ANATOMY OF THE IRIS

THESIS

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Ophthalmology

By

MOHAMED HUSSIEN SALLAM

M. B., B. Ch.
Ain Shams University

Supervised by

Professor Dr. M. EL-ARABI

Department of Ophthalmology
Faculty of Medicine
Ain Shams University

Faculty of Medicine
Ain Shams University
Cairo - A. R. E.

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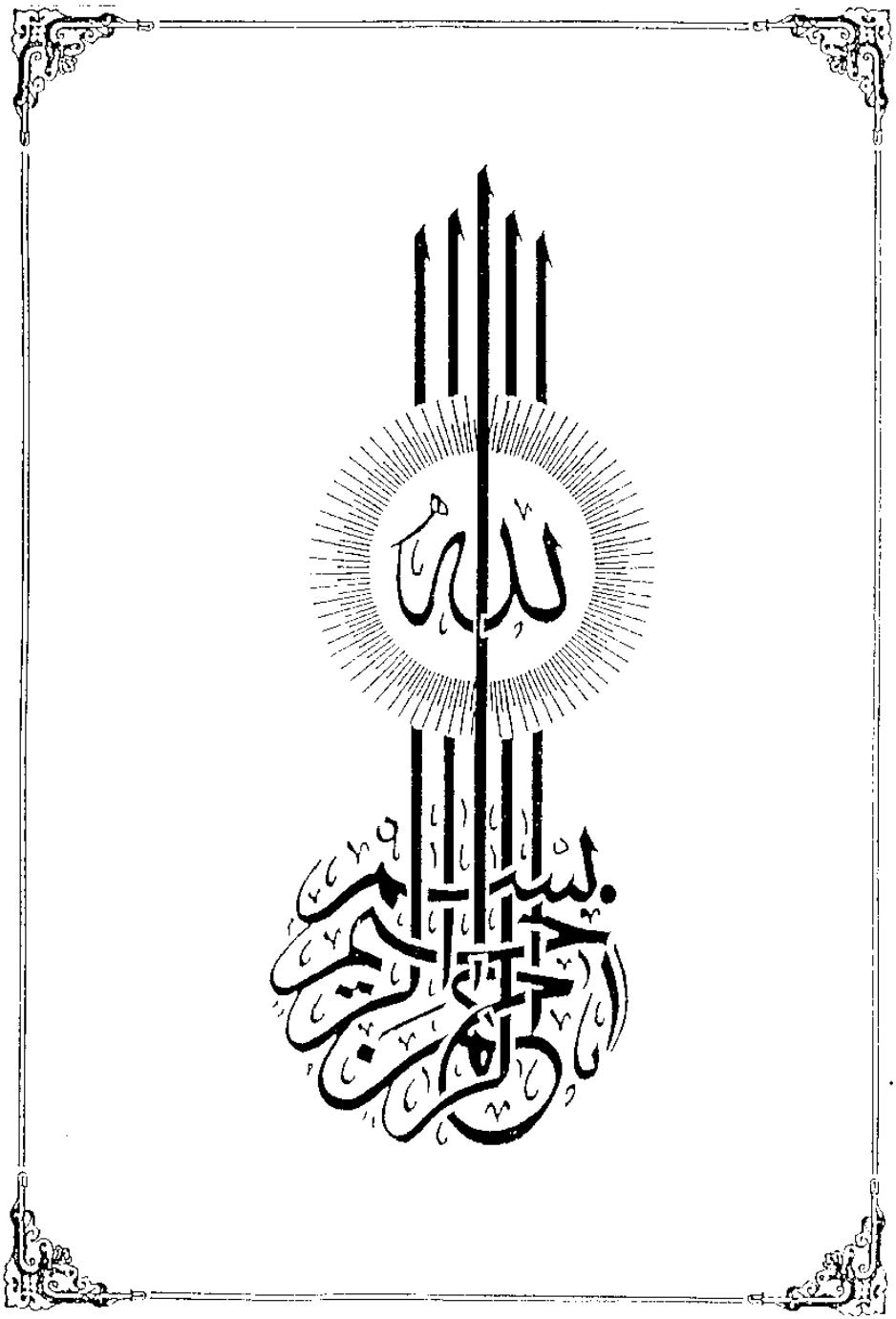

ACKNOWLEDGEMENT

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Mohamed Sallam

HISTORICAL REVIEW

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The word iris dates from classical times (Rufos of Ephesus, c. 98-117; on Naming the parts of the Human Body). The terminology, however, was muddled by Galen c. 131 - 201). who used it to define the (ciliary) ring on which the different membranes of the eye converged, the iris, lying anterior to this, he called the tunica coerulea. The original name, derived from Rufos, was subsequently applied to the anterior surface of the iris by vesalius (1543) and Follopius (1561) to describe its brilliant and variegated appearance, while they called the posterior surface the uvea. The term as we understand it, applied to the whole structure, was first used by winslow (1711) who incidently, first observed that it was narrower on the nasal than on the temporal side.

The pupil was probably so named from the diminutive image seen reflected from the cornea standing out on the black backgrourd of the pupil.

