# VALUE OF X-RAY IMAGING IN THE DIAGNOSIS OF BRONCHIAL TREE DISEAES



THESIS

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By

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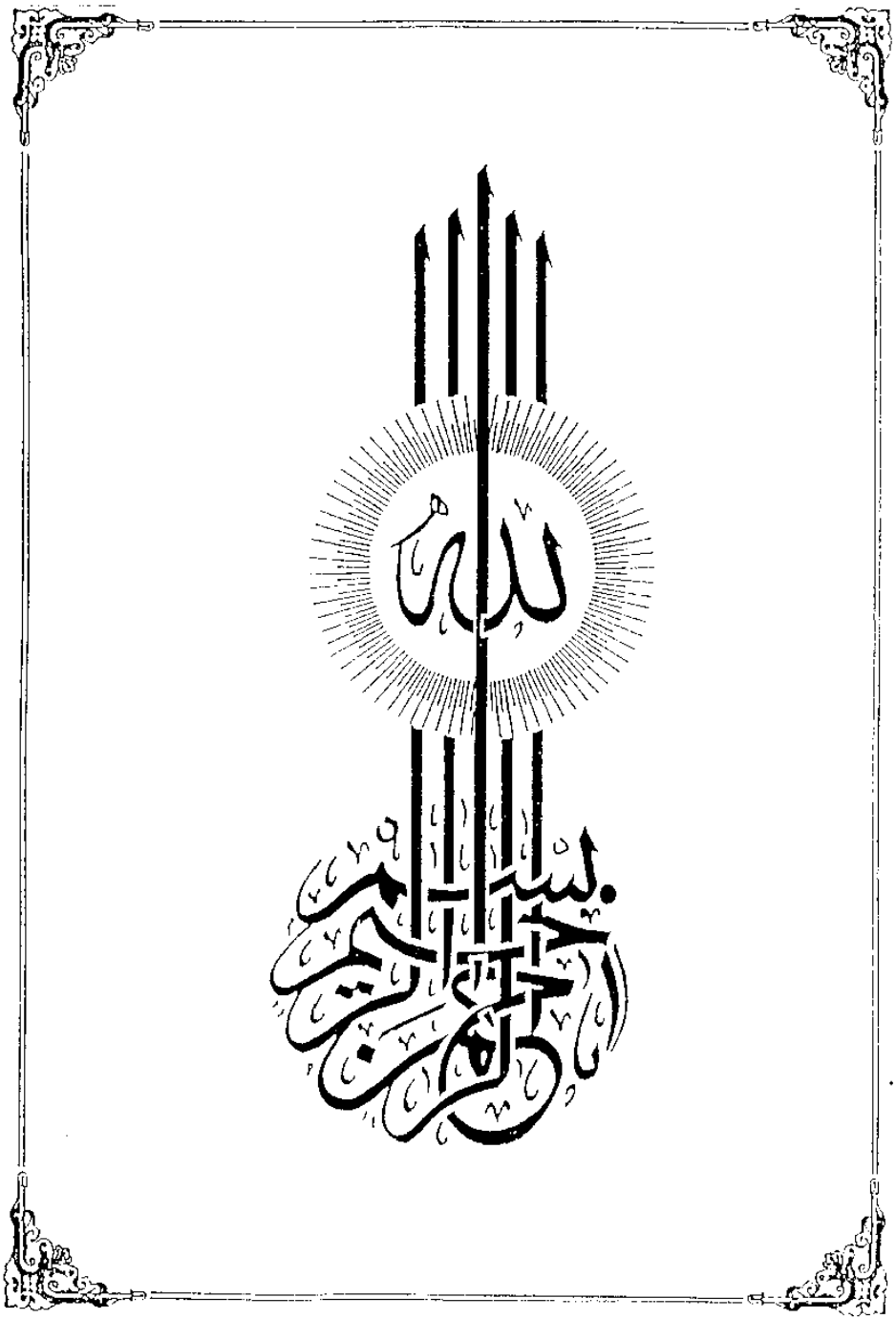

## CONTENTS

# INTRODUCTION AND AIM OF WORK

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The utilization of radiations in the diagnosis of medical conditions dates back to the early years of this century .From then up to recent years,medical radiological diagnostic procedures developed significant advances in methodes of investigations to reach the correct diagnosis of diseases .Such advances have taken place in diagnostic radiological equipment, techniques,positioning,and use of contrast media . This has enabled the medical profession to investigate in much detail various diseases in different human body parts .

