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Cairo University

ROLE OF HIGH RESOLUTION COMPUTED TOMOGRAPHY IN DIAGNOSIS OF BRONCHIOLITIS OBLITERANS

Thesis
Submitted for partial fulfillment of the Master Degree in Diagnostic Radiology

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2012

Abstract

Bronchiolitis obliterans is one of the most common small air way diseases which has fibrotic and irreversible nature .

With the new advances in computed tomography machines, it is now possible to understand the underlying pathophysiologic changes affecting the small airways.

High-resolution CT in deep inspiration and expiration is currently the imaging modality of choice in the assessment , detecting and characterizes the nature of the diseases of bronchioles .

Key words:

High resolution computed tomography, bronchiolitis obliterans.

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LIST OF ABBREVIATIONS

BO	**Bronchiolitis Obliterans**
RMB	**Right main bronchus**
RULB	**Right upper lobe bronchus**
BI	**Bronchus intermedius**
RMLB	**Right middle lobe bronchus**
LULB	**Left upper lobe bronchus**
LB	**Lingular bronchus**
LMB	**Left main bronchus**
LLLB	**Left lower lobe bronchus**
HRCT	**High resolution chest tomography**
BOOP	**Bronchiolitis Obliterans organizing pneumonia**
FEV	**Forced expired volume**
FVC	**Forced vital capacity**
TLC	**Total lung capacity**

CMDC	**Carbon monoxide diffusing capacity**
V/Q scan	**Ventilation/perfusion scan**
CXR	**Chest x-ray**
MR	**Magnetic resonance**
MinIP	**Minimum intensity projection**
HP	**Hypersensitivity pneumonitis**
HSCT	**Hematopoietic stem-cell transplantation**
GVHD	**Ggraft versus- host disease**
ARDS	**Acute respiratory distress syndrome**
DIPNECH	**Diffuse idiopathic pulmonary neuroendocrine cell hyperplasia**

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Introduction

Bronchiolitis obliterans (BO) is a fibrosing form of obstructive lung disease that follows a severe insult to the lower respiratory tract and results in narrowing and/or complete obliteration of the small airway **(Kurland and Michelson ,2005).**

The functional loss of these airways lead to a clinical spectrum that is often insidious in onset with chronic cough, prolonged wheezing and persistent respiratory distress. Although the term BO appears to describe a pathology confined to the small airways, the distribution of inflammation and fibrosis may be more extensive, involving the alveoli and interstitium, resulting in variations in the description and severity of this disorder**(King, 1993).**

Bronchiolitis obliterans has been described in all age groups, the frequency of underlying causes and potential prognoses are different for children and adults. For example, bronchiolitis obliterans in children is most often seen following a severe lower-respiratory-tract infection,usually of adenovirus **(Chiu et al.,2008)**.

Whereas Bronchiolitis Obliterans in adults is more commonly associated with occupational inhalation injuries, hypersensitivity pneumonitis, and autoimmune disorders (**Markopoulo et al, 2002**).

The diagnosis of BO has traditionally been confirmed by bronchography and histopathological evidence from a lung biopsy; two procedures that carry significant risks for mortality and morbidity in children. Chest X-ray findings in BO are rather heterogeneous and may even be normal due to the variable distribution and different degrees of the lung inflammation and fibrosis**(Lau et al.,1998).**

High resolution computed tomography (HRCT) of the chest is now recognized as an important tool in the diagnosis of BO as it is able to demonstrate abnormalities in the small airways and the distribution of air trapping and changes in vascularity **(Lau et al.,1998).**

Currently, the normal bronchiole cannot be recognized radiologically even with thin-section CT. For bronchiolar diseases to be visible on CT, they must cause dilatation, wall thickening, and often mucus plugging so thin-section computed tomography (CT) is still the best imaging technique for assessing Bronchiolitis Oblitrans and can identify various forms of Bronchiolitis **(Kang et al.,2009).**

Bronchiolitis Obliterans can also present in an indirect fashion by showing mosaic perfusion on HRCT; a finding that suggest BO in the presencee of suggestive clinical data **(Kang et al.,2009).**

Post-processing of high-resolution CT images particularly with the use of minimum intensity projection (MinIP) reconstructions improves the detection of subtle areas of low attenuation encountered in patients with emphysema and small airways disease, these techniques are particularly helpful in patients with high clinical suspicion for Broncholitis Oblitrans **(Berstad et al.,2006).**

Aim of the work

The aim of this study is to evaluate the role of HRCT in diagnosis of Bronchiolitis Obliterans.

