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Original Article

Emphasizing the role of multi-detector computed tomography chest in the etiological diagnosis of pulmonary bronchiectasis

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ABSTRACT

In this study we 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.

Patients and methods: This study involved 62 patients; 36 females and 26 males, were referred to the radiology department for MSCT of the chest from the pulmonary department in the period from October 2016 – April 2017.

Results: 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. Then the diagnostic approach to reach different etiologies was displayed.

Conclusion: The role of MDCT imaging in diagnosis and evaluation of bronchiectasis is crucial.

1. Introduction

Bronchiectasis is a permanent irreversible dilatation of the airways [1]. Permanent architectural changes in the airways causing bronchial dilatation attributed to many etiologies mainly resulting from the recurrent infection and inflammation [2].

Clinical diagnosis of bronchiectasis is based on a history of daily viscid excessive sputum production, so it is frequently misdiagnosed as asthma or chronic obstructive pulmonary disease (COPD) due to the similarities in clinical findings [2].

It can cause potential morbidity secondary to recurrent infections and in severe cases, death could occur from massive hemoptysis [3]. Characteristic computed tomography (CT) scan findings is the main differentiating factor [2].

Multi detector row computed tomography (MDCT) especially volumetric high resolution computed tomography (HRCT) provides enhanced quality of multi-planar reconstructed images in axial, coronal and sagittal planes with minimum intensity projection reconstructed images as well, is the most sensitive imaging modality for the detection and diagnosis of bronchiectasis [4]. HRCT findings in bronchiectasis include bronchial wall thickening with dilatation of the bronchi to a diameter greater than that of the accompanying artery (the signet-ring sign); lack of normal tapering of bronchi; and visualization of airway in the outer 1–2 cm of the lung [2].

Bronchiectasis can result from a variety of pathological conditions. Both congenital and acquired conditions can cause bronchiectasis. Acquired causes are more common, such as infection, pulmonary fibrosis, recurrent or chronic aspiration, stenosis or obstruction of airways by neoplasm, granulomatous disease, broncholithiasis, and asthma. Congenital conditions that cause bronchiactasis include, cystic fibrosis, and cartilage development disorders [5,6]. Bronchiectasis could be a part of numerous multi-systemic diseases, such as cystic fibrosis (CF), immunodeficiencies, alpha 1-antitrypsin deficiency, primary ciliary dyskinesia (PCD), rheumatoid arthritis and inflammatory bowel diseases, especially ulcerative colitis [2].

It is beneficial to identify the cause as it aids in management decision, reduce the exacerbations and alter the course of the disease by preserving lung function [2].

In this study, we aimed to confirm the role of multi-slice computed tomography (MSCT) of the chest in the detection of pulmonary bronchiectatic lesions and to discuss the appropriate approach to its most possible etiology.

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Table 1
Number and percentages of lobar distribution of the right, left and bilateral lung bronchiectasis in a single lobe, multiple lobes and diffuse bronchiectasis.

Lobar affection	Right lung only Number (N.) and Percentage/17 cases	Left lung only Number (N.) and Percentage/7 cases	Bilateral Number (N.) and Percentage/40 cases
Upper lobe	5 (29.4%)	4 (57.1%)	8 (20%)
Middle lobe/lingula	2 (11.7%)	1(14.2%)	2 (5%)
Lower lobe	8 (47%)	2 (28.5%)	12 (30%)
Diffuse	1 (5.8%)		9 (22.5%)
Middle and lower lobes	1 (5.8%)		3 (7.5%)
Upper and mid zone[a]			1 (2.5%)
Upper and lower lobes			5 (12.5%)

[a] Mid zone: middle lobe and lingual.

Table 2
The frequency of different morphological types and other CT pictures of bronchiectasis.

