ANTERIOR ISCHAEMIC OPTIC NEUROPATHY

M. S. ESSAY

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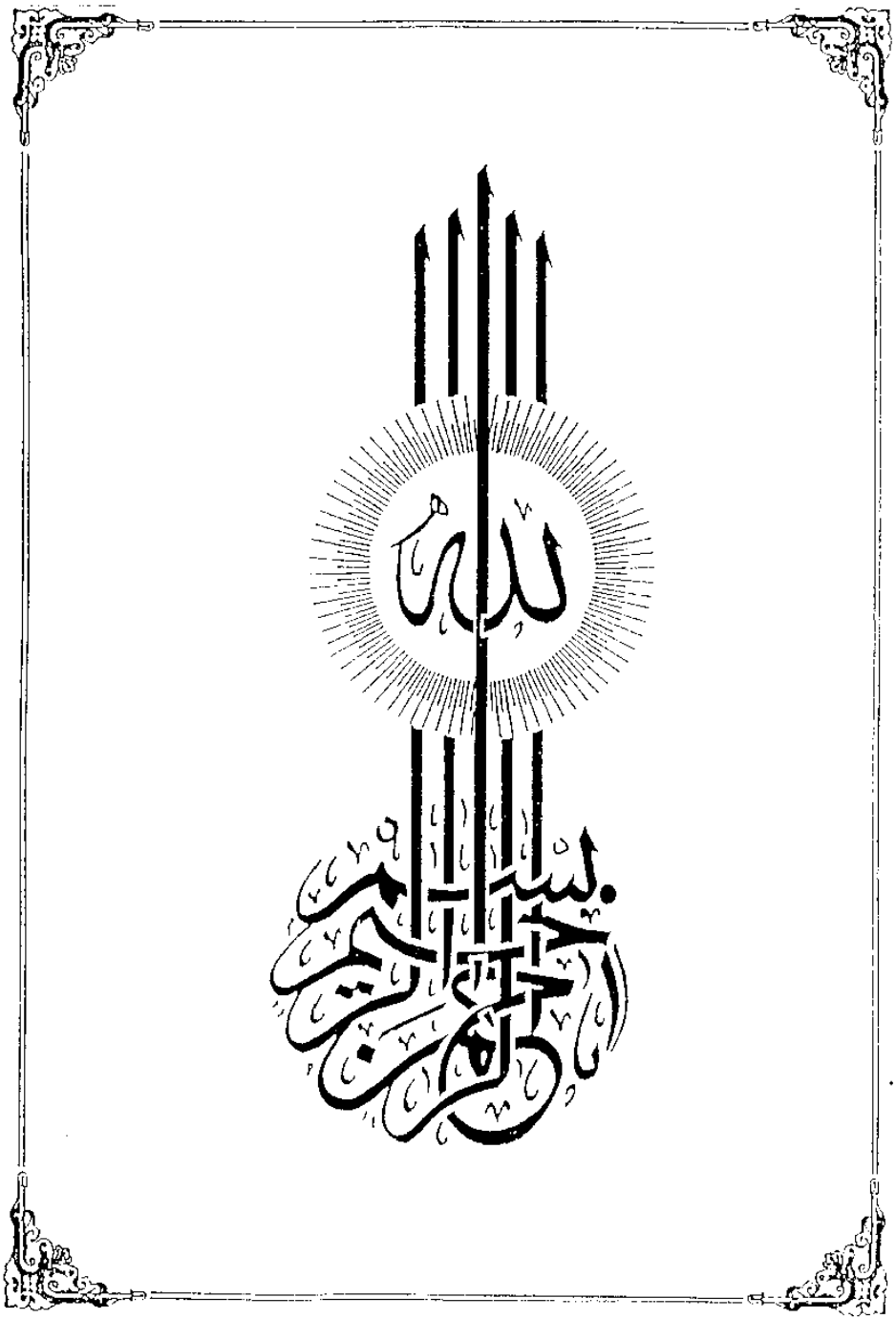

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To My Parents

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Introduction

Anterior ischemic optic neuropathy is one of the most common causes of impaired vision in middle-aged and older persons. It is characterized by acute visual loss in the entire eye or in one sector of the field of vision, initially associated with pallid edema of the optic disc, and a visual field defect usually in a nerve fiber bundle distributions, the condition usually resolves to optic atrophy within a month or two, often leaving a permanent visual defect.

