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Characteristics of Bronchiectasis Patients at Nguyen Tri Phuong Hospital Ho Chi Minh City, Vietnam

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Bronchiectasis; Etiology; Post tuberculosis bronchiectasi

1. Abstract

1.1. Introduction

Bronchiectasis, significant in morbidity and mortality, varies globally in demographics, microbiology, and causes. This study at Nguyen tri Phuong Hospital assessed clinical aspects and etiologies of bronchiectasis in adults.

1.2. Methods

A retrospective, cross-sectional study enrolled eligible patients, exploring demographic, clinical, and paraclinical features, disease severity, and causes. It compared factors like age, gender, BMI, hospital stay duration, symptoms, and lung involvement between post-tuberculosis and other bronchiectasis patients.

1.3. Results

From January 2022 to December 2022, there were 83 patients found to be eligible for the study. The mean age of bronchiectasis patients was 68 (+/-14) with the proportion of female population of 55.4%. Smoking prevalence was 24.1%. Symptoms such as cough, expectoration, and haemoptysis were observed in 81.9%, 61.5%, and 16.9% of patients, respectively. Cystic bronchiectasis was the most common (78.2%) morphology on chest CT, and 59% of patients exhibited bilateral lung involvement. The right upper lobe (57.8%), followed by the right lower lobe (56.6%), and left upper lobe (55.4%) were common sites of involvement in bronchiectasis patients. The bronchiectasis severity condition on CT scan accounts for 55.4%. The sputum microbiological examination was available for 44 patients with the most frequently isolated bacteria of Acinetobacter 18.2%. The cause of post-tuberculosis bronchiectasis was 51.8%. Hemoptysis and upper lobe bronchectatic lesions were two factors associated with post-tuberculosis bronchiectasis compared to non post-tuberculosis bronchiectasis, with a p-value of 0.02 and 0.004 respectively.

1.4. Conclusion

Post-tuberculosis remains a primary bronchiectasis cause. The need for improved diagnostic guidelines would be necessary.

2. Introduction

Bronchiectasis is a chronic pulmonary disease characterized by irreversible dilation of the bronchi (usually identified on high-resolution chest CT scans) and chronic respiratory symptoms such as cough, sputum production, and dyspnea [1]. The fixed dilatation of the bronchi leads to impaired mucociliary clearance, chronic airway inflammation, and bacterial colonization [2]. The condition is common globally with a high rate of morbidity, hospital admission, and mortality, posing a burden on healthcare systems, especially in developing countries. Clinical manifestations vary from mild and asymptomatic between acute episodes to productive cough with purulent sputum, recurrent lower respiratory infections, deteriorating pulmonary function, respiratory failure, and pulmonary hypertension leading to death [3]. The primary cause of bronchiectasis is post-infectious. However, in developed countries, the incidence of

infectious causes has decreased due to the development of vaccination programs, judicious use of antibiotics, and improved social environmental hygiene, leading to an increase in congenital and acquired causes [4]. Moreover, diagnosing the cause of bronchiectasis significantly changes the treatment approach in a considerable proportion of patients. Differences in regions, disease duration, and diagnostic standards, as well as research outlines, show that the estimated disease prevalence and incidence vary greatly from 67-566/100,000 population [5]. Nowadays, the number of bronchiectasis cases diagnosed is increasing due to the availability of high-resolution chest CT scans, and diagnosing the cause is essential as it changes the approach and subsequently alters the prognosis. In Vietnam, in general, and Nguyen Tri Phuong Hospital (NTP) in particular, there has been limited research on bronchiectasis. The goal of this study is to investigate the clinical and paraclinical characteristics, severity, and causes of patients diagnosed with bronchiectasis at Nguyen Tri Phuong Hospital, as well as to compare some characteristics between two groups of patients with and without previously pulmonary tuberculosis, thereby proposing better diagnostic, treatment, management, and follow-up strategies for these patients.

3. Method

3.1. Population

Search the hospital's HIS software for patients with the diagnosis code J47 (bronchiectasis) from January 2022 to December 2022. Patients were eligible for the study when their bronchiectasis conditions are confirmed on a chest CT scan. Patients < 16 years old and with traction bronchiectasis were excluded from the study. According to the sample size calculation formula, about 80 cases would be selected for the study. The study was presented to the hospital's ethics committee.

3.2. Variables

Basic demographic, clinical, and subclinical data were recorded and analyzed. Bronchiectasis is diagnosed as post-tuberculosis if the patient has a history of tuberculosis, chest CT scan signs of old pulmonary tuberculosis, and exclusion of recurrent pulmonary tuberculosis. Some demographic characteristics (age, gender, smoking status, BMI index), clinical (number of hospitalization days, symptoms of cough, hemoptysis, sputum production, chest pain, difficulty breathing), and subclinical (white blood cell count, eosinophil count, CRP, bronchiectasis lesions on CT scan) would be compared between the two groups of patients with and without post-tuberculosis bronchiectasis.

