

Physiotherapy Management of Dyspneic Patients with the History of Asthma: A Case Series

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Abstract

Resolving the symptom and improving quality of life is the prime goal of pulmonary rehabilitation. The present study aims to determine the effect of Nebulization with NaCl, Active Cycle of Breathing Technique (ACBT) and Chest Mobility Exercise (CME) in Asthma. The two subjects included in the study were apparently healthy, young, dyspneic asthmatic female with the complaint of dyspnea on walking for more than 10 minutes at normal pace. The commonly used outcome measures were selected for the assessment; 6 Minute Walk Test (6MWT), Peak Expiratory Flow Rate (PEFR) and Chest expansion (CE). All parameters showed improvement by the end of intervention program. Considering Minimum Clinically Important Difference (MCID) and normative values, high variability was noted between the subjects, however, clinically, both subjects demonstrated improved values on all three outcome measures. Paired t-test was used for data analysis. Because of low sample size, none of outcome measures showed statistical significant difference in pre and post intervention score. Extended study with larger sample size would assist in drawing conclusion which can be generalized to large population.

Keywords: ACBT; Asthma; PEFR; 6MWT; Chest Mobility; Nebulization.

Introduction

Asthma is a disease characterized by recurrent attacks of breathlessness and wheezing, which vary in severity and frequency from person to person (WHO,2010). Clinical presentation of asthma shows bronchospasm, rapid rise in respiratory rate and use of accessory muscle with prolonged expiratory phase manifested by audible wheezes and rhonchi [1]. These features of the disease lead to dyspnea, usually expressed as 'feeling of breathlessness' by the patient. There are multiple triggering factors for asthma attack. Physical exertion is one of the commonest triggering factors for dyspnea in individuals with asthma.

The aim of the study was to determine the effect of Nebulization with Normal Saline for loosening up

of the accumulated lung secretions, followed by ACBT as a chest clearance technique and CME to increase chest expansion in two dyspneic subjects with history of asthma. To our knowledge none of the studies had worked on these three areas of pulmonary rehabilitation in asthma. In asthmatic subjects, with continuous non-productive coughing, there is risk of narrowing of airway and can precipitate bronchospasm [1]. The enrolled subjects had the same complaint but with inefficient expectoration of lung secretions. The auscultation findings revealed retained secretions in the lungs. In such cases, hydration or aerosol therapy for the airway will be effective in chest clearance [1]. ACBT facilitates in expectorating lung secretion [2,3]. And helps in controlling severity of dyspnea (Pawadshetty, Munde, Sureshkumar, & Pawadshetty, 2016). CME were also incorporated in the program with the aim to improve chest excursion and ultimately ventilation.

The two subjects included in the study were apparently healthy, young, asthmatic female with the complaint of dyspnea on walking for more than 10 minutes at normal pace (Point 3 dyspnea on 11 point Borg's scale). Considering the clinical features of the condition and presenting symptoms, the commonly used outcome measures were selected for the assessment; 6MWT[4](Butland, Pang, Gross,

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Woodcock, & Geddes,1982) (Jenkins,2007), PEFR(Tierney et al.,2004) (Santanello, Zhang, Seidenberg, Reiss, & Barber,1999) and CE [5,6].

Methodology

The case series was conducted on two young, non-smoker female dyspnoeic subjects with the history of Asthma. The age of the subject1 and 2 was 22 and 21 years. Both subjects complaint of dyspnea, interfering with moderate intensity ADLs. Both subjects were diagnosed case of Asthma. Auscultation finding confirmed respiratory secretion in both lungs. Both subjects had complaint of coughing but could not expectorate the secretions. The commonest aggravating factor for dyspnea was cold and physical exertion. None had acute exacerbation in last 1 month or any other associated conditions which may limit them from participation. Written consent was obtained from the subject after detailed description of the intervention program.

At baseline, 6MWT, PEFR (Using Peak Flow meter: PFM) and CE (Using standard measure tape/ cloth tape) were measured. The 6MWT was performed as per American Thoracic Society guidelines [7]. Both subjects finished the test completely without demonstrating any features for test termination in-between. European Union (EU) scale peak flow meter (PFM) was used to assess PEFR. CE was measured at 3 levels; a. Axilla level(AL), Nipple level(NL) (4th intercostals space) and Xiphoid process level(XPL).

After this, the intervention program was delivered which included 3 weeks of supervised treatment and 1 month of maintenance home-program. The supervised treatment was delivered for 5 days/week for 3 weeks. It included;

1. Nebulization with 4 ml Normal saline (0.9% NaCl) for hydration of the respiratory tract and loosening of the accumulated secretions. It usually took 10 minutes for 4 ml NaCl to get nebulized.
2. ACBT as a chest clearance technique as per ACBT guidelines [8].
3. Three CME for improving lung expansion. ^[1] (Figure: 1,2,3)

For the remaining two days of the week when supervised intervention was not delivered, subjects were asked to continue ACBT and CME as home-program.

