Tracheo-bronchial Foreign bodies in Pediatrics

Thesis

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PRAISE TO GOD , THE MERCIFUL , THE BENEVOLENT

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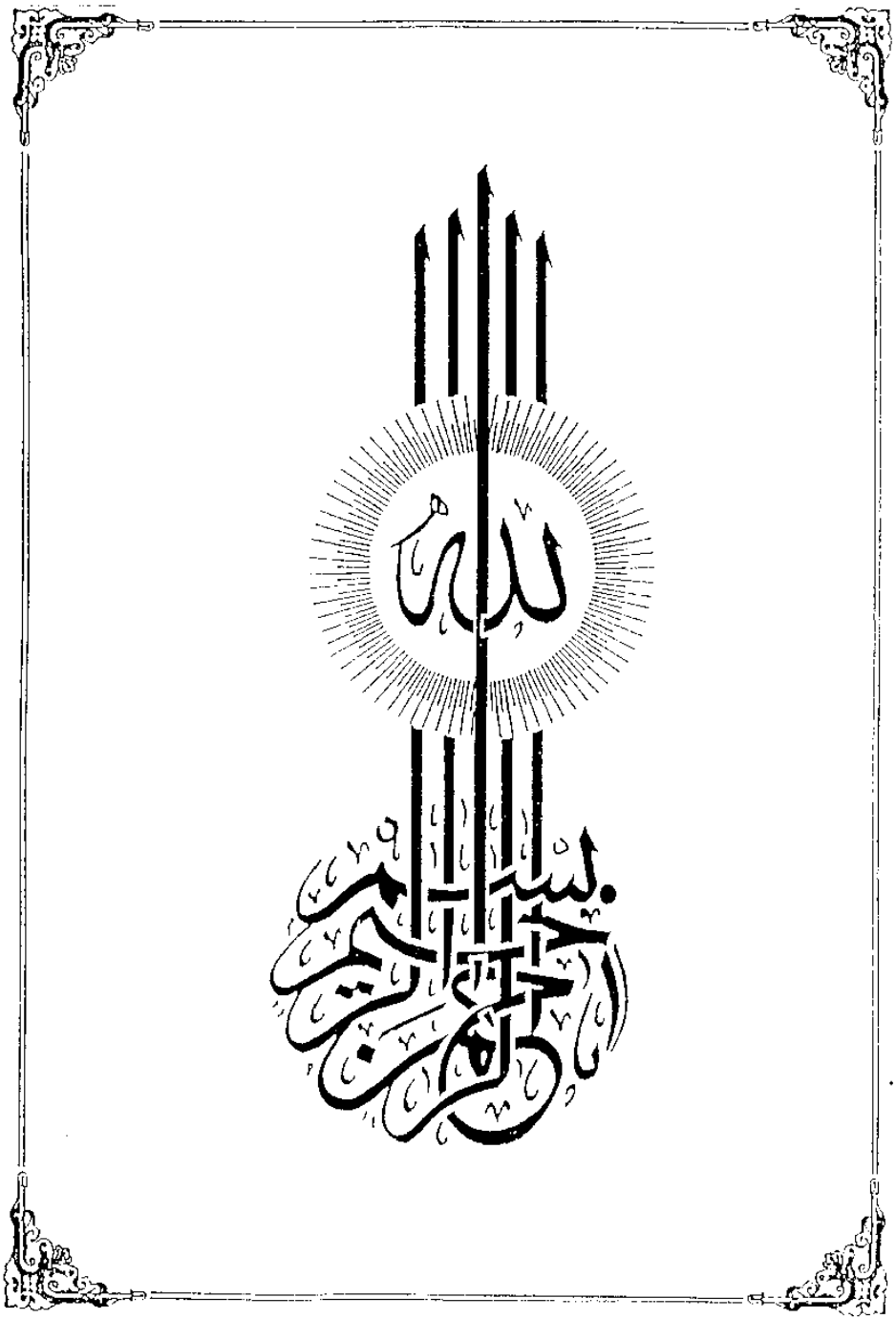

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LIST OF ABBREVIATIONS

C.N.S.	Central Nervous System
C.S.F.	Cerebrospinal Fluid.
F.F.B.	Flexible Fiberoptic Bronchoscope.
f.b.	Foreign body.
U.R.T.I.	Upper Respiratory Tract Infections.
G.A.	General Anaesthesia
G.I.T.	Gastrointestinal Tract.
L.M.B.	Left Main Bronchus.
L.A.	Local Anaesthesia
O.P.Clinics	Out Patient Clinics
R.M.B.	Right Main Bronchus
^{133}Se	Selenium 133.
^{99}TC	Technicium 99.
T.E.F.	Tracheo-Esophageal Fistula.