Morphological types	Number (percentages)
Signet ring	12 (18.75%)
Cystic	8 (12.5%)
Cylindrical	14 (21.9%)
Varicose	1 (1.6%)
Honey combing	4 (6.25%)
Bronchocele	3 (4.7%)
Signet ring and cystic	4 (6.25%)
Cylindrical and varicose	3 (4.7%)
Signet ring, cystic and cylindrical	3 (4.7%)
Signet ring and varicose	1 (1.6%)
Cystic and varicose	4 (6.25%)
Signet ring, cystic, cylindrical and varicose	2 (3.1%)
Varicose and bronchocele	1 (1.6%)
Signet ring and cylindrical	1 (1.6%)
Cystic and bronchocele	2 (3.1%)
Cystic, cylindrical and bronchocele	1 (1.6%)
Bronchial wall thickening	31 (48.4%)

Table 3
Number of cases in different causes of bronchiectasis met during the study period.

Etiologies			Number and percentage
Acquired	Post inflammatory		27 (42.2%)
	Traction bronchiectasis	Post granulomatous	15 (23.4%)
		Atypical mycobacterial infection	2 (3.1%)
		UIP[a]	3 (4.7%)
		Sarcoidosis	2 (3.1%)
	COPD[b]		2 (3.1%)
	Aspiration		2 (3.1%)
	Central bronchogenic carcinoma (proven NSCLC[c])		2 (3.1%)
	Broncholith		1 (1.6%)
	ABPA[d]		1 (1.6%)
Congenital	Cystic fibrosis		3 (4.7%)
	Tracheobronchomegally		2 (3.1%)
	Bronchial atresia and bronchocele		1 (1.6%)
	Kartagner Syndrome		1 (1.6%)

[a] UIP: usual interstitial pneumonia.
[b] COPD: chronic obstructive lung disease.
[c] NSCLC: non-small cell lung cancer.
[d] ABPA: allergic bronchopulmonary aspergillosis.

2. Patients and methods

This cross-sectional study included 64 patients; 36 females and 28 males, age range 7–74 years (average of 47.2 years). All patients presented with productive cough and dyspnea and were all referred from the pulmonary to the radiology department in Kasr Alainy hospital for MSCT of the chest in the period from October 2016 – April 2017.

Inclusion criteria: Cases with bronchiectasis in MSCT chest were included in this study.

Exclusion criteria: Cases with CT contraindications as pregnancy.

Patients were subjected to:

(2.1) Thorough clinical examination with history taking, general and chest examination.
(2.2) Relevant laboratory tests were considered according to the case e.g., tuberculin test, analysis test of sputum.
(2.3) Pulmonary function test was done in 20 cases suspected of having chronic lung diseases (chronic diffuse interstitial lung disease (CDILD) or chronic obstructive pulmonary disease (COPD).
(2.4) MSCT chest was done to all patients using 16 channels MSCT in Kasr Al –Ainy.

- **Assessment of CT chest:** Bronchiectasis was evaluated for the following:

(1) Distribution:
  – Diffuse or Focal.
  – Laterality: right lung, left lung or bilateral.
  – Lobar: RT upper, middle or lower.
    LT upper and lingual or lower.
(2) Types of bronchiectasis: signet ring, cystic, cylindrical or varicoid.
(3) Bronchial wall thickening.
(4) Auxiliary findings.
(5) According to these CT findings together with clinical data and laboratory results the etiologies of bronchiectasis were considered.

(2.5) Histo-pathological assessment was needed in two cases with CT suggesting bronchogenic carcinoma.

3. Results

This study involved 64 patients with bronchiectasis detected in their MSCT of the chest.

In our study female were more commonly affected with bronchiectasis, 56.25% (N. = 36 cases), however male cases were 43.75% (N. = 28 cases). 54.7% of our patients were in the 5th and 6th decades.

In this study, bilateral lung affection in 62.5% of cases (N. = 40) was more prevalent than unilateral affection in 37.5% of cases (N. = 24), as 26.5% (N. = 17) cases had only right sided affection, and 11% (N. = 7) cases had left sided affection.

See Table 1 for the number and percentages of patient's lobar distribution of pulmonary bronchiectasis.

Signet ring sign was the most common finding of bronchiectasis found in 35.9% (N. = 12 cases), followed by the cylindrical type of pulmonary bronchiectasis was most common morphological type of bronchiectasis in 37.5% of cases (N. = 9), see Table 2.

Post-inflammatory etiology was most encountered in our study in 42.2% (N. = 27) followed by traction bronchiectasis 34.4% (N. = 22) see Tables 3 and 4.