STUDY OF CORNEAL DYSTROPHIES WITH SPECIAL REFERENCE TO THE HEREDO-FAMILIAL TYPES

THESIS

Submitted by

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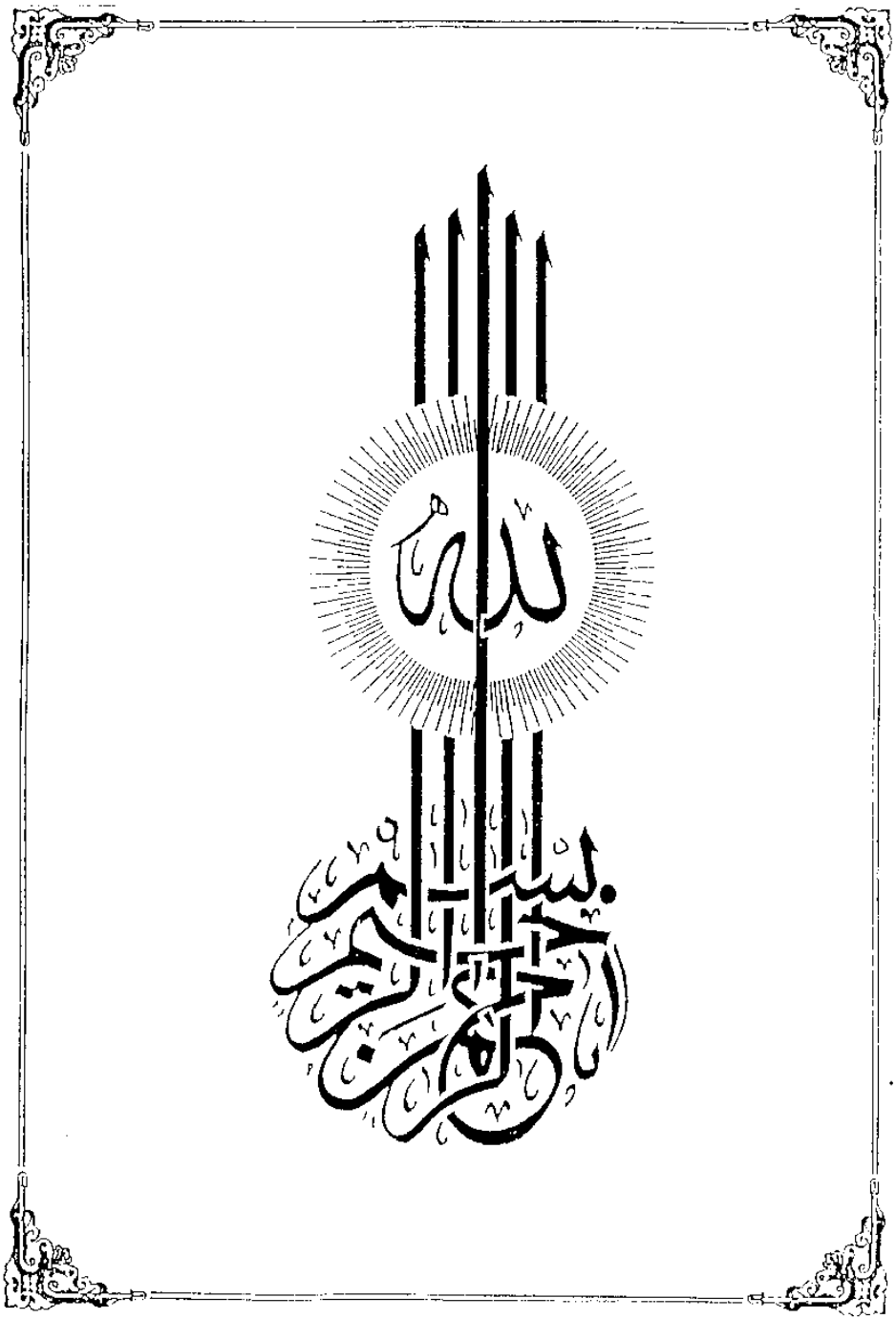
وقل اعملوا فسيرى الله عملكم ورسوله والمؤمنون

- صدق الله العظيم -



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According to Franceschetti et al. (1950),as cited by Duke-Elder (1965) the corneal dystrophies may be defined as hereditary degenerations of the cornea of unknown aetiology occurring bilaterally and manifesting themselves occasionally at birth but more usually during the first or second decades and sometimes later. They are either stationary or slowly progressive throughout life.

Corneal dystrophy is considered one of the most vital and dangerous diseases that may affect the eye, since they appear in an eye which seems to be otherwise normal, they are always primary.

Although the different types of diseases of the cornea are considered to be common in Egypt, corneal dystrophies on the other hand are very rare among Egyptian population. As they may lead to serious deterioration of vision, and because little attention was drawn to their occurrence in the Egyptian literature, the aim of this work is to try to make a pathological study of the different types of corneal dystrophies.

