ADDIS ABABA UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF RADIOLOGY

ASSESSMENT OF THE DISTRIBUTION AND THE MORPHOLOGIC PATTERNS OF BRONCHIECTASIS ON COMPUTED TOMOGRAPHY AT TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA UNIVERSITY, ADDIS ABABA, ETHIOPIA

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ABBREVIATIONS

AAU- Addis Ababa University

ABPA- Allergic Broncho pulmonary Aspergilosis

BLH—Black Lion Hospital

BR –bronchiectasis

CT-Computed Tomography

DC –data collector

HRCT-High Resolution Computed Tomography

NTM –non tuberculous mycobacteria

MDR –Multi Drug resistance

PI- principal investigator

PFT- pulmonary function test

TB –Tuberculosis

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ABSTRACT

Title: assessment of the distribution and the morphologic patterns of bronchiectasis on computed tomography at Tikur Anbessa specialized hospital, Addis Ababa University.

Objective: is to assess the distribution and the morphologic patterns of bronchiectasis on computed tomography at Tikur Anbessa specialized hospital, Addis Ababa University.

Methods: Hospital based Retrospective Descriptive study design was conducted by reviewing the request format and the CT scan images of the patients sent for interpretation Chest CT at department of radiology, Tikur Anbessa specialized hospital, Addis Ababa University from Month of December 2010 E.C to month of November 2011 E.C. It was accomplished by filling of the prepared questioner format. The data was analyzed manually and by using SPSS software.

1. INTRODUCTION

1.1 Back ground

Bronchiectasis is permanent irreversible dilatation of the airways and occurs in a variety of pathologic processes. Recurrent infection and inflammation and the resulting chemical and cellular cascade lead to permanent architectural changes in the airways. Bronchiectasis can confer substantial potential morbidity, usually secondary to recurrent infection. In severe cases of bronchiectasis, massive hemoptysis can lead to death (5).

1.2 Statement of the problem

CT is the imaging method of choice after standard chest radiography for examining patients with suspected bronchiectasis. In most institutions throughout the world, CT has largely eliminated the need for bronchography in the diagnosis of bronchiectasis (4).

Bronchiectasis represents both an important potential cause of morbidity (usually associated with recurrent infection and related complications) and a valuable indicator of underlying pulmonary disease.(5) The majority of deaths were related to respiratory infection, with higher mortality rates associated with increasing age and number of lobes affected.(5) The pattern and distribution of abnormalities revealed by high-resolution CT in patients with bronchiectasis are influenced by the underlying cause (2).

Although bronchi most often appear thick walled, bronchiectasis can result in thin-walled lesions that can superficially mimic other cystic abnormalities, including emphysema. Cystic metastases also can mimic the appearance of bronchiectasis (4).

Multiple studies have revealed that computed tomography (CT) findings such as bronchiectasis, mucous plugging, and airway wall thickening could predict deterioration in patients more reliably than the traditional method of follow-up pulmonary function tests(5).

In addition, bronchiectasis is one of the most common causes of massive hemoptysis, which is associated with substantial morbidity and mortality if not urgently recognized and managed (5).

Moreover, in Ethiopia despite the increased burden of pulmonary infections like pulmonary tuberculous infection as well its associated complications, the imaging pattern of different pulmonary disorders is not well studied.

1.3 Literature Review

The incidence of Bronchiectasis has declined owing to vaccination against viral illnesses, and pertussis and effective, early treatment of bacterial pneumonia and tuberculosis. It remains an important cause of chronic suppurative pulmonary disease in developing countries (15).

Bronchiectasis is usually classified morphologically, in relation to its appearance on CT or pathology, as cylindrical, varicose, or cystic (saccular).
Generally, this classification correlates with the degree of bronchial abnormality and a reduction in bronchial divisions, but other factors are generally more important in predicting abnormalities in lung function and symptoms (29).

Imaging plays a crucial role in the diagnosis and monitoring of bronchiectasis and the management of complications. Chest radiography is useful as an initial screening tool and during acute exacerbations, but has limited sensitivity and specificity. High-resolution computed tomography (HRCT) is the reference standard for diagnosis and quantification of bronchiectasis, providing detailed morphological information. (9).

