Journal of Exercise Science & Physiotherapy Vol.18 No.2 (July - December) 2022
I2OR Impact Factor = 7.266 **ISSN: 0973-2020 (Print)** **ISSN: 2454-6089 (Online)**

Compare the Effect of Respiratory PNF and Chest Wall Mobilization in COPD Patients

Payal Malpani, Anuja Paul and Harsh Thakre

Abstract

Aim: To see the combined effect of respiratory PNF and chest wall mobilizations in COPD patients on chest expansion and FEV_1/FVC ratio. **Materials and Methods**: This study included 30 patients of COPD between the age of 40 to 50 they are divided into two Groups . Group A (n=15) received Respiratory PNF with Diaphragmatic breathing exercise and Group B (n=15) received Chest wall mobilization with Diaphragmatic breathing exercise. The outcome measures was FEV_1 / FVC Ratio and Chest Expansion measurement. **Results**: There is significant difference in the mean values in group A and group B. Both group shows improvement in outcome measures of FEV1/FVC and Chest expansion. But group A shows better improvement in chest expansion after 6 weeks. **Conclusion**: The present studies suggest that the techniques used in patients with COPD were significantly improved pulmonary function and chest expansion. Respiratory PNF and chest wall mobilization play a significant role to improve FEV1/FVC ratio in patients with COPD and respiratory PNF is more effective than chest wall mobilization

Payal Malpani
Associate Professor
Department of Physiotherapy
Rajeev Gandhi College, Bhopal (M.P), India
E-mail: payalmaheshwari123@gmail.com
Anuja Paul
M.P.T.(Cardiopulmonary Student)
Department of Physiotherapy
Rajeev Gandhi College, Bhopal (M.P), India
E-mail: anuja1010.paul@gmail.com
Harsh Thakre
M.P.T. (Ortho)
Department of Physiotherapy
Rajeev Gandhi College, Bhopal (M.P), India
E-mail: harshthakre09@gmail.com

Key words: COPD, Respiratory PNF, Chest wall mobilization, Spirometry, Chest expansion

DOI: 10.18376/jesp/2022/v18/i2/217774

Introduction

Chronic obstructive pulmonary disease (COPD) is a type of obstructive lung disease characterized by chronically poor airflow. It typically worsens over time. The main symptoms include shortness of breath, cough and sputum production (Vestbo 2013). COPD is an ill-defined term that is often applied to patiente who have a combination of chronic bronchitis and emphysema which frequently occur together (and may also include asthama).In majority of cases, Chronic bronchitis is the major

cause of obstruction but in some cases emphysema is predominant (Stuart 2003). Loss of elastic tissue surrounding the smaller airways accompanied by inflammation and fibrosis in the airway wall and mucus accumulation within the airway lumen, result in airflow limitation, further increased by enhanced cholinergic tone. Premature airway closure leads to gas trapping and hyperinflation, which inturn decrease pulmonary and chest wall compliance. During exercise, the time available for expiration shortens, resulting in progressive hyperinflation. Increased V/Q mismatch increases the dead space volume and limits maximal sustainable ventilation. Flattening of the diaphragmatic muscles and an increasingly horizontal alignment of the intercostals muscles place the respiratory musles at a mechanical disadvantage (U.S. Department of Health& Human Services 2013). It is an umbrella term that encompasses chronic bronchitis and emphysema . It is a common and preventable, treatable disease, characterized by persitant airflow limitation that is usually progressive, and associated with an enhanced chronic inflammation response in the airways and the lung to noxious particles or gases. It also includes a significant extra-pulmonary component, systemic inflammation. Within the spectrum of COPD, two extremes of clinical presentation recognized: type A and type B. At a one time these were classified either as “pink puffers” (type A) OR “blue bloaters” (type B) to correlate with the relative amounts of emphysema and chronic bronchitis (U.S. Department of Health& Human Services 2013 ; Kersten S and hampman KR.1993). chronic or recurrent is further defined as a daily cough with sputum for at least 3 month of the year for at least two consecutive years and airway obstruction which does not change markedly over periods of several month . Emphysema is a condition of the lung characterized by permanent dilatation of the air space distal to the terminal bronchioles with destruction of the walls of these airways .The most common symptoms of COPD are sputum production, shortness of breath and a productive cough (National Institute for Health and Clinical Excellence 2010).These symptoms are present for a prolonged period of time and typically worsen over time (National Heart, Lung and Blood Institute.2013). Proprioceptive neuromuscular facilitation technique [PNF] was developed originally in early 1950’s by Dr Hermen Kobart and Maggie Knot.The goal of this technique was to strengthened muscle in movement pattern in which they are designed in function. The pattern of movement used in PNF is mass movement pattern which is characterized by normal motor activity (Westvative et al., 2010).It is used to developed muscle strength,. Endurance, facilitate mobility, stability, control and coordinated.Chest wall mobilization techniques are used to improve thoracic mobility at the upper, middle or lower parts of the chest.The FEV1/FVC is ratio used in diagnosis of obstructive and restrictive lung disease. It represent the proportion of a person’s vital capacity and they are able to expire in the first second of forced expiration. Normal values are approximately 80%.predicted (Westvative et al., 2010).

