PROTEIN ELECTROPHORESIS OF BOTH SERUM AND PLEURAL EFFUSION

Thesis
submitted in partial fulfilment

For Master Degree

IN

Chest diseases

by

Zienab Mahmoud El Sayed
M.B. , B.ch.
Ain Shams university

Supervisors

-Prof. Dr. Adel Gomaa
Prof. of chest disease
Ain Shams university

-Prof. Dr.Hussein Ali
Prof. of chest disease
Ain Shams university

Prof. Dr. Fathi Tash
Assist. prof. of Biochemistry
Ain Shams university

Faculty of medicine

Ain Shams University
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بسم الله الرحمن الرحيم

" قالوا سبحانك لا علم لنا الا ما علمتنا
انك أنت العليم الحكيم "

صدق الله العظيم

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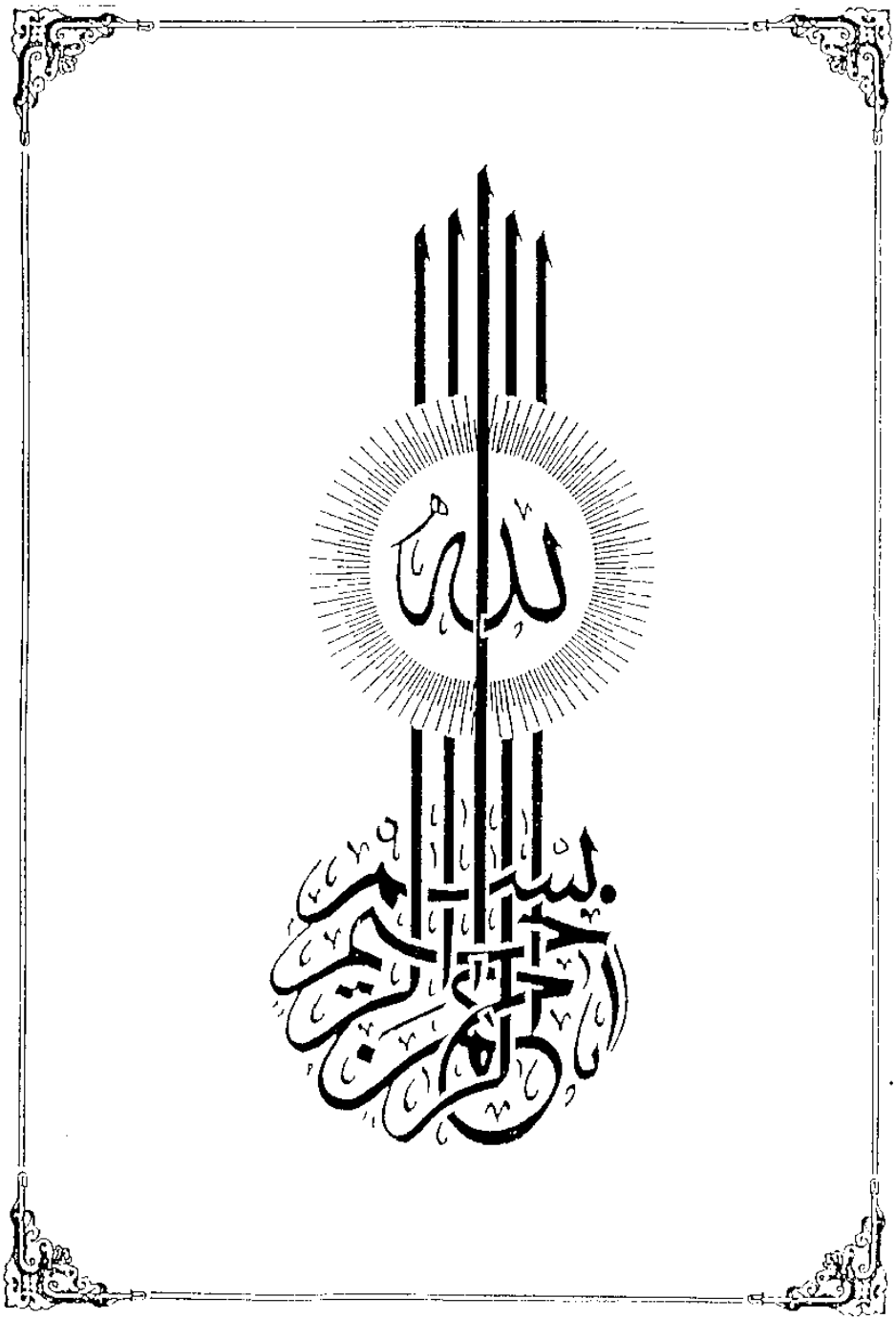

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Introduction & Aim Of The Work

INTRODUCTION AND AIM OF THE WORK

The pleural effusion stands frequently as a difficult problem for many physicians, that has to be solved especially with the advent of moderm techniques for diagnosis.

Regardless of the underlying disease, pleural fluid contains all the major protein fractions present in the serum and probably originates from it. It was, thus, thought that fractionation of proteins of different pleural fluids, and its comparison with those of serum, might throw further light on the possible aetiologenesis of pleural effusion (Salem, et al, 1967 and Watkins, 1958).

The ratio of the alpha 2 globulin in the serum and pleural fluid is of some assistance in differentiating malignant exudate from others, but the estimation of alpha 2 globulin in the pleural fluid alone can not, by itself, help so much.

Aim of the work:

The aim of this work is to use the comparison of different protein fractions of both serum and pleural effusion as an aetiologic diagnostic mean.

Review Of Literature

MORPHOLOGY OF THE PLEURA

The pleura is a glistening wet membrane which lines the interior of the thoracic cavity and envelops the lung. It is of mesodermal origin.