Terminology.

This condition has been given different eponyms because its pathogenesis is controversial for example :

Optic neuritis *(Carroll, F.D., 1952)*, Acute optic neuritis of hypertension (Bonamur,G., 1966), Arteriosslerotic papilbillitis, Papillary apoplexy, Senile papillitis or papillopathy (Behrman,S. 1964), Vascular pseudo-papillites (Francois, J.1956), Optico-malacia, Infarction of the optic nerve. (Ellenberger, 1968), Ischemic popillopathy (Sanders, 1971), Acute ischemia of the disc , Ischemic optic neuropathy *(Miller,1966)*.

Now, the most suitable term which is used frequently is anterior ishemic optic neuropathy or AION Because the condition is ischemic, involves both the nerve head and the retrolaminar part (hence terms defining it as a disease only of the optic disc are incorrect, it is non inflammatory (therefore all terms with the suffix itis are incorrect), and there is nothing pseudo about it.

Structure of the Anterior Part of the Optic Nerve

The Optic Nerve is a portion of a white fiber tract of the central nervous system that consists of axons of retinal ganglion cells. It extends from the optic disc at a level with the retina within the eye to the optic chiasma, where, in normal humans, half of the fibres decussate to the opposite side of the brain in the optic chiasma (Newell, 1986).

The optic nerve is divided into four portions :

1- intraocular, 1mm
2- orbital, 30mm
3- intracanalicular, 4 to 10mm
4- Intracranial, 10 mm

]We are going to concentrate on the anterior part of the optic nerve as this is the part which is more affected in anterior ischemic optic neuropathy.

A- Ophthalmoscopic Appearance of Optic Disc

The optic disc is the intraocular portion of the optic nerve, visible ophthalmoscopically, it marks the radial convergence of fibres from the neural retina and the point at which they exit from the eye. The alternative name, optic papilla, donates the slightly elevated periphery of the disc *(Erno E. kritzmger,1987).*

Although Wolf, (1976) stated that the optic disc under normal conditions lies in the same plane as the retina and doesn't therefore form a projection, so, reference to the papilla is most often made in a descriptive context.

The term optic nerve head relates to the anterior portion of the optic nerve, lying within the scleral canal. It comprises not only the superficial optic disc or papilla, but also the underlying prelaminar layer and the region of the lamina cribrosa, the retrolaminar portion commences posterior to lamina cribrosa *(krilzmger 1987).*

General Features (Fig. 1)

Viewed ophthal moscopically, the optic disc appears circular or slightly ovoid in form (elongated in horizontal axis), it is about 1.5 mm in diameter. The center of the disc lies approximately 4mm nasal and 1mm supericrly in relation to the fovea *(kerlzinger, 1987)*.

Features of the optic disc that are employed in clinical assessment and diagnosis include its color and shape and the characteristics of the physiological cup, neural rim, margin of the disc and retinal vessels.

1- The outer portion, or neural rim, of the normal disc is yellow-pink in color (although temporal side is often paler than the nasal side) where as the center of the disc is occupied by a funnel shaped depression-the physiological cup- almost white in appearance optic nerve fibres converge at the elevated neural rim, where they turn at right angles away from the retina and pass backwards towards the brain in the optic nerve *(kerlzinger, 1987)*.

The pink coloration of the neural rim derives from its rich capillary network, In contrast, the cupped portion is relatively avascular and hence paler, it consists chifly of astrocytes and connective tissue. Michaelson, (1980) related the relative pallor of the disc to the reflection of light from the myelin sheaths of the optic nerve bundles behind thelamia cribrosa.