EMBRYOLOGY

(1) The development of the eye as mentioned by Duke-Elder (1963) begins at an early stage - 4 mm human embryo. The two eyes develop from the neural ectoderm, the surface ectoderm and its derivatives and the mesoderm.

(Figs 1 ---- Fig. 6) explain the development of the eye.

'a) Cavity of the fore brain.
(b) Cavity of the optic vesicle.
(c) Cavity of the optic cup.

Fig. 1: Transverse section through the anterior part of the forebrain and optic vesicles of a 4 mm human embryo.

Fig. 2: The primary optic vesicle.

Fig. 3: The formation of the optic cup by invagination at the embryonic fissure and invagination of the surface epithelium.

Fig. 4: The optic cup and lens vesicle.

Fig. 5: The formation of the ciliary region, and

The development of the eye
(Duke-Elder (1963) Part 1)

the iris , the anterior chamber, the hyaloid artery and the lid folds. The lens is formed from the posterior cells of the lens vesicle.

Fig. 6: The completed eye.

(2) Development of the cornea:

Duke Elder (1963) also reported that the corneal epithelium, provided with its basement membrane is derived from the surface epithelium at about the 4th week. During the 6th week (14 mm stage) a double layer of cells is formed, the surface layer being composed of flattened cells with large nuclei. No change occurs until the 8th week when a layer of polyhedral cells appears between the first two layers ; after the 7th month a fourth layer develops and a fifth and six after birth.

Up to the 4th month, the epithelium is separated from the underlying substantia propria only by a Basement membrane (which remain permanently) but, from this stage onwards, a thin acellular lamina appears which is formed of fine fibres derived from the substantia propria. This lamina gradually thickens to form Bawman's membrane at the 5th month and resembles the adult form by the 7th month.

Descemet's membrane is universaly accepted as being formed from the corneal endothelium. But it is not yet exactely known if the basal membrane of the endothelium should be called Descemet's membrane.

ANATOMY

ANATOMY OF THE CORNEA

According to Eugene Wolff's (1968) the cornea forms part of the surface of a sphere. It is often curved more in one meridian than another, usually more in the vertical than in the horizontal meridian. The radius of curvature of the anterior surface is 7.84 mm, that of the posterior surface is 7 mm. The cornea is thicker at the periphery (1 mm) than at the center, where it is 0.58 mm. The posterior lining cells are rich in glycogen, enzymes and acetylcholine. Their activity regulates that of the corneal corpuscles and controls the transport of water and electrolytes through the lamellae of the substantia propria.

The cornea is very richly supplied with fibres derived from the trigeminal nerve. It has no blood vessels with the exception of minute arcades, at the limbus so that it is dependent for its nourishment upon diffusion of tissue-fluid from the vessels at its periphery and materials from the aqueous humour.

HISTOLOGY OF THE CORNEA

According to Eugene Wolff's (1968) the cornea is formed of the following five layers (Fig. 7).

(1) Stratified sequamous epithelium:

This superficial layer is 50-100 u in thickness and consists of nearly five layers of cells.

i- The deepest of these is the basal cells layer which stand in a palisade like manner and rests on a basement membrane. They are columnar with rounded heads and flat bases. Each cell has a slightly oval nucleus. There are two kinds of basal cells, the shorter ones are clear cells, the longer ones are dark. The basal layer is the germinal layer.

ii- The next layer consists of polyhedral cells, each contains an oval nucleus.

iii- The next two or three layers are also polyhedral, the most superficial of which is formed of flattened nucleated cells.

(2) Bowman's Membrane:

It is also known as the anterior limiting membrane or anterior elastic lamina. It is a thin homogeneous

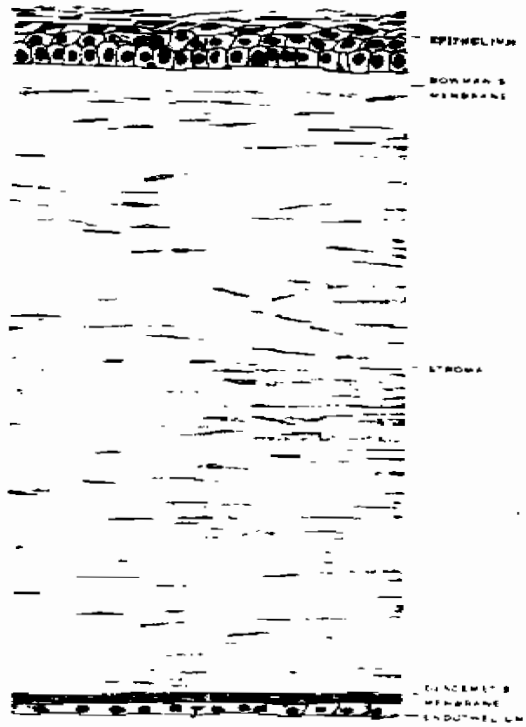

Fig. (7): Transverse section of the cornea (Wolff's 1968 6th Edition).