



A STUDY TO DETERMINE THE USEFULNESS OF FORCED EXPIRATORY TIME IN DIAGNOSIS OF COPD.

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ABSTRACT Chronic obstructive pulmonary disease (COPD), a growing worldwide public health problem and is characterized by the gradual progression of irreversible airflow obstruction, increased inflammation in the airways and lung parenchyma

Objective: Airway obstruction can be clinically quantified at the bedside by measuring the time taken for forced expiration (forced expiratory time). The aim of this study was to examine the accuracy of the forced expiratory time in detecting airflow limitation, and small airway disease when compared with gold standard test of airflow obstruction (spirometry).

Method: Simple spirometry and forced expiratory time were performed on 100 subjects (age range; 50-84 years), referred to a pulmonary function laboratory at a tertiary care hospital. The diagnostic accuracy of forced expiratory time and its correlation with spirometric parameters were tested. Forced expiratory time ≥ 7 seconds was regarded as abnormal, and the ratio of forced expiratory volume in the first second to forced vital capacity of $< 70\%$ was considered indicative of an airflow limitation.

Results: Forced expiratory time was found to correlate highly with spirometric parameters..

Conclusion: Forced expiratory time correlate well with all parameters of a simple spirometry and can be used as a diagnostic test. it may be a helpful test to be used to support the diagnosis of small airway disease in periphery and smaller centres..

KEYWORDS : Forced expiratory time, Mid-expiratory flow, FEV1 /FVC ratio, Small airway disease

INTRODUCTION:

Chronic obstructive pulmonary disease (COPD), a growing worldwide public health problem is characterized by the gradual progression of irreversible airflow obstruction and increased inflammation in the airways and lung parenchyma. Most chronic obstructive pulmonary disease is associated with smoking, but occupational exposure to irritants and air pollution also are important risk factors. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) diagnostic criterion for chronic obstructive pulmonary disease is a forced expiratory volume in one second/forced vital capacity (FEV1/FVC) ratio of less than 70 percent of the predicted value. Severity is further stratified based on forced expiratory volume (FEV1) in one second and symptoms. For measurement of these parameters you need a spirometer. These spirometers are only available in tertiary health care settings such as medical colleges. It can also be safely presumed that the diagnostic tool for the diagnosis of COPD i.e. Spirometry is not available in large areas of our country, thus in most of the areas patients remain undiagnosed and are not put on inhaler therapy as per the GOLD guidelines leading to increased morbidity and mortality.

Slowing of the forced expiration has always been recognized as a feature of obstructive lung disease.(1) In normal individuals the person expires fully within 3-4 seconds with 80% being expired in the 1st second, any value above 5 seconds is suggestive of resistance to the expiratory flow rate, a sign of obstruction. Forced expiratory time (FET) is defined as the time taken for an individual to complete a forceful exhalation after maximal inspiration. FET is measured by asking the subject to take a deep breath and blow it all out as fast as possible. A stethoscope bell is placed over the trachea in the suprasternal notch and the duration of audible expiration is timed with a stopwatch. The test is repeated at least three times and the mean of the three readings is preferred.(1) This test is inexpensive, readily available and can be performed by any physician.

REVIEW OF LITERATURE;

Before spirometry was readily available, this test aroused interest and many studies were carried out to evaluate the efficacy of this test as a diagnostic tool for diagnosis of COPD. The outcome of these studies were a bag of mixed results, with Rosenblatt and Stein,(2) Lal et al,(1) and Schapira RM et al(3) suggesting it to be helpful in diagnosing COPD whereas Sharon E Straus et al(4), Macdonald et al(5) and David G. Kern et al(6) have in their studies expressed reservations regarding the usefulness of this test. With the readily availability of Spirometry in the developed countries interest in this test with time waned off. However it can be a very useful procedure in a vast and resource crunched country like india.

MATERIAL AND METHODS;

To assess the use-fulness of this test we conducted a prospective study spanning over a period of four months from June 2016-September 2016 at RDBP JAIPURIA HOSPITAL, Jaipur (attached to RUHSCMS, Jaipur).in Department of Pulmonary Medicine, RUHS College of Medical Sciences, Jaipur. Based on the history and clinical findings, Only patients who on the basis of their symptoms and risk factors suspected to be having COPD were taken up for the study 100 patients suspected of having COPD, were enrolled for the study. Going by a dictum "law of 50" that says that 50% of the patients of COPD are undiagnosed, patients of COPD are diagnosed by the age of 50, at the time of diagnosis FEV1 $< 50\%$, (7) we only enrolled patients above 50 years of age in our study. After taking detailed history and examination and X-ray of the chest, the patients were subjected to spirometry and FET test. The readings were recorded and data analyzed.

