# COMPARTIVE STUDY OF SPIRAL VOLUMETRIC CT VERUS CONVENTIONAL CT IN THE DETECTION & CHARACTERIZATION OF PULMONARY NODULES

*Essay*

**Submitted for partial fulfillment of the Master Degree in Radiodiagnosis**


*By*

**Aiman Fakhry Iskander Abd El Malek**

M.B.B.ch (Ain Shams University)

Supervised by

**Dr. Yasser Abd El-Azeem Abbas**

Ass. Prof. In Radiodiagnosis

Faculty of Medicine

Ain Shams University

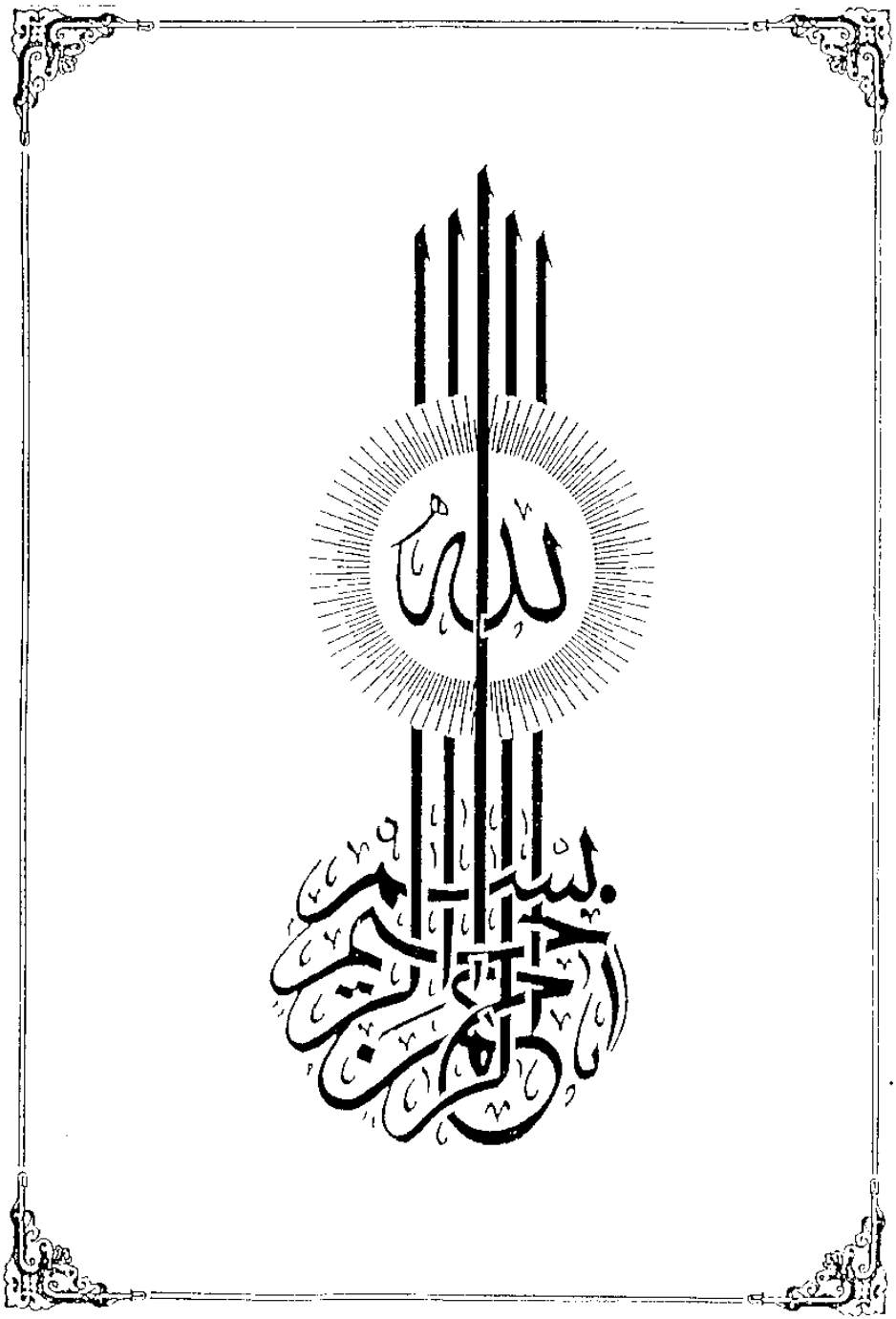
**Dr. Nivene Fawaz Hanna**

Lecturer of Radiodiagnosis

Faculty of Medicine

Ain Shams University


1999



# Acknowledgement

First and Foremost, thanks to

**ALMIGHTY GOD**

to whom any success in life is related

I am greatly honored to have been supervised by

**Dr. Yasser Abd El-Azeem Abbas**

*Ass. Prof. In Radiodiagnosis*

*Faculty of Medicine, Ain Shams University*

Who contributed with his valuable advice, patience and enthusiastic encouragement in the completion of this work,

My sincere gratitude to

**Dr. Nivene Fawaz Hanna**

*Lecturer of Radiodiagnosis*

*Faculty of Medicine, Ain Shams University*

For her generous help and kind assistance and guidance.

