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Research Article

Obstructive Spirometeric Patterns and Its reversibility against Short acting ß-2 Agonist in Patients with Bronchiectasis

[1]Noor ul Huda, [2]Maryam Tahir and [3]Aiman Javid

[1]House Officer, Jinnah hospital Lahore, Pakistan
Cell: 03228808381, Email: dr.noor2794@yahoo.com
[2]Woman Medical Officer, THQ Muridke, Pakistan
Cell No. 03314029953, Emailawesomemay30@gmail.com
[3]Woman Medical Officer, RHC Kala Dera Ghazi Khan, Pakistan
Cell: 03366522727, Email: amnjvd@gmail.com

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ABSTRACT

Objectives: To determine the frequency of obstructive pattern of spirometry in bronchiectasis patients.
Material and methods: This case series study was conducted at Department of Pulmonology, Jinnah Hospital Lahore. Total 143 patients with bronchiectasis having age 30-60 years either male or female and having duration of symptoms ≥1 years were selected for this study.
Results: Total 143 patients with Bronchiectasis were selected for this study. Mean age of the patients was 47.56 ± 9.11 years, mean weight, mean height and mean BMI was 68.01 12.22, 59.63 ± 4.21 and 29.84 5.71 respectively. Out of 143 patients of Bronchiectasis, Positive obstructive pattern was noted in 80 (55.9%) patients and reversibility was noted in 45 (56.25%) patients.
Conclusion: Results of this study showed a higher number of positive obstructive pattern in patients of bronchiectasis and percentage reversibility is also very high. Reversibility was significantly associated with age of the patients and duration of disease.

Keywords: Alpha-1 Antitrypsin deficiency, Emphysema, bronchiectasis; chest radiography; high-resolution CT (HRCT)

INTRODUCTION:

Bronchiectasis is a condition characterized by an abnormal and irreversible dilatation of the subsegmental airways.[1,2] Bronchiectasis may be caused by a variety of disease processes, including congenital disorders, mechanical obstruction of the bronchi, respiratory infections, immunodeficiencies and idiopathic causes.[3-5] High resolution CT (HRCT) scanning has become definitive diagnostic test for bronchiectasis.[6,7] For functional assessment of impairment due to bronchiectasis pulmonary function testing is used.[8] Obstructive impairment (i.e. reduced FEV_1, low FVC and low FEV_1/FVC ratio) is the most frequent funding seen on pulmonary function testing.[9] In patients of bronchiectasis about 50% of the patients showed obstructive pattern and almost 39% of the patients showed significant reversibility with short-acting beta-2 agonist in obstructive pattern.[10]

Presence of a restrictive defect (FEV_1/FVCratio≥70% along with a decrease in FVC <80% of predicted values) is seen in only

few patients and it indicates presence of significant atelectasis (due to mucus plugging), fibrosis (scarring resulting from chronic inflammation) or consolidation (commonly due to infection).[11] A very low FVC can also be observed in advanced disease in which big part of the lung has been destroyed. Reversibility testing i.e. features of improvement in FEV_1 and / or FVC after the administration of inhaled bronchodilator, means that chance of improvement with inhaled bronchodilator is there.[11] Most of the people with bronchiectasis show features of airways hyper responsiveness.[11] Very little data is available on this topic and it is thought to be reemergence of old concept now. Published literature have demonstrated $\geq$15% improvement in FEV_1 in >40% of cases of bronchiectasis after administration of a beta adrenergic abonist.[12]

Currently medical management like antibiotics, occasionally mucolytics and physiotherapy, many patients with bronchiectasis do receive bronchodilator therapy. Evidence of effectiveness of bronchodilator therapy in bronchiectasis has only recently started to be systematically studied. Latter reversibility testing can be carried out with the inhaled anticholinergics and steroids, so making the treatment options wider and more scientifically based for this under studied disease.By adding the most frequently used drug in obstructive pathology of lung diseases; short acting beta 2 agonist in the treatment of bronchiectasis was reduce, multiple admissions, pulmonary hypertension, car-pulmonale, respiratory failure and morbidity.

