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VISUAL FIELD CHANGES ASSOCIATED WITH HIGH MYOPIA

Thesis

Submitted in partial fulfillment of the
Master Degree in Ophthalmology

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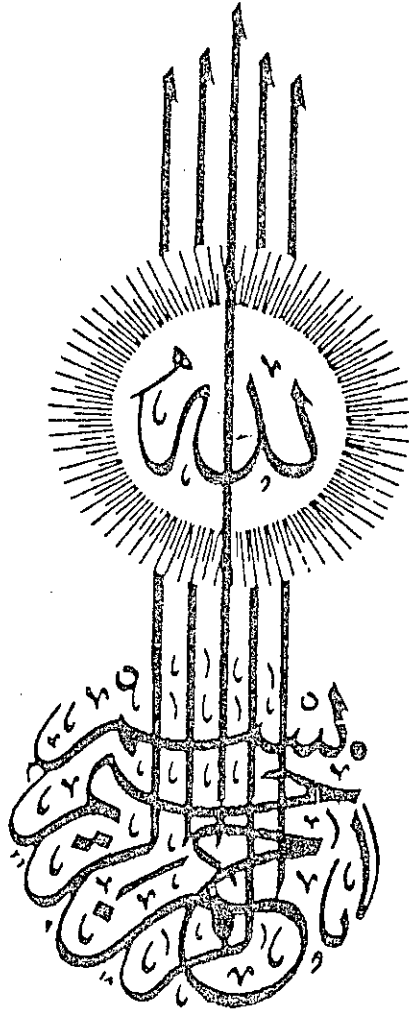
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Introduction and Aim of the Work

Myopia is defined as that optical condition of the non accommodating eye in which parallel rays of light entering the eye are brought to a focus anterior to the retina. Myopia can be classified into 2 types; refractive and axial myopia.

Myopia of a low or moderate degree, generally is not associated with chorioretinal degenerations that are most common with the pathological (high, malignant, degenerative, progressive) myopia (Yanoff and Fine, 1989).

Visual field studies play an important role in the evaluation of pathologic myopia. They are of both diagnostic and prognostic value and of particular worth during the early stages of the disease. In actuality, visual field changes are often the first and most serious functional derangement of these eyes (Blatt, 1964). Careful evaluation of visual field changes in myopia can avoid the erroneous diagnosis of such ocular diseases as low tension glaucoma and atypical retinitis pigmentosa in addition to neurologic disorders. The visual field defects found in high myopia are both central and peripheral, there are, in fact, few types of field changes that are not found in myopic eyes. The defects of the central visual field that present in eyes with high myopia are enlargement of the blind spot, central, paracentral and arcuate defects. A wide variety of peripheral defects can be found in the myopic eye. Among these are concentric contraction, ring and arcuate scotomata, hemianopic and quadrantic defects, and peripheral scotomata (Curtin, 1985).

The aim of the present study was :

To study the relations of visual field changes with age, sex, degree of myopia axial length and funds changes of the myopic eyes.

Review of Literature

Myopia is defined as that optical condition of the non accommodating eye in which parallel rays of light entering the eye are brought to a focus anterior to the retina. The prevalence of myopia is approximately 20% in USA (Curtin and Whitmore, 1985). Over 75% among school children in Taiwan (Fledelins and Goldschmidt, 1988).

According to its etiology myopia can be classified into 2 types; refractive and axial myopia.

In refractive myopia : The overall refractive power of the eye as determined by cornea and crystalline lens power, modified by anterior chamber depth, is excessive in relation to an eye of normal axial length (21.5 mm to 25.5 mm).

Axial myopia is the result of excessive elongation of the eye with respect to its refractive components and is associated with such complications as cataract, glaucoma, retinal detachment and amblyopia (Curtin and Whitmore, 1985).

Said et al (1987) in their study found that in high myopia the mean axial length was 29.16 ± 1.5 mm and the mean refraction was 11.47 ± 2.6 D.

In the same study Said et al (1987) found an in significant relationship between axial length elongation and the degree of myopia in cases of high myopia (over-6 D). They concluded that high myopia is a combination of both axial and refractive ametropia.

Pathological Changes in High Myopia

The posterior fundus changes of the myopic eyes are as striking as they are unique. They are the clinical basis for the diagnosis of pathologic myopia and they can cause an incapacitating loss of vision in later stages of the disease. These fundus changes have generally been assumed to be the consequence of increased axial elongation of the globe with the attendant mechanical tissue strain and vascular changes which occur secondary to the process of stretching (Curtin et al, 1971 and Fledelius, 1983).

Sclero-chorio-retinal changes :

The five clinical signs of myopia are :

- 1- A crescent around the optic disc.
- 2- Lacquer cracks.
- 3- Chorio-retinal degeneration.
- 4- Macular degeneration.
- 5- Posterior staphyloma.

As myopia progresses, these fundus changes worsen. The severity of the pathologic changes also worsen with advancing age (Tso, 1988).

