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Effect of Positive Expiratory Pressure Therapy on PEFR on COPD: An Experimental Study

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Abstract: ***COPD is a major cause of impaired health status, disability, and mortality. The disease is responsible for 2 million emergency department visits and hospitalizations annually in the United States.[1] Effect of treatment and disease progression in COPD is measure through the various parameters. COPD cannot be cured but the symptoms can be controlled with Pharmacological, surgical and physiotherapy management. This study is conducted to examine the effect of Positive expiratory pressure therapy over conventional physiotherapy treatment in patients with COPD. 20 patients in control group and 19 patients in experimental group were treated with convention and PEP physiotherapy treatment. Statically significant difference was seen in both groups before and after treatment but between groups analysis was statistically insignificant.***

Keywords: COPD, PEFR, Positive Expiratory Pressure Therapy

1. Introduction

COPD is a major cause of impaired health status, disability, and mortality. The disease is responsible for 2 million emergency department visits and hospitalizations annually in the United States.[1] Effect of treatment and disease progression in COPD is measure through the various parameters like PFT(Pulmonary function test), Peak Expiratory Flow Rate(PEFR), chest expansion and dyspnea grading.[2] Spirometry is widely used and reproducible lung function test in all patients who may have COPD.[3] Both percentages of predicted forced expiratory volume in 1 second (FEV1) and peak expiratory flow rate (PEFR) are widely used to estimate the degree of pulmonary impairment in patients with COPD.[4–6] In general, FEV1 measurements by spirometry are preferred as it is much more reproducible.[7] However, spirometry is not widely available, and the technical pitfalls of performing spirometry frequently limit usage, especially at a primary care level.[8] Using PEFR measurement is more economical and much more widely available, therefore it is proposed as an alternative to spirometry.[4-6] COPD cannot be cured but the symptoms can be controlled with Pharmacological, surgical and physiotherapy management.[3]

Physiotherapy management of COPD include[9]:

- Positioning (relaxation)
- Breathing exercise
- Airway clearance technique
- Positive pressure breathing
- Respiratory muscles training
- Ventilator training
- O2 therapy
- Pulmonary rehabilitation
- Aerobic training

These exercises are help full to improve mucus clearance, reduce work of breathing, increase strength, power and endurance of respiratory muscles.[10, 11] Positive expiratory pressure therapy was first developed in Denmark in 1970s as a low pressure system which generates pressure at about 10-20 c.m. of H2O at mid expiration.[12] Positive expiratory pressure therapy is used to reduce air trapping, enhance secretion mobilization and so preventing recurrence if infection and disease progression.[12] Now a day's PEP therapy is mostly used for the treatment of COPD worldwide to reduce the symptoms by enhancing the airway clearance and reducing the early air way closure. But there is lack of evidences on PEP device usage in COPD in Indian population. So, this study is conducted to examine the effect of Positive expiratory pressure therapy over conventional physiotherapy treatment in patients with COPD.

1.1 Aim of the study

To evaluate the additional effect of positive expiratory pressure, along with conventional treatment in COPD patients.

1.2 Objectives of the study

To conclude the effect of positive expiratory pressure on PEFR in COPD patients.

2. Materials and Methodology

The study was approved by institutional ethical committee.

a) **Study design:** An Experimental Study
b) **Setting of the study:** This study was conducted at different hospitals and different communities of Ahmedabad.
c) **Duration of the study:** One week
d) **Sample size:** 39 COPD Patients
e) Control Group: 20 patients
f) Experimental Group: 19 patients

g) **Sample selection:** patients, diagnosed with COPD by physician and fulfilling inclusion criteria were selected
h) **Sampling technique:** Simple random sampling
i) **Inclusion criteria:**
- Male and female with age between 40 to 60 years
- Patients with mild to very severe COPD according to the GOLD classification
- Hemodynamically stable patients

j) Exclusion criteria:
- Any other associated cardiovascular or pulmonary disease
- Patients recently under gone thoracic or abdominal surgeries
- Recent facial, oral or skull surgeries or trauma
- Acute sinusitis35
- Acute hymoptysis or nausea
- Patients on ventilator
- Any orthopedic condition of spine or thoracic cage
- Uncooperative patients

Procedure
- 41 Patients Enroled
- 21-patients in the control group
- 20 Patients completed the study
- 1-patient Drop out
- 20 - patients in the experimental group
- 19 Patients completed the study
- 1-patient Drop out

Group A: (Control Group)
Patients in the control group were treated with the Relaxation, Diaphragmatic breathing and pursed lip breathing exercises and forced expiratory maneuver if needed.

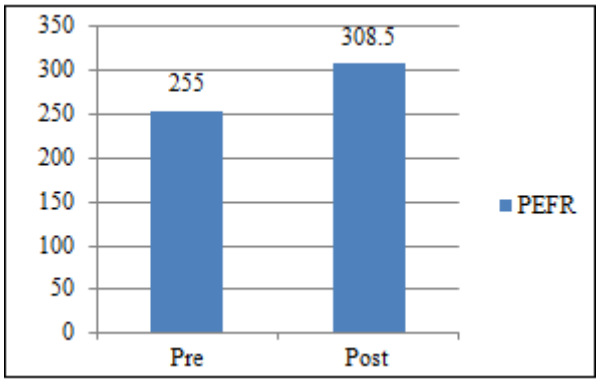
Group B: (Experimental Group)
Exercises which were given in the control group were performed by the patients in experimental group along with POSSITIVE EXPIRATORY PRESSURE therapy.

