SURGICAL TREATMENT OF MYOPIA

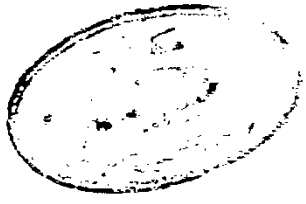
THESIS

Submitted in Partial Fulfilment of

The Master Degree

In

OPHTHALMOLOGY



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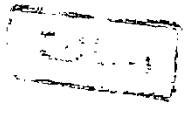

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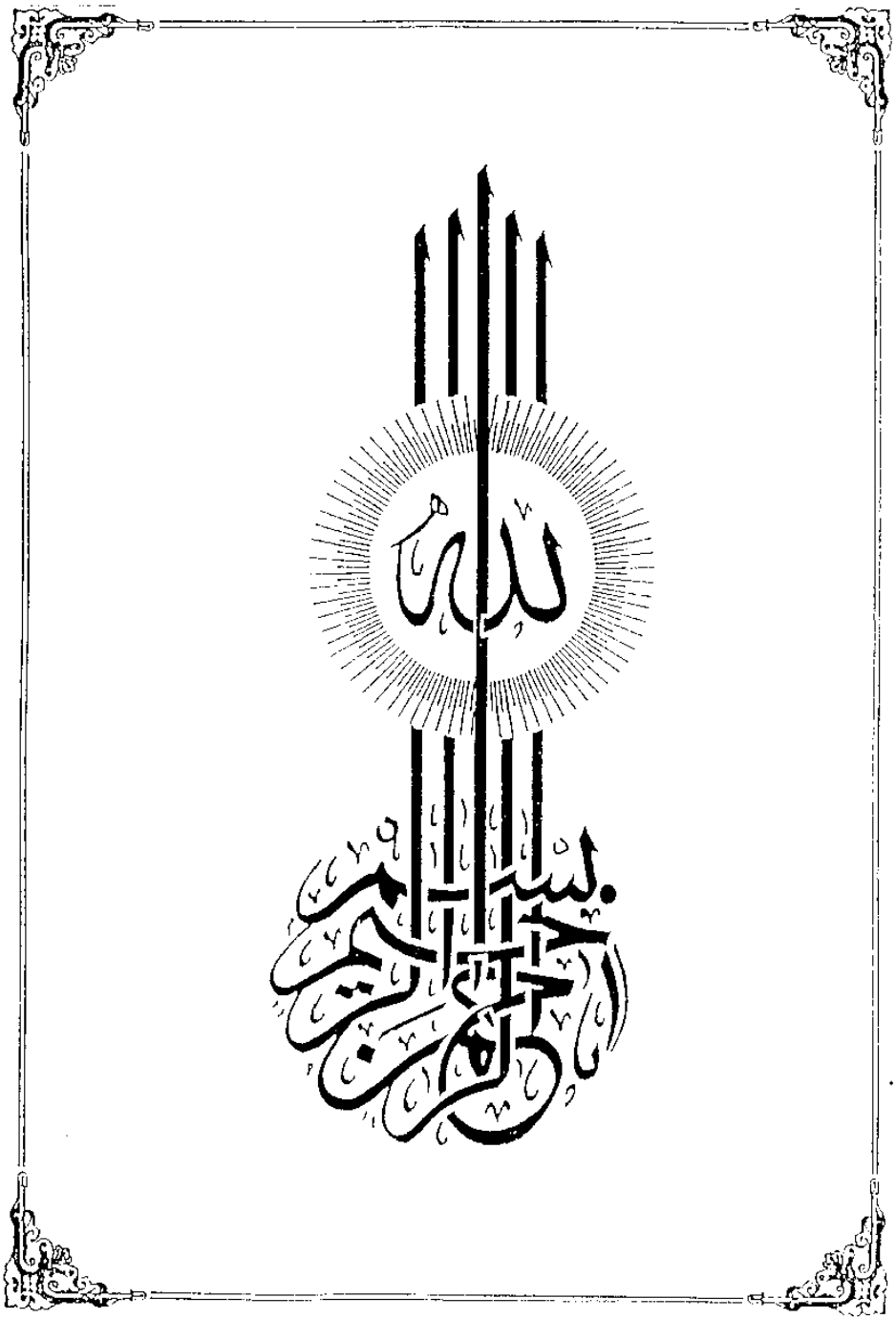

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The optical condition in myopia is one wherein the diopteric power of the eye is too great for its length or the eye is too long for its diopteric power, so that parallel rays of light come to a focus in front of the retina when the accommodation is at rest.

