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Immediate effect of abdominal binder on peak expiratory flow rate (PEFR) in chronic obstructive pulmonary disease (COPD) patients

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ABSTRACT

The purpose of the study is to determine the immediate effect of abdominal binder on peak expiratory flow Rate (PEFR) in chronic obstructive pulmonary disease (COPD) patients. 30 subjects were selected as COPD as a diagnosis. All 30 subjects were checked for their peak expiratory flow rate (PEFR) by wright peak flow meter in sitting position. 3 readings were taken and average of them was recorded. All 30 patients were then applied an abdominal binder in sitting position and checked for peak expiratory flow rate (PEFR). 3 readings were taken and Average of them was recorded. The mean PEFR value after the application of abdominal binder and prior to application of abdominal binder was analysed and mean PEFR value showed significant increase after the application of abdominal binder. Thus this study says immediate effect of abdominal binder on peak expiratory flow rate in COPD patients is increase in peak expiratory flow rate (PEFR).

Keywords: COPD, PEFR, Abdominal binder, Immediate

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a progressive debilitating disease and one of world's leading causes of mortality [1]. Frequent exacerbations of COPD have been associated with poorer quality of life and worse morbidity and mortality [1]. Prevalence of COPD in rural areas lies between 6.5% and 7.7% [2]. Chronic Obstructive Pulmonary Disease (COPD) is an umbrella term used to describe progressive lung diseases including emphysema, chronic bronchitis,

refractory (non-reversible) asthma, and some forms of bronchiectasis [3]. This disease is characterized by increasing breathlessness, large amount of mucus, wheezing, chest tightness [4]. In emphysema, there is distension of air spaces distal to terminal bronchiole with destruction of alveolar septa [4]. In bronchitis there is excessive tracheobronchial mucus production to cause cough with expectoration for at least 3 months of year for more than 2 consecutive years [4]. It is characterized by generalized airflow obstruction of smaller airways [5]. In COPD patients there is

inspiratory and expiratory muscle weakness [5]. Abdominal muscle weakness is common in COPD [5]. The expiratory muscles have an important role in clearing airways by producing effective cough and peak expiratory flow rate [5]. The respiratory muscles of patients with COPD are chronically overworked and fatigued [5].

In normal events of inspiration the intrapleural pressure becomes more negative and in expiration it becomes less negative [6]. The inspiratory muscles of respiration are diaphragm and external intercostal and expiratory muscles of respiration are rectus abdominis, internal intercostal, internal and external oblique and transverse abdominis [6]. In COPD, the diaphragm is displaced into a flattened position which results in the decrease of the zone of apposition between the diaphragm and the abdominal wall [7].

Peak expiratory flow rate (PEFR)

It is defined as the maximal flow achieved during an expiration delivered with a maximal force starting from maximal lung inflation [8]. Peak expiratory flow rate primarily reflects large airway flow and depends on voluntary effort and muscular strength of patient [8]. It is measured by Wright peak flow meter [9]. Peak expiratory flow rate (PEFR) monitoring is a reasonably precise measurement tool for measuring airflow obstruction in COPD individuals [10]. PEFR is good at detecting individuals with COPD [11].

Abdominal binder

Bandage or elasticized wrap that is applied around the lower part of the torso to support the abdominal musculature [12] abdominal binder is an important surgical body garment used in early postoperative phase of abdominal Surgeries [13].

There are studies which say that abdominal binder is used in spinal cord injury patients to improve PEFR [14], in COPD patients to relieve dyspnoea and improve exercise tolerance by enhancing neuromuscular Efficiency of diaphragm during exercise [15] and also used to improve exertional dyspnoea and exercise tolerance in symptomatic patients with COPD by improving dynamic respiratory muscle function [16] Abdominal corset or binder is indicated for patients whose abdomen protrudes, allowing the diaphragm to sag into a poor position for function [17]. The corset will support the abdominal

contents and improve resting position of diaphragm [17]. In addition, abdominal supports provide the secondary benefits of maintaining intrathoracic pressure and decreasing postural hypotension [17] So this study was done to determine immediate effect of abdominal binder on PEFR in COPD patients, to check whether the Elastic property of binder may provide compressive effect to lower part of ribs, the lower part of ribs encompass lower part of lungs. Whether it may push diaphragm, abdominal contents inward, moving diaphragm up and also increase its length during forced exhalation, thus allowing diaphragm to contract more efficiently and the patient to generate higher intrathoracic pressure during forced expiration, and so that Increased pressure over the abdomen may Lead to increase in fulcrum effects of abdominal contents on diaphragm and increased its efficiency. And so that it may lead to increase in inspiratory volume before forceful exhalation, and therefore increase PEFR .So this study has been done to check whether this biomechanics works in COPD to increase its PEFR immediately. Also increase in PEFR may help COPD patients in airway clearance technique and improve mucus expectoration. Less number of studies on immediate effect of abdominal binder on PEFR in COPD patients also has suggested a need for the study.

