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Effect of manual diaphragmatic release technique versus proprioceptive neuromuscular facilitation for diaphragm to improve functional capacity for copd patients

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Abstract
Background: The aim of the study is to evaluate the effect of manual diaphragmatic release technique versus proprioceptive neuromuscular facilitation for diaphragm to improve functional capacity for COPD patients.
Method: In this experimental study, 30 patients were selected using convenient sampling method and randomly divided into two groups. Group A (n=15) received manual diaphragmatic release technique and Group B received PNF for diaphragm for 6 days in a week of 3 consecutive weeks. The pre and post-test values were measured using six- minutes walk distance test (6MWDT) and peak expiratory flow rate (PEFR).
Result: Intergroup analysis was done using unpaired t test which showed significant improvement in Group B treated with PNF for diaphragm along with conventional therapy, when evaluated the mean values of six-minute walk distance test (6MWDT) (mean=309.7) and peak expiratory flow rate (PEFR) (mean=394).
Conclusion: This study concluded that the proprioceptive neuromuscular facilitation along with conventional therapy is effective on improving functional capacity, decrease dyspnea and increase peak expiratory flow rate in COPD patients.

Keywords: Manual diaphragmatic release technique, proprioceptive neuromuscular facilitation for diaphragm, six-minutes-walk distance test (6MWDT), peak expiratory flow rate (PEFR), functional capacity, dyspnea

Introduction

Chronic Obstructive Pulmonary Disease is a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway abnormalities caused by exposure to noxious particles or gases. The risk factor for COPD is tobacco smoking and other environmental exposures such as biomass fuel exposure and air pollution may contribute. Besides exposure, host factors predispose individuals to develop COPD. These include genetic abnormalities, abnormal lung development and accelerated aging. Burden on Lung Disease (BOLD) and other large scale epidemiological studies estimated that the number of COPD cases was 384 million in 2010, with a global prevalence of 11.7% globally; there are around three million deaths annually [1]. The estimated pooled prevalence of chronic bronchitis was 5.0% in India [2].

Proprioceptive Neuromuscular Facilitation (PNF) is an effective treatment tool in respiratory conditions like COPD. It provides proprioceptive feedback to the respiratory muscles, which create reflex respiratory movement responses, and improves rate and depth of breathing [30]. PNF techniques with autogenic stretching give respiratory muscle relaxation and improve inspiration and expiration in next inspiration –expiration cycle by reflex stretching.

The Manual Diaphragmatic Release Technique (MDRT) is an intervention intended to directly stretch the diaphragmatic muscle fibres resulting in increased chest wall mobility [4].

Diaphragmatic breathing is the normal mode of respiration. The patient with primary pulmonary disease should be instructed in relaxation of the accessory muscles to decrease the work of breathing. Controlled diaphragmatic breathing needs to be emphasized on all postures and with all therapeutic activities [6].

A peak flow meter is a hand-held device that measures how fast a person can blow air out of the lungs when there is forceful exhalation, after maximum inhalation and this measurement is called the 'peak expiratory flow' (PEF). The peak flow meter helps to assess the airflow through the airways and thus help to determine the degree of obstruction along them [7].

The 6MWD has the capacity to detect the changes following pulmonary rehabilitation and to assess the outcomes of pulmonary rehabilitation and also it can be used to quantify the magnitude of a patient's disability [11].

Borg scale (MBS) that had the potential to provide quick, easy, and rapid information about a patient's subjective state of dyspnoea. This scale used in all post treatment assessment notes on patients with exacerbations of asthma or chronic obstructive pulmonary disease (COPD) who was seen in the emergency department and urgent care clinic [8].

Materials and method

30 patients with COPD were selected through convenient sampling method based on the selection criteria at Sri Ramakrishna Multi Speciality Hospital, Coimbatore.

