1968 Jun 20;278(25):1355-60.
19. Tokuda Y, Miyagi S. Physical diagnosis of chronic obstructive pulmonary disease. Intern Med. 2007;46:1885-91.
20. Goddard PR, Nicholson EM, Laszlo G, Watt I. Computed tomography in pulmonary emphysema. Clin Radiol. 1982;33:379-87.
21. Cavigli E, Camiciottoli G, Diciotti S, *et al*. Whole-lung densitometry versus visual assessment of emphysema. Eur Radiol. 2009;197:1686-1692.
22. Gross NJ, Petty TL, Friedman M, Skorodin MS, Silvers GW, Donohue JF. Dose response to ipratropium as a nebulized solution in patients with chronic obstructive pulmonary disease. A three-center study. Am Rev Respir Dis. 1989;13:1188-91.
23. Gregory Feldman *et al*. Efficacy and safety of indacaterol 150 µg once- daily in COPD: a double-blind, randomised, 12-week study
24. Nici L, Donner C, Wouters E, Zuwallack R, Ambrosino N, Bourbeau J, *et al*. ATS/ERS Pulmonary Rehabilitation Writing Committee. American Thoracic Society/European Respiratory Society

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 02, 2023

statement on pulmonary rehabilitation. Am J Respir Crit Care Med. 2006;173:1390-413.
25. Clinical indications for noninvasive positive pressure ventilation in chronic respiratory failure due to restrictive lung disease, COPD, and nocturnal hypoventilation: A consensus conference report. Chest.
26. Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global Strategy for the Diagnosis, Management and Prevention of COPD; c2015.
27. Papi A, Bellettato CM, Braccioni F, Romagnoli M, Casolari P, Caramori G, *et al*. Infections and airway inflammation in chronic obstructive pulmonary disease severe exacerbations. Am J Respir Crit Care Med. 2006;173:1114-21.
28. Guidelines for diagnosis and management of chronic obstructive pulmonary disease: Joint ICS/NCCP (I) recommendations Lung India. 2013 Jul-Sep; 30(3):228-267.
29. Sharma S, Agarwal R, Aggarwal AN, Gupta D, Jindal SK. A survey of noninvasive ventilation practices in a respiratory ICU of North India. Respir Care. 2012;57:1145-53.