Both tuberculosis and bronchiectasis carry a significant burden worldwide in terms of morbidity and mortality, as well as financial, especially in the developing world. The global prevalence of bronchiectasis, a recognized sequel of tuberculosis, is unknown, but is by no means insignificant. The pathophysiology of chronic airflow obstruction in both of these diseases is poorly understood, but it is associated with an accelerated rate of loss in pulmonary function.(17)

According to a study done in cukurova University Research Hospital in Turkey, 2001 23 children (13 boys (57%) and 10 girls (43%), with a mean age of 8.45_4.02 years) were evaluated and Infection was the major cause of BR in that region. In 8 patients, BR developed after tuberculosis
Or pneumonia, was associated with immune deficiency syndromes in 4 children, and with Asthma in 4. Cystic fibrosis was diagnosed in 4 cases and ciliary dyskinesia in 3. In 10 patients, only one lobe was involved. Bronchiectatic lesions were most commonly found in the left lower lobe and were observed in 7 patients. Multilobar involvement was found in 13 patients. and they concluded their results suggest that BR is still a problem in their region (11)

Reiff et al. AJR:165, carried out a study to determine whether the pattern and distribution of bronchiectasis shown on CT scans can be used to discriminate between idiopathic cases and those with an identifiable cause and found that no significant lobar predominance was seen in any of the known-cause groups, apart from a higher frequency of lower lobe involvement in the patients with syndromes of impaired mucociliary clearance .The bronchiectasis of allergic Broncho pulmonary aspergillosis and adult cystic fibrosis was more often widespread than idiopathic bronchiectasis. Central bronchiectasis was more common in allergic Broncho pulmonary aspergillosis. In all groups, cylindrical bronchiectasis was the most common type, with varicose and cystic bronchiectasis occurring more frequently in allergic Broncho pulmonary aspergillosis. (1).

Also Cartier et al. carried out retrospective study on 82 consecutive patients to determine whether various causes of bronchiectasis can be differentiated by the pattern and distribution of abnormalities seen on high resolution CT and On average, a correct diagnosis was made in 19 (68%) of 28 cases Of cystic fibrosis, 16 (67%) of 24 cases of previous tuberculosis, six (43%) of 14 cases of previous Childhood infection, five (56%) of nine cases of allergic Broncho pulmonary aspergillosis, and four (57%) of seven cases of other causes of bronchiectasis were found and concluded that the pattern and distribution of abnormalities revealed by high-resolution CT in patients with bronchiectasis are influenced by the underlying cause. Bilateral, predominantly upper lobe, bronchiectasis is seen most commonly in patients with cystic fibrosis and allergic Broncho pulmonary aspergillosis, unilateral upper lobe predominance in patients with tuberculosis, and lower lobe predominance in patients after childhood viral infection.(2).

Ward et al. assessed CT images from 44 asthmatic patients with ABPA and 38 without and found much higher levels of bronchiectasis, Centrilobular nodules and mucous impaction in ABPA.
They concluded that randomly distributed predominantly central moderate-to-severe bronchiectasis affecting three or more lobes, bronchial wall thickening and Centrilobular nodules in asthmatics is highly Suggestive of ABPA(7).

Primack et al. carried out a study to compare CT findings of Pulmonary tuberculosis and Mycobacterium avium-intracellulare and Bronchiectasis was more common in NTM infection, being seen in up to 94% of patients with Mycobacterium avium complex and 27% of patients with M. tuberculosis.(8).

Lynch et aI. evaluated the relationships between the extent and severity of bronchiectasis on CT and clinical symptoms, Spiro metric abnormality and sputum characteristics and his study revealed Cystic bronchiectasis was associated with sputum purulence and with the growth of Pseudomonas therefore, CT classification of the type of bronchiectasis may be useful as an index of severity of disease (10).

Wickremasinghe, Ozerovitch, Davies, et al perform prospective study of 100 patients with bronchiectasis evaluate the prevalence of NTM in patients with bronchiectasis and the result shows the prevalence of NTM in this population of patients with bronchiectasis was 2%.and also Mycobacterium avium complex (MAC) species predominated in patients with bronchiectasis compared with non-bronchiectasis lung disease (12).

In one systematic review done in china, Hospital of Zhengzhou University, Zhengzhou, which aimed to determine the etiological spectrum of bronchiectasis, and how often etiological assessment could lead to the changes in patients' management, showed that Of known aetiologies, post-infective was the most frequent (29.9%), of which post-tuberculosis was the predominant category, which contrasted to the etiologic spectra in children where bacterial and viral pneumonia were the main cause. (20)

Guan W-j, Gao Y-h, Xu G, Lin Z-y, Tang Y, et al. (2014) conducted crosectional study for Characterization of Lung Function Impairment in Adults with Bronchiectasis and concluded that Significant lung function impairment should raise alert of chest HRCT abnormality and sputum culture positive for Pseudomonas aeruginosa, in patients with predominantly mild to moderate steady-state bronchiectasis. Acute exacerbations elicited reductions in FVC and FEV1. Changes of other spirometric parameters were less significant during exacerbations.(19)

In patients with bronchiectasis, the extent of bronchiectasis, the presence of bronchial wall thickening, and associated small airway abnormalities, such as mosaic perfusion, are associated with exacerbation frequency, symptoms such as sputum volume, and airflow obstruction on PFTs (30).Using multivariate analysis, bronchial wall thickening was found to be a significant determinant of airflow obstruction, whereas small airway abnormalities were associated with sputum volume.