DEVELOPMENT

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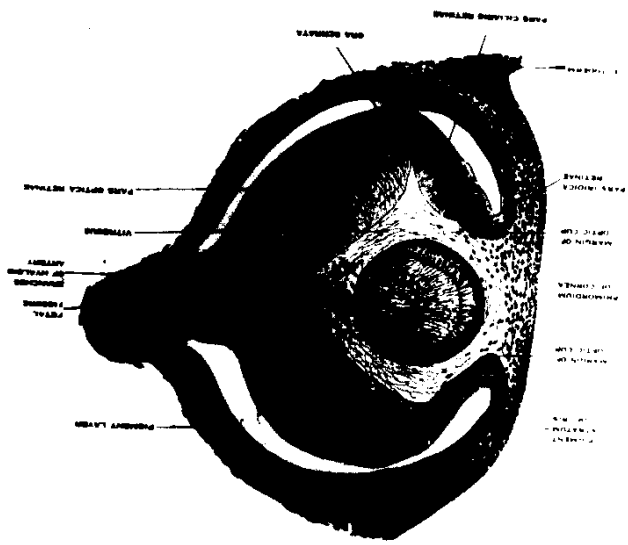
The iris is in part neurectodermal, derived from the marginal region of the optic cup the tissues from this origin are the sphincter and dilatator pupillae and both layers of the epithelium on the posterior aspect of the iris. The mesodermal invasion is responsible for the stroma and vessels of the region.

Up to the end of the third month of embryonic life there is no true iris. The development of the iris commences about the middle of the fourth month by a forward growth of the rim of the optic cup with its overlying mesoderm. It is preceded by a spur - like process of mesoderm which is continuous with the pupillary membrane. The iris thus becomes more or less differentiated from the ciliary body and pupillary membrane.

The sphincter pupillae is developed at this period from the pigment epithelium of the rim of the optic cup. At about the sixth month the sphincter begins to separate from the cells that

gave it origin, passes into the mesodermal portion of the iris and is invaded by vessels. Pigment cells, derived from the anterior portion of the optic cup, pass through the sphincter and into the iris stroma to form the clump cells. At birth the sphincter pupillae is still closely adherent to the epithelial cells of the pupillary border. The dilatator pupillae is also derived from the same ectodermal cells at the end of the sixth month. The anterior epithelium already contains pigment when the iris commences to form. Pigmentation of the posterior epithelium commences at the pupillary margin, and reaches its base at about the sixth month. The iris develops in width more slowly than the rest of the eye; so the pupil gets wider up to the beginning of the seventh month. At five months the iris is hidden by the limbus and resembles the condition of aniridia.

After the eighth month the pupil becomes smaller, due to the development of the sphincteric portion of the iris. With the disappearance of the pupillary membrane changes take place in the front of the iris with the formation of iris crypts. At about this time the anterior border or limiting layer can be recognised. It is formed by several rows of star-shaped cells which anastamose with each other and which may at times contain pigment cells at birth. The pigmentation of the stroma usually takes place in the first year after birth, and appears to be under the control of the sympathetic system. The pattern of the anterior surface of the iris is produced during the first year, and as a rule the iris is not fully formed till twelve months after birth.



Section through the eye and fetal fissure of a 13.5 mm human embryo (X 157).

(From fischel, 1925 - Eugene wolff's Anatomy of the eye and orbit.).

GROSS ANATOMY

CROSS ANATOMY

Inasmuch as the iris varies in colour, appearance, and architecture, not only between individuals but in the same person with age and with its state of contraction, its anatomical description is difficult. Attached to the anterior surface of the ciliary body by a Root(or CILIARY BORDER), it forms an extremely delicate and motile diaphragm stretching across the anterior part of the eye, provided with a circular opening, usually placed slightly eccentrically towards the nasal side, the PUPIL. It lies in the form of a flat truncated cone, the pupillary border resting upon, and being supported by the lens; only when the lens is absent does it become flat, and then, losing this support, it also becomes tremulous (iridodonesis). The entire tissue is thin and fragile, but the thinnest part is at its root where it merges with the ciliary body, here therefore, the iris tears on trauma.

As seen in the living eye, the image of the iris is magnified by about one-eighth, since the cornea and aqueous act as a planoconvex lens (V.Helmholtz, 1856); moreover it seems nearer to the cornea than it actually is and appears to be convex. If, however, the eye is viewed through a box with glass sides filled with water so

that the corneal refraction is eliminated, it appears in its natural form and position.

Since the pupil is constantly changing in diameter, the width of the iris is very inconstant, it varies from 3 to 5 mm., an average being 3.5 mm, which appears clinically to be 4 mm. Similarly the pupil may well alter in diameter from 1.1 to 8 mm., a variation which actually appears in vivo to be 1.3 to 9 mm.; on the average it is wider in the short sighted than in the long sighted and slightly larger in females than in males (Tange, 1903). Just before death the pupil usually dilates widely (8 mm) it then contracts again to about 3.5 mm., while histological hardening and fixing contract it still further to 2 to 3 mm. (Albrand and Schroder, 1906). Since after death atropine and eserine lose their effect, it follows that it is impossible to prepare anatomical specimens other than in this average state of contraction. A slight degree of dilatation can, it is true, be obtained if an atropinised eye is plunged into warm Fleming's solution immediately after excision (Heine, 1900).