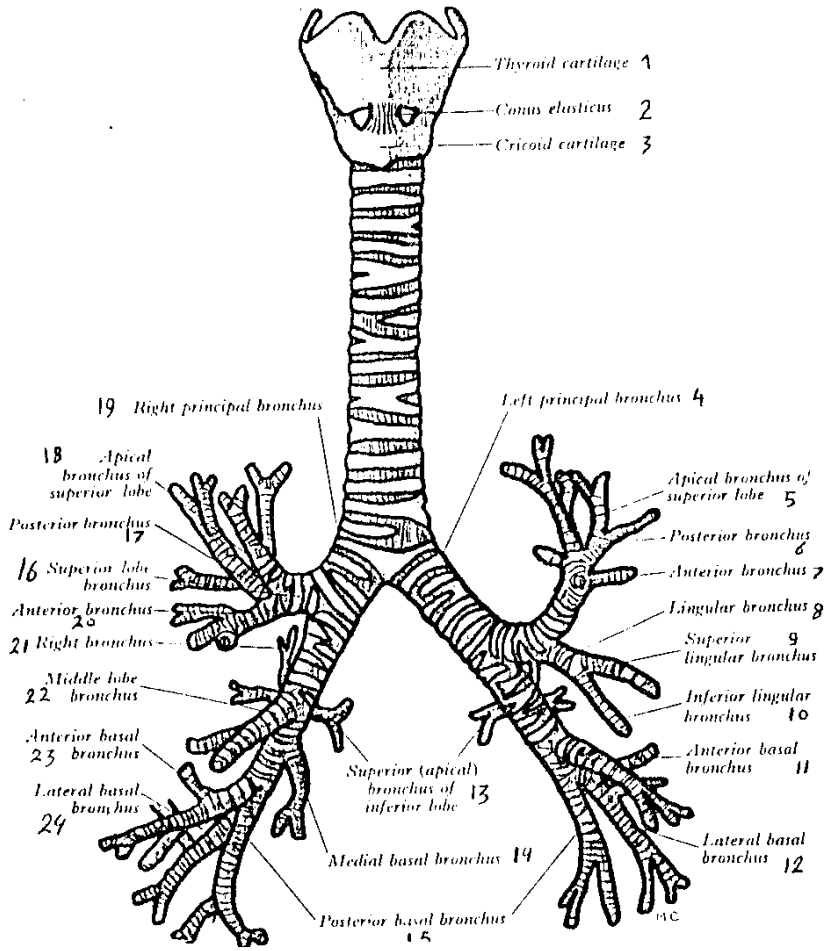
This thesis mainly aims at evaluation of X-Ray imaging as an important diagnostic procedure in bronchial tree diseases .

Inspite of the fact that bronchial diseases have certain diagnostic clinical features,yet,radiological investigation has been shown to be essential for establishing and confirming the correct diagnosis .

The present work proceeds to give a brief survey of the normal anatomy,pathology,and methods of radiological investigation of bronchial tree diseases .A detailed study of seventeen cases of different common bronchial tree diseases was carried

out including complete clinical and radiological examinations .The different methodologies adopted are described .All cases studied are presented as a breaf history together with illustrative photographs of the radiological investigations performed .The role and limitations of the chest physician in the diagnosis of bronchial tree diseases and the specific advantages of radiological examination to confirm and establish the final diagnosis were made evident .

# ANATOMY OF THE TRACHEO-BRONCHIAL TREE




Grays anatomy 1973, Rogerwarwick&Peter L.William & P.Chir 1973.

fig.1. The cartilages of the larynx ; trachea and bronchi (anterior aspect).
1.thyroid cartilage 2.conus elasticus 3.cricoid cartilage 4.LT.main bronchus 5.apical bronchus of upper lobe 6.posterior bronchus 7.anterior bronchus 8.lingular bronchus 9.superior ling. bronchus 10.inferior lingular bronchus 11.anterior basal bronchus 12.lateral basal bronchus 13.apical bronchus of inferior lobe 14.medial basal bronchus 15.posterior basal bronchus 16.upper lobe bronchus 17.apical bronchus of upper 18.posterior bronchus 19.RT.main bronchus 20.anterior bronchus 21.RT. bronchus 22.middle bronchus 23.anterior basal bronchus 24.lateral basal bronchus.

## TRACHEA

The trachea is an expansile tube made of fibro-elastic tissue. It is kept from collapsing during inspiration by hyaline cartilages. They are C shaped 16 to 20 in number , open posteriorly , the posteriorly free ends are connected by unstriped muscle named the trachealis.

( J.Joseph 1963 ; Rogerwarwick and Peter L.W.& P. - 1973. ).

The trachea extends from the lower end of the cricoid cartilage at the level of the lower border of the 5 th or the 6 th cervical vertebra to its termination at the bronchial bifurcation which is named the carina. In the preserved dissecting room cadaver the carina is at the level of the fourth thoracic vertebra posteriorly and the manubrio - sternal junction (the angle of Louis ) anteriorly ; but in the living subject in the erect position it is at the level of the 5 th or ( in full inspiration at the level of the 6 th ) thoracic vertebra.

In children carina is at the level of the 3 rd costal cartilage.

(Harold Ellis and Stanley Feldman 1977. ).