Post-treatment; 6MWT, PEFR and CE were reassessed. After that subjects were asked to continue

ACBT and CME at home for 1 month as a part of maintenance home-program. Follow up assessment was taken after a month.



Fig. 1:



Fig. 2:



Fig. 3:

Subject 1:

Subject1 was a known case of Asthma from last 8 years. The subject had positive family history. The subject showed sedentary life style. On auscultation the air entry was found to be bilaterally reduced with

added lung sound (crackles) in both lower lobes. The subject was overweight with BMI of 26.64 (Height=155cm, Weight=64kg).

BMI 33.06 (Height=165cm, Weight=90kg) and sedentary life-style. On auscultation the air entry was bilaterally reduced with rhonchi in bilateral lower lobes.

Subject 2:

Subject 2 was a known case of Asthma from last 7 years. The subject was falling in Obese category with

The graphical representation of the result is shown in the Figure 4, 5, 6.

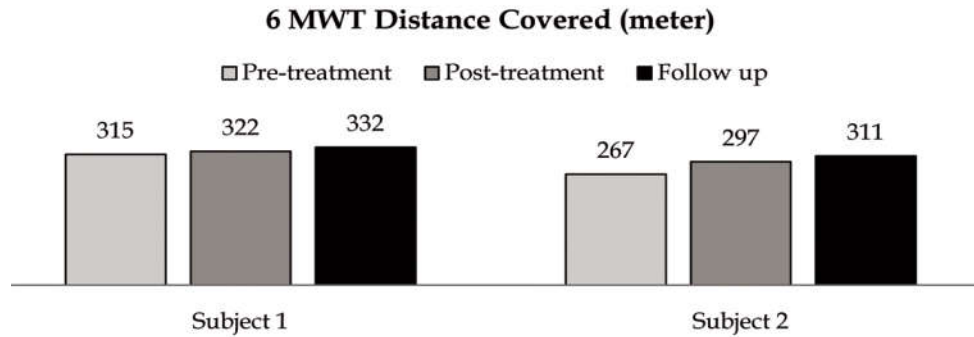


Fig. 4: Pre, post and follow up 6MWT distance covered by subject1 and 2

Post-intervention, no subject had reached MCID value for 6MWT, 6MWT MCID: 54 m (Wise & Brown, 2005) (Rehab measures: 6 minute walk test,2010)

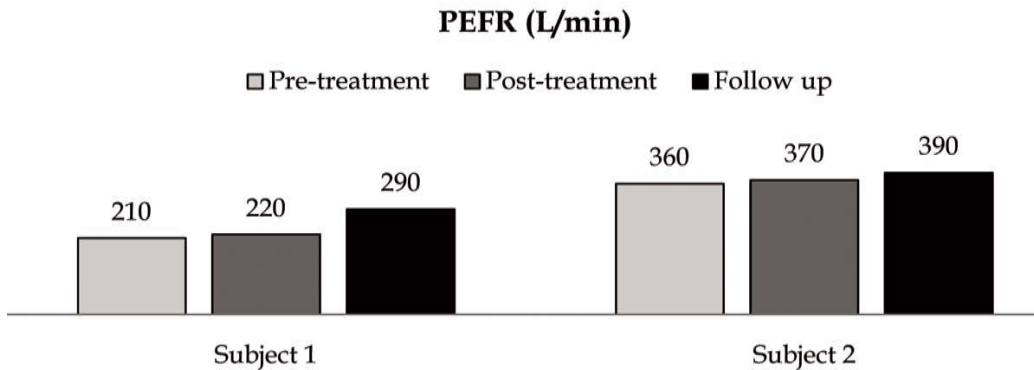


Fig. 5: Pre, post and follow up PEFR score of subject1 and 2

Post-intervention, subject1 had achieved MCID value for PEFR
PEFR MCID: 18.79L/min (Santanello, Zhang, Seidenberg, Reiss, & Barber,1999)

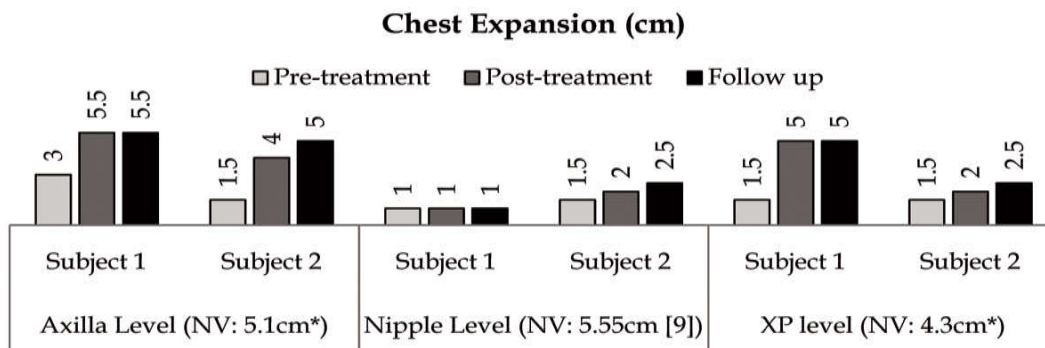


Fig. 6: Pre, post and follow up CE score

NV =Normal value; * = (Moll & Wright,1972)
Post-intervention, the CE was normalized at AL in both subjects. At NL, none showed considerable improvement. At XPL, subject1 showed normal value of CE.