Panda, *et al*. In another crosectional study performed in India which aimed to study the correlation between dyspnea, radiological findings, and pulmonary function tests (PFTs) in patients with sequelae of pulmonary tuberculosis (TB), revealed that PFTs were impaired in 78/101 (77.2%) patients. Restrictive defect was most common in 39.6% followed by mixed in 34.7% and concluded that Both fibrosis and bronchiectasis correlated with dyspnea and with PFT. However, this correlation was not linear. The overall extent of radiological abnormalities correlated only with dyspnea but not with PFT.(18)

Study done in Egypt .Youssriah Y. Sabri et al which aimed to highlight the role of multi-slice computed tomography (MSCT) and high resolution computed tomography (HRCT) of the chest in the detection of pulmonary bronchiectatic lesions and to display the approach used in determining the proper etiological diagnosis. According to the study Pulmonary bronchiectatic lesions were classified

according to bronchiectasis distribution; with bilateral lesions were more common in 62.5% of patients, classification according to morphological type with the cylindrical bronchiectasis was the most common shape in 37.5% of case, classification according to bronchiectasis etiology, most of cases were post inflammatory in 42.2% of cases, followed by traction bronchiectasis in 34.4% of cases and concluded that MDCT imaging in diagnosis and evaluation of bronchiectasis is crucial.(23)

1.4 Significance of the study

This study will serve as a baseline data for large scale study using more comprehensive study design. Therefore, I hope this study will provide plenty of relevant information about the distribution and morphologic patterns of bronchiectasis on thin section CT and narrow the differential diagnosis for common specific causes of bronchiectasis observed on CT in BLH.

2. OBJECTIVE

2.1 General objective

- To assess the distribution and morphologic pattern of bronchiectasis as seen on thin slice computed tomography at black lion specialized Hospital.

2.2 specific objectives

- To describe the frequent zonal/lobar distribution pattern of bronchiectasis as seen on thin slice computed tomography at black lion specialized Hospital.

- To describe morphologic pattern of bronchiectasis as seen on thin slice computed tomography at black lion specialized Hospital.

- To assess the common possible causes of bronchiectasis and also to assess relationship of morphology and distribution of bronchiectasis with common possible identified causes of bronchiectasis in our hospital.

- To assess the common associated lung parenchymal abnormalities in bronchiectasis.

3. METHODOLOGY

3.1 Study Design

A Hospital based Retrospective Descriptive study design was conducted.

3.2 Study Period

The study was conducted from the data collected starting from December 2010 E.C to November 2011 E.C.

3.3 Study Area

This study was conducted at the chest and cardiovascular sub unit in the department of Radiology and Diagnostic imaging at Addis Ababa University

(AAU), Addis Ababa Ethiopia. The hospital which is included in the study is Black Lion Specialized Hospital.

Black lion Specialized hospital is a the largest general public referral and oncologic referral hospital found in the capital city of Ethiopia, Addis Ababa, near to Ethio –Cuba Friend ship Memorial park and monument ,Churchill Avenue Addis Ababa and provides under graduate ,post graduate and fellowship program in medical teaching and versatile clinical services in different units of the hospital and affiliation sites.

3.4 Study Population

The study population consisted of Patients in whom the CT scan identification of bronchiectasis was done and patients who come to radiological chest unit with clinical suspicion or diagnosis of bronchiectasis during the study period stated.

3.4.1 Inclusion and Exclusion criteria

Inclusion criteria:

- Patients who underwent chest CT scanning and patients having radiological diagnosis of bronchiectasis on chest CT scan after visual inspection of acquired CT images.
- CT performed because of clinical history suggestive of bronchiectasis.

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Exclusion criteria:

- Those Subjects having CT scan images without CT scan feature of bronchiectasis.
- Subjects with incomplete (unverified) CT scan report
- Subjects with lost chart.

Sampling Unit

All patients with radiological diagnosis of bronchiectasis and complete CT scan report and complete information from the chart record.

3.5 Data Collection Method

CT scan images of 156 patients were reviewed to determine CT scan distribution and morphologic patterns of bronchiectasis. The medical chart records and the i – care data system were reviewed for epidemiological and clinical profile.