Many types of optic nerve crescent have been observed Temporal and annular crescents are the most commonly met with in progressive myopia The tendency towards annular crescent formation is increased as the axial length of the globe increased. Furthermore, all crescents, regardless their position and shape, tend to be larger in size as the axial length of the globe increases. It is demonstrated that steady rise of the incidence of myopic crescent from 0% in eyes of 20-21.4 mm

axial length to 100% in eyes of 28.5 mm axial length and above (Curtin and Karlin, 1971)

The crescents of high myopia are located temporally in approximately 80% of cases. In 10% of cases the crescent may extend to become annular surrounding the entire disc, sometimes even spreading to include a large area of the fundus with envelopment of the macular area. In rare instances, the myopic crescent is situated on the nasal side of the disc (inverse crescent) (Apple and Rabb, 1985).

Lacquer cracks :

Yellowish-white, irregular linear lesions of the posterior fundus in eyes of 26.5 mm axial length or more, with an incidence of 4.3% in these eyes. The eyes of males are affected more often than those of females in a proportion of almost 2:1. The greatest incidence of lacquer cracks is noted between 20 years and 39 years-old (Curtin and Karlin, 1971).

These lesions represent breaks in Bruch's membrane and choriocapillaries through which connective tissue grows beneath the RPE. These breaks in the macular region may lead to subretinal neovascularization and a small haemorrhage that later become organized and pigmented. This appears clinically as Forster-Fuch's spot (a small dark macular lesion which is actually a "mini" disc form macular degeneration (Yanoff and Fine, 1989).

Chorioretinal degeneration :

Tessellation of the fundus and chorio-retinal atrophy (atrophy of the choroid which is occurring near the posterior pole) are almost consistent features of severe myopia. Initially the RPE become attenuated and the choroidal vessels as well as choroidal stroma and melanocytes disappear, so that circumscribed white areas of the sclera become ophthalmoscopically visible. Simultaneous proliferation of RPE occurs in scattered areas, leading to alternating patches of hyper-pigmentation and

hypo-pigmentation. Retinal thinning, photoreceptors and RPE degeneration are specially prominent in the posterior staphylomatous areas (Apple and Rabb, 1985).

Curtin and Karlin (1971) found that age and axial diameter of the myopic eyes have striking effects on the development and progression of chorioretinal atrophy in high myopic eyes. The eyes of females represent an 8-20% greater incidence of atrophic changes at axial lengths below 27.4 mm than eyes of females. In higher axial lengths, the incidence of such changes is almost equal, although slightly greater in female eyes.

Macular degeneration :

Macular degeneration in pathologic myopia is common and highly incapacitating. Macular degeneration may occur independently of the scleral conus or may be caused by enlargement of a temporal conus involving the macular area. A central circular dark spot, Forster-Fuch's spot, occasionally is a characteristic feature at the macula. It is probably caused by a combination of proliferation of RPE and deposition of blood pigments after subpigment epithelial neovascularization and/or choroidal haemorrhage. The Forster-Fuch's spot usually appears rapidly in the fourth to fifth decade (Apple and Rabb, 1985).

Curtin and Karlin (1971) stated that central pigmented spot (Fuch's) is a rounded black area of variable diameters at the macula occurred at 26.5 mm or more axial length. This represents an incidence of 5.2% in such eyes. The eyes of females were affected more than eyes of males in almost a two to one (18: 10) proportion. The most of these cases occurred above the age of 40 years.

Posterior staphyloma :

Scleral thinning with occasional formation of a posterior bulge or staphyloma of the sclera is common in pathologic myopia. The staphyloma may surround the optic nerve head and extend temporally to involve the posterior pole and sometimes

even the equator. The normal sclera progressively thickens from the equator backwards, becoming thickest at the posterior pole. In a globe with severe myopia, the opposite occurs, the sclera becomes progressively thinner posteriorly in the peripapillary region (Curtin et al, 1979).

Posterior staphyloma had been detected in 1.4% of cases of highly myopic eyes of axial length 26.5-27.4 mm and up to 71% in eyes of 33.5-36.6 mm or above. Staphylomas were seen in eyes of males slightly more often than eyes of females (55: 47) as detected in Curtin's study (1971).

The pathogenesis of these degenerative changes in and about the macula of the myopic eyes is not clearly understood. These lesions are thought to be either biomechanical or heredodegenerative in nature. In the biomechanical concept, the chorioretinal lesions are viewed as a consequence of the distorting forces transferred to the inner layers of the eye from the weakened and elongated sclera of the posterior pole (Duke-Elder, 1970). The heredodegenerative theory sees the chorioretinal changes as a genetically determined, abiotrophy effect that is associated with, but independent of the anatomic changes of the scleral wall (Duke-Elder, 1970 and Blach et al, 1965).

Visual field studies play an important role in the evaluation of pathologic myopia (Blatt, 1964). Accurate evaluation of the visual field changes in pathologic myopia is complicated by :

- 1- High refractive error. Some types of field changes such as hemianopic and sector field defects can be markedly improved or eliminated by proper optical correction (Blach, 1977).
- 2- The minus spectacle lens itself is a source of visual field distortion.