Inclusion criteria were patient between 45 to 55 years of age, only male patients, their dyspnea score should be 4-7 in Modified Borg Scale, smokers who stopped smoking atleast 1 year prior to study and clinically stable patients (no exacerbation in the previous 6 weeks). Exclusion criteria includes patients with cardiac disease, patient with neurological disease, acute rib fracture, severe osteoporosis, recent thoracic surgery, patients with infectious disease like

tuberculosis and pneumonia, malignancy of lung and chest wall deformity.

Informed consent was obtained and clear explanation prior to their participation in the study was given. It was an experimental study design in which the participants were randomly divided into two groups. Group A received Manual diaphragmatic release technique performed in two sets of 10 deep breaths, with 1 minute interval between them along with Diaphragmatic breathing exercise. Group B received PNF for diaphragm in which repeated contractions and rhythmic stabilization was given for 10 repetitions with 1 minute interval between them along with Diaphragmatic breathing exercise. Both Group A and Group B were treated for 6 days in a week for 3 consecutive weeks for a duration of 30 minutes.

Statistical analysis and results

Pre and post-test values of the groups were obtained on the first day of treatment and at the end of third week. Data collected were statistically analysed. Paired 't' test and unpaired 't' test was used to find out the statistical differences. The 'p' value was set at < 0.05. formulas for paired 't' test and unpaired 't' test were used. In Six-minute walk distance test, the mean value of Group A is 280.7 and the mean value of Group B is 309.7. The Standard deviation values for Group A and Group B is 18.01, whereas 't' value is 4.405, at 0.05 level of significance. In peak expiratory flow rate, the mean value of Group A is 350.6 and the mean value of Group B is 38.07, whereas the 't' value is 3.121, at 0.05 level of significance.

Table 1: Post-test mean values of Six-minute walk distance test and Peak expiratory flow rate for Group A and Group B

Parameter	Post-test mean A	Post-test mean B	Mean difference	Standard deviation		Calculated t value	Table – t value	Level of Significance
				A	B			
6MWDT	280.7	309.7	29	6.99	14.9	4.405	2.048	$p < 0.05$
PEFR	350.6	394	43.4	7.28	22.35	3.121	2.048	$p < 0.05$

Fig 1: Post test mean of six minute walk distance test

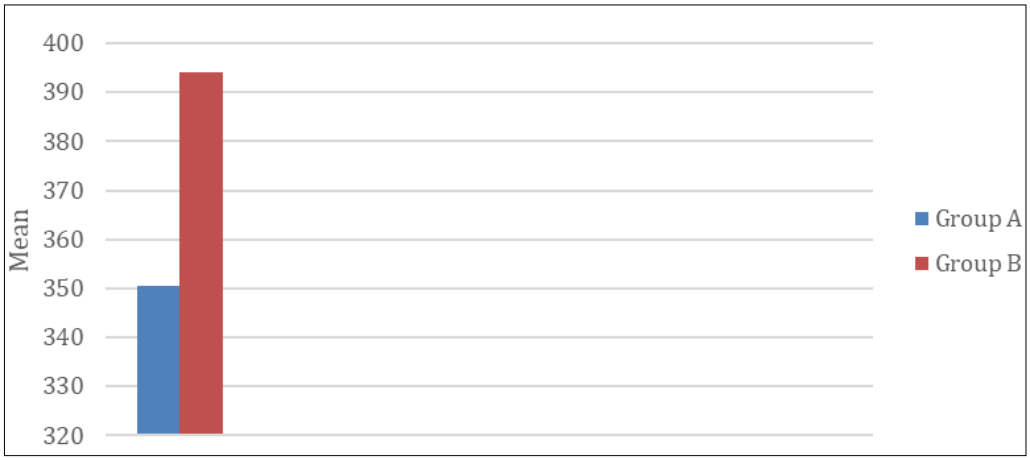

Fig 2: Post test mean of peak expiratory flow rate - group A and group B

Discussion

The results of this study show that patients who underwent Proprioceptive neuromuscular facilitation for diaphragm along with conventional therapy showed better outcomes on 6MWDT and PEFR.