OBSERVATIONS;

Out of the 100 patients 88 were males and 12 females. Patients presented with complaints of breathlessness, cough with or without expectoration, hemoptysis and chest pain. Out of 100 patients, 70 had breathlessness as the major chief complaint while 26 patients had cough with or without expectoration as a major complaint and the remaining 4 patients complained of hemoptysis. All the patients selected for our study were above 50 years of age and the eldest person enrolled for the study was 84 years old. Table1

Table1- Baseline characteristics of study population:

Patient characteristics			Total (N=100)
sex	male	88	100
	female	12	
Age interval in years	51-60	54	100
	61-70	40	
	>70	6	
Major complains	breathlessness	70	100
	cough	26	
	hemoptysis	4	

Regarding their smoking history, out of the 88 male patients, 83 were smokers with 78 of them having chronic smoking history of more than 15 pack years. Though the habit of smoking in Indian females is low, as in our study only 2 female patients were smokers, the rest of the females were exposed to passive smoking, environmental tobacco smoke or domestic air pollution (chullah smoke). X-ray of the chest in COPD patients usually show signs of hyperinflation, flattening of the dome of diaphragm, low set diaphragm, tubular heart, more than 6 anterior ribs visible on chest X-ray PA view, increased anterior-

posterior diameter of thoracic cavity, increased retrosternal air and multiple blebs or bullae. 80% of the patients had at least three of the above mentioned chest X-ray findings.

FET of the patients was evaluated. Out of the 100 patients, 9 patients had a FET of <5 seconds, 30 had a FET of 5-7 seconds and the remaining 61 patients (53 M, 9F) had a FET of above 7 seconds. We took >7second as the cut off limit to be suggestive of airway obstruction, Schapira et al(3) in their study had taken >6 sec as the cut off limit whereas Straus et al(4) had in their study took >9 sec as the cut off limit.

Fig1: showing FET of 100 patients



Green- FET>6SEC,RedFET 6-7 sec, Blue FET>7 SEC

Out of the 39 patients who had a FET of less than 7 seconds 8 had a normal spirometry, 13 had spirometric findings suggestive of at risk of COPD and the remaining 18 showed spirometric values suggestive of mild COPD.61 patients who had a FET of >7 seconds, all had spirometric findings suggestive of moderate or severe COPD as summarized in table2

Table2 Correlation of FET with spirometric indices in patients with FET >7 sec

(N=61)	Range	r-value	p-value
FVC Observed	0.40-5.00	0.319	<0.001
FEV1 Observed	0.19-2.29	0.325	<0.001
FEV1/FVC Observed	0.22-0.67	0.390	<0.001
FEV1% Predicted	10.61-70.00	0.641	<0.001

DISCUSSION:

The findings of our study and the strong correlation of FET >7 seconds with the spirometric abnormality can be questioned by many but we would like to clarify that such high correlation may be because of firstly, our study group which consisted of suspected patients of COPD based on their symptoms and risk factors and secondly we only selected patients above the age of 50 years, by the time patients have moderately advanced or severe COPD as classified by the GOLD guidelines. Schapira et al(3) have maintained that FET is a valuable bedside test for the diagnosis of obstructive lung disease in appropriate clinical settings, the results of our small study also endorse this view.

We did not go into the detailed comparison of these results such as sensitivity and specificity in relation to the findings of the spirometry, because we do not consider this test to be a replacement for spirometry which is the gold standard test for COPD and would remain the best modality for the diagnosis of COPD.

CONCLUSION;

Going by the findings of our study, the sample size of which was small and selective we would conclude by suggesting that as spirometry which is the gold standard for diagnosis of COPD is not available to a large percentage of our population, we can use this simple, inexpensive and a bed side test in patients with history and risk factors suggestive of COPD, as a supportive test and if FET comes out be more than 7 seconds, initiate treatment as per GOLD guidelines so as to minimize the symptoms, improve quality of life and above all decrease morbidity and mortality. As we have got encouraging results of this test, we would suggest and request other centers around the country to carry out such studies and results from all these studies can be evaluated and discussed by eminent pulmonologists/Physicians of our country and suitable recommendations be made.

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