# ELECTROPHYSIOLOGICAL STUDY OF AXIAL MYOPIA IN EGYPT

## Thesis

SUBMITTED IN PARTIAL FULFILMENT

OF THE (M. D.) DEGREE

IN

( OPHTHALMOLOGY )


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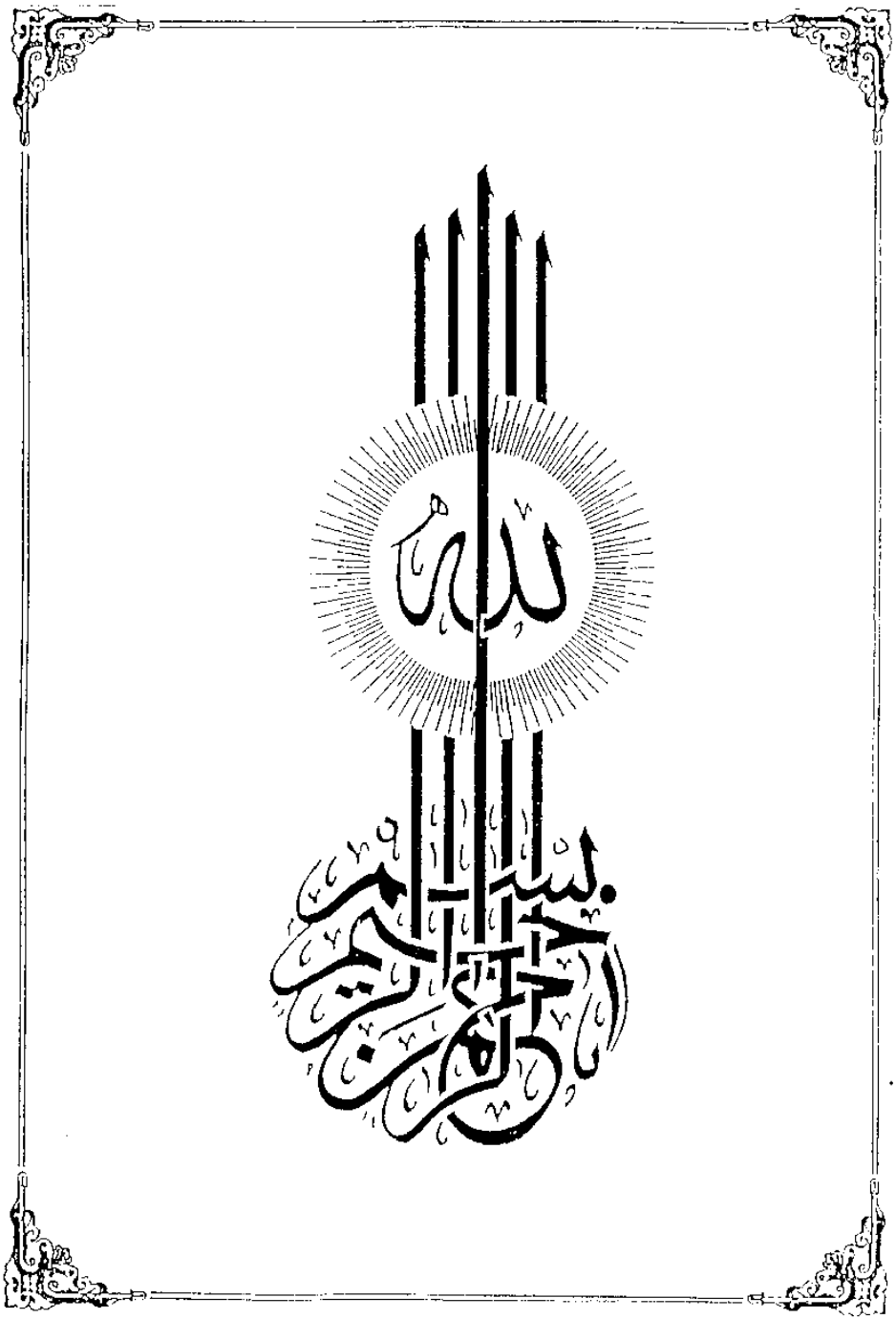
***1985***



## ACKNOWLEDGEMENT

I am greatly indebted to Prof. Dr. ABD EL-LATIF SIAM for having suggested the topic of this work, and for having encouraged me so decently in overcoming any difficulty. His great efforts, desire for perfection and enthusiasm will always remain a good example for me and for all candidates in this field of medicine.

I wish I were able to express my gratitude to Prof. Dr. MAHMOUD HAMDI under whose meticulous supervision it was indeed a great pleasure to work. He has revised every detail of this work, sparing no effort in guiding me towards the best. His devotion and honesty will stand always as bright signs in my future practice.