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CORRIGENDUM

I would like to apologize for the following mistakes and omissions .

PAGE	LINE	WRONG	RIGHT
3	8	supreseded	superseded
19	7	garvitational	gravitational
20	22	Breur	Breuer
23	8	drowing	drowning
25	12	hygroscopic	non-hygroscopic
26	15	parodoxic	paradoxic
27	15	is mixed	in mixed
29	1	granualtion	granulation
30	6	prevalance	prevalence
33	2	ration	ratio
34	14	good	food
40	2	trial	triad
42	8	tracheao-	tracheo-
56	5	lead to	end
57	15	pre-traumatic	post-traumatic
58	1	radioluscent	radiolucent
61	2	trunck	trunk
68	9	avoid	ovoid
64	13	Tracheao-	tracheo-
65	last	caff	cuff

The following reference was dropped during typing :

Gerlings , P.G. (1939) . Pathology secondary to foreign bodies in the air passages . *Journal of laryngology and otology* , 55 : 23-35 .

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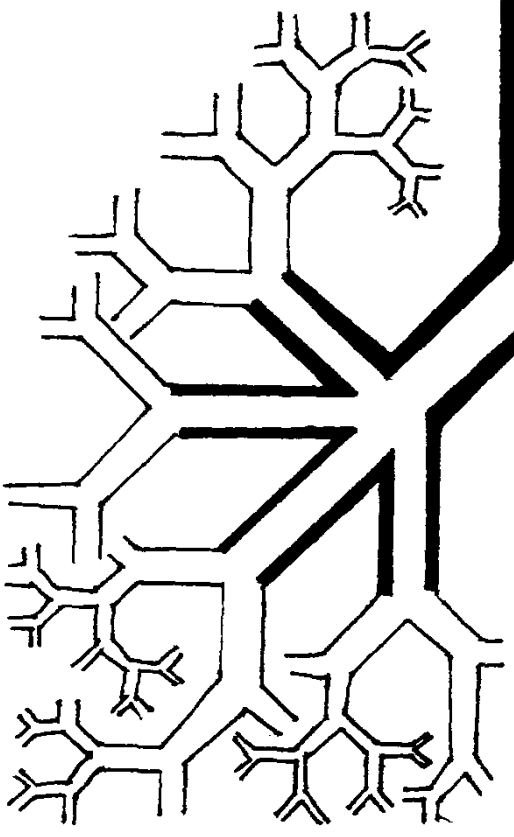

INTRODUCTION

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Foreign bodies of the trachea and of the bronchial tree continue to challenge all physicians caring for children. New techniques, new instruments and wider training enable physicians to remove foreign bodies safely.

However, the challenge is most significant in the diagnostic stage of the foreign bodies' history. To remove the foreign body before it may cause acute respiratory distress and before it may create atelectasis, pneumonia or bronchiectasis is the goal of all physicians which come to deal with such a problem.

The diagnosis requires a thorough understanding of the pathophysiology and symptomatology associated with a foreign body in the airway. In addition, the physician must be aware of the advantages and pitfalls of the radiologic diagnosis of this problem.

Parents and physicians alike should also be educated to prevent exposure of children to food items and objects that are most likely to create a risk of inhalation. Since airway foreign bodies represent a significant health hazard in children, efforts should be concentrated on that age group.

In this study we will review the relevant points of tracheobronchial anatomy, pulmonary physiology and pathophysiology secondary to foreign body inhalation. The literature dealing with this problem will also be summarized.