METHODOLOGY

Type of study is experimental study with purposive sampling. The study was carried out at Bhausahab Sardesai Talegaon rural hospital on 30 subjects diagnosed with COPD. Patients with other respiratory conditions, unstable cardiac conditions, neurological conditions and Subjects having allergy to latex were excluded from study.

PROCEDURE

Informed consent was taken from patients. According to inclusion criteria patients were taken into study. 30 COPD patients were included in the study. 30 COPD patients were checked for their peak expiratory flow rate with patient in sitting and wright peak flow meter held at 90 degree of angle of mouth, patient was asked to take a deep breath through nose and exhale forcefully into the wright peak flow meter and 3 PEFR readings were taken, average of 3 readings were recorded. Abdominal

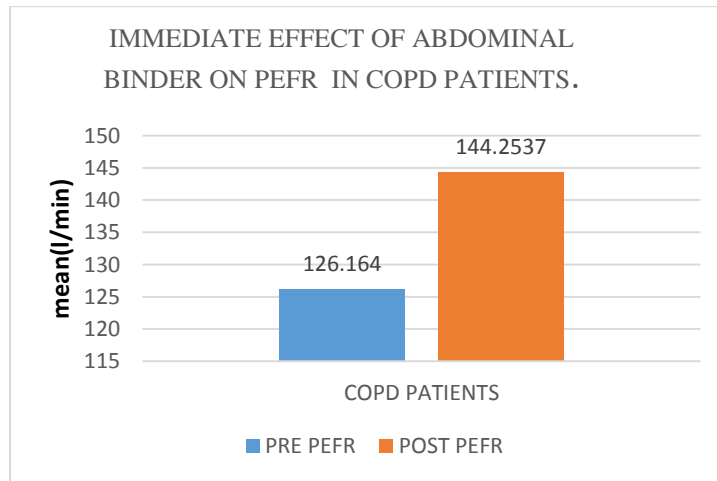
binder was applied to all 30 patients. After application of abdominal binder, immediately the PEFR values were checked, the average of 3 values was recorded. The pre and post values of PEFR were recorded and compared to see the immediate effect of abdominal binder on PEFR in COPD patients.

STATISTICAL ANALYSIS AND GRAPH

Values of PEFR prior to application of abdominal binder and after application of abdominal binder were statistically analysed using paired t-test.

PRE PEFR(l/min)	
MEAN	126.1640
SD	64.4388
POST PEFR(l/min)	
MEAN	144.2537
SD	71.8028

P value = 0.0004, considered extremely statistically significant



DISCUSSION

The study was designed to see the immediate effect of abdominal binder on PEFR in COPD patients. In this study 30 COPD Patients were taken and in them PEFR value was checked before application of abdominal binder. 3 readings were taken and average of them was recorded. The abdominal binder was then applied to check immediate effect of abdominal binder on PEFR, 3 readings were taken and average of them was recorded. In this study it was found that the mean value of PEFR after application of abdominal binder (144.2537) is more than mean value of PEFR prior to application of abdominal binder (126.164) and p value is 0.0004 which is considered extremely statistically significant. In COPD Patients, there is abdominal muscle

weakness, therefore voluntary effort needed to create a normal PEFR is reduced, there is also flattening of diaphragm and altered resting position of diaphragm leading to reduced intra thoracic pressure and decrease in PEFR. So in this study the Elastic property of binder provided compressive effect to lower part of ribs which encompass lower part of lungs. It also pushed diaphragm, abdominal contents inward, moving diaphragm upward and increasing its length during forceful exhalation, allowing diaphragm to contract more efficiently and subject to generate higher intrathoracic pressure during forced expiration. Increased pressure over the abdomen increased the fulcrum effects of abdominal contents on diaphragm and increased its efficiency. This lead to increase in inspiratory volume before exhaling forcefully, thereby increasing PEFR. Since abdominal binder

worked immediately to increase PEFR value, abdominal binder can be incorporated in treatment protocol of COPD patients. In few patients it lead to production of cough and expectoration of mucus.

CONCLUSION

The study concludes that the immediate effect of abdominal binder in COPD patients is increase in peak expiratory flow rate (PEFR).

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