Materials and Methods

For the purpose of study 30 subjects of age group 40-50 years having COPD in city hospital Harda district were randomly selected by means of simple random sampling method (Random number method). The subjects were informed about the nature of the study and their consent was taken before involving them as subjects of the study. The subjects were later randomly assigned to 2 groups in equal sizes experimental group A respiratory PNF with diaphragmatic breathing exercises & experimental group B Chest wall mobilization with diaphragmatic breathing exercises. Each subject underwent formal evaluation including FEV1/FVC ratio and chest girth measurement at two levels Axillary and Xiphoid. Six weeks of training program was done where subjects were called 3 times in a week for exercise session. Each exercise session lasted for about 30 minutes.

Results and Discussion

The result of study shows that both techniques respiratory PNF and Chest wall mobilizations are effective in improving chest expansion and FEV1/FVC ratio in patients with COPD but when we

compare pre and post values after 6 weeks we find that respiratory PNF is more effective than chest wall mobilization in improving chest expansion.

Table 1. Mean ± SD of FEV1/FVC and chest expansion at axillary and xiphoid level of group A

	MEAN ± SD (FEV1/FVC)	MEAN ± D (AXILLARY LEVEL)	MEAN ± SD (XIPHOID PROCESS)	P VALUE
PRE	62.39±3.69	1.49±0.25	2.37±0.17	
POST [3 WEEKS]	66.71±2.33	2.56±0.23	3.74±0.20	P value <0.0001
POST [6 WEEKS]	69.43±1.17	3.38±0.32	4.58±0.25	

Table 2. Mean ± SD of FEV1/FVC and chest expansion at axillary and xiphoid level of group B

	MEAN ±SD (FEV1/FVC)	MEAN ± SD (AXILLARY LEVEL)	MEAN ± SD (XIPHOID PROCESS)	P VALUE
PRE	61.76±4.49	1.38±0.18	2.36±0.17	
POST[3WEEKS]	65.03±3.34	2.702±0.37	3.77±0.44	P value <0.0001
POST[6WEEKS]	69.49±2.05	3.69±0.27	4.916±0.14	

Table 3. Mean ± SD of Group A & Group B of pre, Post 3 weeks and Post 6 weeks of FEV1/FVC & CHEST EXPANSION at Axillary & Xiphoid level

