To determine the frequency of undiagnosed Bronchiectasis in patients suffering from severe persistent Asthma in Nishtar Hospital Multan

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Date Received: Nov. 10, 2017
Date Revised: Jan. 12, 2018
Date Accepted: Mar. 10, 2018

Author Contributions

MAM conceived idea, MAM TK planned the study, MWT SSN drafted the manuscript, MAU AK ZK collected data, MAM did statical analysis and interpretation, MAM TKM MWK SSN critical reviewed manuscript MAM approved the final version to be published.

Declaration of conflicting interests

The Authors declares that there is no conflict of interest.

ABSTRACT

Introduction: Though asthma and bronchiectasis are two different diseases, their coexistence has been shown in many patients. Bronchiectasis can contribute to severe and difficult to control asthma with pulmonary complications like chronic respiratory failure. Bronchiectasis often goes unrecognized, even when characteristic features are present and appropriate diagnostic techniques are readily available. Successful management of the patients suffering from severe persistent asthma depends on the early recognition of bronchiectasis or any other underlying disorder and their timely treatment.

Objective: To determine the frequency of undiagnosed bronchiectasis in patients suffering from severe persistent asthma.

Material and Methods: This was a cross sectional descriptive study conducted at Department of Pumonology, Nishtar Medical University, Multan - Pakistan. This was a six month study in which total of 147 patients with severe persistent asthma were included. All patients had undergone High resolution CT scan chest to detect undiagnosed bronchiectasis. Frequency of undiagnosed bronchiectasis was determined. P-value $\leqslant 0.05$ was considered significant.

Results: The mean age of the patients was 43.82±12.43 years. There were 23.8% patients in the age range of 20–30 years, 21.8% patients of age range of 31–40 years, 16.3% patients of age range of 41–50 years and 38.1% patients of age range of 51–60 years. Bronchiectasis was found to be present in 53 patients (36.1%) out of 147 patients suffering from severe persistent asthma.

Conclusions: The frequency of undiagnosed bronchiectasis in patients suffering from severe persistent asthma is quiet high especially in older patients with longer disease duration.

Key Words: Undiagnosed bronchiectasis; Severe persistent

This article may be cited as: Mushtaq MA, Tahir K, Tariq MW, Naqvi SSA, Atiq ul Mannan Muhammad, Khan A. To determine the frequency of undiagnosed Bronchiectasis in patients suffering from severe persistent Asthma in Nishtar Hospital Multan. Pak J Chest Med 2018; 24 (1): 28-33.

Introduction

Asthma is increasing in prevalence worldwide with an estimated 300 million affected individuals. Asthma affects approximately 8-10% of adults in the general population, of whom approximately 5% to 10% have severe and/or difficult-to-treat asthma.[1] These patients with inadequately controlled severe asthma are at a particularly high risk of exacerbations, hospitalization, and death, and often have severely impaired quality of life. Although this group represents a relatively small proportion of the asthma population, they consume a disproportionately high amount of health-care resources attributed to asthma.[2]

Patients with therapy-resistant or difficult-to-control asthma require a rigorous and systematic approach to their diagnosis and treatment. The first step in the care of these patients is evaluation and testing directed at

determining that asthma is the correct diagnosis.[3] Many diseases present with respiratory symptoms that mimic asthma and may be associated with airflow obstruction. These include COPD, bronchiectasis and cystic fibrosis, constrictive bronchiolitis and congestive heart failure.[4] High-resolution CT (HRCT) scanning plays a role in the diagnostic workup of patients with severe asthma. HRCT scan studies in asthmatic subjects may reveal abnormal radiologic findings, such as bronchial wall thickening (BWT), bronchial wall dilatation, bronchiectasis (BE), mosaic lung attenuation, mucus plugging, prominent centrilobular opacities, emphysema, and atelectasis.[5] Bronchiectasis is defined as abnormal, irreversible thick-walled dilatation of the bronchi and represents the end stage of a variety of pathological processes. It is caused by the inflammatory reaction of the bronchi and their frequent chronic bacterial colonization, bronchiectasis usually presents with recurrent lower respiratory tract infections and chronic mucopurulent sputum production. Bronchiectasis often goes unrecognized, even when characteristic features are present and appropriate diagnostic techniques are readily available.[6]