OPERATIONAL DEFINITIONS

Bronchiectasis: Bronchiectasis was diagnosed by high resolution computed tomography. We were diagnose bronchiectasis on the basis of one of the following six features seen on HRCT.

1. Airways dilatation:

a) Detected as parallel (tram) lines or end on ring shadows.

b) A luminal airway diameter more than 1.5 times the adjacent vessel (indicative of cylindrical bronchiectasis).

2. Lack of tapering in combination with airways dilatation.
3. Bronchial wall thickening in dilated airways.
4. Muco-purulent secretions or debris plugging in dilated bronchi and post obstructive air trapping.
5. "Tree in bud pattern" peripheral small airways appearing as irregular, short and linear branching pattern.
6. "Cyst in clusters" cysts off the bronchial wall or grapes like cysts, these are indicative of severe disease.

Obstructive spirometric pattern:

Spirometric pattern is said to be obstructive when forced expiratory volume in one second (FEV_1) is less than 80% and FEV_1/FVC is <70%.

Post bronchodilator reversibility:

Post bronchodilator reversibility was said to be present if there is improvement in post bronchodialtor FEV1 and / or FVC of 12% (relative) and 200ml (absolute) as compared to pre-bronchodilator values.

MATERIAL AND METHODS:

This case series study was conducted at Department of Pulmonology, Jinnah Hospital Lahore. Total 143 patients with bronchiectasis having age 30-60 years either male or female and having duration of symptoms $\geq$1 years were selected for this study.

Patients with history of smoking or ex-smoker, patients with history of acute infective exacerbation during the past four weeks, associated respiratory disease diagnosed case of interstitial lung disease (ILD), chronic obstructive lung disease (COPD) and bronchial asthma on HRCT were excluded from the study. This study approved by the instutional review committee and written informed consent was taken every patient.

On the 1st day, spirometry of the patient was performed and values of FEV_1, FVC, FEV_1/FVC was noted on pre-designed proforma to detect frequency of obstructive pattern of spirometry. Then all these patients was nebulised with 2.5mg salbutamol. Salbutamol respiratory solution

(5mg/ml) ½cc and ½cc normal saline was used for nebulization. After 15 minutes spirometrywas performed again and values of the above given parameters were noted in the proforma. When FEV_1 is less than 80% of predicted and FEV_1/FVC value is less than 70% the spirometrywas considered as obstructive pattern. Post bronchodilator improvement in the (FEV_1 and/or FVC) was noted. Improvement of 12% in FEV_1 from pre-bronchodilator value was considered as post bronchodilator reversibility. Demographic data of all the patients was also be noted on proforma.All the collected data wasentered in SPSS version 17 and analyzed. Mean and SDwascalculated for quantitative variables like age, weight, height, BMI and duration of symptoms. Frequency and percentages wascalculated for qualitative variables like gender, obstructive spirometric pattern and post bronchodilator reversibility. Effect modifiers like age, gender, duration of symptoms and BMI wascontrolled through stratification. Post stratification chi-square test wasapplied. P value ≤ 0.05 wasconsidered as significant.

RESULTS:

Total 143 patients with Bronchiectasis were selected for this study. Mean age, weight, height, BMI and duration of symptoms was 47.56 ± 9.11 years, 68.01 ± 12.22 kg, 59.63 ± 4.21 inch, 29.84 ± 5.71 and 8.55 ± 3.47 years. Out of 143 patients of Bronchiectasis, positive obstructive pattern was noted in 80 (55.9%) patients. (Fig. 1)Out of these 80 patients with positive obstructive pattern, reversibility was noted in 45 (56%) patients. (Fig. 2).These patients were divided into two age groups i.e. age group 30-45 years and age group 46-60 years. Out of 45 (56.25%) patients of age group 30-45 years, reversibility was noted in 36 (80%) patients. Among the 35 (43.75%) of age group 46-60 years, reversibility was noted in 9 (25.71). Significant association between age of the patients and reversibility was noted with p value 0.000. (Table 1) In present study, 47 (58.75%) patients were male and 33 (41.25%) patients were female. Reversibility was noted in 25 (53.19%) male patients and 20 (60.61%) female patients. Insignificant (P = 0.648) association between gender and reversibility was noted. (Table 2) Total 37 (46.25%) patients were obese and 43 (53.75%) patients were non-obese. Reversibility was noted in 19 (51.35%) obese patients and 26 (60.47%) non-obese patients. Insignificant (P = 0.500) association of reversibility wit obesity was noted. (Table 3)

