A Re-evaluation of Bronchiectasis Using Fume Fixation

1. The Broncho-alveolar Structures: A Preliminary Study*

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Numerous authors have written at great lengths on the subject of pulmonary physiology in bronchiectasis. Similarly, the histopathologic observations have been correlated with the gross appearance of the specimen as well as the radiologic changes that are present. All of these studies have shed considerable light on this disease entity, but a clear and concise understanding of the effects of bronchial or bronchiolar dilatation upon the distal structures, such as the alveolar duct and alveolar wall, is still not available to the student of pulmonary respiration.

Recently Blumenthal and Boren,* as well as Hentel and Longfield** published their methodology and observations in fume fixation-inflation of the lungs. This method permits a more comprehensive study of the integral portions of the pulmonary parenchyma. Utilizing the concept of stereoscopic study of unstained and stained sections, one can also study interrelated changes that occur in many diseases. We have adopted this methodology for renewed studies of bronchiectasis.

Gordon et al. previously differentiated tuberculous from nontuberculous bronchiectasis. Study of nontuberculous bronchiectatic specimens seems to indicate a distinct differentiation into two separate types which bear no relationship to the grossly described forms of cylindrical and saccular ectasia. For the sake of simplicity we have designated these two types of bronchial disease as: (a) congenital or developmental, and (b) pyogenic. In the congenital variant, one is impressed with the gross bronchial dilatation without destructive or degenerative changes in the adjacent parenchyma (Fig. 1). Histo-

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FIGURE 1: Gross section, congenital bronchiectasis right lower lobe. Dilatation of bronchi with minimal involvement of parenchyma.
logically, there is close proximity of uniform and slightly dilated alveolar ducts without concomitant evidence of an inflammatory reaction in the parenchyma (Fig. 2). There is no evidence of peribronchial fibrosis and reticulum stains show a compact reticular network, predominately in the septal regions. The alveolar wall itself appears to be intact and within normal limits, when compared with sections taken from “normal” individuals in essentially the same age bracket (Fig. 3). Pigmentation is minimal and, in addition, the cellular constituents of the alveolar membrane fail to demonstrate the presence of fibrotic changes when specific histochemical techniques are used.

The pyogenic bronchiectasis, which is the commonly inferred type, presents a gross and stereomicroscopic picture which is in sharp contrast to the developmental or congenital variant (Fig. 4). The alveolar ducts are difficult to visualize and, when seen, vary considerably in size and shape. The alveolar membrane is enlarged and shows a greater surface area than that seen in congenital disease (Figs. 5 and 6). The alveolar membrane

**FIGURE 2:** Congenital bronchiectasis. Dilatation and distortion of alveolar ducts with relatively no alveolar involvement (x15). **FIGURE 3:** Congenital bronchiectasis. Lack of inflammatory reaction on alveolar wall (x30).
also demonstrates excess pigment depositions, inflammatory cellular foci, and focal areas that are specific for fibrotic change. The reticulum stroma is fragmented and loosely arranged.

In observations at the time of surgery, it is noted that in pyogenic ectasia a segment, group of segments, or lobe is firm, collapsed, dull slate blue, and fails to ventilate. Numerous enlarged lymph nodes are present. On the other hand, in congenital disease the lung is bright to pale pink in color, inflates and deflates readily, and there is lesser evidence of surface pigmentation in the involved portion of the lung. Lymphadenopathy is not striking. Bronchograms in the congenital form commonly show diffuse ectasia throughout an entire lobe or lung. The disease may be unilateral or bilateral (Fig. 7). The bronchograms in pyogenic bronchiectasis demonstrate ectasia in the posterior segments of the lower lobes, the right middle lobe, and lingula of the left upper lobe (Fig. 8).

To date, we have not studied details of the capillary vascular bed in the alveolar membrane. These studies will be undertaken in the near future in an attempt to demonstrate (a) an alveolar capillary block in the pyogenic variant and lack of same in the congenital form, and (b) differences in the capillary patterns between both forms to confirm gross contrasts seen in the injected specimens.

**Summary and Conclusion**

Introduction of fume fixation-inflation of lung specimens has brought renewed interest in the study of bronchiectasis. The three dimensional studies provide further insight into hitherto unseen facets of pulmonary histopathology. Our observations indicate two separate forms of bronchiectasis. These are distinguishable in the gross as well as in the three dimensional studies of the histologic sections.

**Figure 4**

Pyogenic bronchiectasis. Note diffuse pulmonary involvement suggesting a coarse sponge-like structure.

**Figure 5**

Pyogenic bronchiectasis. Enlargement of alveolar membrane, pigmentation and focal inflammation (x30).

**Figure 6**

Pyogenic bronchiectasis. Inflammatory reaction on alveolar membrane (x60).
RE-EVALUATION OF BRONCHIECTASIS

RESUMEN

La introducción del método de inflación-fijación del pulmón por vapos ha despertado nuevo interés en el estudio de la bronquiectasis.

Los estudios tridimensionales proporcionan mayor conocimiento del interior hacia aspectos no vistos antes, de la histopatología pulmonar. Nuestras observaciones indican que hay dos formas distintas de bronquiectasis. Tales formas son distinguibles en los estudios tanto en grueso como en el tridimensional de las secciones histológicas.

RESUME

L'introduction de la technique de fixation des poumons avec insufflation a apporté un renouveau d'intérêt dans l'étude de la bronchectasie. Cette étude à trois dimensions offre un nouvel aperçu sur des facettes jusqu'ici inconnues de l'histoire pathologique pulmonaire. Les observations de l'auteur montrent deux formes distinctes de bronchectasie. Elles peuvent être distinguées à l'examen macroscopique aussi bien qu'à l'examen à trois dimensions des coupes histologiques.

REFERENCES


EFFECT OF VITAMIN A AND D CAPSULES ON INCIDENCE OF CORONARY HEART DISEASE AND BLOOD CHOLESTEROL

The incidence of coronary heart disease over a period of five and one half years in a group of 136 patients receiving vitamin A and vitamin D capsules for between six months and five and one half years was compared with that of 271 controls attending the same clinic. Of the treated group, eight (5.8 per cent) developed coronary heart disease, compared with 43 (15.8 per cent) of the control group. The difference is statistically significant. Of the more serious and less equivocal types of coronary heart disease, there were only two (1.5 per cent) cases among the treated group and 23 (8.5 per cent) among the controls. The difference is significant. Following administration of the vitamin A and vitamin D preparation, there was a highly significant reduction (P 0.001) of the mean serum cholesterol level in a group of 13 males with an initial level of 250 mg. per 100 ml. or more. There was no significant change in the mean cholesterol level of seven men with an initial level of 249 mg. per 100 ml. or less. As there is independent evidence that vitamin A deficiency causes an abnormal cholesterol metabolism and that vitamin A supplements are antihypercholesterolemic and can reverse atheroma experimentally, vitamin A is likely to be the active substance in the capsules.