The prevalence of bronchiectasis in asthmatic patients varies from 9% to 77% with a median of 31%.[4,5,6] The wide variation in the reported prevalence of bronchiectasis is likely to be due to differences in the patient population and scanning techniques. In a study conducted by Sumit Gupta et al who studied the HRCT scans of the chest in patients with severe asthma, they found out that bronchiectasis was present in 40% of these patients.[7] In another study the reported prevalence of bronchiectasis in patients with asthma was reported to be 26 (24.8%).[8] Oguzulgen et al.[9] found that bronchiectasis was seen in severe persistent asthma in 49% of the patients. By conducting this study we want to identify what proportion of our patients with severe and difficult to treat asthma have undiagnosed bronchiectasis as there is a wide variation found in the literature regarding its prevalence. If found to be high will enable us recommend the use of HRCT chest among these patients routinely so that they can be diagnosed properly at an earlier stage of bronchiectasis and receive appropriate treatment for this condition. This study will also add information to our local database of respiratory diseases in our population.

Objective

To determine the frequency of undiagnosed bronchiectasis in patients suffering from severe persistent asthma.

Operational Definitions:

Severe Persistent Asthma: It will be diagnosed on the basis of history of asthma symptoms (cough, wheeze, chest tightness) which would not have been fully controlled, being experienced daily while being on maximum medical treatment (High dose inhaled corticosteroids with Long acting inhaled beta2 agonists plus montelukast plus oral theophyllines and who have received at least two courses of oral steroids in the last year). It will be confirmed by bronchodilator reversibility on spirometry demonstrating $\geq$ 12 % improvement in FEV1 but with FEV1/FVC ratio < 70 after 5-10mg salbutamol administration via a nebulizer.

Bronchiectasis: It will be defined when there will be finding of signet ring appearance or cylindrical / saccular dilatation of the bronchi affecting at least three segments on HRCT.

Material and Methods

Setting: Inpatient Department of Pulmonology Nishtar Hospital Multan - Pakistan

Duration of study: 6 months.

Study Design: Descriptive cross sectional study.

Sample Size: 147 patients calculated by the following formula:

$N = z^2 \times P(1-P) / d^2$
where
P = 24.8% (expected percentage of asthmatic patients with bronchiectasis)[8]
Z = 1.96
D = 7%
n = 147

Sample Technique: Consecutive non-probability.

Inclusion Criteria:

1. Patients of both genders.
2. Patients in age group 20-60 years.
3. Patients diagnosed to have severe persistent asthma as per operational definition.

Exclusion Criteria:

1. Patients with abnormal chest radiographs (interstitial shadowing, fibrocavitary areas, bullae)
2. Patients with history of smoking > 10 pack years.
3. Patients with co-existent heart failure
4. Patients with decompensated cirrhosis of liver.
5. Patients unwilling to participate in the study.

Data Collection Procedure

Permission taken from the ethical committee of the hospital. 147 consecutive patients in age group 20-60 years meeting the inclusion and exclusion criteria admitted through the emergency or outpatient department were included in the study. Fully informed written consent was taken from all the patients. Complete history and physical examination was carried out in all the patients. Investigations including blood complete, serum creatinine, urea, electrolytes, glucose, liver function tests, chest x-ray and spirometery (with bronchodilator reversibility) was done in all the patients to confirm the diagnosis. All the patient undergone High resolution CT scan chest which was reported for the presence or absence of bronchiectasis by a consultant radiologist with at least 5 year post fellowship experience. Data was entered in a specially designed proforma.