Fatma M.S. El Hennawi

C O N T E N T S

# INTRODUCTION

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## MYOPIA

Myopia "short sightedness" is that form of refractive error wherein parallel rays of light come to a focus in front of the sentient layer of the retina when the eye is at rest.

In simple myopia this is brought about by variations within normal limits of the optical system - an increased curvature of the corneal surface, lens surface, a shallow anterior chamber, a high refractive effectivity of the lens, or a great axial length of the globe "axial type". In so far as it is due to an increased length of the globe, the myopic eye can be considered an over-developped eye in which the processes of growth have exceeded the normal limit.

In the great majority of cases, myopia first appears between the ages of five and puberty and may progress during the growing age until adolescence is passed when the eye stabilizes. Such progress, however, is by no means constant, thus in series of children followed over many years, Sorsby (1935), found that 35% of myopes remained stationary while 15% showed only slight progress. All the time, however, whether or not progression occurs,

in the majority of myopic cases, the eyes remain healthy and the visual acuity can be corrected to expected standards with the appropriate lenses.

Degenerative Myopia

It is that type of myopia which is accompanied by degenerative changes occurring particularly in the posterior segment of the globe. Usually, but not invariably, it is associated with lengthening of the anteroposterior axis of the eye ball, which is by no means always progressive.

From the medical point of view, degenerative myopia is the most serious of all refractive errors.

Pathological Changes in Degenerative Myopia

Sclera:

Thinning of the sclera occurs in myopia, particularly in the posterior segment of the eye, and very markedly so in association with posterior staphyloma, which is an old observation (Bass, 1893; Heine, 1900; Kraupa, 1914). The thinning may occur on the nasal side of the optic disc, but ectasias are most common at the posterior pole which is normally the thickest part of the sclera (Mawas, 1934). Dehiscences may be observed on the inner surface of the sclera into which the retinal

tissues dip (Polatti, 1906; Plocher, 1919). Stocker (1943) found such a thinning in an early case of myopia, suggesting that it may be a result of stretching but, on the other hand, Stilling (1904) and Fuchs (1919) reported advanced cases of myopia in which the sclera was thicker than that of the average emmetropic eye.

Choroid:

The choroidal changes are essentially atrophic in nature "myopic choroidal degeneration". In their consideration two facts must be kept in mind, first, in juvenile or commencing myopia, the choroid is usually normal and shows no signs of atrophy (Sotcker, 1934) and, second, the atrophy does not usually occur untill some considerable time after the elongation of the eye has ceased. The degeneration does not run pari passu with the degree of myopia and the resemblance between the changes characteristic of myopic and senile degeneration is great.

The chief change is a generalized thinning of the choroidal coat which which may become very attenuated and may even disappear completely over large areas.

Retina:

Atrophic changes in the retina progress coincidentally with those in the choroid. Among the earliest evidence

of atrophy are those involving the pigmentary epithelium which shows marked alterations in the posterior segment before atrophy of the rods and cones, and chorioretinal fusion, occurs. The regular hexagonal pattern of the normal cells is replaced by an untidy layer, with an irregular pattern of misshapen cells with much of the pigment lying externally. Sometimes, particularly in association with the dehescences in Bruch's membrane, the pigment epithelium proliferates to form branched pigmented figures or large conglomerate masses. It is a localised proliferation of this type which forms the circular Forster-Fuchs black spot at the macula (Lehmus, 1857). When the elastic lamina is defective, fusion of the retina and choroid occurs; and with subsequent cicatrization and pigmentary proliferation, produces a picture identical with late inflammatory lesion. Following the degeneration of the pigmentary epithelium and choriocapillaris, the neuro-epithelium also degenerates, the rods and cones and outer nuclear layer gradually become attenuated, but the atrophy usually ceases at the inner nuclear layer which has a retinal nutrient supply. Only at the periphery does retinal degeneration appear to run a separate course where the typical picture of peripheral cystoid degeneration with the formation of cysts so characteristic of a senile change is frequent (Hansen, 1925), "Bleesig's cysts".

## Clinical Features

Symptoms: In simple myopia, the corrected visual acuity is generally good while the visual disability in high myopia is usually considerable. Statistically, the higher the myopia and the longer it has existed, the worse it tends to be (Schleich, 1882). This diminution in acuity has been attributed to a spreading-out of the cones in the expanded retinal surface, but it is probably accounted for by the atrophic changes in the sentient layer. The development of macular changes, of course, leads to the formation of an incapacitating central scotoma.

Apart from the visual incapacity, the high myope is usually uncomfortable in the use of his eyes. When corrected, the small sharply defined and bright images are annoying; much use of the eyes brings about a feeling of strain and fatigue. The degenerated and liquified vitreous gives rise to a multitude of symptomatic muscae volitanes due to floating opacities which throw abnormally large images upon the retina owing to their background distress and anxiety to the patient.