The image on the retina is therefore made up of the circles of diffusion formed by the diverging beam (Fig. 1). It follows that distant objects can not be seen clearly.

Only divergent rays will meet at the retina, and thus, in order to be seen clearly, an object must be brought close to the eye, so that the rays coming from it are rendered sufficiently divergent (Fig. 2).

The furthest point at which objects can be seen distinctly, is called the far point (punctum remotum). In the emmetropic eye it is at infinity; in the myopic eye it is a finite distance away, and the higher the myopia, the shorter the distance. This distance is thus a measure of the degree of myopia. If the far point is one metre from the eye, there is one dioptre of myopia. If it is two metres away, there is 0.5 dioptre of myopia, and so on.

If they are to be brought to a focus at all, parallel rays coming from distant objects must be rendered more divergent, and this can be done only by placing a diverging lens (concave lens) in

front of the eye (Fig. 3) with its focus coinciding with the punctum remotum.

To some extent the myope compensates for his poor visual acuity, for, since the nodal point is further away from the retina, the image will be appreciably larger than it would be in the emmetropic eye (Fig. 4). With the correcting spectacles, however, the opposite holds good and the image appears smaller and brighter.

Accommodation is of little value to the myope, but rather increases his difficulties. He has no means of reducing his myopia or increasing his vision apart from screwing up his eyelids in the attempt to attain the advantages of stenopaeic aperture. At the same time, in the higher degrees of defect he may not be without accommodative difficulties. In these cases the range of accommodation is small. Thus, if a myope of -5.0 dioptres has a far point at "20.0" cm and a near point at 10.0 cm, he has to vary his amplitude of accommodation by 5.0 dioptres to obtain a range of 10.0 cm. It follows that in the higher degrees of uncorrected myopia, the slightest variation in the distance at which work is done may entail immense accommodative efforts, if clear vision is to be maintained. Therefore, even if convergence is eliminated and one eye only is used, fatigue of accommodation may be an important factor in inducing eye strain (Duke Elder, 1970).

The excess of convergence for close work disorientates the accommodation which is not required. The physiological impulse for the two related functions to work together may have one of

The Optical Condition in Myopia

Fig. (1): A focus is formed in front of the retina where circles of diffusion are formed by the diverging beam.

Fig. (2): Divergent rays from a near object are focused on the retina.

Fig. (3): Parallel rays are focused on the retina only with the aid of a diverging lens.

Quoted from Duke Elder: System of Ophthalmology. Vol. 5, 1970.

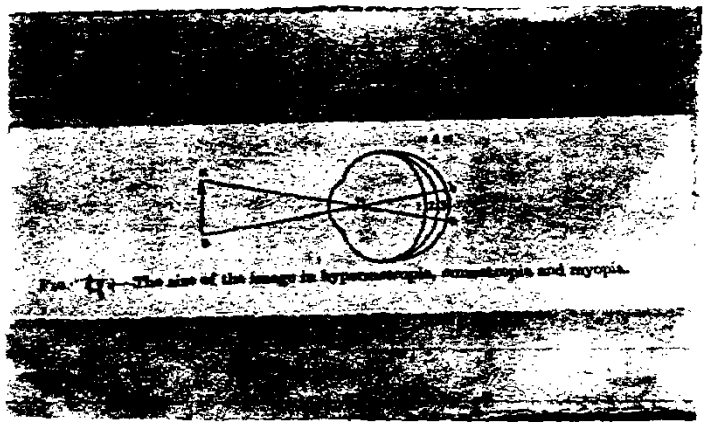

Fig. (4): The size of the image in hypermetropia, emmetropia and myopia.