Wolf (1976) postulated that, the disc is pink in color to the medial side than to the lateral, is due to the greater thickness of nerve fibres and more capillary vessels.

2- The cup-disc ratio (C/D) which is expressed as a ratio of the diameter of disc to the diameter of the cup measured along the vertical axis shows wide variations in normal eyes from 0.1-0.6.

Pickard (1948) concluded that the cup increases with age. But Armaly (1967), said that the C/D ratio is not found to be affected by age or sex.

Snydacker (1964), found that the distributions of C/D ratio is the same in each sex and the size of the cup is not affected by age or hypermetropia, although, Wolf (1976), stated that it tends to be absent in high hypermetropia and patients with myopia had large cups, whereas hypermetrope have small cup.

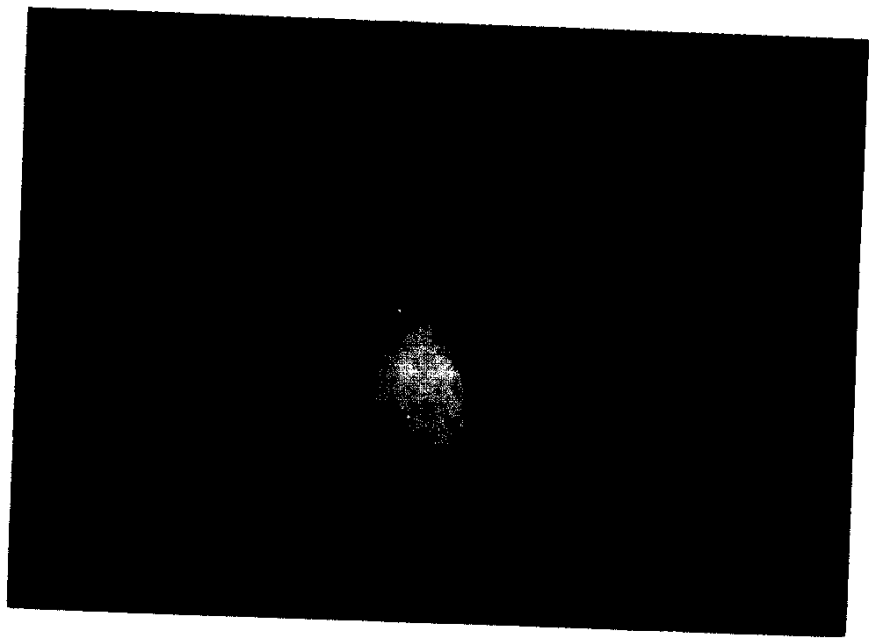

Fig. 1: Normal Optic Disc, showing distinct margin (arrows), pink neural rim, pale physiological cup, and central retinal vessels emerging from the nasal side of the physiological cup.

(Erna, E, Kritzinger 1987).

3- The margin of the optic disc is usually well defined although the nasal boundary may be less distant than that on the temporal side.

4- The central retinal artery enters the globe through the physiological cup. The vessel usually divides dichotomously within the cup and again on the surface of the disc, giving rise to four branches which supply the inferior and superior nasal and temporal quadrants of the fundus. Occasionally, the artery divides within the optic nerve head, so that two or four branches of the retinal artery emerge separately from within the physiological cup.

The arrangement of central retinal veins generally parallels that of the arteries, although the veins usually lie more temporally within thephysiological cup. *(Erna, E. Kretzinger, 1987).*

Spontaneous pulsation of the central retinal vein occurs on nearly all normal eyes and is most clearly seen opthamosopically at the physiological cup.

From the temporal half of the disc and from the superior and inferior temporal vessels small branches pass towards the macula where they terminate in very fine twigs around the margin of the macular depression *(Michaelson, 1980)*. Cilioretinal arteries are present in 40% of normal individuals . They are derived from the posterior ciliary circulation and usually emerge from the temporal speck of the disc.

