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دراسة هستومورفولوجية على الجزء المقلى من العصب البصرى فى الجمل وحيد السنام

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ينقسم الجزء المقلى من العصب البصرى الى ثلاث طبقات الطبقة الشبكية والطبقة المشبيمية والطبقة الصلبة . والطبقة المشيمية تنقسم الى صفيحتين أمامية وخلفية أما الطبقة الصلبة فتتكون من نسيج ضام محتويا على أليافا ليفية ومرنة . أما الكساء الدهنى لألياف العصب البصرى ولكن مشاهدتها فى الطبقة الصلبة .

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A HISTOMORPHOLOGICAL STUDY OF THE INTRAOCULAR (BULBAR) PORTION OF THE OPTIC NERVE IN ONE HUMPED CAMEL

(With 12 Figures)

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SUMMARY

The neurites within the retinal layer are demonstrated into two layers namely; an anterior thick and posterior thin. The choroidal layer is clearly divided into two laminae, an anterior choroidal lamina and a posterior scleral lamina. The scleral layer is consists of connective tissue fibers strands of the collagenous and elastic varieties.The myelinated axons of the optic nerve are demonstrated within the scleral layer into well distinct bundles.

INTRODUCTION

Many anatomical and histological features of the optic nerve is very important. The literature on this study in animals is rare specially in camel. Moreover, many authors studied the histomorphological features of the optic nerve in man (Vanghan and Ashury, 1961; Wolter, 1961; Copenhaver, 1964; Foster, 1964; Fine and Yanoff, 1972; and Ham, 1974). The optic nerve composed of two portions, the intraocular portion and orbital portion. In the present study, the intracular portion is determinate. The aim of the present study is helping the anatomist and histologist to teach the histomorphological features of the intraocular portion of the optic nerve in camel.

MATERIAL AND METHODES

For histomorphological study of the intraocular portion of the optic nerve of single humped camel, specimens were collected from ten camels of both sexes, ranging from 4-6 years old. The eyeball were classified into different regions as follows:

1- The nasal portion of the globe.
2- The temporal portion of the globe.
3- The dorsal portion of the globe.
4- The ventral portion of the globe.
5- The globe at the optic dise.
6- The junction between the caudolateral portion of the globe and the rostral portion of the optic nerve (Fig.1)

- The specimens were fixed in 10% fermalin and were embeded in paraffin.

Sections were cut at about 5 um. thickness for the collected specimens as follows:

A - The eye ball:
  a- Transverse sections parallel to the equator.
  b- Transverse meridianal sections.

B - The ciliary body, cornea and iris:
  a- Horizontal meridianal sections.
  b- Transverse meridianal sections.

- For studing the myelination, frozen sections were cut at 20 um. thickness.
- The following stains were employed:
  1- Harris's Haematoxylin and Eosin for general histological examination (Harris, 1898).
  2- Weighert's resorcin fuchsin for the demonstration of elastic fibers (Weighert, 1898).
  3- Heidenhain's Azan modification for demonstration of collagenous fibers (Heidenhain, 1915).
  4- Gros-Bielschowsky's silver stain for axons in frozen and paraffin sections (Modified) (Bencroft and Stovens 1977).
  5- Sudan black stain for demonstration of lipids (Lison and Dagenlie, 1935).

Measurments were made with an eyepiece micrometer disc calibrated on a stage micrometer to the nearst 0.1 um.

RESULTS

The thickness of the intraocular portion of the optic nerve, ranges from 2025-2092 um. (Fig. 3). The intraocular portion of the optic nerve is composed of retinal, choroidal and scleral layers.

A - The retinal layer:

The retinal layer of the intraocular portion of the optic nerve (about 225 um.) is composed of neurites, blood vessels and nearoglia (Fig. 2). The neurites of the retinal layer are demonstrated into two layers namely; an anterior thick and a posterior thin layer. The axons are obliquely disposed within the anterior layer, however they arrange themselves into bundles which course in a parallel pattern caudally (Fig. 3). The anterior portion of the retinal layer is separated from the vitreous body by a single layer of neuroglial cells. The latter are flattend elongated and contain oval or flattend nuclei. The retinal layer contains blood vessels of various varieties derived from the central vessels of the retina, namely arterioles, venules and various capillaries which persue different directions (Fig. 4 and 5). The diameter of the optic disc is about 3.0 mm.