3.6 Data Processing and Analysis

Data was checked for completeness, cleaned, coded and the collected data was entered and analyzed by using SPSS version 20.0 statistical software packages by the principal investigator.

3.7 Ethical considerations

Ethical clearance was obtained from the research and ethics committee of department of radiology Addis Ababa university school of medicine and Health science to secure a written permission from the patient card recording room. Efforts was made to maintain the confidentiality of the data.

3.8 Dissemination and Utilization of Results

The final result of the research will be submitted to the research and ethics committee of department of radiology and Addis Ababa university school of medicine and Health science.

3.9 Operational Definitions

- Duration of respiratory symptom (like cough hemoptysis, wheeze):

Acute- less than 07 days

Subacute – 7 days to 02 weeks

Chronic – more than 02 weeks

None – symptoms not belonging to respiratory system

- .Severity of bronchiectasis

Mild - luminal diameter slightly greater than that of adjacent blood vessel.

Moderate - luminal diameter 2–3 times that of adjacent blood vessel.

Severe - luminal diameter > or = 3 times that of adjacent blood vessel.

- Regarding the extent of bronchiectasis (REIFF ET AL.)

Diffuse or widespread bronchiectasis – means if five or six lobes involved

-Regarding Severity of Peribronchial wall thickening.

Mild -wall thickness equal to diameter of adjacent vessel.

Moderate -wall thickness greater than and up to twice the diameter of adjacent vessel.

Severe -wall thickness >2 times the diameter of adjacent vessel.

-Regarding predominant morphologic types (Milliron et al) and according to the Reid classification (34).

Cylindrical bronchiectasis -smooth tubular contour of the bronchial wall with lack of tapering

Varicoid bronchiectasis -undulating irregular contour of the bronchial wall

Cystic bronchiectasis - saccular dilatation of the bronchial airways.

Mixed bronchiectasis – two types are equally prevalent (Reiff et al).

Traction bronchiectasis - dilatation of the bronchial airways in association with areas of the lung with severe fibrosis/architectural distortion (28).

Lingular lobe – considered as separate lobe as right middle lobe equivalent (Cartier et al.).

-Regarding site of bronchiectasis (REIFF ET AL.)

Central bronchiectasis – medial to the midpoint between the hilum and lateral chest wall.

Peripheral bronchiectasis - lateral to the midpoint between the hilum and lateral chest wall.

Mixed bronchiectasis – cases that could not be termed unequivocally central or peripheral.

-**Regarding zonal distribution:** Each zone corresponded to approximately one third of the Scans starting from the lung apices to 1 cm below the dome of the diaphragm (Cartier et al.).

4. RESULT

A total of 156 cases were reviewed. The mean age was 44 with standard deviation of 17. Male accounted for 49.4% and female accounted for 50.6%.

Majority had chronic respiratory symptom at presentation (84%), with 6.9% and 9.2% presenting as acute and subacute course, respectively.

In this retrospective study possible risk factors identified for bronchiectasis were immune suppressing conditions (in our study specifically implying retroviral infection) was present in 19%, recurrent childhood respiratory infections like

measles, pertussis etc was documented on the chart in 5.1%, and risk factors of aspiration like underlying esophageal cancer which was commonest finding in this particular study was present in 8.3%. Previous history of treatment for pulmonary tuberculosis was present in 52.6%, which was the most common possible underlying cause.

Table1. frequency distribution of the variables			
		Frequency	Percent
Sex	M	77	49.4
	F	79	50.6
Duration of respiratory symptoms	Acute	9	6.9
	Sub-acute	12	9.2
	Chronic	110	84
Immunity status	Competent(non-reactive)	124	81
	Compromised(seroreactive)	29	19
Childhood illness	Yes	8	5.1
	No	147	94.2
Aspiration risk	Yes	13	8.3
	No	143	91.7
Bronchiectasis suspect	Yes	30	19.5
	No	124	80.5
Previous history Of TB treatment	Yes	82	52.6
	No	72	46.2

Although more than one basic morphologic subtypes of bronchiectasis were identified per one case, the predominant morphologic pattern of bronchiectasis was cystic (29.7%), cylindrical (29%), and varicoid (27.7%). Traction and mixed bronchiectasis accounted for 6.5% and 7.1% of the cases respectively.

Regarding the predominant zonal /lobar distribution of bronchiectasis revealed by sagittal and coronal reformatted CT scan images in our patients we found that the predominantly involved lobe was upper lobe in 31.4%, middle lobe 27.6%, and lower lobe in 30.1%. The rest of 10.6% cases had diffuse (extensive) bronchiectasis with no particular lobar predilection for any lobe or lung zone.

