Role Of Spacer Device In Improving FEV1 And PEFR In Asthmatic Patients

Aneela Chaudhary and Zafar Hussain Iqbal

Objective: To study the role of spacer device in improving FEV1 and PEFR in asthmatic patients.

Material & Methods: In this quasi experimental study, fifty asthmatics patients, already on inhaled therapy, visiting outpatient department of Jinnah Hospital Lahore were included.

Results: While assessing the improvement, the mean FEV1 (mean±SD) was 1.46±0.42 litres, 1.97±0.76 litres, and 2.32±0.39 litres at first, second and third visits respectively. The improvement in FEV1 was found to be significant after the use of spacer device ($p < 0.001$). The mean PEFR (mean ±SD) was 163.34±58.56 L/min, 271.68±69.12 L/min, and 346.66±64.15 L/min at first, second and third visits respectively. The improvement in PEFR at second and third visits as compared to first visit was statistically significant ($p = 0.001$).

Conclusion: FEV1 & PEFR significantly improve after the use of spacer device.

Keywords: Spacer device, Asthma, Inhaled Therapy

Introduction

Asthma is a chronic inflammatory disorder of the airways. In susceptible individuals, this inflammation causes recurrent episodes of shortness of breath, wheezing, chest tightness, and cough, particularly at night and/or in the early morning. Despite recent advances in the understanding of the patho-physiology, assessment, and treatment of asthma, the condition continues to have significant medical and economic impacts worldwide.[1] It is now estimated that as many as 300 million people of all ages suffer from asthma. Inhalation remains the main route of administration for asthma therapy. Main stay of asthma treatment is inhaled steroids and broncho-dilators.[3]

The improper timing of pressurized metered dose inhalers (PMDI) actuation with breath initiation is a common problem and training and skill are required to coordinate actuation of inhaler and the inhalation. Improper inhaler technique results in reduction of aerosol being deposited in the lung and, consequently leads to poor control of asthma.[4] This study was designed to see the role of spacer device in improving FEV1 and PEFR in our population where literacy rate is very low and poor inhaler technique is very common problem.

Objective

To study FEV1 and PEFR before and after introduction of spacer device in asthmatic patients already on inhaled therapy.

Material & Methods

Design: It was a Quasi Experimental study.

Settings: The study was carried out in department of Pulmonology, Jinnah Hospital/AIMC Lahore.

Sampling technique & size: Sampling technique was convenience/non-probability. 50 adult asthmatics, already on inhaled therapy, visiting Pulmonology department of Jinnah Hospital/AIMC Lahore were included in this study.

Data collection: Asthmatic patients, already using pressurized metered dose inhalers answered a short questionnaire for the assessment of asthma severity. Their spirometery and PEFR were measured in the morning with Spirolab spirometer and Mini Wright's peak flow meter respectively before 12:00 noon and a proforma was filled. Then they were given a spacer device to use with their pressurized metered dose inhalers. Technique to use the spacer device was demonstrated to the patients. They were evaluated after 2 weeks and 6 weeks by repeating the Spirometery and PEFR.

Results:

50 adult asthmatic patients were included in this study. 44% were males and 56% were females **(Fig-1)**. Out of these 50 patients 38% fell in the age group of 15-25, 30% fell in the age group 26-35 years, 22% fell in the age group 36-45 and 10% of the people were above 46 years of age **(Table 1)**. The FEV1 (mean ±SD) was 1.46±0.42 litres at first visit, 1.97 ± 0.76 at second visit and 2.32±0.39 at third visit. On comparing FEV1 at first visit with that at second visit,

there was significant improvement after the use of inhaler with spacer device ($p < 0.001$). Similarly, when FEV1 at first visit was compared with that at third visit statistically significant increase in FEV1 was noted ($p<0.001$) **(Table-2)**. The mean PEFR (mean±SD) was 163.34±58.56 L/min, 271.68 ±69.12, 346.66±64.15 at first, second and third visits respectively.

Fig -1: Distribution of cases by sex n = 50.