The physiologic cup is about 945 um. In depth and lies just temporal to the center of the optic disc. It is seprated from the vitreous body by a single layer of flat glial cells, namely; the central supporting tissue meniscus.

B - The choroidal layer:

The choroidal layer of the intraocular portion of the optic nerve ranges 550-750 um. in thickness and is clearly divided into two laminae, an anterior choroidal lamina and a posterior scleral lamina (Fig. 3 and 6). The choroidal lamina ranges 150-300 um. in thickness and formed of interrupted strands of collagenous fibers loaded by thread-like extentions of melanin pigments. The latter persue a transverse course and are demonstrated into more than one layer all over the diameter of the optic disc in this region (Fig. 7 A-B and 8). The density of melanin pigments decreases gradually towards the scleral lamina, and is rarely demonstrated within the scleral layer of the intraocular part of the optic nerve. The scleral lamina ranges 400-525 um. in thickness and consists of strands of collagenous fibers that persue a transverse direction. The aformentioned strands are disposed into columns which are arranged parallel to the longitudinal axis of the optic nerve (Fig. 9). The latter columns permit several pathways for the bundles of neurites that gain a myelin sheath and passes caudally to the scleral layer of the intraocular portion of the optic nerve (Fig. 10).

C - The scleral layer:

The scleral layer of the intraocular portion of the optic nerve ranges from 750-1200 um. It consists of connective tissue fibers strands of the colagenous and elastic varieties (Fig. 11 A,B), the latter strands persue a longitudinal direction parallel to the long axis of the optic nerve and harbour blood vessels of various varieties. The myelinated axons of the optic nerve are demonstrated within this layer into well distinct bundles (Fig. 12).

DISCUSSION

Similar to the description given by Fine and Yanoff (1972) the nerve fiber bundles of the optic nerve, in camel, are musch thicker on the nasal than on the tomporal side.

Although the diameter of the optic disc in man is 1.5 mm. (Fine and Yanoff 1972, and Ham 1974), the present study showed that the optic disc in camel is about 3.0 mm in diameter.

In agreement with the structure of the optic nerve in human eye (Fine and Yanoff 1972) the optic nerve in camel was found to be composed of two portions namely; the intraocular portion (bulbar) and orbital portion (retrobulbar).

The intraocular portion consisted of the retinal, choroidal and the scleral layers. The neurites in camel are demonestrated into two layers namely; an anterior thick and a posterior thin layer. In addition,the axons were found to be obliquely disposed within the anterior layer,however they arranged themselves into bandles which course in a parallel pattern caudally.

The choroidal layer in the camel consisted of two laminae an anterior choroidal and posterior scleral lamina as revealed by the present study. In this respect, the eye of the camel simulates that of the man(Fine and Yanoff 1972). However, the choroidal lamina in the camel consisted of intrupted strands of collagenous fibers loaded by

thread-like extentions of melanin pigments from the choroid proper. The latter persued a transverse course and were demonestrated in more than one layer allover the diameter of the optic disc in this region. A matter which may aid the diminness of the interior of the eye ball in the camel. The latter micromorphological features of the choroidal lamina was not described in the similar region of the human eye.

In addition to the collagenous elements forming the connective tissue strands of the scleral layer of the intraocular portion of the optic nerve of man (Fine and Yanoff 1972), the present investigation showed that the scleral layer also contained elastic elements which persued a longitudinal direction parallel to the long axis of the optic nerve.

The myelination of the retinal ganglion cells axons in the camel appeared as the axons gain their myelin sheathes immediatly behind the choroidal layer in human eye (Fine and Yanoff, 1972).

Contrary to what was described in human optic nerve, the central blood vessels of the optic nerve in the camel did not penetrate the nerve trunk allover its course within the orbit, a fact which was described in man (Copenhaver, 1964; Foster, 1964 and Fine and Yanoff, 1972).

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LEGENDS

Fig. 1 : Schematic representation for the caudal half of the globe at its junction with the optic nerve.