Most of the cases had moderate degree of bronchial dilatation/bronchiectasis (41.3%), and mild and severe degree of bronchiectasis among 29% and 29.7%, respectively.

Based on the spatial apico-basal gradient within the predominantly involved site of bronchiectasis in axial distribution, 53.2% were predominantly basal in distribution, 34% were predominantly apical, and the 12.8% had diffuse apico-basal involvement.

Table2. frequency distribution of variables based on distribution and severity			
		Frequency	Percent
Predominant Morphology	Cystic	46	29.7
	Cylindrical	45	29
	Varicoid	43	27.7
	Traction	10	6.5
	Mixed	11	7.1
Lobar distribution	Upper	49	31.4
	Middle	43	27.6
	Lower	47	30.1

	Diffuse	16	10.6
Severity	Mild	45	29
	Moderate	64	41.3
	Severe	46	29.7
Apico-basal	Apical	53	34
	Basal	83	53.2
	Diffuse	20	12.8
Symmetry	Unilateral	99	63.5
	Bilateral	57	36.5
Extent	Focal	134	85.9
	Diffuse	21	14.1

Based on the extent of the disease that showed bronchiectasis on CT scans in our study, 85.9% of the bronchiectasis were focal, while the rest 14.1% were diffuse.

Regarding the symmetry of the bronchiectasis changes in this study our result showed that majority of the cases had unilateral bronchiectasis (63.5%) with the remaining 36.5% of cases being involving the bilateral lung.

Regarding additional associated parenchymal findings other than bronchiectasis, we found that peribronchial thickening was present in 91%, volume loss in 23.7%, fibrosis in 55.8%, consolidation in 10.3%, and collapse/atelectasis in 5.8% of the cases.

Variable		Frequency	Percent
Thickening	Yes	141	91
	No	14	9
Thickening-severity	Mild	73	51.4
	Moderate	49	34.5
	Severe	20	14.1
Volume loss	Yes	37	23.7
	No	119	76.3
Collapse	Yes	9	5.8
	No	147	94.2
Consolidation	Yes	16	10.3
	No	140	89.7
Fibrosis	Yes	87	55.8
	No	69	44.2
Mucus plug	Yes	24	15.9
	No		

The relative proportion of cystic bronchiectasis was almost comparable among cases with history of previous treatment for tuberculosis, the presence of

conditions causing immunosuppression(retroviral infection) , the presence of risk factors for recurrent aspiration and recurrent childhood respiratory infections .

The proportions of varicoid bronchiectasis was comparable among those patients with history of treatment for tuberculosis and among patients with predisposing conditions for immunosuppression (particularly retroviral infection in this study), while none of the patients with risk factors of aspiration and recurrent childhood respiratory infection history had varicoid bronchiectasis.

Cylindrical bronchiectasis was most commonly observed variable among cases with childhood respiratory illnesses and risk factors of aspiration, while the lowest proportion was observed among cases with previous treatment for tuberculosis.

Fig. Morphologic subtypes of bronchiectasis among different risk categories

In patients with previous history of treatment for pulmonary tuberculosis, the most commonly involved lobe was the upper lobe. Diffuse or other lobar involvement was as well common in these groups of patients.

The pattern of lobar involvement among patients who had retroviral infection closely resembled those with previous history of pulmonary tuberculosis treatment, except middle lobe involvement was relatively higher in those patients retroviral infection.

In patients who recalled history of recurrent childhood respiratory infections and who have risk factors of aspiration, the lower lobe was the most commonly involved lobe followed by middle lobe. Involvement of upper lobes was infrequent (<5%) and no patient had diffuse involvement of the lobes.

Fig. the Lobar distribution of bronchiectasis among different risk groups

Symmetry and apico-basal distribution

**risk factors of aspiration and recurrent childhood respiratory infections*

Fibrosis was the most common among patients with history of tuberculosis treatment (67.5%) followed by patients with predisposing conditions for immunosuppression like retroviral infection (51.7%), while it was lowest among cases with risk factors of aspiration and history of recurrent childhood respiratory infection (9.5%).

Among 156 patients with radiologically identified bronchiectasis on CT scan in this study and we found only 12 patients who underwent Spiro metric examination from their medical record chart and found 3 cases with normal Spirometric pattern with good session quality and 9 patients with abnormal pulmonary function (restrictive pattern (n=3), obstructive pattern and (n=4) and those with both mixed obstructive and restrictive pattern (n=2)).

