

Original Research Article


# Radiological and pulmonary function test assessment in clinically stable bronchiectasis patients

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## Abstract

**Background:** Bronchiectasis is a disease in which patients spends morbid life having dyspnoea and productive, often foul-smelling sputum which produces social isolation and depressive states. The mortality rate in bronchiectasis patients 2, states the mortality rate of bronchiectasis in 12 years follow up period is 29.7% in the age group at 52 in 1years. 70% cause of death in bronchiectasis is due to respiratory tract infection leading to respiratory failure.

**Aim of the study:** To evaluate the Bronchial inflammatory response and its relationship to bacterial colonization through radiological evaluation.

**Materials and methods:** This study was done for a period of 7 months from February 2016 to August 2016 in the Department of Thoracic Medicine, Government Villupuram Medical College, Villupuram. The Bacterial flora from Lower Respiratory tract of Bronchiectasis patients who attended Thoracic Medicine Outpatient Department with diagnosis confirmed by a radiologist was studied. Bronchoalveolar lavage was done as an invasive procedure in 90 patients with bronchiectasis and from 6 patients admitted with chronic upper respiratory symptoms as laboratory control in Interleukin-8 estimation for all the patients radiological and pulmonary function test assessment done.

**Results:** Among the 90 patients in this study Cylindrical types were 53%, Cystic types were 35%, Varicose types were 4.4 %, Traction bronchiectasis were 3% and 3% were mixed types i.e. Cystic

plus cylindrical and Traction plus cylindrical. Spirometry pattern distribution showing Normal spirometer in 14% of patients, Obstructive pattern observed in 64% of patients, Restrictive pattern observed in 15% of patients and the mixed pattern was observed in 7% of patients.

**Conclusion:** Increased incidence of bronchiectasis in females (58%). Cylindrical bronchiectasis was the commonest type followed by Cystic bronchiectasis. Regarding etiology of Bronchiectasis, 42% of bronchiectasis was Idiopathic followed by post infectious 21%. The pulmonary function FEV1 < 70% was associated with microorganisms colonization of bronchiectasis airways.

## Key words

Radiological Assessment, Bronchiectasis, Pulmonary Function Test, Lung Disease Pattern.

## Introduction

Chronic bronchial sepsis has been used to describe the chronic bacterial infection of the impaired mucociliary action leads to microbial infection of the lower respiratory tract that leads to the release of inflammatory mediators [1]. Sepsis is the condition in which bacteremia occurs, whereas this is rare in bronchiectasis because of exuberant immune response confines the infections to the lung. In bronchiectasis, there is chronic inflammation in which lymphocytes predominate in the bronchial wall and Neutrophils in the lumen. As well as B Lymphocytes, plasma cells and CD4 T lymphocytes in the follicles, there is a well-developed cell-mediated immunity, with increased numbers of activated T lymphocytes, mainly of the suppressor/cytotoxic CD8 phenotype, antigen processing cells and macrophages [2]. A proportion of the CD8 cells express a marker for cytolytic potential. Mucus is poorly cleared from the bronchiectatic areas for several reasons [3]. There is pooling in the abnormally dilated airways; ciliated cells are lost when the epithelium is damaged and mucus is less elastic more viscous and forms a vicious cycle [4]. In bronchiectasis the subsegmental airways are permanently dilated, tortuous and partially or totally obstructed by copious amounts of secretion. Structural proteins are lost from the bronchial wall and there is a variable amount of fibrosis. [5].

## Materials and methods

This study was done for a period of 7 months from May 2016 to January 2017 in Rajiv Gandhi

Govt. General Hospital, Madras Medical College. Bronchiectasis patients who attended the Thoracic Medicine outpatient department with diagnosis confirmed by a radiologist were included.

### Inclusion criteria

- Bronchiectasis (non-cystic fibrosis) patients.
- Age >25 years.

### Exclusion criteria

- Patients with complications like Hemoptysis, Lung abscess and Amyloidosis.
- Patients with Cystic fibrosis.
- SPO2 <90% in room air.
- Patients with prior hospitalization within 2 months and had antibiotic within 4 weeks.
- Patients with cardiac illness and Recent Myocardial infection.
- Patients with Renal failure.

Forced Vital Capacity (FVC), Forced expiratory volume in 1 second (FEV1), the ratio of FEV1 to FVC (FEV1%) were recorded. Radiological and HRCT evaluation were done by standard scoring system.

### Statistical analysis

All the collected data were incorporated into Microsoft sheets, statistical analysis was done with the help of a professional statistician. Fischer exact p-value = < 0.05 was considered as high significant > 0.05 was considered as weak significant.

## Results

Among the 90 patients in this study population, 29% of patients were in the age group between 36-45 years, 16% were in between 56-65 years, 15% were in between 46-55 years and 10% were between 16-25 years: Females were 58% and males were 42%. Regarding personal habits 12% of patients were smokers, 7% were past smokers and 81% of patients were never smokers: 13% of patients were alcohol consumers and 5% were past alcohol consumers and 82% were not alcohol consumers.