A- Anteriorlly. P- Posteriorlly.
T- Temporally. N- Nasally.
R- Retina. C- Choroid.
S- Sclera. P.C.- Physiologic cup.
O.N.- Optic nerve.

The illustration shows the site of Figs. 2 A, 2 B, 3, 4, 5, 6, 10, 16.

Fig. 2 : The retina near the optic disc. Note the relatively thick retinal nerve fiber layer (R) (Hematoxylin and Eosin stain. (oc. &0x ob. 16).

Fig. 3 : The intraocular portion of the optic nerve. Note the retinal layer (A), the choriodal layer (B) and the scleral layer (c). Haematoxylin and Eosin stain. (oc. 10x ob. 6.3).

Fig. 4 : The retinal layer of the intraocular portion of the optic nerve. Note the neurites (N), the fibrous astrocytes (F) and blood vessels (B) (Haematoxylin and Eosin stain. oc. 10x ob. 16).

Fig. 5 : Arteriole (A) and veinule (V) derived from the central Vessels of the retina within the retinal layer of the intraocular portion of the optic nerve (Haematoxylin and eosin stain. oc. 10x ob. 16).

Fig. 6 : The choroidal layer of the intraocular portion of the optic nerve showing the choroidal lamina (A) and

the scleral (B) (Haematoxylin and eosin. stain. oc. 10x ob. 16).

Fig. 7 : The choroidal lamina of the choroidal layer, of the optic nerve, at its junction with the choroid porper (C). Note the interrupted strands of the collagenous fibers which are loaded by melanin pigments (Haematoxylin and Eosin stain. A- oc. 10x ob. 40).

Fig. 8 : The melanin pigments within the choroidal lamina arranged transverselly into more than one layer (Haematoxylin and Eosin. oc. 10x ob. 25).

Fig. 9 : The scleral lamina of the choroidal layer of the intraocular portion of the optic nerve. Note the transversely arranged strands of collagenous fibers (S) (Haematoxylin and Eosin stain. oc. 10x ob. 40).

Fig. 10: A thick frozen section showing the myelination of the optic nerve. Note the nonmyelinated nerve fibers within the retinal layer of the optic nerve (N), and the myelinated nerve fibers passing through the choroidal layer to the scleral layer of the optic nerve (M) (Sudan black stain. oc. 10x ob. 16).

Fig. 11: The scleral layer of the intraocular portion of the optic nerve to show the collagenous and elastic elements within the longitudinally disposed connective tissue strands (A: Haematoxylin and Eosin stain. B: Weighert's resorcin fuchsin stain. oc. 10x ob. 16).

Fig. 12: A thick frozen section showing the myelinated nerve bundles passing through the scleral layer of the intraocular portion of the optic nerve (Sudan black stain. oc. 10x ob. 16).