CT ANATOMY OF THE AIR-WAY; BRONCHI AND BRONCHIOLE

Main Bronchi:

The main bronchi arise from the trachea at the level of carina and course obliquely to the axial plane **(Fig. 1);** The right main bronchus is relatively short, usually about **1.1**cm (range **0-2.9**cm), compared with 5 cm for the left main bronchus ***(Olivier et al., 2006).***

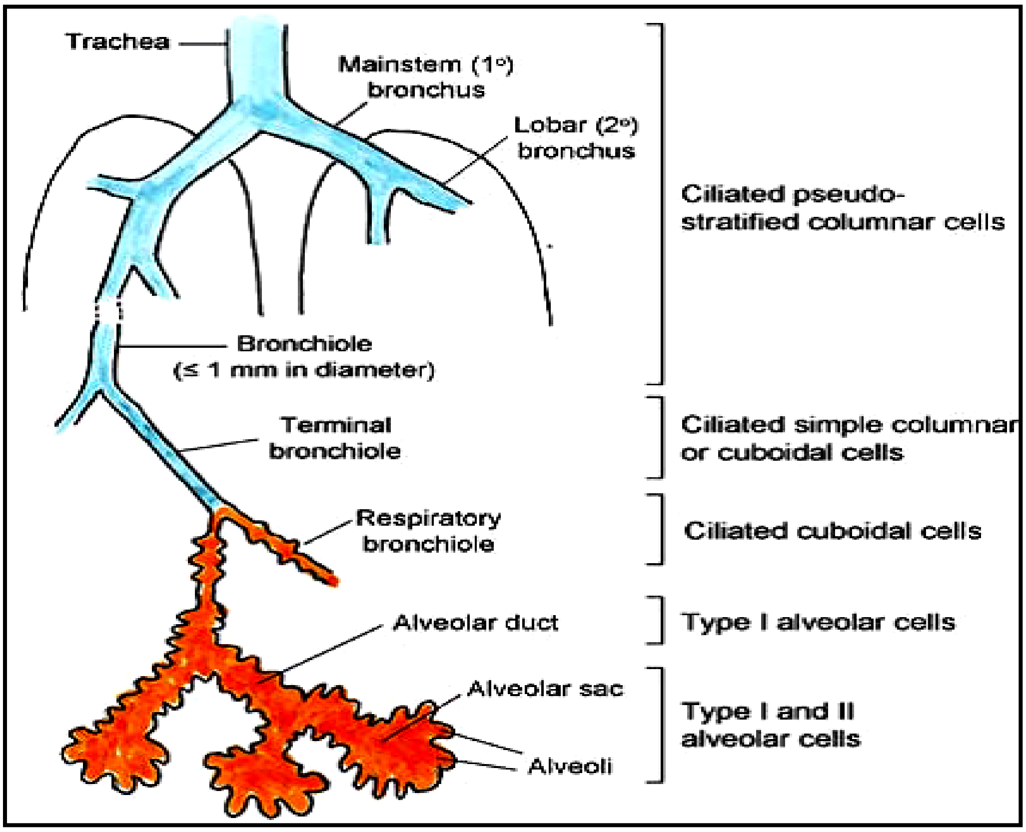

Fig: 1. Schematic demonstration of the tracheobronchial tree ***(Boiselle & Lynch, 2008)*.**

<u>Lobar, Segmental and sub segmental Bronchi</u>:-

Lobar and Segmental bronchial anatomy can be readily identified on axial and variable reconstruction CT images (**Fig. 2, 3, 4,and 5).** Subsegmintal bronchi can typically be followed out to the peripheral one-third of the lung. ***(Olivier et al., 2006).***

Table (1): Lobes and Bronchopulmonary Segments of the Lung with Boyden's Schema for Numbering of Bronchi.

