CHRONIC BRONCHITIS IN PEDIATRICS

AN ESSAY

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BY

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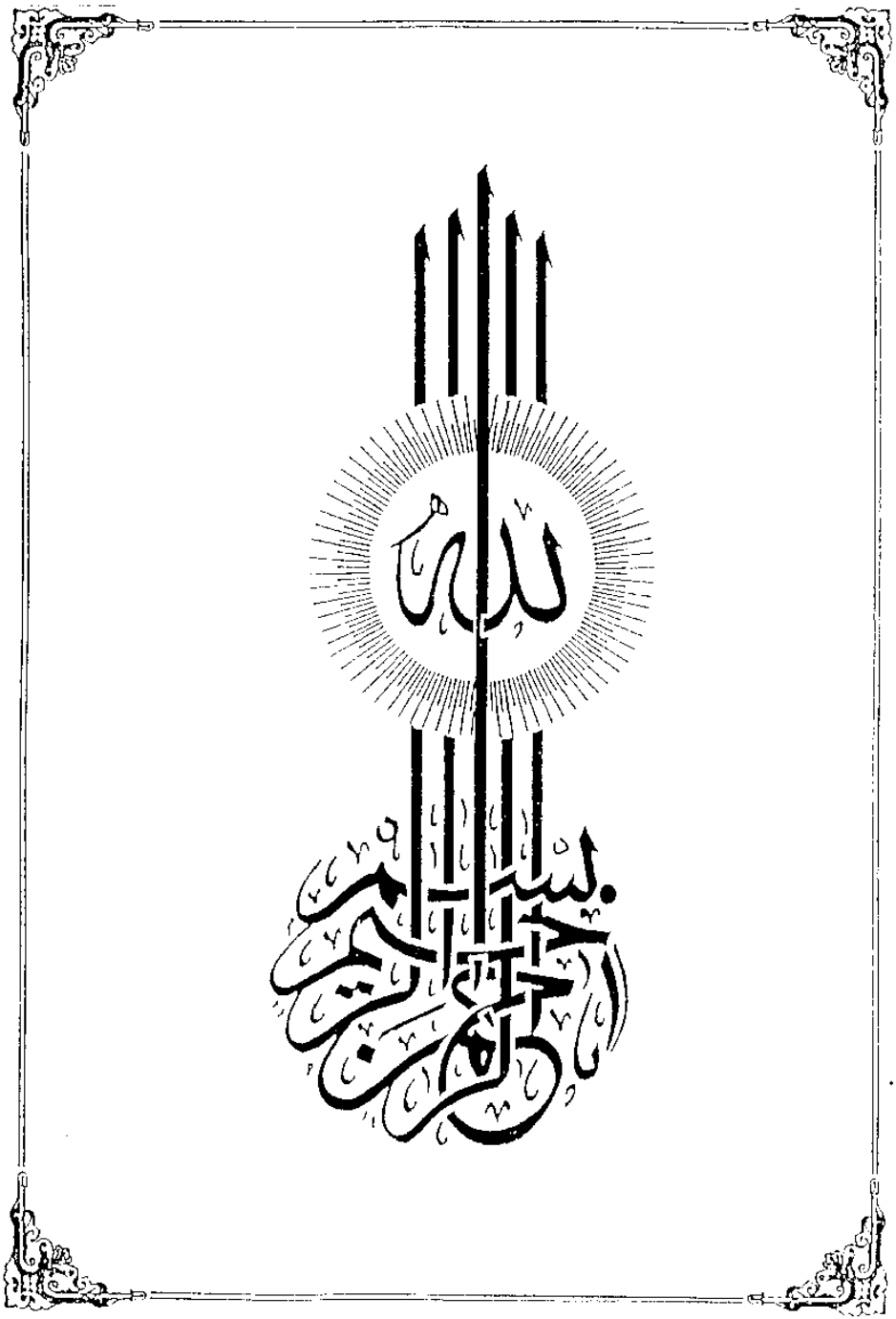

C O N T E N T S

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INTRODUCTION

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There is considerable doubt whether chronic bronchitis [CB] as an isolated clinical entity exists in children, and it should rarely be accepted as a final diagnosis. A chronic or frequently recurring productive cough usually indicates an underlying pulmonary or systemic disease . Patients should be evaluated for immune deficiencies, anatomic abnormalities, allergic disorders, environmental disease, upper airway infection with postnasal discharge, cystic fibrosis and immotile cilia syndrome [Stern, 1983].