B- Morphology of the Optic Nerve Head (Fig. 2)

Most authors divide the optic nerve head into the retinal, choroidal and sderal parts, from the front backwards but Hayreh (1975) divided the optic nerve into the following three parts for descriptive purposes.

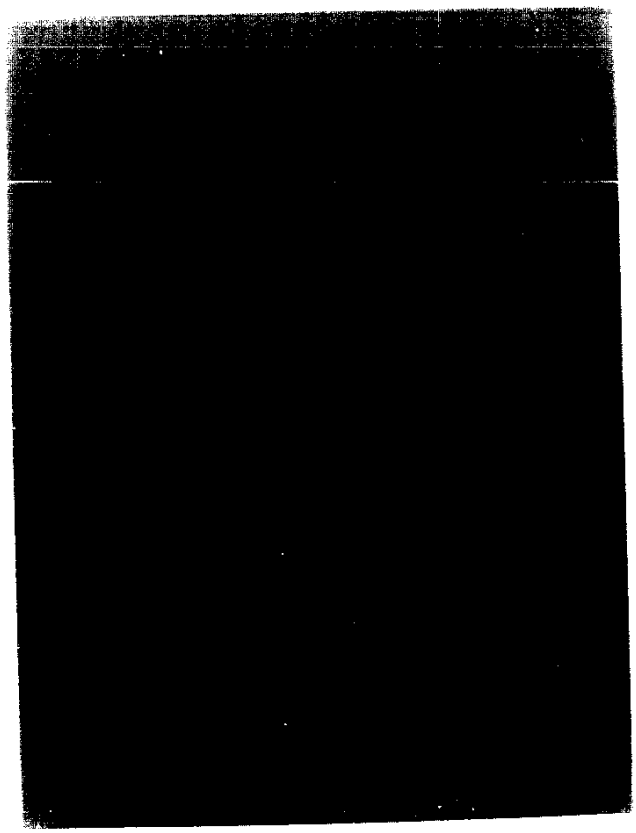

Fig. 2: Section through the optic nerve head :

1. Surface layer of the optic disc.
2. Ganglion cell layer and retinal nerve fibre layer. (non meyelinated)
3. Other layers of neural retina.
4. R. P. E.
5. Choroid.
6. Sclera.
7. Prelaminar layer.
8. Lamina cribrosa at the scleral canal (post limit of optic nerve head).
9. C. R. V.
10. C. R. A.
11. Optic nerve fibres (myelinated).
12. Dura, pia and arachnoid.

(Erna E, Kritzinger, 1987).

1- Surface Nerve Fiber Layer

This is the most superficial layers, containing the compact non-myelinated nerve fibres originating from ganglion cells in the neural retina converge in the neural rim of the optic disc.

It is covered by the inner limiting membrane of Elschnig, which is composed of astrocytes and which separates the nerve fiber layer from the vitreous *(Anderson, 1969). (Roth, 1972). (Hayreh, 1975).*

2- Prelaminar Region :

This region has been called glial, choroidal or more commonly the anterior part of the lamina cribrosa *(Anderson, 1969), (Hayreh, 1966).*

It consists of nerve fibres arranged in bundles surrounded by tube-like glial channels, formed of specialized astrocytes.(spider cells).

The loose glial tissue between the nerve fibre bundles forms trabecular capillaries are located within theglial septa.

A narrow, perivascular, connective tissue space accompanies most of the capillaries. The capillaries are surrounded by a glial limiting membrane, built up from the foot plates of the glial cell *(Anderson, 1969), (Hayreh, 1969).*

At its edge the prelaminar region is separated by a layer of glial tissue from the adjacent deeper layer of the retina (intermediary tissue of kuhnt and from the adjacent choroid "Border tissue of Jacoby" *(Hayreh, 1974).*

The optic nerve fibres made a 90° bend and their main support is the glial tissue of the prelaminer region.

3- The Lamina Cribrosa Region :

It has been described as the scleral or posterior part of lamina cribrosa, it form a band of dense, compact connective tissue that bridges