Data Analysis

Data were entered in SPSS version 16. Mean, median, standard deviation was calculated for quantitative variables like age and duration of disease. Frequencies and percentages were calculated for qualitative variables like gender. Frequencies and percentages were calculated for presence or absence of bronchiectasis among the patient population. Stratification done with regards to age, gender and duration of disease to see the effect of these on outcome through application of Chi-square test. P-value $\leq$ 0.05 was taken as statistically significant.

Results

A total of 147 patients were included in the study.

Distribution of patients by age: The mean age of the patients was 43.82±12.43 years. There were 23.8% patients in the age range of 20–30 years, 21.8% patients of age range of 31–40 years, 16.3% patients of age range of 41–50 years and 38.1 % patients of age range of 51–60 years. (Table 1).

Distribution of patients by gender: There were 62 (42.2%) male patients and 85 (57.8%) female patients. The male to female ratio in this group was 1:1.37. (Table 2)

Distribution of patients by duration of the disease: The mean of the duration of disease was 31.8±8.7 years. There were 23.8% patients in the duration period of 16–25 years, 21.8% patients in the duration period of 26–35 years and 54.4% patients in the duration period of 36–45 years. (Table 3)

Table 1: Distribution of patients by age (n= 147).

Age (years)	Number	Percentage
20 - 30	35	23.8
31 - 40	32	21.8
41 - 50	24	16.3
51 - 60	56	38.1
Mean $\pm$ SD	43.82±12.43	
Median	45	

Table 2: Distribution of patients by gender (n= 147).

Gender	Number	Percentage
Male	62	42.2
Female	85	57.8
Total	147	100

Table 3: Distribution of patients by duration of the disease (147)

Duration of the disease (years)	Number	Percentage
16 - 25	35	23.8
26 - 35	32	21.8
36 - 45	80	54.4
Mean$\pm$SD	31.8±8.7	
Median	36	

Distribution of patients on the basis of HRCT findings: There were 53 (36.1%) patients who had bronchiectasis on HRCT and 94 (63.9%) patients did not have bronchiectasis on HRCT. (Fig 4) .

Cross tabulation of age groups of patients against HRCT findings: Bronchiectasis was detected on HRCT in 53 (36.05%) patients. There was 1 patient with bronchiectasis on HRCT in age group 20–30 years, 4 patients in age group 31–40 years, 9 patients in age group 41–50 years and 39 patients in age group 15–60 years. P-value=0.000, statistically significant. (Fig 5)

Cross tabulation of gender of patients against HRCT findings: Bronchiectasis was detected on HRCT in 53 (36.05%) patients. Among 53 patients 29 were male and 24 were female. P-value was 0.021, statistically significant. (Fig 6)

Cross tabulation of duration of disease against HRCT findings: Bronchiectasis was detected on HRCT in 53 (36.05%) patients. There was no patient in the time period of 16–25 years, 4 patients within time period 26–35 years and 49 patients within time period 36–45 years. P-value=0.000, statistically significant. (Fig 7)

Table 4: Distribution of patients according to HRCT findings (147)

Bronchiectasis on HRCT	Number	Percentage
Yes	53	36.1
No	94	63.9
Total	147	100

Table 5: Cross tabulation of age groups against HRCT findings (n=147)

Age groups (years)	Bronchiectasis on HRCT	
	Yes	No
20 - 30	1	34
31 - 40	4	28
41 - 50	9	15
51 - 60	39	17
Total	53	94
p-value	0.000	

Table 6: Cross tabulation of gender against HRCT findings (n=147)

Gender	Bronchiectasis on HRCT	
	Yes	No
Male	29	33
Female	24	61
Total	53	94
p-value	0.021	

Table 7: Cross tabulation of duration of the disease against HRCT findings (n=147)

Duration of the disease (years)	Bronchiectasis on HRCT	
	Yes	No
16 - 25	0	35
26 - 35	4	28
36 - 45	49	31
Total	53	94
p-value	0.000	

Discussion

Bronchiectasis often goes unrecognized in patients of severe asthma, even when characteristic features are present and appropriate diagnostic techniques are readily available. Therefore, in patients with severe asthma, associated diseases need to be investigated as the cause of respiratory symptoms and uncontrolled asthma.