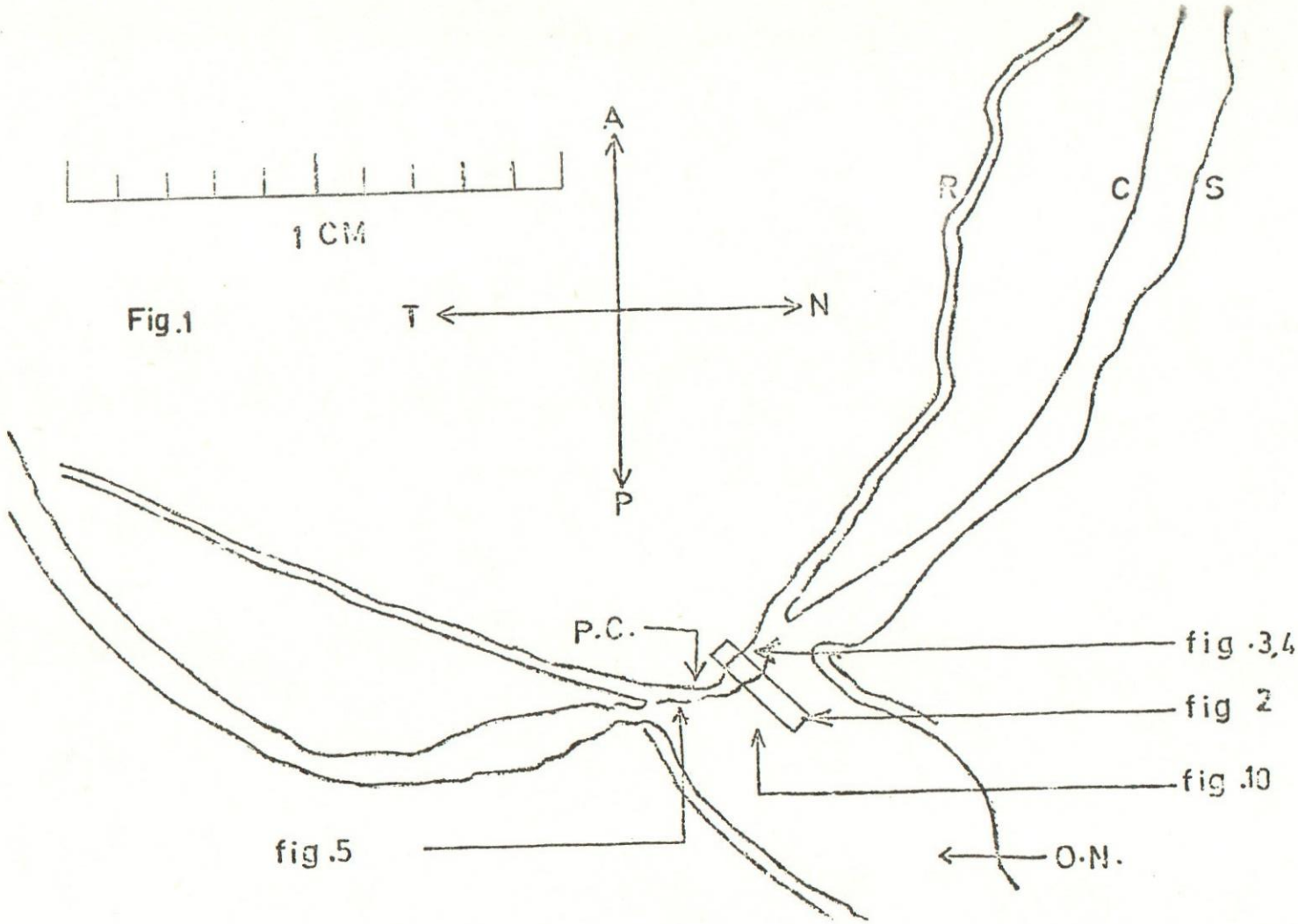
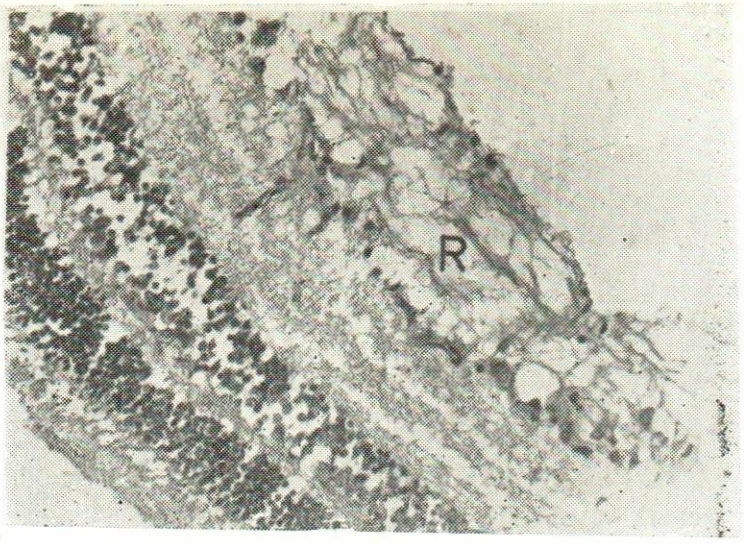