## Clinical Signs

Clinically, the eye generally appears obviously large and prominent. When the eyes are turned strongly

inwards the equatorial region appears in the outer part of the palpebral opening, making the flatness of its curvature obvious. The cornea is abnormally flat, counteracting to some extent the optical effect of the axial elongation. The pupil is usually slightly dilated.

Ophthalmoscopically, degenerative myopia shows very characteristic changes. The essential features are:

1. Changes at the optic disc:

These are of great interest and are frequently the first organic signs to become clinically evident. It is to be noted that the thinness of the precribriform glial tissue in the myopic eye may give the appearance of slight cupping which may sometimes suggest the presence of glaucoma. The myopic crescent may be present at birth but usually becomes evident at puberty. It usually appears in the first place as a white sharply defined area lying on the temporal side of the optic disc where the inner surface of the sclera or in some cases the scleral canal is directly seen.

The crescent may be narrow (Fig. 1) or wide. It is commonly temporal. It lies somewhat superiorly or inferiorly and occasionally nasally or annular surrounding the entire disc in the form of a myopic halo (Fig. 2).

Fig. 1: Myopic crescent

Fig. 2: Annular crescent

Sometimes, it spreads therefrom to include a large area of the fundus and envelop the whole macular area. The slow and gradual extension of the atrophic change can sometimes be followed when repeated ophthalmoscopic examination, over a period of years, reveals the migration of pigment temporally, as the crescent progresses.

2. Atrophy of the choroid:

This is almost a constant feature of the higher degrees of myopia, occurring simultaneously with pigmentary disturbances. A generalized appearance of thinning is common wherein the pigment layer of the retina becomes attenuated and the choroidal vessels become clearly visible, the small meshwork of vessels disappears leaving the large trunks, and eventually the atrophic changes lead to the complete ophthalmoscopic disappearance of the tissues so that circumscribed white areas of sclera become visible. Simultaneously, proliferation of pigment occurs in scattered areas leading to the picture of extensive myopic chorioretinitis which, however, despite its appearance, is degenerative in nature not inflammatory. These changes tend to be most marked in the central area and the periphery (Fig. 3, 4).

The changes at the macula are characteristic, common and, of course, incapacitating. Schwezer (1890) found

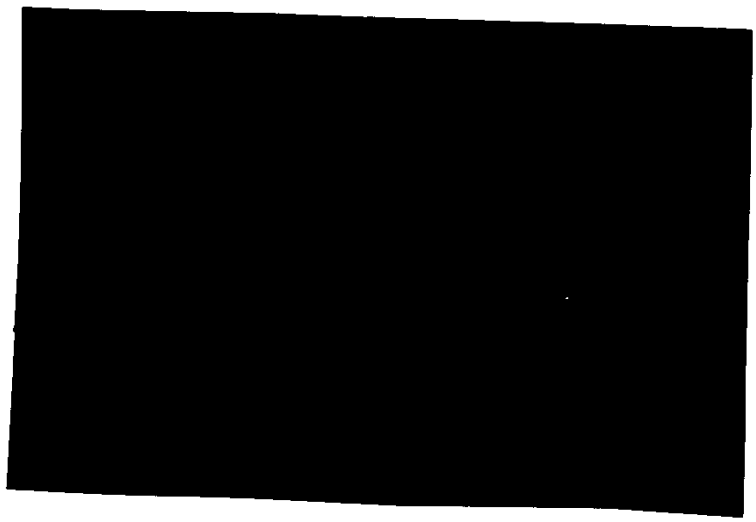

Fig. 3: Equatorial lattice degeneration: The choroidal vessels are well seen, as well as areas of increased pigmentation.

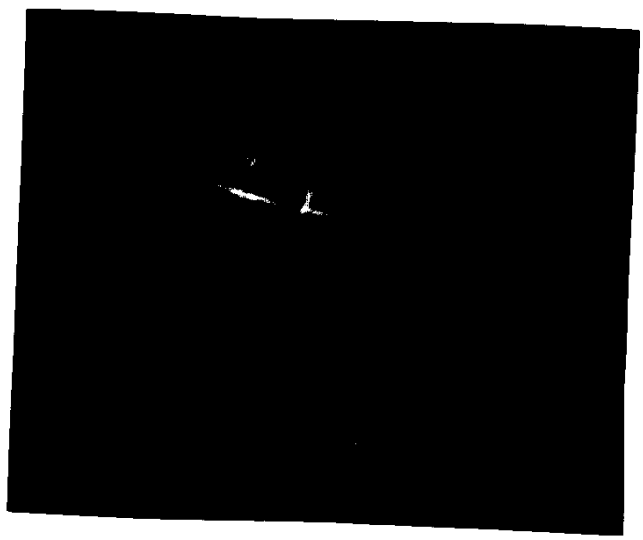

Fig. 4: Peripheral lattice degeneration in the course of a retinal vessel.