In adults the trachea is about 15 cm. long of

which 5 cm. lie above the suprasternal notch. It moves with respiration and with alteration in the positions of the head. In deep inspiration carina can descend as much as 2.5 cm. and extension of the head and neck can increase the length of the trachea by as much as 23 - 30 °/₀ compared to the trachea when the head and neck are flexed.
( Harold Ellis and Stanley Feldman.1977. ).

The external diameter of the trachea from side to side is about 2 cm. in adult male , and 1.5 cm. in adult female , and much smaller in the child. The diameter is correlated with age and size of the subject.
( Harold Ellis and Stanley Feldman 1977. ).

The trachea is lined with ciliated columnar epithelium with goblet cells which secrete mucus. The mucus humidify inspired air , entrap particles such as dust or micrp-organisms , and also has a bactericidal property , and lubricate the action of ciliary mechanism. The ciliated mucosa is responsible for moving secretions towards the glottis at rate of 0.25 - 1 cm. per minute. Ciliary activity is the most important single factor in the prevention of the accumulation of secretions.
( J.Joseph. 1963. ).

Blood supply:

Upper 2/3 are supplied by the inferior thyroid artery , lower 1/3 is supplied by the bronchial arteries. The arteries run circumferentially and there are few anastomosis in the long axis of the trachea.
( J.Joseph. ).

Nerve supply:

The sympathatic or dilator fibres are from the middle cervical ganglion accompaning the inferior thyroid artery.
Parathympathetic constrictor and secretory fibres are from both recurrent laryngeal nerves and right vagus.
( J.Joseph. 1963. ).

Relations:

The trachea lies exactly in the middle line in the cervical part of its course but within the thorax it is slightly deviated to the right by the aortic arch.
1) In the neck: The relations are symetrical. It is covered anteriorly by the skin and by the superficial and deep facia , through which rings are easily felt. The 2 nd , 3 rd & 4 th rings are covered by the isthmus of the thyroid , along

whose upper border branches of the superior thyroid artery join from either sides. In the lower part of the neck the edges of the sternohyoid and the sternothyroid muscles overlap the trachea , which is here also covered by the inferior thyroid veins ( as they go downwards to the innominate ) ; by the cross communication between the anterior jagular veins and , when present , by the thyroidea-ima artery which ascends from the arch of the aorta or from the innominate artery. It is because of this close relationship with the innominate artery that erosion of the tracheal wall by a tracheostomy tube may cause sudden profuse hœmorrhage. It is less common for the carotid artery to be involved in this way. On either sides are the lateral lobes of the thyroid gland , which intervene between the trachea and the carotid sheath and its contents ( the common carotid artery , the internal jagular vein and the vagus nerve. ). Posteriorly , the trachea rests on the œsophagus , with the recurrent laryngeal nerves lying in a groove between the two.
( J.Joseph 1963. ).

2) <u>In the thorax</u>:The relations are asymmetrical. The thoracic part of the trachea descends through the superior mediastinum.

Anteriorly:, from above downwards , lie the inferior thyroid veins , the origin of the sternothyroid muscle from the back of the manubrium , the remains of the thymus , the innominate artery and the left common carotid artery ( which separate the trachea from the left innomate vein ) , & lastly the aortic arch.

Posteriorly: As in its cervical course , the trachea lies throughout on the œsophagus , with the left recurent laryngeal nerve placed in a groove between the left border of these two structures.

On the left: The left common carotid and left subclavian arteries , the aortic arch and the left vagus intervene between the trachea and the pleura. The altering relationship between the major arteries and the trachea is due to the diverging - somewhat spiral - course of the arteries from their aortic origins to the root of the neck.

The large tracheobronchial lymph nodes lie at the sides of the trachea and in the angle between the two bronchi.

In infants the relationship is somewhat modified , the innominate artery is higher and crosses the trachea just as it descends behind the suprasternal notch. The left innomate vein may project upwards into the neck to form an anterior relation of the cervical trachea.

In children up to the age of two , the thymus is large and lies infront of the lower part of the cervical trachea.

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## BRONCHI

The bronchi distrebute air to the pulmonary segments and they were named according to the pulmonary segments they serve. ( Fig. 1 ).

At the level of T.5 , the trachea divides into right and left bronchi. The angle at the bifurcation is termed the carina.
( Thomas T. & Thompson. 1980 ).

Right bronchial tree:

Right main bronchus: It is 2.5 cm. long. It leaves the trachea at an angle of 25° from the vertical & enter the right lung opposite the 5 th thoracic vertebra. As it is more nearly vertical & wider & shorter than the left main bronchus , there is a much more tendency for foreign body to enter its lumen. ( Wylie & Churchill - Davidson. 1978 ; R.S.Atkinson & J.Alfred Lee. 1977. ).

The main bronchial stem can be divided into extra and intra - pulmonary portions. The extra-pulmonary part is kept permanently open by curved cartilaginous bars like those in the trachea, and