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Finally a review of the cases admitted at the Ain-Shams University Hospitals with a diagnosis of foreign body inhalation in the past 5 years will be made. Seventeen fresh cases admitted during the year 1987 will also be included.

The relevant clinical and radiologic information for each case will be presented as far as is available. Unfortunately in a proportion of cases the available data is quite succint most probably due to the state of acute emergency in which the cases usually present.

Lastly, it should be pointed out that by definition cases of aspiration into the tracheobronchial tree secondary to other primary pathologies-e.g. laryngeal incompetence, tracheo-esophageal fistula... - will be excluded.

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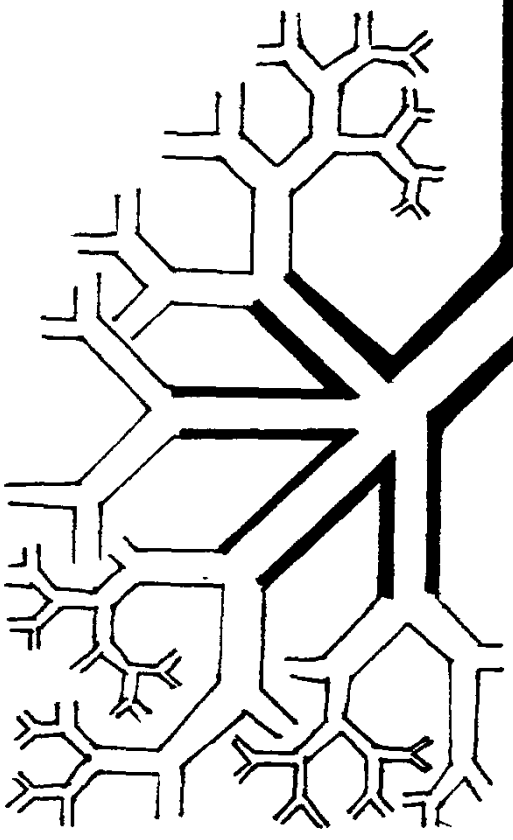

ANATOMY

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For the proper understanding of the pathophysiologic effects of foreign body inhalation in the tracheobronchial tree, it is essential that the anatomy of the tracheobronchial tree and the subdivisions of the lungs be well understood. The importance of such scrutiny lies in the fact that foreign bodies reaching the air passage are for the most part radio-lucent and only their secondary effects on the lungs are apparent so that their location is only determined by inference from clinical and radiological signs.

THE TRACHEA: (Stell & Byckford, 79) (Snow, 84)

The trachea is a cartilagenous and muscular tube lined with pseudostratified ciliated columnar epithelium extending from the cricoid cartilage at the level of the sixth cervical vertebra down through the mediastinum where it bifurcates into right and left main bronchi at the level of the upper border of the fifth thoracic vertebra. In children however until age 10-12 the bifurcation lies at a higher level.

The lumen of the trachea is supported by approximately 18 incomplete rings of hyaline cartilage which, on cross section are rounded internally and flat externally. Some of the rings branch and join adjacent rings.

The posterior part of the tracheal wall is composed of the trachealis muscle which connects the free ends of the C-shaped cartilages.

A fibro-elastic membrane which blends into the perichondrium of the cartilages extends across the open segments and connects adjacent cartilages to each other and the first tracheal cartilage to the perichondrium of the cricoid. The cartilages are wider than the space between them, being 3-4 mm wide and about 1 mm. thick.

One half of the trachea is in the neck and the other half is in the mediastinum. The trachea is in the midline in the neck but deviates

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slightly to the right in the mediastinum just above its bifurcation. The trachea is quite elastic and its length and position vary with the position of the head and neck.

The lowest tracheal ring extends inferiorly and posteriorly between the right and left bronchi and produces a sharp ridge internally, the carina.

THE MAIN BRONCHI:

At the level of the fifth dorsal vertebra posteriorly or the second costal cartilage anteriorly, the trachea bifurcates into the right and left main bronchi. The right main bronchus deviates laterally 25 degrees while the left main bronchus deviates 45 degrees to the left of the midline.