Fig.1



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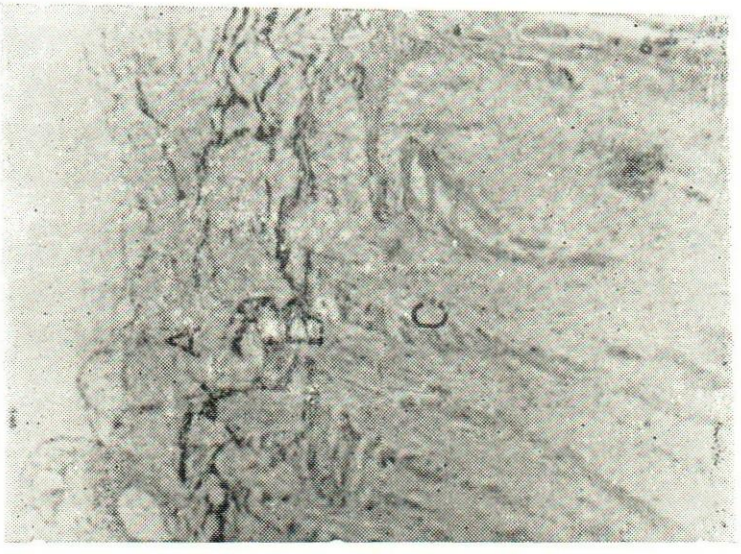
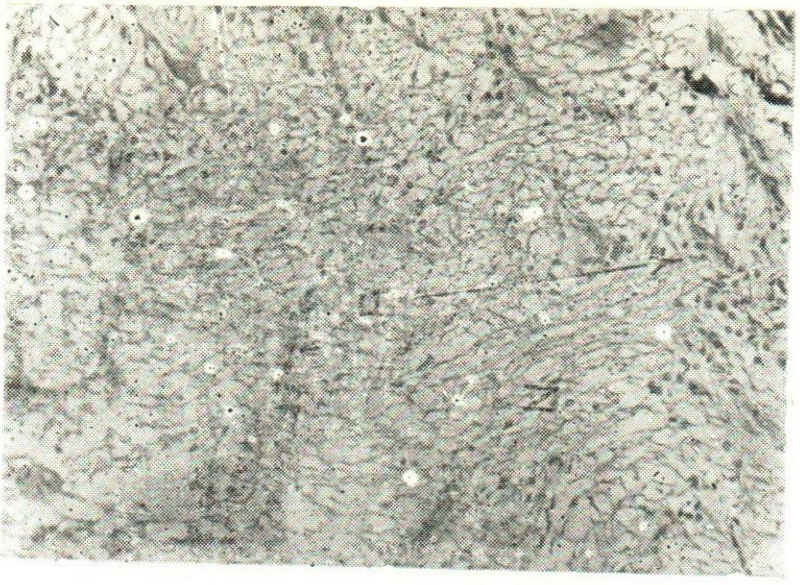


Fig. 3 : The intraocular portion of the optic nerve, Note the retinal layer (A). the choriodal layer (B) and tha scleral layer (C). Heamatoxylin and eosin stain. oc. 10 x ob. 6.30)



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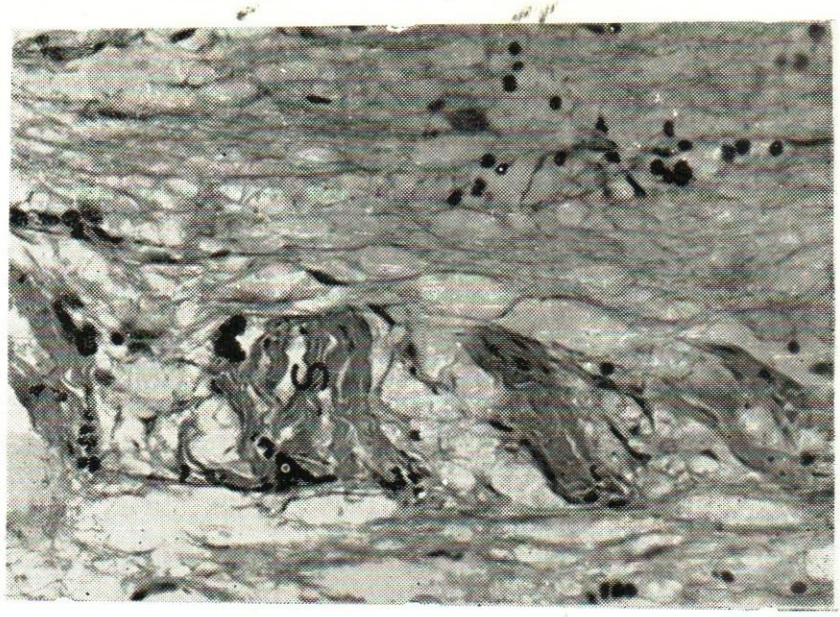


