A Study to Find Out the Effect of Upright Sitting and Forward Lean Sitting Position on Lung Functions in Stable COPD Patients A Comparative Study

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Abstract

Back Ground: Chronic Obstructive Pulmonary Disease (COPD) is a major cause of health care burden worldwide and the only leading cause of death that is increasing in prevalence. Patients with Chronic obstructive pulmonary disease (COPD) are severely limited in the ability to carry out activities of daily living due to dyspnoea and breathlessness, this is due to reduction in lung functions. The purpose of the study was to find out the effect on lung functions in forward lean sitting position and upright sitting position in COPD patient.

Aim/Purpose: To find out the effects of Upright sitting position on pulmonary functions in patients with stable COPD.

To find out the effects of forward lean sitting position on pulmonary functions in patients with stable COPD.

Objectives: To compare the change in FEV1, FVC, FEV1/FVC in patient with COPD in the Upright sitting and Forward lean sitting positions.

Methodology: 60 COPD patients were participated in the study. All subjects had undergone spirometry in 2 different positions i.e. position A: Upright sitting position and position B: Forward lean sitting position. FEV1, FVC, FEV1/FVC of subjects were recorded. Same measures were taken for 7 consecutive days. Mean of all 7 days was taken for all measures and used for statistical analysis.

Outcome Measure: FEV, FVC, FEV1/FVC

Results: The results of the above study shows that there are Significant Improvements of Forward Lean Sitting on FEV1, FVC, FEV1/FVC compared to Upright Sitting.

Keywords: *COPD - Chronic obstructive pulmonary disease, FEV1 - Forced Expired Volume in One second, FVC - Forced Vital Capacity, PFTs - Pulmonary Function Tests, Upright Sitting & Forward Lean Sitting*

Introduction

- According to WHO chronic obstructive pulmonary disease (COPD) is a lung disease characterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible.[1]
- Chronic obstructive pulmonary disease (COPD) is a major cause of health care burden worldwide and the only leading cause of death that is increasing in prevalence.[2]
- COPD is predominately a disease of men and only 40% of cases in India occur in women.

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Prevalence rate of COPD in India is 5% in males and 3.5% in females. [11] Its prevalence is more in cigarette smoking and bidi. [12]

- In COPD there is increased use of expiratory muscle during normal expiration due to reduced elastic recoiling of the lung tissue, and dynamic hyperinflation.[3]
- There is considerable variability in the relationship between the FEV_1 and other physiologic abnormalities in COPD.
- Studies have confirmed that various postures affect pulmonary function.[4,5]
- However, studies done on specific sitting positions, mainly slumped and upright, to determine a change in pulmonary function.[6]
- The position did not affect forced vital capacity (FVC), respiratory rate (RR), or forced expiratory volume in 1 second (FEV_1).
- Previous research to this point has not examined the relationship between an upright sitting and forward lean sitting posture in a population of patients diagnosed with COPD
- Therefore, the purpose of the present study was to explore population of adults with COPD to investigate whether a forward lean sitting posture, relative to an upright sitting posture, would result in increased respiratory function in patients diagnosed with COPD.

Method

Study Design : A Comparative Study

Duration Of Study 1 Month

Sample Size: 60

Study Sampling : Purposive Sampling

Inclusion Criteria:

1. Age 30-80 years.
2. Both sexes.
3. Physician Diagnosed COPD patients as per GOLD classification
4. No acute exacerbation in past 3 months.
5. Willing to participate in study

EXCLUSION CRITERIA:

1. People with severe cardio vascular, vestibular, musculo-skeletal disease major psychiatric illness, acute metabolic diseases, neurological diseases, tumour.
2. People unable to sit, walk and change the position. And dependent on every ADL activity
3. Patient younger than 30 years and older than 80 years.
4. Unconscious patient
5. Patient with Diabetes and Hyper tension
6. Pregnant women
7. Patient with recent thoracic or abdominal surgeries
8. Uncooperative patients.

MATERIALS USED:

- Examination table and stool, plinth
- Consent form and assessment chart
- Pencil, papers and recording sheet
- Weighing machine, measure tape,
- Spirometer Figure 3: Spirometer

OUTCOME MEASURES:

FEV1:

FEV1 is defined as forced expiratory volume in 1st second during forceful expiration.

It is very helpful measure in assessing COPD its value mostly decrease in COPD and correlate with progression of the diseases.

FEV1 that is reproducible, objective and allows a measurement of the severity of the disease to be categorised. COPD is classified as mild, moderate or severe.

FVC:

FVC is defined as a forced vital capacity. It is the amount of air coming out of the lung forcefully after deep inspiration.

FEV1/FVC:

It is the ratio of FEV1 and FVC expressed in percentage.

FEV1/FVC*100= FEV1/FVC ratio.

Methodology:

Those who fulfilled the inclusion criteria were taken up for the study. The procedure of the study was explained to the subjects. A written informed consent of the subject was taken prior to the study. All subjects were assessed as per assessment form.

60 COPD patients were recruited. All the patients were underwent spirometric measurement in 2 different positions. ***Upright sitting position, forward lean sitting position.***

Assessment:

On the first visit patient was explained about the study measures. Patient who is willing to participate in the study were included in the study. Exclusion criteria and contraindication were checked.

Preparation of the Patient:

Prior to the test, patient was instructed about spirometry and all the procedure.

Patient is instructed to avoid following things before test.

- Smoking for 24 hours
- Drinking alcohol for at least 4 hours
- Eating a large meal at least 2 hours before the test
- Taking short-acting bronchodilators for 6 hours
- Taking long-acting beta-2-agonist inhalers for 12 hours
- Taking any slow-release medications that affect respiratory function and
- Theophylline-based drugs for 24 hours
- Vigorous exercise for at least 30 minutes
- Wearing any tight clothing
- Patient is instructed to empty the bladder prior to test.