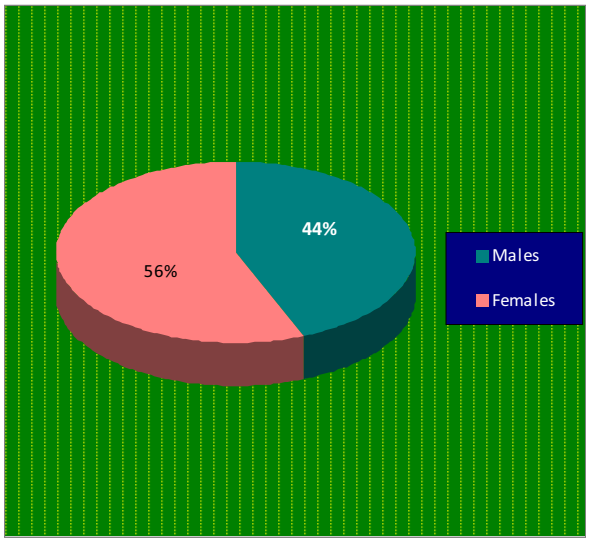

Table-1: Distribution of cases by age

Age (years)	No. of Patients	Percentage
15-25	19	38%
26-35	15	30%
36-45	11	22%
46-55	04	08%
> 56	01	02%
Total	50	100%
Mean ± SD	31.6 ± 11.3 years	

Table-2: Distribution of cases by FEV1(L) n = 50

FEV1	Mean ±SD	P value
1st Visit vs	1.46 ± 0.42	P<0.001
2nd Visit (2nd weeks)	1.95 ± 0.76	
1st Visit vs	1.46 ± 0.42	P<0.001
3rd Visit (6th Weeks)	2.32 ± 0.39	

Key: FEV1= Forced expiratory volume in one second

The improvement in PEFR at second and third visit as compared to first visit was statistically significant (p value = 0.001) **(Table 3).**

Table-3: Distribution of cases by PEFR (L/min) n = 50

FEV1	Mean ±SD	P value
1st Visit vs	163.34 ± 58.56	p<0.001
2nd Visit (2nd weeks)	271.68 ± 69.12	
1st Visit vs	163.34 ± 58.56	p<0.001
3rd Visit (6th Weeks)	346.66 ± 64.15	

Key: PEFR = Peak expiratory flow rate

Discussion

Inhalation therapy is the corner stone for asthma treatment. Compared to systemic administration, the inhalation route offers a quicker and better pulmonary deposition with lower systemic side effects. Pressurized metered-dose inhalers (PMDIs) are the most widely used devices for delivering inhaled medication but have some inherent limitations. First, the spray from PMDIs comprises large rapidly moving propellant droplets that readily deposit in the oropharynx. Only about 10 percent of the dose is delivered to the lungs, with 80 percent deposited in the oropharynx.[5] Oropharyngeal deposition causes increased systemic absorption and, with corticosteroids an increased risk of local side effects. About one-third to one-half of the patients use an improper technique of inhalation.[6] About 14 to 16 percent are unable to learn even after careful tuition.[7] A study conducted by James B Fink and Bruce K Rubin in 2005 showed that between 28% and 68% of patients do not use metered-dose inhalers or powder inhalers well enough to benefit from the prescribed medication, and 39 to 67% of nurses, doctors, and respiratory therapists are unable to adequately describe or perform critical steps for using inhalers.[8] Hand breath asynchrony drastically reduces the mass of medication inhaled from a PMDI. Actuation 1 second prior to inhalation reduces inhaled mass by 90%.[9] Similarly, actuation late in the inspiratory cycle may fill the anatomic dead space with aerosol, which is then exhaled before it can enter the target airways. It was also hoped that the spacers would reduce problems of coordination, principally by causing a delay between actuation and inhalation. K. Demirkan et al conducted a study which showed that administration of salmeterol with MDI plus spacer resulted in significant increases in PEFR from baseline vs MDI given alone.[11]

Williams MV et al, conducted a study to determine the relationship of literacy to asthma knowledge and ability to use a metered-dose inhaler (MDI) among

patients with asthma. Poor MDI technique was found in 89% of patients reading at less than the third-grade level compared with 48% of patients reading at the high-school level. [12] Patients, who use PMDI, majority has very poor inhaler technique because either the technique is not properly explained by their physician or they find it difficult to understand and coordinate. It leads to poor control of the disease and non-compliance and they lose confidence in the doctor and in inhalers. The results of our study were consistent with other studies carried out previously, and showed a remarkable improvement in FEV1 & PEFR when spacer was added to their inhalers.

Conclusion

The results of this study clearly indicated that spacer devices have a definitive role in improving FEV1 and PEFR. Patients especially the elderly, who find PMDI technique complicated or are unable to coordinate properly due to any reason, should benefit from spacer device.

Department of Pulmonology
JHL / Allama Iqbal Medical College, Lahore
theesculapio@hotmail.com

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