The term parietal pleura refers to the pleura which does not invest the lung, but lines the hemithorax and is divided into; mediastinal diaphragmatic and costal pleura (portions). (Petty 1975).

The visceral pleura sweeps over the surfaces of the lung and lines the interlobar fissures, and is continuous at the hilum with the parietal pleura. (Petty 1975).

The pleural cavity is only a potential space for under normal conditions, the visceral and parietalpleura are in aposition save a small quantity of lubricating fluid. The volume of this fluid remains constant due to a balance between filtration from surrounding tissues and absorption into the pleura lymphatics. (Petty 1975)

HISTOLOGY OF THE PLEURA

The pleura consists of a thin superficial layer known as endopleura and a dense deeper layer known as the chief layer.

The superficial layer is composed of a delicate sheet of elastic and collagenous fibres, in no particular pattern,underlying a sheet of

mesothelial cells. The mesothelial cell layer is important for mobility of the lung because adhesion of the pleural membranes seems to be present when it is lacking (Fraser et al., 1977). The mesothelial cells are 15-30 U wide and 6-7 U thick. They are derived from the primitive mesoderm and have no basement membrane and the epithelium lies directly on the connective tissue layer. Among polygonal cells are islets (0.1-0.5 mm in diameter) of small round cells with little cytoplasm (Fraser et al 1977).

The connective tissue layer varies in composition and thickness in different parts. Over the pericardium it is almost entirely collagenous; over the diaphragm and central tendon elastic fibres predominate. Normally the diaphragmatic and costal pleura come into contact in the costophronic angle during expiration.

Deep to the epithelium of the visceral pleura, there is, successively, a fine layer of connective tissue (collogenous and elastic fibres), a strong fibrous layer and a layer of highly vascular connective tissue continuous with the underlying interlobular septa. (Crofton and Douglas 1981).

The electron microscope has shown that the surface mesothelial cells is not smooth but bears

microvilli (varying) in length up to 3 U. The number of microvilli varies from cell to cell but increases caudally. They are numerous in the visceral than the parietal pleura and are sparse over the ribs (Wang 1974).

They may have an absorptive function, but may also increase surface mucopolysacharide and so counteract frictional forces (Corrin 1980).

Lipoid droplets up to 1 U in diameter are found just inside the free border. Several micropinocytosis vesicles on the opposite side of cells, and small desmosomes between the cells have been also observed by electron microscopy on the large mesothelial cells of human visceral pleura (Corrion 1980).

The chief layer of pleura which is responsible for its mechanical stability, consists of dense collagenous and elastic tissues.

The visceral pleura is seperated from the limiting membrane of the lung by a layer of loose connective tissue. The pleura is only loosely attached to the limiting membrane and the two are readily sperated in the plane of the subpleural connective tissue, and fluid as air may collect in this layer (Krahl et al., 1964). Subpleural connective tissue is made up of loose connective

tissue. Lymphatic channels, veins, arteries and a rich capillary network are present in this layer, which is also referred to as the vascular layer of the pleura. The diameter of these blood capillaries is about 3-10 times than that of other capillaries, although the features of their wall are similar (Hayek, 1960).

The deep connective fibres of the parietal mingle with the endothoracic fascia. Over the pleural copula this fascia becomes thick and it is attached to the arch of the first rib and to the transverse process of the seventh cervical vertebra by the costopleural and vertebro-pleural ligaments, respectively. (Krahl, et al., 1964).

The lymphatic vessels are mainly subjacent to intercostal muscles and the muscular part of the diaphragm, whereas the blood vessels are mainly to the ribs (Hayek et al., 1960).

BLOOD SUPPLY OF THE PLEURA

Visceral pleura: The main blood supply of the visceral pleura is derived via the branches of bronchial artery, which reach the pleura in the interlobular septa. (Hayek, 1960 and Krahl 1964). Few branches of the pulmonary artery supply the deepest part of the visceral pleura. The terminal branches of the arteries supplying the pleura

ramify in a loose network of capillaries which are about 10 times the width of alveolar capillaries and have been termed by Von Hayek "giant capillaries" (Hayek, 1960).

Parietal pleura : The blood supply of the costal part of the parietal pleura is from the intercostal arteries. The mediastinal and diaphragmatic pleura is supplied by the pericardiophrenic branch of the internal mammary artery. (Croftan and Douglas 1981).

The visceral pleura is drained, primarily by the pulmonary veins (Agostoni, 1972) and the parietal pleura by the intercostals, although the mediastinal portion drains into the bronchial veins.

LYMPHATIC DRAINAGE OF THE PLEURA

Lymphatic drainage of the visceral pleura is via the small subpleural network of lymphatics within the interlobular connective tissue which communicate with the deep lymphatic vessels within the lung (Simer 1952). The lymphatics of the costal part of the parietal pleura drain into the sternal glands along the internal mammary artery and to the internal intercostal glands near the heads of ribs. Mediastinal pleural lymphatic vessels accompany the pericardio phrenic artery and drain to the

posterior mediastinal and tracheobronchial lymph nodes. Some lymph from the caudal parietal pleura drains to infradiaphragmatic lymph nodes. Lymphatic vessels of the pleural diaphragmatic surface drain into the sternal, anterior and posterior mediastinal lymph glands. (Crofton and Douglas 1981). They also inter-communicate with the subperitoneal vessels of the undersurface of the diaphragm. (Simer, 1952).

NERVE SUPPLY OF THE PLEURA

The visceral pleura is supplied by autonomic fibres only and is essentially devoid of pain fibres.

The sensory innervation of the central portion of the diaphragmatic parietal pleura is derived from the phrenic nerve.

The innervation of the peripheral diaphragmatic pleura is dervied from adjacent lower intercostal nerves (Robert et al, 1974). Spinal nerves supply the costal parietal pleura.