THE RIGHT MAIN BRONCHUS:

The right main bronchus is about one fourth wider than the left main bronchus and being more in line with the tracheal axis, so that there is a much greater tendency for anything entering the trachea to continue into the right main bronchus rather than the left. This includes, endotracheal tubes, suction catheters and foreign bodies.

It runs obliquely laterally and posteriorly and is about 5 cms long in the adult. It has a posterior membraneous wall and a series of cartilage rings similar to but smaller than those of the trachea.

The right main bronchus ends at the orifice of the middle lobe bronchus which opens anteriorly.

THE LEFT MAIN BRONCHUS:

The left main bronchus is longer and narrower than the right and forms a more acute angle with the trachea as it passes downwards and laterally.

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Structurally it is similar to the right main bronchus with a posterior membraneous wall and an incomplete cartilagenous framework.

It is about 5.5 cms long and ends by division into upper and lower lobar divisions.

The right and left main bronchi are termed primary bronchi. As the bronchi divide and become smaller, the walls become thinner, the cartilages become irregular in shape and disappear in bronchi that are 1mm in diameter and become supreseded by the muscular wall.

The right lung is divided into three lobes and the left into two. Each lobe is aerated through a secondary or lobar bronchus. Each lobe is further subdivided into bronchopulmonary segments each aerated by a tertiary bronchus.

THE LOBAR BRONCHI: (Crofton & Doyles, 81)

A-RIGHT LUNG:

The right lung being composed of three lobes, it has three secondary bronchi namely the right upper lobe, right middle lobe and right lower lobe bronchi respectively.

a) The right upper lobe bronchus:

It arises from the right lateral aspect of the right main bronchus about 12-20 mm from the carina in the adult. It passes for a very short distance almost at right angles to the line of the main bronchus.

It is about 10 mm long and ends by dividing into three tertiary bronchi. These divisions supply apical, anterior and posterior segments of the upper lobe:

- The apical segmental bronchus passes upwards and divides into apical and anterior subsegmental (quaternary) branches.

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- The posterior segmental bronchus runs backwards and upwards parallel to the oblique fissure and divides into lateral and posterior subsegmental bronchi.
- The anterior segmental bronchus passes forwards, downwards and laterally and divides into lateral and anterior subsegmental branches.

b) The right lower lobe bronchus:

This is the termination of the right main bronchus. It divides into 5 subsegmental bronchi:

- The apical segmental bronchus: it arises from the posterior aspect of the right main bronchus and divides into medial and lateral subsegmental bronchi.
- There are four basal segmental bronchi, medial, anterior, lateral and posterior basal bronchi.

B-LEFT LUNG:

a) The left upper lobe bronchus:

It arises at the lateral end of the left main bronchus. It passes anterolaterally downwards and forwards and gives rise to four segmental branches namely apical, posterior, anterior and lingular.

- The apical segmental bronchus divides into apical and anterior subsegmental branches.
- The posterior segmental bronchus divides into lateral and posterior subsegmental branches.
- The anterior segmental bronchus divides into lateral and anterior subsegmental branches.
- The lingular segmental bronchus is divided into superior and inferior subsegmental branches.

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b) The left lower lobe bronchus:

It supplies four segments of the left lower lobe and divides into an apical segmental bronchus and three basal segmental bronchi namely the anterior, lateral and posterior basal bronchi.

DIVISIONS OF THE TRACHEO-BRONCHIAL TREE: (Jackson & Huber 43)

The divisions of the tracheobronchial tree are fundamentally dichotomous. The trachea divides into 23 bronchial dichotomies. Dichotomies 1 through 16 are conductive bronchioles, and 17 through 22 are transitional bronchioles with increasing alveolation. Number 23 is the alveolar sac.

A letter and a number system has been developped to designate the segmental bronchi and their dichotomous branching.

The right lung is designated R and the left is designated L. The segmental bronchi on each side are designated B1 through B10 as follows: (Fig. 1).

RIGHT LUNG

Lobes	Segments	
Upper	Apical	B1
	Posterior	B2
	Anterior	B3
Middle	Lateral	B4
	Medial	B5
	Apical	B6
	Medial basal	B7
Lower	Anterior basal	B8
	Lateral basal	B9
	Posterior basal	B10

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