Total 50 (62.5%) patients were found with 2-7 years duration of symptoms and 30 (37.5%) patients were found with 8-14 years duration of symptoms and reversibility was noted in 34 (68%) patients and 11 (36.67%) patients respectively. Statistically significant (P = 0.010) association of reversibility with duration of disease was noted. (Table 4)

Fig. 1: Frequency of Obstructive pattern (n = 143)

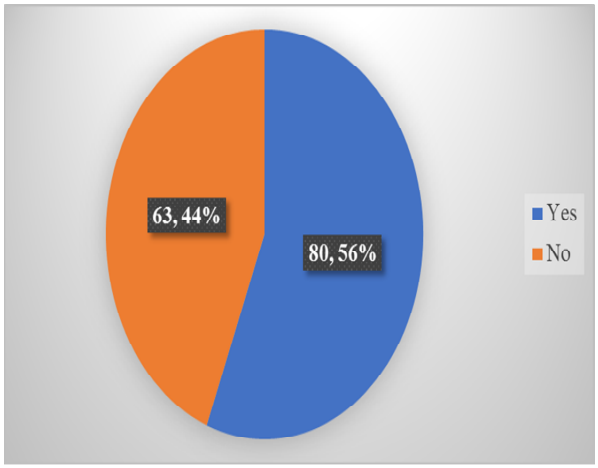

Fig. 2: Frequency of reversibility (n = 80)

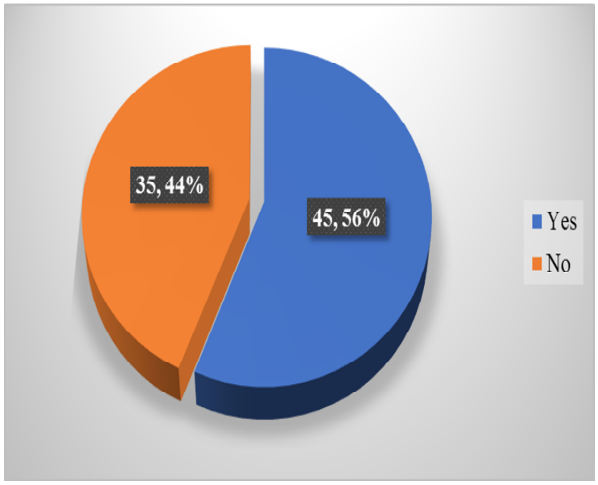

Table 1: Association of reversibility with age (n = 80)

Age Group	Reversibility		Total	P value
	Yes	No		
30-45	36 (80)	9 (20)	45 (56.25)	0.000
46-60	9 (25.71)	26 (74.29)	35 (43.75)	
Total	45 (56.25)	35 (53.75)	80	

Table 2: Relation of gender with reversibility (n = 80)

Gender	Reversibility		Total	P value
	Yes	No		
Male	25 (53.19)	22 (46.81)	47 (58.75)	0.648
Female	20 (60.61)	13 (39.39)	33 (41.25)	
Total	45 (56.25)	35 (53.75)	80	

Table 3: Relation of reversibility with obesity

Obesity	Reversibility		Total	P value
	Yes	No		
Obese	19 (51.35)	18 (48.65)	37 (46.25)	0.500
Non-obese	26 (60.47)	17 (39.53)	43 (53.75)	
Total	45 (56.25)	35 (53.75)	80	