Right lung			Left lung	
	Segment	***Boyden's Number***	***Segment***	***Boyden's Number***
Upper lobe	Apical segment	B1	Apical segment	B1
	Anterior segment	B2	Anterior segment	B2
	Posterior segment	B3	Posterior segment	B3
			Superior segment of lingual	B4
			Inferior segment of lingual	B5
Middle lobe	Medial segment	B4	None	
	Lateral segment	B5		
Lower lobe	Superior segment	B6	Superior segment	B6
	Medial basal segment	B7	Anteromedial basal segment	B7, B8
	Anterior basal segment	B8	Lateral basal segment	B9
	Lateral basal segment	B9	Posterior basal segment	B10
	Posterior basal segment	B10		

(Boiselle & Lynch, 2008).

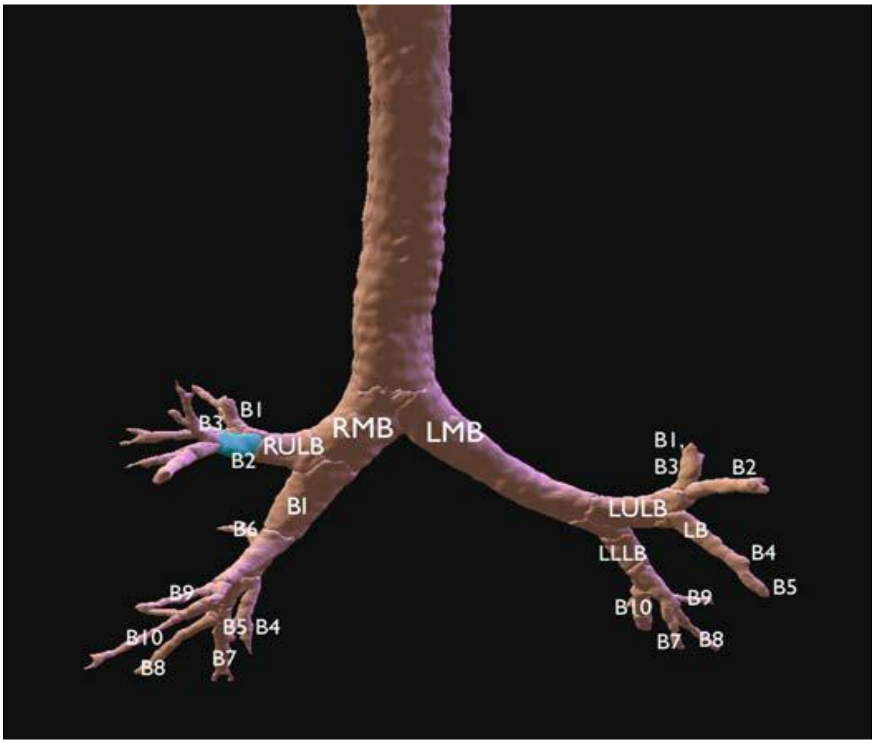

Fig: 2. Three-dimensional segmentation of the tracheobronchial tree, viewed in frontal projection, allows identification of main, lobar, and segmental bronchi Right sided bronchial anatomy, illustrated using Boyden's numbering system. Selected axial images through the right bronchial tree demonstrate the right main bronchus (RMB), right upper lobe bronchus (RULB), apical (B1), anterior (B2), and posterior (B3) segmental bronchi of right upper lobe; bronchus intermedius (BI); right middle lobe bronchus (RMLB); medial (B4) and lateral (B5) segments of right middle lobe, superior (B6); and the medial basal (B7), anterior basal (B8), lateral basal (B9), and posterior basal (B10) segments of right lower lobe ***(Boiselle & Lynch, 2008).***