It is important to determine what is the nature of this childhood bronchitis. The studies of Colley et al., 1973 ; Kierman et al.,1976; Holland et al.,1978 and Leeder et al., 1976 seem to assume that it is an infective illness but Burrows et al.,1977 raised the possibility that it may in fact be asthma. This distinction could be of considerable importance - Bronchitis is a difficult disease to define clinically in children yet the studies have relied on either a doctor's or parent's diagnosis. Non seems to have defined specifically what was meant by bronchitis. Clinical experience suggests three patterns of illness are frequently diagnosed in a young child as

"bronchitis' - upper respiratory infection with cough [often also called a chesty cold], upper respiratory infection [or allergic rhinitis] with cough and wheeze [usually called " wheezing bronchitis"] and wheeze and cough without upper respiratory symptoms . In older children the latter is usually called asthma [Phelan, 1984].

A clear definition, etiology, natural history, therapy, and prognosis have not been described in detail for OB in childhood. Whether the condition described for adults occurs in childhood is unknown; moreover, the diagnosis of OB has the potential to divert the pediatrician from detecting a more specific respiratory condition [Taussig et al.,1981].

The most reasonable " diagnosis' may be OB, which itself is an enigma and represents asymptom complex rather than a single disease entity.

Morgan and Taussig 1984, offer a pragmatic approach to this dilemma by considering the term OB as a pathophysiologic description of a symptom complex that results from the interaction of both intrinsic and extrinsic factors.

AIM OF THE ESSAY

The aim of the essay is to throw a light on etiology, pathology, clinical picture, diagnosis and treatment of chronic bronchitis in pediatric age.

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ANATOMY OF THE RESPIRATORY SYSTEM

The respiratory system may be divided into the upper and lower respiratory tracts. The lower respiratory tract lies below the cricoid cartilage and includes the trachea, bronchi, lungs and pleura. The upper respiratory tract comprises the nose, nasal sinuses, nasopharynx and larynx. The airways serve as a tubular system that conducts air into and out of the alveolar portions of the lung. Additionally, tracheobronchial airways participate in humidification and temperature adjustment of inspired air and are involved in the capture, absorption and elimination of inhaled airborne pollutants. Tracheobronchial airways can also become involved in disease processes such as bronchitis and asthma [Phalen and Oldham,1983].

TRACHEOBRONCHIAL TREE

The lungs are supplied by a single common airway, the trachea, which passes down from the larynx into the thorax. It divides into the right and left main bronchi.

The right main bronchus wider and shorter than the left . it follows the line of the trachea more closely than the left main bronchus, and for this reason inhaled foreign material is more likely to enter the right lung

than the left. The right main bronchus gives rise to three lobar bronchi :

1. Right upper lobe bronchus :

   It arises from the lateral wall of the main bronchus at an angle of 90°.

2. Middle lobe bronchus :

   It arises from the anterior wall of the main bronchus.

3. Lower lobe bronchus :

   It is the downward continuation of the main bronchus.

The left main bronchus gives rise to two lobar bronchi:

1. Upper lobe bronchus.
2. Lower lobe bronchus.

The lobar bronchi each divide into two or more segmental bronchi. The lingular bronchus which runs downwards from the left upper lobe bronchus supplies a segment of lung on the left side, the lingula, which corresponds to the middle lobe on the right .