We also found cases with specific final radiological impression of mounier Kuhn syndrome with tracheomegally (n=1), William Campbell syndrome (n=1), bilateral middle and lingular bronchiectasis with suspected MAC infection (n=3), ABPA (n=1), endobronchial mass with likely diagnosis of endobronchial carcinoid tumour (n= 2) and interstitial lung disease (n=6).

There were three cases of bronchiectasis one with suspicion of MDR TB (n=1) and the other two who were having treatment history for MDR TB (n=2).

Fig. Associated findings among different risk groups of bronchiectasis

4.1 DISCUSSION

Bronchiectasis is permanent irreversible dilatation of the bronchial airways and occurs in a variety of pathologic processes. Recurrent infection and inflammation and the resulting chemical and cellular cascade lead to permanent architectural changes in the airways (5).

In spite of the fact that, the incidence of bronchiectasis has significantly declined in the developed nations perhaps, owing to development of vaccination against child hood respiratory viral illnesses, and pertussis as well timely and effective early treatment of bacterial pneumonias and also due to successful national control tuberculosis infection. However; in developing countries, bronchiectasis still remains an important cause of chronic suppurative pulmonary disease (15) which leads to substantial potential physical and social morbidity, usually secondary to poor living standard and poor hygienic status leading to recurrent infections. Moreover; in severe cases of bronchiectasis, massive hemoptysis can lead to death (5).

To our knowledge there have been no studies done among adults with bronchiectasis in developing countries such as Ethiopia to assess the morphologic and distribution pattern of bronchiectasis as well to identify common possible causes on computed tomography scan. Therefore; in the current study we retrospectively reviewed the clinical and radiological data of 156 patients having the disease.

Bronchiectasis has wide variety of causes including several infections and genetic abnormalities as well causes of chronic airway inflammation such as allergic broncho pulmonary aspergilosis (2). Tuberculosis and AIDS are also common predisposing conditions especially in developing countries .Karakoc et al (14).

In our study we found that, the most common identified cause of bronchiectasis was previous history of pulmonary tuberculosis treatment, which was present in 52.6% of our patients with bronchiectasis. This result suggests that, bronchiectasis is one of the chronic sequelae of pulmonary tuberculosis with post infectious

bronchiectatic change resulting in significant long term morbidity and mortality, even though the patient might have been cured from the previous infection process. In study by Primack et.al (8), bronchiectasis was seen on high resolution CT in 27% of patients with pulmonary tuberculosis and predominantly involved the upper lobes. In our current study, an upper lung predominance was found in 38.6 % of patients with history of previous pulmonary TB treatment. In another study done by Cartier et al (2), the upper lung predominance was found to be 50% which is relatively higher than that is found our study may be attributed to our zonal classification each lung for descriptive purpose and consideration of the lingular segment as separate equivalent of the right middle lobe. When such zonal predominance was present the involvement is usually less extensive and more commonly unilateral than in other patients and this finding allows distinction of previous tuberculosis from other disease entities like ABPA Cartier et al (2).

Besides, the previous TB treatment mentioned above, an underlying primary or secondary immune deficiency syndrome particularly retroviral infection as we considered in current study was as well another common possible cause of bronchiectasis occurred in 19% of cases in this study. Immune suppression like retroviral infection is an established risk factor for the development of bronchiectasis due to predisposition for repeated lung infections.

Post infectious bronchiectasis is a frequent cause of lower-lung-predominant bronchiectasis. It is less seen today because of better control of tuberculosis, earlier treatment of pneumonia, and immunization. However, recurrent infections still remain a frequent cause of bronchiectasis in immune-suppressed patients .(Cantin et al(6)).

The most common predominant morphologic subtype has been reported to be cylindrical bronchiectasis ranging from 63% to 94% of all bronchiectasis. While varicoid subtype is the lowest, accounting for 11% of all bronchiectasis. In contrary, in our study varicoid subtype was the commonest predominant morphologic subtype accounting for 34.2% of the total. The relative proportions of cystic and cylindrical subtypes were comparable accounting for 29.7%, and 29% respectively.

The relative proportions are determined by the type of underlying cause and the severity of the bronchiectasis. Higher frequency of varicoid bronchiectasis in our study may indicate higher proportion of parenchymal lung infections with chronic sequele of scaring and fibrosis, such as pulmonary TB and the absence of cystic fibrosis in our setup. In addition, reports showing cystic bronchiectasis as the commonest morphologic types are done in setups where cystic fibrosis is commonly encountered.