According to Taciano Rocha et.al (2015), conducted a study on the manual diaphragmatic release technique improves diaphragmatic mobility, inspiratory capacity and exercise capacity in people with COPD and this study stated that this technique could be considered in the management of COPD [4]. Aishwarya Nair *et al* (2018) compared diaphragmatic stretch technique and manual diaphragm release technique on diaphragmatic excursion in COPD and this study stated that the diaphragmatic stretch technique and manual diaphragmatic release technique can be safely recommended

for patients with clinically stable COPD to improve diaphragmatic excursion [10].

According to study done by Chalmers G *et al*, reported that while performing PNF, contractions of a stretched muscle are not only due to pre synaptic inhibition of muscle spindle sensory signal. The spinal cord reflex responses activation of additional respiratory muscle results to regulate by chemoreceptors for $paCO_2$, paO_2, pH as well as by neural impulses from lung. The active contraction changes the muscle tissue includes actin-myosin contraction/stretching. These findings shows that PNF techniques one of the functional methods to retain the diaphragm muscle in the pulmonary rehabilitation [20].

Prenidha M Sagna (2016) conducted a study on effectiveness of PNF technique to improve chest mobility and pulmonary function in COPD and this study concludes that PNF technique is effective in improving the pulmonary function in COPD in post treatment sessions of patients with COPD [31].

Though both techniques showed significant improvement the Proprioceptive neuromuscular facilitation for diaphragm along with conventional therapy appears to be more effective in improving functional capacity, decrease dyspnea and increasing expiratory flow rate in patients with COPD.

Conclusion

The study states that Proprioceptive neuromuscular facilitation for diaphragm along with conventional therapy is more effective than Manual diaphragmatic release technique along with conventional therapy on improving functional capacity in COPD patients.

Limitations

The sample size is small. The patient selection could be more discrete with more homogeneity of subjects. Only male patients were taken. The study describes only the short-term benefits.

Recommendations

The study can be conducted with longer duration of intervention. Study can be done with larger population. Future studies can be done with both genders. A long term follow up can be done to analyze the long-term effects.