Fig. 9 : The scleral lamina of the choroidal layer of the intraocular portion of the optic nerve Note the transversely arranged strands of collagenous fibers (S) (Haematoxylin and eosin stain. oc, 10 x ob. 40)

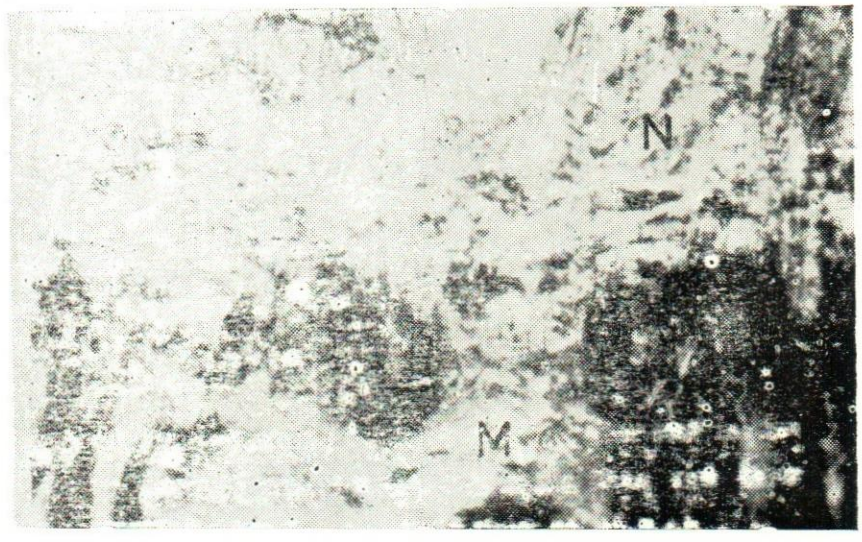
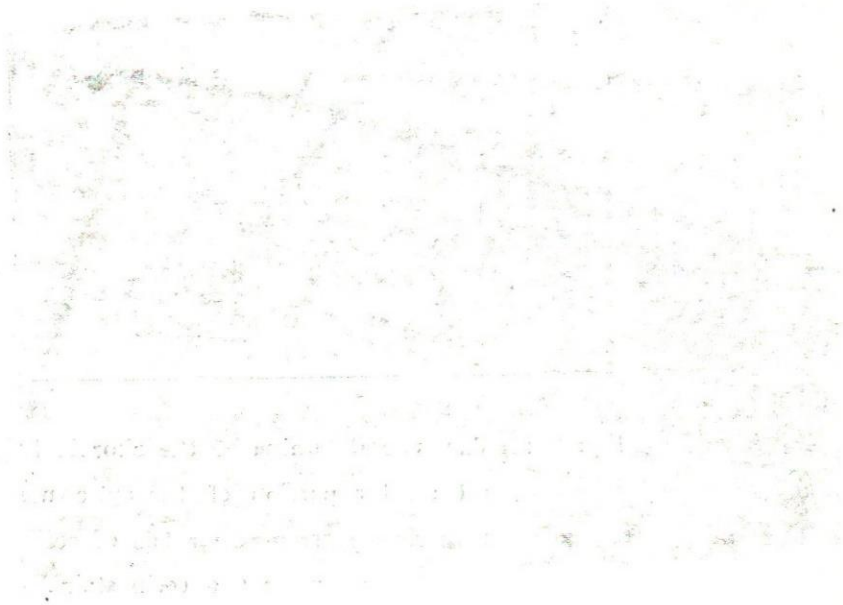
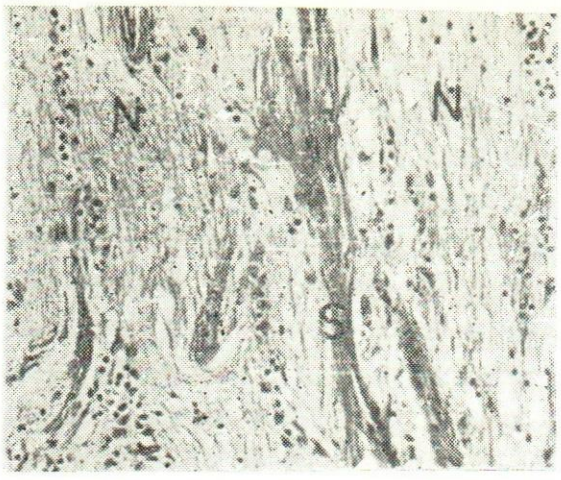