Different concomitant findings are often present in addition to bronchiectasis. In our study, the most common concomitant finding was peribronchial thickening which was observed in 91% of the cases. 14.1% of the thickening was severe one, 34.5% were moderate, and the rest were mild thickening. It may be due to inflammation and edema, reactive hypertrophy of connective tissue element of the bronchial wall as a response to inflammatory process or peribronchial fibrosis. The presence of peribronchial thickening indicates the presence of the above mentioned factors and it has no great significance to serve as a clue to identify possible underlying causes of bronchial wall damage. However, the severity of peribronchial thickening has been reported to have strong inverse correlation with functional impairment as determined by FVC1, better than the severity of the bronchiectasis.

Fibrosis was observed in 55.8% of the cases. In the setting of bronchiectasis, it may be caused by the bronchiectasis itself as the repeated inflammation end up in scaring and fibrosis usually at a later stages. The presence of disproportionally higher degree of fibrosis in comparison to the degree of bronchiectasis may indicate chronic destructive and scaring parenchymal lung infections or interstitial lung disease as the possible underlying cause. Fibro broncho ectatic changes after post infectious insult usually tends to be unilateral or asymmetric distribution while fibro bronchiectatic changes due to systemic causes like in cases of interstitial lung diseases are usually tends to be relatively symmetric and bilateral.

There are many etiologies associated with bronchiectasis, but a specific underlying cause is found in <40% of patients. The utility of CT scan in identifying specific cause has been controversial. In a study done by REIFF et al (1).concluded that, although some HRCT features were more common in some etiological groups, the differences were not sufficient to be diagnostic. LEE et al.reinforced this

observation in a study of 108 bronchiectatic patients in whom the correct cause was identified on CT in only 45% of cases. A confident diagnosis was asserted in a minority (9%) and was correct in only 35%. Interobserver agreement in likely etiology was also poor (kappa 0.2).

However, Cartier et al. [2] reported accurate diagnoses on the basis of HRCT in 61% of 82 patients with bronchiectasis of known cause, with moderately good agreement (kappa 0.53). Confident and accurate diagnosis was made in 44% of patients (kappa 0.53). Accuracy was highest in CF (68%), previous tuberculosis (67%) and ABPA (56%). They concluded that the combination of radiological pattern and clinical profile of the patient would have improved the accuracy of the evaluation. However, the limitation of this study was it excluded bronchiectasis due to idiopathic causes which are in fact the majority groups responsible for (>60%) of the bronchiectasis.

Despite these controversies, some of the patterns are highly suggestive of underlying causes and can be very helpful in elucidating the underlying cause especially when they are combined with clinical presentations of the patient. Pulmonary Tb is characterized by unilateral upper lobe predominant bronchiectasis with fibrosis. Upper zone and central predominance, in particular when associated with high attention mucus plug is highly suggestive of ABPA. An apical predominant bronchiectasis with predilection for right middle lobe and lingual with tree in bud opacity and surrounding nodules, patchy ground glass consolidations may suggest NTM infections. Bibasilar bronchiectasis is usually a feature of bronchiectasis due to recurrent infections, aspiration, and idiopathic causes. Fibrotic lung conditions often produce architectural distortion and traction/ varicoid bronchiectasis. Associated additional findings may suggest a clue. A bilateral upper zone predominant fibrosis with traction bronchiectasis and nodular infiltrates in peri -lymphatic distribution with bilateral hilar and mediastinal lymphadenopathy suggest end stage Sarcoidosis. Fibrosis with architectural distortion and bibasilar and peripheral predominant bronchiectasis associated with variable degree of ground glass opacity, reticular opacity, and honey combing may suggest IPF or NSIP. Asymmetric and usually unilateral bronchiectasis with fibrosis suggest sequelae of parenchymal infectious process.

In our study, the frequency of traction/varicoid bronchiectasis was high, most had unilateral bronchiectasis (63.5%), and most had concomitant fibrosis (55.8%). This pattern suggests that parenchymal lung infections are probably the commonest cause of bronchiectasis in our setup. A unilateral and upper lobe predominant bronchiectasis with fibrosis was most encountered in patients with history of treatment for tuberculosis, further indicating post tuberculosis complications may be the commonest cause of bronchiectasis in our setup. we observed that the pattern of bronchiectasis in patients with aspiration and recurrent childhood infection was characterized by lower lobe predominance, much lower frequency of concomitant fibrosis. Consolidation and mucus plug were observed more frequently in patients with immunosuppression, otherwise no other pattern was particularly related with this condition. In general we observed that no single finding was specifically associated with any condition to the extent that it will serve as diagnostic clue, rather combinations of findings creating patterns may help in elucidating the underlying cause. This strengthens the report of other studies which suggested addition of clinical features to these patterns may improve diagnostic accuracy CT in determining the specific causes.