3.3. Statistical Analysis

STATA17 software was used. Qualitative data were calculated in numbers and percentages. Quantitative data were presented as mean, median, quartiles, minimum, and maximum values. The Chi-square test or Fisher's test (if more than 20% of the cells in the table have an expected frequency less than 5) was used for comparing qualitative variables, and the t-test (if the distribution is normal for comparing two groups) and Wilcoxon test (if the distribution is not normal for comparing two groups) were used for comparing quantitative variables. A difference was considered statistically significant if $p < 0.05$.

4. Results

During one year (from 1/1/2022 to 31/12/2022), a total of 248 cases with the J47 code (bronchiectasis) were found using the hospital's HIS software. Some cases were excluded from the study according to the scheme below. Therefore, a total of 83 cases (83/248= 33.5%) met the criteria for inclusion in the study (Figure 1). In these 83 cases, the average age was 68 years (with the youngest at 28 and the oldest at 98). There were 46 females and 37 males, with a female to male ratio of 1.2. Some epidemiological characteristics are presented in Table 1. Common clinical symptoms included cough (68 cases, 81.9%), fatigue (58, 69.9%), and sputum production (51, 61.5%). The symptom of coughing up blood accounted for 16.9%.57.8% of the cases had anemia with Hb < 120 g/dl, 78.2% had a viral or bacterial infection with CRP ≥ 5 mg/L, with about 43.4% of the cases requiring antibiotic treatment. Additionally, 60% of the cases tested for procalcitonin had values ≥ 0.1 ng/ml. The rate of patients with eosinophils ≥ 0.3 g/l was 18%, including 2 cases with a history of bronchial asthma. The eosinophil count decreased in the blood (<0.1 g/l) in our study, with this rate being 51.8%. Among the 83 cases of bronchiectasis studied, 44 cases were tested for sputum examination for bacteria (53%). Among these 44 cases, the rate of positive bacterial infection was 43.1% (19/44). Common bacteria included: Acinetobacter (8 cases-18.2%), Haemophilus parainfluenzae (4 cases-9%), Burkholderia (3 cases-6.8%), Pseudomonas aeruginosa (3 cases-6.8%), Stenotrophomonas maltophilia (2 cases-4.5%), coagulase-negative Staphylococcus (2 cases-4.5%), Haemophilus influenzae (2 cases-4.5%), Staphylococcus aureus (1 case-2.2%), and Staphylococcus epidermidis (1 case-2.2%). Chest radiography detected bronchiectasis only in 3 cases, accounting for 3.6% (3/83). On chest CT scans, types of bronchiectasis included: cystic (78.2%), tubular (43.4%), and varicose (8.7%). Classifying severity on chest CT scans, we have severe lesions accounting for 55.4% (46/83) and mild lesions 44.6% (37/83). The location of bronchiectasis lesions was as follows: right lung (26.5%), left lung (14.5%), both lungs (59%), upper right lobe (57.8%), middle right lobe (50.1%), lower right lobe (56.6%), upper left lobe (55.4%), left lingula (39.8%), lower left lobe (45.8%). Regarding respiratory function, pulmonary function testing was performed in 6 cases, accounting for 7.2% (6/83), of which 2 cases had a restrictive pattern (33.3%) and 4 cases had a mixed pattern (66.6%). No cases were measured for gas transfer capacity. Arterial blood gases were measured in 50 cases (50/83=60.2%). The number of cases with pH < 7.31 was 11 (22%), pCO_2 > 46 was 18 cases (36%) and pO_2 < 71 was 18 cases (43.9%). The average hospital stay was 9

days, with treatment outcomes showing 89.2% were discharged, 7.2% left hospital by request in a stable condition, 2.4% left in a severe condition, 1.2% were transferred to another hospital, and 0% died. Regarding the cause of bronchiectasis, 43 cases (51.8%) had a history of pulmonary tuberculosis with an average treatment duration of 20 years (the most recent 4 years, the longest 40 years); and 40 cases (48.2%) did not have a previous history of tuberculosis. Patients were divided into 2 groups based on the cause: bronchiectasis in patients with a history of treated pulmonary tuberculosis (group 1: 43 patients) and patients without a history of treated pulmonary tuberculosis (group 2: 40 patients). Coughing up blood and upper lobe bronchiectasis lesions in both lungs were two common features in the group of bronchiectasis patients with a history of pulmonary tuberculosis compared to the group of bronchiectasis without a history of tuberculosis, with p-values of 0.02 and 0.004, respectively.