	PRE MEAN AND SD(FEV1/FVC)	POST 3 WEEKS MEAN & SD (FEV1/FVC)	POST 6 WEEKS MEAN &SD (FEV1/FVC)	PRE MEAN AND SD(AXILLARY AND XIPHOID LEVEL)	POST 3 WEEKS MEAN AND SD (AXILLARY AND XIPHOID LEVEL)	POST 6 WEEKS MEAN AND SD (AXILLARY AND XIPHOID LEVEL)
GROUP A	62.39±3.69	66.71±2.33	69.43±1.17	1.49±0.25 2.37±0.17	2.5±0.23 3.74±0.20	3.38±0.32 4.58±0.25
GROUP B	61.76±4.49	65.03±3.34	69.49±2.05	1.38±0.18 2.36±0.17	2.7±0.37 3.77±0.44	3.69±0.27 4.31±0.14
P VALUE	P < 0.67	P < 0. 1203	P <0.9287	P<0.18 P<0.92	P<0.25 P<0.84	P<0.0079 P<0.0002

Discussion

COPD is disorder characterized by reduced maximum expiratory flow and slow forced emptying of the lungs. The clinical manifestation may be irreversible in some cases there may be reduced exercise endurance and tolarence. COPD is the fourth leading cause of death. It tends to affect men more than women. It is now considered a systemic disease affecting not only lungs but a number of organs including the peripheral muscle system. These abnormalities in peripheral muscle function are attributed to decreased oxygen delivery, inflammatory mediators effects disease , malnutrition, medications and comorbiditis and have shown to correlate negatively with survival and over all health status. Hyperinflation of the chest places the pectoralis major in shortened position increasing the resistance of the chest wall to expand which causes further increase in the work of breathing and demand placed on respiratory muscle (National Heart, Lung, and Blood Institute 2003). Pulmonary rehabilitation is a multidisciplinary program of care of patients with COPD that is individually tailored and design to optimize physical and social performance and autonomy stated by the committee ATS. In this study we are taking two parameter of chest physiotherapy that is respiratory PNF and chest wall mobilization as comparative study on patient with COPD. Respiratory PNF is a technique used to design normal motor actvity. The respiratory muscle contraction and relaxation under control of GTO which is sensive to muscle stretch due to firing discharge of muscle spindles which the message to CNS via alpha and gamma motor neuron which directly responsible for muscle contraction. The mechanism of the technique increases the length of intercostals muscle that helps to improve the biomechanics of chest movement by enhancing the direction of anterior upward of upper coastal and lateral outward of lower coastal movement (Maharjan and Mallikarjunaiah 2015 ; Hindle et al., 2012). In this study we take 30 subjects between age of 40-50 years both male and female with mild and moderate diagnosed COPD patients diagnosed by chest physician. We divide those subjects in two experimental groups A and B with 15 subjects each. All the subjects were informed of the objectives of the study and informed consent was taken from the subjects prior to participation. Group A was started with respiratory PNF for 6 week exercises session targeted with 30 minutes repetition, 3 times per week and group B was started with chest wall mobilization for 6 weeks with 30 minute repetition and 3 per week. Subjects were assessed prior with outcome measures of FEV1/FVC and chest expansion at xiphiod and axillary level. After 3 weeks we found a good improvement in both groups. Group A and group B both shows significant improvement in FEV1/FVC as well as chest expansion at both axillary and xiphiod level . After 6 weeks of treatment program when we assessed individually both the groups they shows improvement in both outcome measures, but when we compare group A with Group B for chest Expansion at both levels after 6 weeks Group A shows better improvement in chest mobility then Group B. Keswani et al., (2018) also said in her article that PNF of respiratory muscles is the term used to describe externally applied proprioceptive and tactile stimulus that produces reflex to respiratory movement. Appropriate resistance at the time of applying one of the PNF techniques strengthens the muscles and guides the chest motion. PNF is a new technique to improve the respiratory function. Raj et al., (2017) studied about effectiveness of PNF of respiration to improve exercise capacity in COPD patients by comparing two groups. This study concluded that the PNF of respiration was more effective and can be a useful therapy in 15 improving exercise capacity in patients with COPD. Debouche et al., (2016) found a significant correlation between CE and all lung function parameters (FEV1, FVC, VC, and maximal inspiratory pressure (MIP), except FEV1/FVC). In contrast to our study, Malaguti et al., (2009) found no correlation between CE and pulmonary function parameters in subjects with COPD . In spite of the pathology involved in subjects with COPD (hyperinflation and low diaphragm), this study showed when comparing the p value of group A &B that Group A shows more significant improvement in chest expansion after 6 weeks as compare to group B while both group shows equal improvement in FEV1/FVC values .