PROCEDURE:

After obtaining informed consent, subjects were placed in either a forward lean or upright seated posture, which was determined by the flip of a coin.

Postural position was then counter balanced for the remaining subjects so that an equal number of subjects started with each position.

Position A (FIGURE 1) was defined as an **UPRIGHT SEATED** posture.

Instructions for assuming this posture included the following:

1. Sitting on stool or chair without arm support
2. Head in position assumed normally by the patient
3. Rib cage lifted upward to elongate the spine comfortably with support (a standard lumbar role was placed in the small of the back and the patient was instructed to maintain contact with it.)
4. Scapula retracted to decrease kyphosis of the thoracic spine
5. Ankles and knees at 90

Position B (FIGURE 2) was defined as a **FORWARD LEAN SITTING** posture.

Instructions for assuming this posture included the following:

1. Sitting on stool or chair
2. Head in position assumed normally by the patient.
3. Spine/upper body inclined forward.
4. Elbows and forearm supported on the plinth.
5. Ankles and knees at 90.

A person is allowed to spend as much time as he/she wants to become comfortable.

The patient should be instructed to take a full inspiration through the mouth and to place the mouthpiece in the mouth, ensuring the lips and teeth are securely around the mouthpiece to form a tight seal.

The patient is instructed to blow out, forcibly, as hard and as fast as possible, until there is nothing left to expel. Patients will require some encouragement to keep blowing to provide a complete blow.

Maximum 3 attempts were taken and best among them is chosen.

Same is repeated for 7 consecutive days. Then mean of all 7 days readings is taken for all 3 outcome measures.

Result

Statstics : Values of FEV1,FVC,FEV1/FVC (%pred) of position A and position B are analysed by Z test at 5% level of significance.

Summary of mean & SD of FVC, FEV1, FEV1/FVC (%Pred) values of position A & position B and the result of the Z-test.

Table 1: shows MEAN and SD of the all outcome measures in both groups, difference between two means and their p values, degree of freedom and comments which suggests that differences are significant or not.

Outcome Measures	Position "A" Mean±Sd	Position "B" Mean±Sd	Difference Between The Means	Z – Value	P - Value	Result
FEV1	55.63 ± 4.26	61.87 ± 4.99	6.233	10.886	<0.05	Significant
FVC	49.56 ± 9.01	52.40 ± 8.71	2.833	12.350	<0.05	Significant
FEV1/FVC	58.37 ± 4.46	63.98 ± 4.04	5.613	26.571	<0.05	Significant

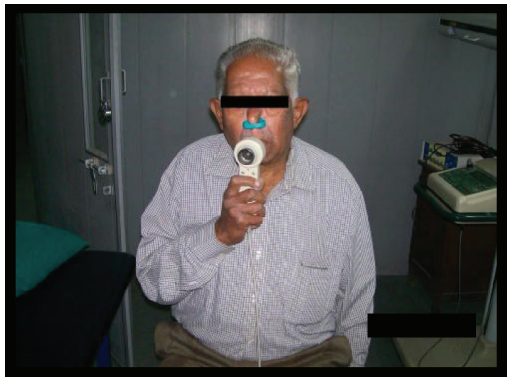

Figure 1:- Straight Sitting.

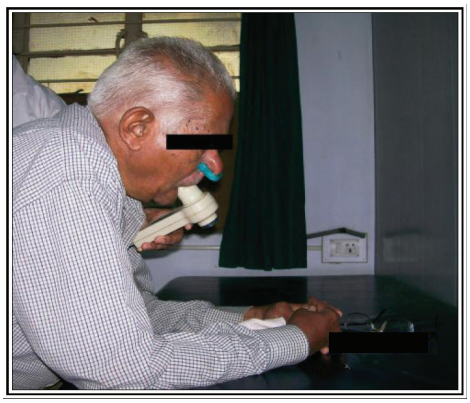

Figure 2 : Forward Lean Sitting

Figure 3: Spirometer

List of Abbreviations

COPD: Chronic obstructive pulmonary disease

FEV1 : Forced Expired Volume in One second

FVC : Forced Vital Capacity

FEV1/FVC: The ratio of FEV1 to FVC expressed as a percentage.

MV Minute Ventilation

RR	- Respiratory Rate
SaO2	- Oxygen Saturation
MIP	- Mean Inspiratory Pressure
MEP	- Mean Expiratory Pressure
PFTs	- Pulmonary Function Tests
FRC	- Functional Residual Capacity

Discussion

This study has found FEV_1, FVC, FEV_1/FVC are improved in forward lean sitting position than in upright sitting.

The forward-lean position for dyspnea relief has been reported as a posture that improves diaphragmatic function by reducing abdominal muscle tension.[7,8]

Kera and Maruyamamention that pectoralis major and minor and serratus anterior are easily activated when arms are supported.[9]

So study shows that Cephaled displacement of short flattened diaphragm in forward lean position could lead to stretching and greater tension generation and hence improve diaphragmatic function.[10]

Limitations

1. Sample size was small

2. We have compared only 2 positions i.e. Upright sitting and Forward lean sitting, so the effects of other positions were not signified.

3. We have compared effects on only 3 parameters i.e. FEV1, FVC, FEV1/FVC. Other parameters can also be considered.

Clinical Implication

As this study suggest significant improvement in the spirometric measures (FEV1, FVC and FEV1/FVC) in Forward lean sitting position, Forward lean sitting position will be the position of choice during breathlessness while exercises, and during exacerbation. And physiotherapist should encourage the forward lean sitting in patients with COPD.

Ethical Clearance- Taken from Ayushman college committee, Bhopal

Source of Funding- Self

Conflict of Interest- Nil

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