



Radio Diagnosis

EVALUATION OF BRONCHIECTASIS USING HIGH RESOLUTION COMPUTED TOMOGRAPHY AND ITS CORRELATION WITH PULMONARY FUNCTION TESTS.

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ABSTRACT The primary objective of this study is to evaluate the role of High-Resolution Computed tomography (HRCT) in the diagnosis of bronchiectasis, to evaluate the severity by using HRCT score, characterize the bronchiectasis morphologically, and study the relationship between HRCT scoring and pulmonary function tests. 50 patients diagnosed with bronchiectasis on HRCT were studied, bronchiectasis scored, morphologically characterized and pulmonary function tests were compared with HRCT score. The most common type of bronchiectasis was found to be cystic type accounting for 64%, followed by cylindrical and mixed (8% each). The severity of the lesion was found to have a significant negative correlation with respiratory function ($p < 0.006$).

KEYWORDS : Bronchiectasis, Pulmonary function tests, HRCT, Types of bronchiectasis, FEV.

INTRODUCTION:

Bronchiectasis is defined as irreversible and abnormal dilatation and distortion of bronchi with destruction of bronchial wall. Bronchiectasis was first described by Laennec in 1819. It is characterized by irreversible dilatation of the bronchi with chronic productive cough, airway obstruction and recurrent infections.

It can be categorized according to the radiographic or pathological appearance of airways as cylindrical or tubular bronchiectasis characterized by dilated airways alone and is sometimes seen as a residual effect of pneumonia, varicose bronchiectasis characterized by focal constrictive areas along the dilated airways that result from defects in the bronchial wall and saccular or cystic bronchiectasis characterized by progressive dilatation of the airways, which end in large cysts, saccules or grape-like clusters.

Computed Tomography (CT) is a fast, widely available imaging technique that provides a detailed view of the internal organs and structures. The consequent widespread use of computed tomography (CT) for evaluation of pulmonary diseases has revealed that mild and moderate forms of bronchiectasis are fairly common, even in patients without clinical or plain radiographic suspicion of bronchiectasis⁴. HRCT has largely eliminated the need for bronchography in the diagnosis of bronchiectasis.

Currently, high-resolution computed tomography (HRCT) is commonly used to grade severity and extent of bronchiectasis. The severity of airflow obstruction is related to extent of bronchiectatic segments as demonstrated on HRCT. Extensive bronchiectatic changes results in restrictive defect due to reduction in vital capacity, where as productive sputum causes obstructive impairment through mucosal impairment and sputum retention.

Pulmonary function tests are valuable investigations in treatment of patients with suspected or previously diagnosed respiratory disease. They aid in diagnosis; help monitor response to treatment and can guide decisions regarding further treatment and intervention. This study compares the relationship between HRCT scoring of bronchiectasis and pulmonary function tests.

OBJECTIVES:

1. To evaluate the role of HRCT in diagnosis of bronchiectasis
2. To assess the severity of bronchiectasis by HRCT score.
3. To characterize bronchiectasis morphologically.
4. To study the relationship between HRCT scoring of bronchiectasis with pulmonary function tests.

MATERIAL AND METHODS:

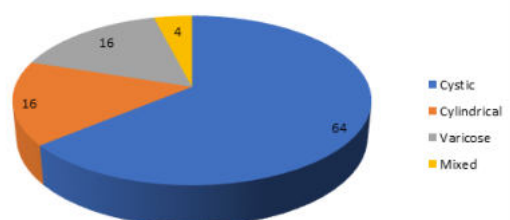
The study was conducted at the Department of Radiodiagnosis, Alluri Sitarama Raju Academy of Medical Sciences, West Godavari district, for duration of 12 Months (August 2018 to August 2019) Patients referred to the department for HRCT chest, diagnosed with bronchiectasis and gave consent to participate in study were subjected to pulmonary function tests. All HRCT scans were performed on the GE Revolution ACT 50 slice scanner at our hospital. A total of 50 subjects were included in this study.

RESULTS:

Majority of the subjects were of the age group 41-60 years. The most common type of bronchiectasis was cystic (64%) followed by cylindrical and mixed (8% each), varicose type was least common (4%). Correlation between severity of lesion with FEV1 (< 0.001), FVC (< 0.001) and FEV/FVC (0.04) was found to have a significant negative correlation. Similar significant negative correlation was found between bronchial wall thickening and respiratory function.

Table 1: Correlation between severity score of lesions with respiratory function

	Pearson's correlation coefficient(r)	Significance(p)
FEV1	-0.56	<0.001
FVC	-0.54	<0.001
FEV1/FVC	-0.29	0.04

Distribution of Types of Lesions**DISCUSSION:**

The objectives of the present study are to assess the severity of bronchiectasis by HRCT score, to characterize bronchiectasis morphologically and to study the relationship between HRCT scoring and pulmonary function tests.

A total of fifty subjects, referred for HRCT Thorax with clinically diagnosed bronchiectasis were included in the study. All the patients were subjected to Pulmonary Function Tests and HRCT Chest.

The lung function parameters and CT scores were documented and subjected for statistical analysis.

In the present study there was female preponderance. Bronchiectasis was found to affect individuals of any age. Age was not found to significantly impact the presentation, type and extent of the disease. One major feature being influenced by age was the location. It was documented that bronchiectasis secondary to childhood infections was found to have more predominance to lower lobes. All other age groups were found to have mixed predominance.