Quoted from Duke Elder: Practice of refraction · Ninth Ed. p. 38, 1978.

two opposite results. The accommodation may attempt to be equal to the convergence, thus inducing ciliary spasm and artificially increasing the amount of myopia. But as accommodation is usually leading, convergence is given up resulting in troubles of muscular imbalance, until finally the advantages of binocular vision are abandoned, one eye alone is relied upon and the other deviates outwards. Thus the usual apparant convergent squint gives place to a true divergent squint in a considerable portion of uncorrected myopic children (Duke Elder, 1978).

CAUSES OF MYOPIA

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(1) **Axial myopia:** It is due to an increase in the antero-posterior diameter of the eye. This is the most common cause of myopia.

(2) **Refractive myopia:** The refractive system becomes more powerful. It includes two types:

(a) **Curvature myopia:** It is due to an increase in the curvature of the cornea or one or both surfaces of the lens. Increase in the curvature of the cornea is usually evident as an astigmatic rather than a spherical error. A variation of 1.0 mm results in a refractive change of 6.0 dioptres. Keratoconus is an example of curvature myopia due to increased corneal curvature.

Increase of lenticular curvature occur in conditions of anterior and posterior lenticonus and whenever the suspensory ligament is relaxed as occurs in spasm of accommodation or when the suspensory ligament is ruptured and the lens is dislocated.

(b) **Index myopia:** It is due to an increase in the refractive index of the ocular media especially the lens. The increase of the refractive index of the lens is due to either an increase of the refractive index of the nucleus as in senile nuclear sclerosis and senile nuclear cataract or a decrease in the refractive index of the cortex as in un-controlled diabetics (Duke Elder, 1978).

CLASSIFICATION OF MYOPIA:

SIMPLE AND PATHOLOGICAL MYOPIA

CLASSIFICATION OF MYOPIA

Clinically two types of myopia are recognized, simple myopia and pathological myopia.

Simple myopia:

It is brought about by variation within normal limits of the optical system as an increase of curvature of corneal or lens surfaces. a shallow anterior chamber, a high refractive effectivity of the lens or an increase of axial length of the globe.

The lower degrees of myopia are produced when the flattening of the cornea and of the surfaces of the lens is insufficient to counteract the effect of an increasing axial length of the globe during the growth (Sorbsy, 1957).

The change in refraction does not lead to symptoms until the early teens. Thereafter the error generally progresses to the level of "-5.0" or "-6.0" dioptres over the succeeding few years, finally stabilizing at puberty.

The eye as a rule remains healthy and the visual acuity can be corrected to the accepted standard with the appropriate lenses (Duke Elder, 1978).

Pathological myopia:

Is that type of myopia asssociated with degenerative changes occurring particularly in the posterior segment of the globe. The

condition is sometimes termed progressive myopia but this terminology is not correct since even simple myopia is frequently progressive. Some refer to it as high myopia because it is as a rule above "-6.0" dioptres but this terminology is also inappropriate. for myopes should be classified not by retinoscopy but by ophthalmoscopy.

Low myopes and indeed, eyes with an axial length less than normal may show the degenerative changes characteristic of pathological myopia, while cases of high myopia may show no degenerative changes in the fundus (Harman, 1913).

Pathological myopia is usually but not invariably associated with lengthening of the antero-posterior axis of the eyeball and is usually but not always progressive (Duke Elder, 1970).

It may frequently attain "-20.0" dioptres, but cases up to -30.0 dioptres are not very unusual. High degrees of astigmatism are not uncommonly associated with high myopia (Harman, 1913).

Types & evolution of pathological myopia:

Three types of high myopia associated with degenerative changes may be recognized:

(1) **Congenital axial myopia:**

It is not uncommon. These cases do not usually come under observation until the second or third year of life. A hereditary tendency is sometimes marked (Bruckner and Franceschetti, 1931).