1) Patients were seated in comfortable upper right position while holding mouthpiece tightly between the lips.
2) Took larger than normal tidal breath from diaphragm, but not to the total lung capacity.
3) Exhale actively but not forcefully maintaining the point between the two marks.
4) Exhalation time was last approximately 3 times longer than inhalation.
5) Patients had performed 10-20 PEP breaths followed by 2-3 huffs or cough.
   - PEP breaths were performed for two times a day for one week.
   - After one week outcome measures were again taken which was statistically analyzed with SPSS version 20.

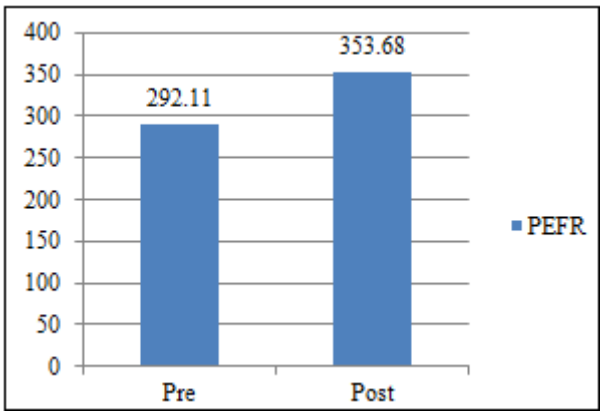
Table 1: Test Used for Comparison of Outcome Measure in the Both Group

	Group A	Group B	Comparison
PEFR	Paired Sample T-Test	Paired Sample T-Test	Mann Whiteney U-Test

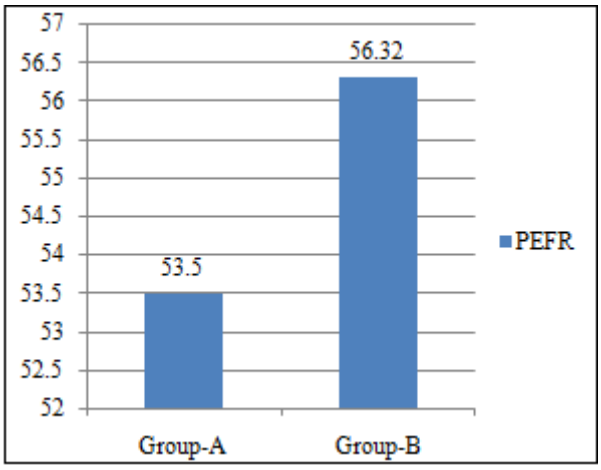
3. Results



Graph 1: Mean Difference of PEFR in Group-A



Graph 2: Mean Difference of PEFR in Group-B



Graph 3: Mean Difference of PEFR in Group A & B

4. Discussion

Pre and post interventional difference were compared with the help of digital spirometry, PEFR and chest expansion (at all three levels).

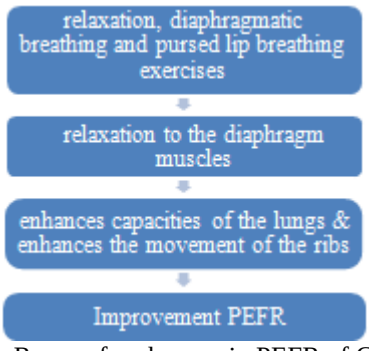


Chart 1: Reason for changes in PEFR of Group-A

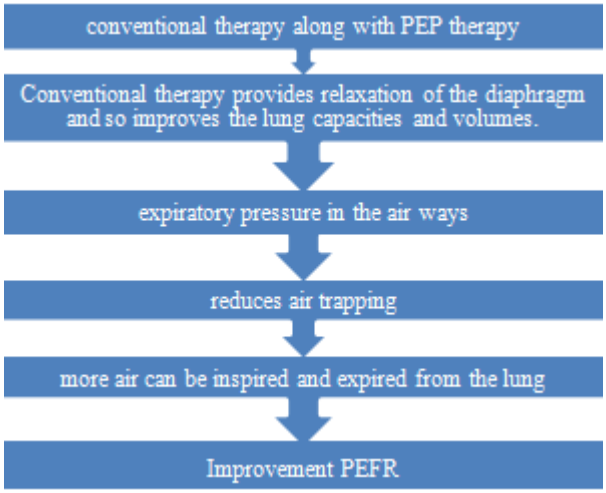


Chart 2: Reason for changes in PEFR of Group-B

There is no statistical significant change in comparison of both groups but clinically group with PEP therapy shows more improvement this can be because of PEP therapy was new for patients and so not able to follow the commands properly.

5. Conclusion

COPD patients treated with PEP along Conventional therapy showed more clinical improvement in PEFR.

Clinical Implication:

a) PEP therapy is beneficial in treatment of COPD patients along with the Conventional therapy as it causes
   - Reduction in air trapping
   - Improving secretion mobilization
   - Improvement in gas exchange

b) So, in clinical practice PEP therapy should be recommended with the conventional therapy for patients with COPD.

Limitations of the study:

- Small sample size
- Short duration of study
- Short duration of intervention
- Blind was not applied

Possible future studies:

- Study can be done with larger sample size
- Larger study duration can be implicated
- Long duration of intervention can be performed
- Follow up study can be done
- Result can be divided according to the stages of the COPD
- Correlation of PEFR and FEV1 can be done for PEP therapy

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