The most common symptom was a chronic productive cough which was present in 98% of patients. In over 65% of patients this symptom started in childhood with the most common time of onset being in the first decade of life. The only features of the clinical history which predicted the presence of bronchiectasis were the continual production of purulent sputum and childhood pertussis. Other features of the history which did not differentiate between those with or without bronchiectasis included: the duration of symptoms, the volume of sputum per day, hemoptysis and smoking history.

FEV1 was highest in varicose lesions followed by cylindrical and cystic types, FVC was highest in cylindrical lesions followed by varicose and cystic types whereas FEV1/FVC was highest in varicose lesions followed by cylindrical and cystic types.

Patients with moderate or severe bronchiectasis usually have reductions in the FEV1, FVC, and FEV1/FVC ratio, indicating a mixed obstructive-restrictive disorder. The decline in the FVC in patients with bronchiectasis, particularly cystic bronchiectasis, may be associated with a combination of lung scarring and atelectasis but may also be associated with irreversible hyperinflation, with an increase in residual volume.

Types of lesions on CT:

In the present study, the mean FEV1 was highest in subjects with cylindrical lesion (77.6), followed by varicose (72.5) and cystic (63.2). FVC was highest for subjects with cylindrical lesions (87.8) followed by varicose (83) and cystic (73).

Correlation between CT scoring and pulmonary function tests:

Bronchial Wall Thickening is one of the important CT signs in bronchiectasis. However, this is not specific to bronchiectasis and also seen in COPD and bronchial asthma. Bronchial wall thickening was found to have significant negative correlation with FEV1, FVC and FEV1/FVC. The strength of correlation was found to be moderate.

Mosaic attenuation:

Mosaic attenuation is the cardinal feature of bronchiolitis obliterans; in patients with bronchiectasis, mosaic attenuation has been suggested as the primary cause of airflow obstruction and air trapping. Mosaic attenuation was found to have very weak negative correlation with FEV1 and FEV1/FVC. There was very weak positive correlation with FVC. However, none of these correlations were statistically significant.

Variation of correlation with Gender:

No significant difference between the two genders with respect to correlation.

Correlation with Extent, severity and Global CT scoring:

The severity, extent and total score were all found to have significant negative correlation with all three parameters – FEV1, FVC and FEV1/FVC.

CONCLUSION:

1. Majority of the study subjects (59%) were female. Men comprised of the remaining 42% of the study population.
2. Majority of the study subjects belonged to age group 41-60 (52%). A smaller number of subjects (4%) were aged under 20.
3. Cough was a presenting complaint in majority of the study subjects (78%). Hemoptysis was a presenting complaint in 14% of the study subjects.
4. Bilateral lung involvement was seen in 54% of the subjects.

5. The most common type was cystic (64%), followed by cylindrical and mixed (8% each). Varicose lesions were least common (4%).
6. Bronchial Wall Thickening, Severity and Extent of lesion were found to have significant negative correlation with FEV1, FVC and FEV1/FVC.

REFERENCES:

1. Baydarian M, Walter RN. Bronchiectasis: introduction, etiology, and clinical features Disease-a-month. 2008 Aug 1;54(8):516-26.
2. Barker AF. Bronchiectasis. New England Journal of Medicine. 2002 May 2;346(18):1383-93.
3. Kwak HJ, Moon JY, Choi YW, Kim TH, Sohn JW, Yoon HJ, Shin DH, Park SS, Kim SH. High prevalence of bronchiectasis in adults: analysis of CT findings in a health screening program. The Tohoku journal of experimental medicine. 2010;222(4):237-42.
4. Rajasekharan S, Bhanusree R, Vallinayagi V, Gopal V, Nirmaladevi S. Value of high resolution computed tomography in diagnosis and assessment of bronchiectasis. Tuberculosis. 1997;14:28.
5. Lee JH, Kim YK, Kwag HJ, Chang JH. Relationships between high-resolution computed tomography, lung function and bacteriology in stable bronchiectasis. Journal of Korean Medical Science. 2004 Feb 1;19(1):62-8.
6. Ibrahim RM, Rizk A, Yossef A, Abdelrahman S. Correlation between a proposed MDCT severity score of bronchiectasis and pulmonary function tests. The Egyptian Journal of Radiology and Nuclear Medicine. 2016 Jun 1;47(2):313-20.
7. Ranu H, Wilde M, Madden B. Pulmonary function tests. The Ulster medical journal. 2011 May;80(2):84.
8. Textbook of Radiology and Imaging by David Sutton. Volume 1, Seventh Edition.
9. High Resolution CT of Lung, W. Richard Webb, Nestor L. Muller, David P. Naidich, Fifth Edition.
10. Robins and Cotran Review of Pathology, Fourth Edition.
11. Grainger and Allison's Diagnostic Radiology, Sixth Edition
12. Rifai D, Hadid W, Rodgers DE, Sadikot RT. Bronchiectasis: A Correlation Between Chest CT Scan Findings and Pulmonary Function Test. Chest. 2010 Oct 1;138(4):506A.
13. Ibrahim RM, Elnekeidy A, Rizk A, Yossef A, Abdelrahman S. Correlation between a proposed MDCT severity score of bronchiectasis and pulmonary function tests. The Egyptian Journal of Radiology and Nuclear Medicine. 2016 Jun 1;47(2):413-20.
14. Habesoglu MA, Tercan F, Ozkan U, Fusun EO. Effect of radiological extent and severity of bronchiectasis on pulmonary function. Multidisciplinary respiratory medicine. 2011 Dec 1;6(5):284.
15. Habesoglu MA, Ugurlu AO, Eyuboglu FO. Clinical, radiologic, and functional evaluation of 304 patients with bronchiectasis. Annals of Thoracic Medicine. 2011 Jul;6(3):131.