**Table – 1:** Radiological types of bronchiectasis.

Bronchiectasis type	Frequency	%
Cylindrical	48	53.3
Cystic	32	35.6
Traction bronchiectasis	3	3.3
Varicose	4	4.4
Cystic & Cylindrical	2	2.2
Traction & Cylindrical	1	1.1
Total	90	100

**Table - 2:** Spirometry pattern distribution.

Spirometry pattern	Frequency	%
Normal	13	14.1%
Obstructive	58	64%
Restrictive	14	15%
Mixed	6	6.6%

**Table - 3:** Distribution of HRCT score.

HRCT Score	Frequency	%
< 33%	60	66.7
33-50%	22	24.4
> 50%	8	8.9
Total	90	100

Among the 90 patients in this study Cylindrical types were 53% Cystic types were 35%, Varicose types were 4.4%, Traction bronchiectases were 3% and 3% were mixed types i.e. Cystic plus cylindrical and Traction plus cylindrical (**Table – 1**).

Spirometry pattern distribution showing Normal spirometry in 14% of patients, Obstructive pattern observed in 64% of patients, Restrictive

pattern observed in 15% of patients and the mixed pattern was observed in 7% of patients. Out of 90 patients in this study 14% of patients had FEV1 > 80%, 11% of patients had FEV1 80-79%, 52% of patients had FEV1 50-69% and 15% of patients had FEV1 <50%; Normal spirometry in 14% of patients, Obstructive pattern observed in 64% of patients, Restrictive pattern observed in 15% of patients and mixed pattern was observed in 7% of patients (**Table – 2**).

Among the 90 patients in this study, 66% patients were presented with HRCT score <33%, 24% patients were presented with 34-50% and 8.9% patients were presented with above 50% (**Table – 3**).

## Discussion

Most of our patients were detected to be symptomatic in middle age. They often complained of productive cough and dyspnea at the initial evaluation. While eight cases were admitted because of the first-time hemoptysis, there was a history of hemoptysis in approximately one-third of the patients. Hemoptysis was established sometimes as the only reason for assessment and sometimes as a life-threatening complication. In 10 out of 19 cases with massive hemoptysis, bleeding could be controlled by either bronchial artery embolization or surgery [6]. Chronic respiratory failure is another important complication leading to increased morbidity and worsening of quality of life. In a study of 67 patients with more extended bronchiectasis, admitted to ICU because of acute respiratory failure, 25% of the cases had used LTOT previously. The mortality rate in 1 year was 40% and a previous history of LTOT was identified as a predictor for mortality [7]. Most of our patients were detected to be symptomatic in middle age. They often complained of productive cough and dyspnea at the initial evaluation. While eight cases were admitted because of the first-time hemoptysis, there was a history of hemoptysis in approximately one-third of the patients [8].

Hemoptysis was established sometimes as the only reason for assessment and sometimes as a life-threatening complication. In 10 out of 19 cases with massive hemoptysis, bleeding could be controlled by either bronchial artery embolization or surgery [9]. Chronic respiratory failure is another important complication leading to increased morbidity and worsening of quality of life. In a study of 67 patients with more extended bronchiectasis, admitted to ICU because of acute respiratory failure, 25% of the cases had used LTOT previously. The mortality rate in 1 year was 40% and a previous history of LTOT was identified as a predictor for mortality [10]. In our study including patients with less extended as well as advanced disease, CRF was present in 40 of our patients with the necessity of LTOT at home, and nearly half of them did not have a history of COPD or asthma. CRF was observed more in the cystic type of disease. Among the 90 patients, normal spirometry  $FEV_1 > 80\%$  was measured in 13 (14.4%) patients and in 53(59%) patients obstructive pattern ( $FEV_1 < 70\%$ ) and Restrictive pattern were observed in 14 patients (15%). The negative growths were observed in 18/21 of patients who had  $FEV_1 > 70\%$  (14% normal spirometry +5.5% mild obstructive pattern) [11]. Among the 69(77%) positive growths observed patients, patients with  $FEV_1 < 70\%$  were 67(74%) with moderate obstructive pattern 53(58%) and severe restrictive pattern 14(15%) - co-relating that microorganisms colonization in the airways of bronchiectasis lead to more tissue damage and poor pulmonary function [12]. Among the 90 study patients, the predominant radiological type of bronchiectasis was Cylindrical 48 patients (53%) Cystic 32 patients (36%) and Varicose type 4 cases (4.4%). Among 32 cystic types, 28 cystic bronchiectases were positive for PPM and Non-PPM growth [13]. In the Cylindrical type of bronchiectasis 16 patients against 48 cases were found to be No growths in BAL culture - co-relating that microorganisms colonization were more in Cystic and Varicose type [14].

## Conclusion

Our findings stated that bronchiectasis might be one of the ongoing important reasons of mortality and morbidity, with worsening quality of life in our region. The disorder is generally presented with recurrent productive cough, hemoptysis, dypnea, and persistent secretory bibasilar rales. It should be considered as co-morbidity in severe and complicated forms of asthma or COPD. Clinicians should be aware of the clinical and radiologic presentation of bronchiectasis for accurate diagnosis and appropriate multimodality treatment.

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