Table 4: Relation of reversibility with duration of symptoms

Duration of symptoms	Reversibility		Total	P value
	Yes	No		
2-7	34 (68)	16 (32)	50 (62.5)	0.010
8-14	11 (36.67)	19 (63.33)	30 (37.5)	
Total	45 (56.25)	35 (53.75)	80	

DISCUSSION:

Bronchiectasis is a condition characterized by an abnormal and irreversible dilatation of the subsegmental airways.[13] Bronchiectasis may be caused by a variety of disease processes, including congenital disorders, mechanical obstruction of the bronchi, respiratory infections, immune deficiencies and idiopathic causes. Many of these conditions lead to impaired tracheobronchial clearance, resulting in recurrent lower respiratory tract infections and inflammation, scarring and bronchial damage.[14] Although some patients may remain clinically stable for many years, the natural history of the condition is usually a slow, progressive deterioration of lung function over time, with the most severe group developing respiratory failure. Symptoms include chronic productive cough, wheeze, and dyspnoea. Infective exacerbations of bronchiectasis are associated with worsening of the symptoms and patients with severe disease may have ventilatory failure. Medical treatment includes physiotherapy, antibiotics and occasionally mucolytics. Since many patients show signs of airflow obstruction and bronchial hyper responsiveness, many receive bronchodilator therapy.[15]

Exact prevalence of bronchiectasis is not known. It is very badly studied disease especially in our part of world. High resolution CT (HRCT) scanning has become definitive diagnostic test for bronchiectasis.[16]Pulmonary function testing is used for functional assessment of impairment due to bronchiectasis. Obstructive impairment (i.e. reduced FEV_1, low FVC and low FEV_1/FVC ratio) is the most frequent funding seen on pulmonary function testing.[5]In bronchiectasis 50% patients showed obstructive pattern and 39% patients showed significant reversibility with short-acting beta-2 agonist in obstructive pattern in patients.[17]

Presence of a restrictive defect (FEV_1/FVC ratio $\geq$70% along with a reduction in FVC <80% of predicted values) is seen in only few cases and it indicates presence of significant atelectasis (due to mucus plugging), fibrosis (scarring resulting from chronic inflammation) or consolidation (commonly due to infection). A very low FVC can also be seen in advanced disease in which much of the lung has been destroyed. Reversibility testing i.e. features of improvement in FEV_1 and / or FVC after the administration of inhaled bronchodilator, means that chance of improvement with inhaled bronchodilator is there. Most of the people with bronchiectasis show features of airways hyper responsiveness.[18] Studies are very limited and it is thought to be reemergence of old concept now. In

the past studies have demonstrated about ≥15% improvement in FEV_1 in >40% of cases of bronchiectasis after administration of a beta adrenergic abonist.[19]

In present study total 143 patients with Bronchiectasis were selected. Mean age of the patients was 47.56 ± 9.11 years. In one study by Walker et al[20]mean age of the patients with Bronchiectasis was 53±14 years which is comparable with the mean age of my study. In another study conducted by Sevgiliet al[21] the mean age of the patients was 48.9±14.3 years, which is also comparable with our study. In present study male patients were 47 (58.75%) and female patients were 33 (41.25%). Walker et al[20] reported in their study male patients as 44% and female patients as 56%. In another study conducted by Sevgiliet al[21] there were 60% male and 40% female patients, which is comparable with our study.In this study, obstructive pattern was found positive in 55.9% patients. King et al[17]reported positive obstructive pattern in 50% patients which is comparable with our study.

In present study reversibility was noted in 45 (56.25%) patients. In one study byKing et al[17] 39% patients showed significant reversibility with short-acting beta-2 agonist in patients with bronchiectasis, which is not comparable with our study. In another study conducted by Kuziemskiet al[22] the reversibility positive was found in 31% patients, while in our study reversibility positive was found in 40% patients, which is comparable with the above study.

CONCLUSION:

Results of this study showed a higher number of positive obstructive patterns in patients of bronchiectasis and percentage reversibility is also very high. Reversibility was significantly associated with age of the patients and duration of disease.

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Conflict of interest: No potential conflict of interest relevant to this article was reported

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