Paired t-test was used to determine the statistical significance of the obtained improvement. As the sample size was limited, the difference in pre and post values did not show statistical significant difference. However, clinically, both subjects demonstrated improved values on all three outcome measures. Extended study with larger sample size would assist in drawing conclusion which can be generalized to large population.

Discussion

The case report is conducted on two female subjects (Age: 22 and 21 years) with the complaint of dyspnea on walking for more than 10 minutes at normal pace. Both subjects were diagnosed case of Asthma from last around 7 years. The study was conducted in the winter, auscultation finding revealed presence of added lung sound in bilateral lungs. But subject was unable to expectorate it out. The aim of the study was to determine the effect of; 1.Nebulized Normal Saline, 2.ACBT and 3.CME on dyspnoeic subject with the history of asthma.

Walking for more than 10 minutes at normal pace used to induce dyspnea in the subjects. Considering this fact, walk test was selected as one of the outcome measures. In 12 Minute Walk Test (12MWT), there is initial burst rise in the speed but later person walks at constant speed. Hence, shorter distance walk test would be a better alternative compared to 12MWT (Butland, Pang, Gross, Woodcock, & Geddes,1982). Moreover, 6MWT has established reliability and validity as a tool to measure of person's disability and could sense improvement following pulmonary rehabilitation (Jenkins,2007).

At baseline, the distance covered in 6MWT by subject1 and 2 were 315 and 267 meter respectively. The normal values of 6MWT calculated based on gender, age and body built was 581m and 549m for subject1 and 2 respectively (Enright & Sherrill,1998). At baseline, the measured 6MWT value for subject1 and 2 were 46% and 51% lower than desired value. The second outcome measure was PEFR, it is commonly used quantitative measure of lung function (Tierney et al.,2004). European Union (EU) scale PFM was used to measure PEFR of the subjects.^[10] PEFR score of subject1 and 2 came to 210 and 360L/min respectively at baseline. The calculated age and height specific PEFR value should be 335 and 360L/min for subject1 and 2 (Salvi et al., 2014). Subject1 shows 37% reduction in PEFR compared to predicted value. However, subject2 showed desired value of PEFR at baseline. The third

outcome measure used was CE. CE measurements are used to evaluate a patient's baseline status, treatment effectiveness, and progression of disease with regards to chest wall mobility and respiratory muscle function (Adedoyin & Adeleke, 2012) [9]. The normal value for chest expansion for upper, middle and lower chest are 5.1cm [9],5.55cm (Moll & Wright,1972) and 4.3cm [9] respectively. Both subjects showed much lower than normal value of CE.

As a part of treatment, 4 ml nebulised NaCl (0.9w/v) was given to patient in relaxed sitting position (Gallon,1996). The use of hypertonic saline enhances chest clearance [1]. Face mask was used for the delivery of nebulised content as it more preferable over mouthpiece (Steventon & Wilson,1981). It usually took 10 minutes for 4 ml NaCl to get nebulised. Loosened up secretions are to be expelled out with a chest clearance technique. ACBT and Autogenic drainage (AD) are equally effective in clearing secretions [2,3].

However, ACBT shows more improvement in PEFR and to reduce severity of dyspnea compared to AD (Pawadshetty, Munde, Sureshkumar, & Pawadshetty, 2016). Considering this fact, ACBT was included in the intervention. As bilateral lung was being involve, the ACBT was performed in upright position [8]. Three chest expansion exercises targeting entire chest was also included.

Subject1 showed 7m and 17m improvement and subject2 showed 30m and 44m improvement in post-treatment and follow up score of 6MWT. The MCID for 6MWT is 54m (Wise & Brown, 2005) (Rehab measures: 6minute walk test, 2010). None of the subjects reached MCID value. The MCID for PEFR is 18.79L/min (Santanello, Zhang, Seidenberg, Reiss, & Barber,1999).

Subject1 showed 10L/min and 80L/min improvement and subject2 showed 10L/min and 30L/min improvement from baseline in post-treatment and follow up score. None of the subjects reached MCID in post-treatment PEFR score. But after 1 month, the follow up data showed tremendous improvement in subject1. CE does not have established MCID; however the improvement can be compared with desired normal values. Post-intervention, the CE was normalized at AL in both subjects. At NL, none showed considerable improvement. At XPL, subject1 had improved to normal value of CE.

The improvement was noted following intervention in all areas of assessment. Extended study with larger sample size would help in overcoming confounding factors and drawing a conclusion.

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