My deepest and profound appreciation for my parents for their continuous support and encouragement.

# CONTENTS

# INTRODUCTION

# INTRODUCTION

Detection & assessment of pulmonary nodules is usually provided by CT which follows conventional chest radiographs.

In conventional slice by slice acquisition, a lack of contiguity due to inconsistent levels of inspiration from scan to scan is often present. When applying this method, small pulmonary nodules may be missed. Also, it may often be impossible to estimate the exact size & density of the nodules. (Friese et al., 1994).

Spiral volumetric CT seems to be the solution for these problems. This technique offers continuous patient transport during a single breath hold. In this manner the complete volume is scanned without any breathing gaps (Kalender et al., 1990).

Spiral CT allows multiplanar reconstruction to be generated in any desired imaging plane without the steplike discontinuities that commonly result from conventional CT. The multiplanar capability improves the detection & localization of pulmonary nodules which might be of crucial diagnostic value. Helical CT is especially important in performing nodule densitometery for proper characterization of the pulmonary nodules, regarding presence of calcifications, fat & fluid (Naidich et al., 1994).

Helical CT allows continuous data collection while the patient is advanced through the CT gantry. This provides an uninterrupted volume of data that can be

reconstructed to produce 3D images, which may be helpful in preoperative assessment of peripheral bronchogenic carcinoma (Kuriyama et al., 1994).

## AIM OF THE WORK

To compare spiral volumetric CT technique versus conventional CT in detection & characterization of pulmonary nodule(s).

# ANATOMY

# ANATOMY OF LUNG

## PLEURA:

The pleura is a serous membrane that : a) covers the lung (i.e) the visceral pleura & b) lines the thoracic cavity & mediastinum (i.e the parietal pleura) (Fig. 1).

Parts of the pleura are named according to the site, eg. costal, diaphragmatic, mediastinal & apical pleura. The visceral & parietal layers are continuous with each other anterior & posterior to lung roots but below hilum the two layers hang down in a loose fold called the pulmonary ligament. This may extend to the diaphragm or have a free inferior border & allows descent of lung roots in respiration & also distension of the pulmonary veins.

The pleura extends into inter lobar and accessory fissures. At rest, the parietal pleura extends deeper into the costophrenic & costomediastinal recesses than the lung & visceral pleura (table 1) (Ryan et al., 1994).

***Table (1): Lower limits of the lung and pleura***

| | Visceral pl. & lung | Parietal pleura |
|---|---|---|
| Anterior | $6^{th}$ costal cartilage | $6^{th}$ costal cartilage |
| Mid-axillary | $8^{th}$ rib | $10^{th}$ rib |
| Posterior | T10 | T12 |

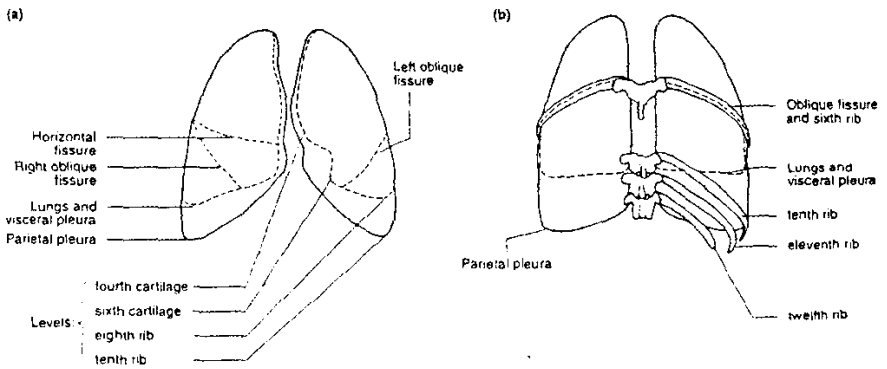



**Fig. (1):** Pleura **(a)** Ant view, **(b)** Post view (after Ryan et al., 1994)

## *CT Anatomy of the pleura:*

On axial CT the pleura cannot usually be distinguished from the thoracic wall or mediastinum unless it is thickened. The pulmonary ligaments can be seen occasionally extending below the inferior pulmonary vein caudally & posteriorly to the diaphragm. The right pulmonary ligament lies close to the inferior vena cava, while the left pulmonary ligament lies close to the esophagus (Ryan et al., 1994).

# THE LUNG:

The lungs are described as having costal, mediastinal, apical & diaphragmatic surfaces. The right lung has 3 lobes & the left has 2 with the lingula of the left upper lobe corresponding to the right middle lobe (Ryan et al., 1994).