The bronchi become progressively narrower and eventually become bronchioles . These divide further until the terminal branchioles are reached; these lead into respiratory bronchioles which have alveolar ducts and alveoli opening into their lumen. The lung tissue distal

to the terminal bronchiole is an acinus and is composed of respiratory bronchioles and the alveolar ducts and alveoli which arise from them [Horsfield, 1981].

Tissue components of tracheobronchial tree :

The trachea and bronchi are composed of the following layers :

1. Mucosa : It is lined with ciliated columnar epithelium and contains mucous secreting goblet cells.
2. Submucosa : It contains mucous glands.
3. Fibro-cartilaginous layer containing plain muscle.

The trachea and main bronchi are supported on their anterior and lateral aspects by horseshoe shaped plates of cartilage and the posterior deficiency is supported by muscle fibres. Cartilage is irregularly distributed in the walls of the lobar bronchi where they enter the lung substance and in the walls of the segmental and smaller bronchi .

The bronchioles do not contain cartilage or mucous glands in their walls. The alveolar wall is composed of a continuous layer of epithelial cells, fibres of elastin, reticulin and collagen, and small arteries and capillaries. The epithelial lining of the alveoli consists of

a continuous basement membrane and two types of cells called pneumocytes. Type I pneumocytes are predominant and are in direct contact with the pulmonary capillaries and contribute to the blood-gas barrier. Type II pneumocytes are responsible for the production of pulmonary surfactant. Pores in the alveolar wall, pores of Kohn, allow collateral ventilation of air from alveolus to alveolus and segment to segment and help to prevent lobular and segmental collapse [Campbell and Schonell,1984].

PULMONARY CIRCULATION

The lung has two different circulatory systems. The pulmonary circulation serves the respiratory function, and the bronchial circulation supplies the relatively high metabolic needs of the lung tissue itself.

INNERVATION

The trachea , bronchi and lungs are supplied by the vagus and the thoracic sympathetic nerves. Stimulation of the vagus causes broncho-constriction while sympathetic stimulation with drugs such as adrenaline causes bronchial dilation [Slonim ,197].

GROWTH AND DEVELOPMENT OF THE LUNG

I. PRENATAL DEVELOPMENT

The initial phase of fetal development, the embryonic period, occurs during the first 5 weeks after conception. The primitive lung bud evaginates from the cervical region of the endodermal tube. Dichotomous, asymmetric bronchial branching continues; the number of branches of the conducting airways found in the adult is reached by the end of the 16th week of fetal development, completing the pseudoglandular phase. Subsequent conducting airway growth occurs by increase in size and length but not in numbers.

The canalicular phase, 16 - 26 week, is characterized by the further development and vascularization of the future respiratory portions of the lung. The final phase the terminal sac period, end at birth. By this time the respiratory unit consists of 3 orders of respiratory bronchioles, a generation of transitional ducts and terminal clusters of alveolar sacs. Fewer than 70 million primitive alveoli are present at birth [Doershuk, 1983].

II. POSTNATAL GROWTH AND DEVELOPMENT

Two distinct processes occur in all lungs postnatally:

1. A quantitative change that is brought about by cellular multiplication and cellular enlargement.

2. A qualitative change in which there is alteration in the structure and shap of the lung tissue and this involves growth of new alveoli and vessels. The peripheral airways show an increase in the amount of muscle in their walls after birth. Mucous glands form a high proportion of the bronchial wall in children compared to adults [Thurlbeck, 1981].

Cudmore , et al.,1962 found that growth was faster in the proximal airways than in the distal airways.

Hilsop et al., 1972 reported that the pre-acinar airways of the infant may be regarded as a miniature version of those in the adult and that the relationship persists during postnatal growth. Total pre-acinar length and diameter increased in direct proportion to each other.

DIFFERENCES BETWEEN TALL AND SHORT SUBJECTS

The size of major bronchi is related to stature . The bronchioles are constant in number, regardless of stature and the total number of alveoli in