References

1. Global initiative for chronic obstructive lung disease report, 2022.
2. Prashant Jarhyan, Anastasia Hutchinson *et al*. prevalence of chronic obstructive pulmonary disease and chronic bronchitis in eight countries: a systematic review and meta-analysis
3. Global initiative for chronic obstructive lung disease (GOLD) criteria
4. Taciano Rocha, Helga Souza, *et al*. The Manual Diaphragm Release Technique improves diaphragmatic mobility, inspiratory capacity and exercise capacity in people with chronic obstructive pulmonary disease; Journal of Physiotherapy,2015:61:182–189.
5. Premkumar K, *et al*. Efficacy of Retraining Diaphragm by Proprioceptive Neuromuscular Facilitation versus Diaphragmatic Breathing Exercises in Reducing Dyspnoea in the Copd Patients; International Journal of Innovative Science and Research Technology, 2019. ISSN No:-2456-2165
6. Amithab M. Comparative analysis of MET, PNF and conventional physiotherapy in improving Fev1 and vital capacity in COPD patients;270308112amithab.pdf, 2012.
7. BO Adeniyi, GE Erhabor. The peak flow meter and its use in clinical practice.
8. Karla R Kendrick, RN, MSN, Sunita C Baxi, MD, *et al*. Usefulness of the modified 0-10 BORG scale in assessing the degree of dyspnea in patients with COPD and asthma; Journal of emergency nursing, 2000, 26(3).
9. Lucyna Slupska, Tomasz Halski *et al*. Proprioceptive Neuromuscular Facilitation for Accessory Respiratory Muscles Training in Patients After Ischemic Stroke; Springer Nature Switzerland AG, 2019.
10. Aishwarya Nair, Gopala Krishna Alaparthi *et al*. Comparison of diaphragmatic stretch technique and manual diaphragm release technique on diaphragmatic excursion in chronic obstructive pulmonary disease; Pulmonary medicine Volume 2019, Article ID 6364376, 2018.
11. Sue c Jenkins**.** 6 Minute walk test in patients with COPD: Clinical application in pulmonary rehabilitation, 2007.
12. Clanton TL, Levine S. Respiratory muscle fiber remodelling in chronic hyperinflation: dysfunction or adaptation? J Appl Physiol,2009:107:324–335.
13. De Troyer A. Effect of hyperinflation on the diaphragm. Eur Respir J,1997:10:708–713.
14. O'Donnell DE, Laveneziana P. Physiology and consequences of lung hyperinflation in COPD. Eur Respir Rev,2006:15:61–67.
15. American Thoracic Society. ATS Statement: Guidelines for the Six-Minute Walk Test. Am J Respir Crit Care Med,2002:166:111–117.
16. Ambrosino N. respiratory journal 2004 New strategies to improve exercise tolerance and COPD
17. Celli BR, Snider GL, Heffer J. Standards for the diagnosis and care patients with COPD American journal of respiratory medicine and critical care medicine,1995:166:559-570.
18. Sanchez Riera H, Montemayor Rubio T, Ortega Ruiz F. Inspiratory muscle training on patient with Chronic Obstructive Pulmonary Disease; effect on dyspnoea exercise performance and quality of life,1995:75(11):996-1005.
19. Amj. Respir critical care medicine, 159; Pulmonary rehabilitation; American Thoracic society 19991666-1682
20. Chalmers G, Depts. physical education, Health and Recreation Re-examination of the possible role of Golgi tendon organ and muscle spindle, Reflexes in proprioceptive neuromuscular facilitation muscle stretching USA sports,2004:3(1):159-83.
21. Casciari RJ, Fairshter RD, Harrison A. Effects of breathing retraining in patients with Chronic Obstructive Pulmonary Disease,1981:79:393-398.
22. Cahalin LP, Braga M, Matsuo Y. Journal of Cardiopulmonary Rehabilitation,2002:22:7-21.
23. Choudhury G, Rabinovich R, MacNee W. Comorbidities and systemic effects of chronic obstructive pulmonary disease, Clinics in Chest Medicine,2014:35(1):101–130.
24. Abdelaal AA, Ali MM, Hegazy IM. Effect of diaphragmatic and costal manipulation on pulmonary

function and functional capacity in chronic obstructive pulmonary disease patients: Randomized controlled study, International Journal of Medical Research & Health Sciences,2015:4(4):841.
25. K Okura, A Kawagoshi, M Iwakura, *et al*. Contractile capability of the diaphragm assessed by ultrasonography predicts nocturnal oxygen saturation in COPD, Respirology,2017:22(2):301–306.
26. Pryor J, Webber B. Physiotherapy for Respiratory and Cardiac Problems. In: Pryor j, Prasad A, editiors 2 th, 5(197-203).
27. Dangi A, Sheth B, Deo M. Comparison of Intercostal Stretch Technique Versus Diaphragmatic Breathing on Dyspnoea, Chest Expansion and Functional Capacity in Stable COPD. International Journal of Scientific and Research Publications, 2017, 7(5).
28. Tangri S, Woolf CR. The breathing pattern in chronic obstructive lung disease during the performance of some common daily activities. Chest,1973:63:126-27.
29. Hetal M Mistry 1, Rutuja V Kamble 2. Immediate effect of Chest Proprioceptive Neuromuscular Facilitation on Respiratory Rate, Chest Expansion and Peak Expiratory Flow Rate in patients with Chronic Obstructive Pulmonary Disease; International Journal of Physiotherapy and Research, Int J Physiotherapy Res,2020-2021:9(1):3723-29. ISSN 2321-1822.
30. Mousumi Saha1, Meenu Verma2. Efficacy of chest PNF on pulmonary function in patients with Parkinson's diseases: A pilot study; Journal of Society of Indian Physiotherapists,2020:4(2):79–85.
31. Prenidha M Sangma. Effectiveness of PNF techniques to improve chest mobility and pulmonary function in COPD; 27030981prenidha-sangma.pdf, 2016.