Fig. 10 : A thick frozen section showing the myelination of the optic nerve. Note the nonmyelinated nerve fibers within the retinal layer of the optic nerve, (N) and the myelinated nerve fibers passing through the choroidal layer to tha scleral layer of the optic nerve (M) (Sudan black stain. oc 10 x ob. 16)





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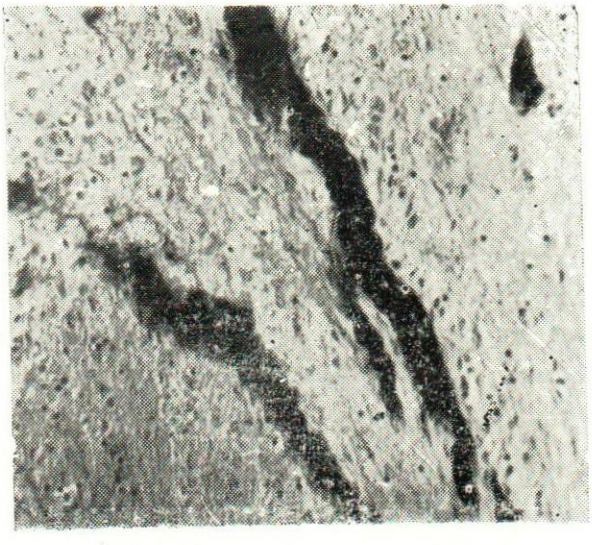

Fig 11 :

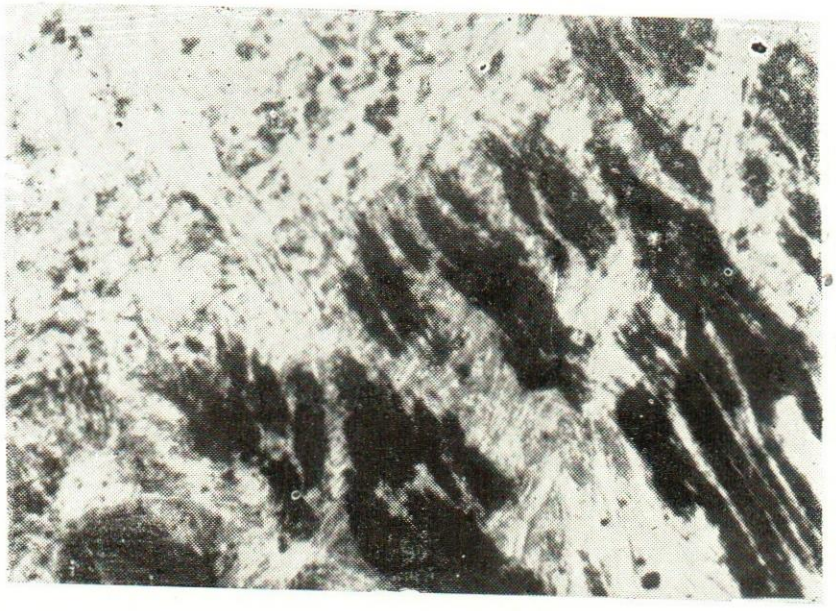

Fig. : 12 A thick frozen section showing the myelinated nerve bundles passing through the scleral layer of the intraocular portion of the optic nerve(Sudan black stain, oc. 10 x ob. 16).