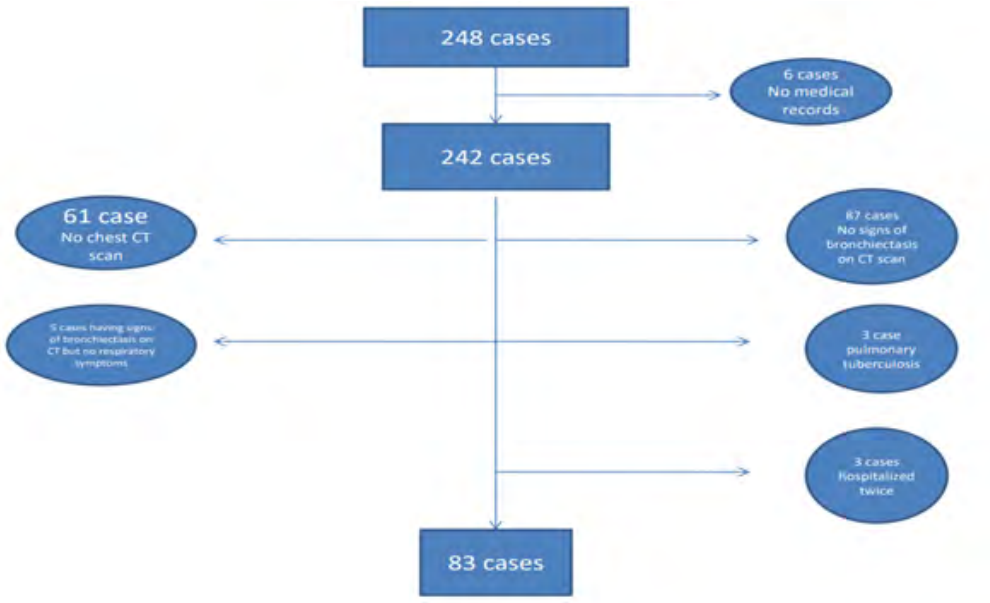

Figure 1: Study Scheme.

Table 1: Epidemiological Characteristics in the Patient Study Group.

Characteristic		Average value (+/- Standard Deviation). Median [Quartile] or Number of cases N (%)
Age		67,5 (+/- 14,1)
Age ≥ 60		58 (69,9%)
Female Gender		46 (55,4%)
BMI (kg/m^2)		21,6 (+/- 3,3)
Smoking		20 (24,1%)
During of illness (days)		4 [2-7]
Medical History		
	Bronchiectasis	12 (14,5%)
	Asthma	6 (7,2%)
	COPD	17 (20,5%)
	Pulmonary Tuberculosis	43 (51,8%)
	Gastroenteritis	1 (1,2%)
	Sinusitis	1 (1,2%)
	HIV	0 (0%)
	Connective Tissue Disease	0 (0%)