These similar findings and relationships are observed in this study. The sample size of COPD subjects included in this study was smaller. Results might be different if the COPD sample is increased. This study also shows chest wall mobility is closely associated with FVC and FEV1/FVC. Therefore, maintaining chest wall mobility may be an important element for preserving FVC and FEV1/FVC in patients with COPD.

Conclusion

The present studies suggest that the both techniques used in patients of COPD were significantly improve pulmonary function and chest expansion but Respiratory PNF is more effective in improving chest expansion then chest wall mobilization. Hence Alternate hypothesis was accepted. However, there is a need of further studies to describe the use of these techniques in respiratory disorders as the present research was conducted in COPD patients only & can use another parameter to measure chest expansion for accuracy.

Acknowledgement

We would like to thank all the participants, colleagues, family members and staff of hospital and college to make this research possible.

References

Debouche S., L. Pitance, A. Robert, G. Liistro, and G. Reychler.(2016). Reliability and reproducibility of chest wall expansion measurement in young healthy adults. *Journal of Manipulative and Physiological Therapeutics*, vol. 39, no. 6, pp. 443–449.

Hindle, K., Whitcomb, T., Briggs, W., & Hong, J.(2012). Proprioceptive Neuromuscular Facilitation (PNF): Its Mechanisms and Effects on Range of Motion and Muscular Function**.** *Journal of Human Kinetics*, 31: 105-113.

Kersten S., and Hampman K.R.(1993). Physcian perception and management of COPD, *Chest* 1993;104.

Keswani Shobha, Sumit Kalra,Akansha Sharma. (2018). Role of Proprioceptive Neuromuscular techniques on respiration in Intensive care unit patients-A Review. *Indian Journal of Research.* April:77-78.

Maharjan, J., Mallikarjunaiah, H. S.(2015). Proprioceptive neuromuscular facilitation stretching versus static stretching on sprinting performance among collegiate sprinters. *International Journal of Physiotherapy*, 2, 619-626.

Malaguti C., R. R. Rondelli, L. M. de Souza, M. Domingues, and S. Dal Corso.(2009).Reliability of chest wall mobility and its correlation with pulmonary function in patients with chronic obstructive pulmonary disease. *Respiratory Care*, vol. 54, no. 12, pp. 1703–1711, 2009.

National Heart, Lung, and Blood Institute.(2003). Data Fact Sheet: Chronic Obstructive Pulmonary Disease. National Institutes of Health Publication 03–5229. Bethesda, MD: US Department of Health and Human Services.

National Heart, Lung, and Blood Institute.(2013).What are the signs and symptoms of COPD ? July 31,2013 .

National Institute for Health and Clinical Excellence. (2010).Clinical Guideline 101 : Chronic Obstructive Pulmonary Disease . London , June 2010.

Raj M.Paul ,S.Deepika Shristhudhi, Dr. Supri ya K ,Vinod, & K. Anand Babu. (2017). Effectiveness of PNF of respiration to improve the exercise capacity in patients with COPD: a pilot study. *International Journal of World Research* 1(35):6.

Stuart Porter.(2003).Respiratory Disease, COPD-Basic Issues., pg 293.

U.S. Department of Health& Human Services, National Heart, lung and Blood Institute, "COPD Learn more Breathe Better", 31 uly, 2013

Vestbo, Jorgen.(2013).Introduction Global Strategy for the Diagnosis, Management, the Prevention Chronic Pulmonary Disease. *Global Initiative for Chronic Obstructive Lung Disease* .xii-xv.

Westvative Woods, Adam N, Karyy R.(2010).The use of PNF in physiotherapy practice. *Physical Therapy Reviews*, Wall.50,p.23-27.

Conflict of Interest: None declared