4.3 CONCLUSIONS

- Previous tuberculosis is the most common cause of bronchiectasis
- Varicoid/traction bronchiectasis is the most common morphologic subtype, and cystic and cylindrical bronchiectasis were as well common subtypes
- Most of the bronchiectasis were unilateral
- Patterns are not highly specific for a single cause, but unilateral, upper lobe predominant, varicoid bronchiectasis with fibrosis was most commonly observed in patients with history of previous tuberculosis. Lower lobe predominant bronchiectasis, with much lower frequency of fibrosis was observed in patients with aspiration and recurrent childhood infections. The

morphologic subtypes, lobar predominance, symmetry, and presence of fibrosis had no peculiar pattern in patients with immunosuppression, but consolidation and mucus plug was observed more frequently in this group.

LIMITATIONS:

Lost patient charts

Poor chart recording of patient data

Incomplete recording of patient data on the newly started I care system

Lack of proper radiological report

Insufficient other ancillary diagnostic tools like bacteriologic study and Spirometric exam

The Short duration of study as well the methodology of the study

Poor chart keeping and short and incomplete patient history was encountered

Some patients clinical suspicion of bronchiectasis were not having chest CT

RECOMMENDATIONS:

Patients' medical records should be kept well with full clinical information

Further institutional based prospective research is recommended by experienced radiologists in chest imaging.

Complete recording of patient data both on the chart and I care system

Further Large scale studies with longer duration and with multidisciplinary team especially with internal medicine department involvement is recommended

The chest sub unit in the department of radiology should clearly set operational definitions for assessment of morphologic and distribution patterns of bronchiectasis since there is no clearly set standard.

Further future population based studies are recommended to know the burden of bronchiectasis in our country.

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QUESTIONER

This questionnaire is prepared to be filled by reviewing the charts of the patients requested for chest CT and those who have bronchial dilatation during the interpretations of their chest CT.

1. Epidemiological information

1. Age 2.***Sex***

2. Duration of symptoms (cough, hemoptysis and others)

1. Acute 2.sub acute 3 .chronic 4. None

3. Immune status of the patient

1. Immunocompitent

2. immunocompromised (like HIV positives)

4. Any known history of childhood illness (i.e. history of childhood pulmonary infection like Measles, Pertussis, Adenovirus).

1. Yes 2. No

5. Any predisposition/risk for repeated aspiration (like seizure, coma, GERD, esophageal ca..etc)

1. Yes 2. No

6. Clinical diagnosis/suspicion of bronchiectasis

1. Yes 2. No

7. Previous history of TB Treatment

1. Yes 2. No

8. Predominant morphologic types of bronchiectasis

1. Cystic 2. Cylindrical 3. Varicoid 4. Traction 5 mixed

9. Predominant Lobar Distribution

1. Upper lobe 2.middle lobe / lingular 3. Lower lobe 4. Diffuse

10. Severity of bronchiectasis

1. Mild - (luminal diameter slightly greater than that of adjacent blood vessel).

2. Moderate - (luminal diameter 2–3 times that of adjacent blood vessel).

3. Severe - (luminal diameter > 3 times that of adjacent blood vessel).

11. The predominant Apicobasal distribution of bronchiectasis

1. Apical 2. Basal 3. Diffuse

12. The extent of bronchiectasis

1. Focal 2. Diffuse (if five or six lobes involved)

13. If there is evidence of diffuse bronchiectasis cross sectional (axial) distribution

1. Central 2. Peripheral 3. Mixed

14. Crosectional Symmetry of bronchiectasis

1. Unilateral 2. Bilateral

15. Presence of Peribronchial thickening

1. Yes 2. No

16. If yes for question number 11, how much is the Severity?

1. Mild (wall thickness equal to diameter of adjacent vessel)

2. Moderate (wall thickness greater than and up to twice the diameter of adjacent vessel)

3. Severe (wall thickness >2 times the diameter of adjacent vessel)

17. Other associated parenchymal and air way findings

1. Mucous plugging 2. Peribronchial consolidation 3.Lobar collapse and atelectasis

4. Emphysema 5. Air trapping 6. Fibrosis 7. Volume loss

8. Tracheomegally 9. Others …

18. Pattern of pulmonary function test recorded on the chart (if it is done).

- Normal 2. Restrictive 3. Obstructive 4. Mixed obstructive /restrictive 5. N/A

19. Final radiological impression/explanation…….

20. Final Clinical diagnosis /impression ……..