5. Discussion

During one year from 1/2022 to 12/2022, there were 83 cases that met the criteria for analysis, with an average age of 68 and a female ratio of 55.4%, with only 24.1% being smokers. In a study from Europe, the average age of patients with bronchiectasis was 67 [quartiles 57-74] with females comprising 60.9% [6]. In the US, the average age for bronchiectasis diagnosis is 57, with a majority being female (79%) [7]. Bronchiectasis patients in India tend to be younger (average age 56) and predominantly male (56.9%) [8]. Therefore, there are geographical differences in gender distribution, although most studies show a female predominance and occurrence in non-smokers [9]. Older age predominates in bronchiectasis, but this does not mean bronchiectasis only occurs in the elderly. Idiopathic and post-tuberculous bronchiectasis have been found in children and young adults [10]. The most common symptom of bronchiectasis is productive cough with mucopurulent sputum, though it may also present as a dry cough without sputum. This is explained by lesions in the upper lobes and in an upright posture, where mucus drainage is efficient, leading to a dry cough, often referred to as "dry bronchiectasis." Other symptoms may include shortness of breath, weight loss, fatigue, and blood in sputum as the disease progresses [11]. In our study, dry cough (81.9%), fatigue (69.9%), sputum production (61.5%), and shortness of breath (59%) were the most common symptoms. Blood eosinophils are a useful marker in bronchiectasis. Th2-responsive bronchiectasis is defined by blood eosinophils ≥ 0.3g/l in patients without asthma. In this study, the rate of patients with eosinophils ≥ 0.3 g/l was 18%, including 2 cases with a history of bronchial asthma. Not only is an increase in blood eosinophils a useful indicator, but a decrease in blood eosinophils (<0.1 g/l) is also associated with the severity of bronchiectasis and an increased mortality rate. In our study, this rate was 51.8%. A possible mechanism is that patients with low eosinophils are those with increased neutrophil states, reflecting a shift from eosinophil to neutrophil dominance. Neutrophils in bronchiectasis have dysfunctional states, increased protease breakdown, overload of the anti-protease system, and failure in bacterial clearance. The formation of NETs (Neutrophil Extracellular Traps) has been identified as the main mechanism of neutrophil dysfunction. NETs function to expel pathogens, but excessive production leads to tissue damage and chronic airway inflammation. NETs release a network of neutrophil DNA into the airways with a large amount of enzymes including neutrophil elastase (NE). NE is a primary agent in bronchiectasis related to granulation tissue degradation, impaired bacterial clearance, and increased mucous secretion. Elevated NE in sputum is linked to decreased FEV1, chronic *P.aeruginosa* infection, increased acute episodes, and mortality risk [12]. The rate of patients tested for pathogenic bacteria in sputum in this study was 53% (44/83), with a positive rate of 43.1% (19/44). Recent guidelines recommend routine sputum culture in all bronchiectasis patients [9], as failing to do so may underestimate the true rate of chronic bacterial colonization. Common bacteria isolated in this study were *Acinetobacter* (18.2%), *Haemophilus parainfluenza* (9%), *Burkholderia* (6.8%), *Pseudomonas aeruginosa* (6.8%). A study in Europe found *Pseudomonas aeruginosa* and *Haemophilus influenza* as commonly isolated bacteria [7]. Differences across regions may be due to different bacterial isolation methods in labs, environmental and climate conditions, and antibiotic use practices [10,13]. These differences reflect real changes in the lung microbiome, affecting disease progression and treatment response. The presence of *Pseudomonas aeruginosa* is associated with more severe clinical outcomes, lung function, more frequent acute episodes, and poorer quality of life [14]. CT scans are the gold standard for bronchiectasis, and in this study, CT was chosen as the definitive diagnostic method. In this study, bronchiectasis affected both lungs in 59% of cases and was cystic in 78.2%. In a study in South Korea, the cylindrical form was the most common type, accounting for 70.8%, and was also found in both lungs in 70% of cases. The most common cause of bronchiectasis in a European study was post-infection, accounting for 21.2%. Bronchiectasis due to previous tuberculosis is commonly seen in Eastern European, Central European, and Southern European countries, correlating with countries that have a high tuberculosis incidence, such as Moldova, Turkey, and Portugal. In Australia, bronchiectasis post-infection accounted for 28.1%, but post-tuberculosis accounted for only 1.8%. Research from an Asian country like India, which also has a high frequency of tuberculosis unlike the US and European countries, shows that bronchiectasis due to tuberculosis accounted for 50%. A systematic study showed that the frequency of bronchiectasis due to tuberculosis diagnosed by CT scan ranged from 35% to 86%. In this study, we categorized into two types: bronchiectasis in patients with a history of tuberculosis (51.8%) and without a history of tuberculosis (48.2%). Factors such as age, gender, smoking status, BMI index, hospital length, clinical symptoms, white blood cell count, eosinophil count, Hb, CRP, and lesion location in the lung lobes were compared between the post-tuberculosis and non-post-tuberculosis bronchiectasis groups, and the results showed that coughing up blood and upper lobe lesions were associated with the post-tuberculosis bronchiectasis group with p-values of 0.02 and 0.004, respectively. Coughing up blood, a severe symptom of the disease, was observed with a frequency of 42.4% in the tuberculosis bronchiectasis group and 30.3% in the non-tuberculosis group according to a study from India. In our study, the rates were 34.3% (11/32) and 8.1% (3/37) in the groups with and without a history of tuberculosis, respectively. The symptoms of post-tuberculosis bronchiectasis, especially coughing up blood, are not only caused by bronchiectasis but also by old tuberculosis lesions such as destruction, obstruction not caused by bronchiectasis, fibrosis, cavitation, and calcification. Upper lobe lesions are also more common in post-tuberculosis bronchiectasis than in oth-

er causes of bronchiectasis, because the tuberculosis bacteria often cause upper lobe damage and then cause bronchiectasis sequelae. The limitation of this topic is that it is a retrospective study, so many tests were not conducted, making it impossible to accurately determine the severity of the disease based on the bronchiectasis severity score, as well as to precisely identify the specific causes of bronchiectasis. A prospective study needs to be conducted in the future to address these challenges.

6. Conclusion

Bronchiectasis is increasingly encountered in clinical practice, and establishing guidelines as well as standards for examination and diagnosis is essential today. Despite many limitations, this study has provided us with a general view of hospitalized patients diagnosed with bronchiectasis at Nguyen Tri Phuong Hospital. The study highlights the importance of medical history, physical examination, and testing according to guidelines, which, if fully implemented, can give us a more accurate view of the characteristics and causes of bronchiectasis. This will help us improve treatment, leading to improved prognosis and a better understanding of the natural history of the disease.

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