HRCT scanning is part of the management of severe asthma, but its application varies between centers. HRCT scanning plays a role in the diagnostic workup of patients with severe asthma. It has emerged as a useful tool to noninvasively assess airway wall changes in patients with asthma. HRCT scan studies in asthmatic subjects may reveal abnormal radiologic findings, such as BWT, bronchial wall dilatation, bronchiectasis, mosaic lung attenuation, mucus plugging, prominent centrilobular opacities, emphysema, and atelectasis.

The current, qualitative, cross-sectional study, has illustrated the importance of HRCT scan in the detection of undiagnosed bronchiectasis in severe persistent asthmatic patients and showed that 53 (36.1%) patients out of 147 patients suffering from severe persistent asthma had bronchiectasis on HRCT.

The mean age of the patients in my study was 43.82 ± 12.43 years with female predominance (i.e. 57.8% against 42.2%). In a study by Gupta S, Siddique S, Haldar P et al the mean age of the patients was 50.2 years with male to female ratio 1:1.53.[7] Whereas, in another study by Bisaccioni C, Aun MV, Haldar P et al, the mean age of the patients was 57.8 years and male to female ratio was 1:3.8.[8]

In my study most of the patients (54.4%) presented with history of asthma in the range of 36 - 45 years and the mean of disease duration was 31.8 ± 8.7 years. In a study by Gupta S, Siddique S, Haldar P et al the mean of disease duration was 25.7years.[7]

In this study the frequency of bronchiectasis in patients suffering from severe persistent asthma was 36.1%, 76.8% patients were within the range of age 51-60 years and mostly 54.72% were male. The reported incidence of bronchiectasis among asthma patients is between 37% and 65%. Autopsy studies have shown that 15 – 20% of patients who died from exacerbation of asthma had bronchiectasis, most often in the upper lobes. One hypothesis to explain the prevalence of bronchial dilation in asthma patients is destruction of the bronchi by an inflammatory process or recurrent infection.[111] In a previous study by Gupta S, Siddique S, Haldar P et al, the frequency of bronchiectasis was 40%.[7] Whereas, in another study by Bisaccioni C, Aun MV, Haldar P et al, it was observed that the frequency of bronchiectasis in patients with severe persistent asthma was 24.8%.[8] Another study by Oguzulgen IK, Kervan F et al, the frequency of bronchiectasis was 49%.[9]

Although bronchiectasis and asthma are different in many respects, but if patient have both conditions simultaneously then the asthma with be difficult to control. In a study by Kang HR, Choi GS, Park SJ et al, effects of bronchiectasis on asthma exacerbation was assessed. They compared fifty patients suffering from asthma and bronchiectasis simultaneously with fifty patients of asthma alone and it was found that, the annual incidence of asthma exacerbation was higher in patients with asthma and bronchiectasis than in patients with asthma alone (1.08 ± 1.68 vs. 0.35 ± 0.42, p = 0.004). The annual prevalence of steroid use (0.9 ± 1.54 vs. 0.26 ± 0.36, p = 0.006) and the frequency of emergency room visits (0.46 ± 0.84 vs. 0.02 ± 0.13, p = 0.001) due to asthma exacerbation were also higher in patients with asthma and bronchiectasis than in patients with asthma alone.[112] Therefore patients suffering from severe persistent asthma should be evaluated and managed properly for bronchiectasis in order to decrease the incidence of asthma exacerbations, prevalence of steroid use and frequency of emergency room visits.

Conclusion

We can conclude from this study that the prevalence of bronchiectasis in patient suffering from severe persistent asthma is quiet high especially in older patients with longer disease duration. Therefore patients suffering from severe persistent asthma should be evaluated for bronchiectasis by HRCT in order to treat them properly and prevent the exacerbations of asthma and hence reduce hospital admissions.

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