Section-3

The external morphology of the brain of slender loris
(Loris tardigradus lydekkerianus)
INTRODUCTION

The primates which became successful in terrestrial life underwent diversified lines of evolution. It is of great interest to study the different levels of evolution of the central nervous system, the evolution of which has lead to the development of intelligence, refinement of sensory and motor function. The varied groups of prosimians which were isolated in the great islands like Madagascar and Australia have undergone little change in their anatomy (Mc. Ferland et al. 1979), and they form the living representatives of some of the stages of evolution that the present day higher primates have undergone.

The importance of the correct comprehensive homologies of the cerebrum in different vertebrates to understand and interpret the varying behaviour of the animals is emphasized by Smith (1902 & 1910). An analysis of the literature reveals that the morphological features of the brain have been recorded in some prosimians. These include the works of Smith (1903 & 1908) in Lemurs; Clark (1924) in Tupia minor and (1931) in Microcebus murinus; Zuckerman et al. (1941) in Perodicticus potto and Galago demidovi, Bonin (1945) in Galago,
Kanagasuntheram et al. (1960) in Galago senegalensis, and Krishnamurti (1966) in Nycticebus coucang. Papez (1929), Kappers et al. (1965), Connolly (1950) and Kuhlenbeck (1973) have reviewed and discussed the data available in their textbooks. Govinda Menon (1947) has given only a very brief account of the morphology of the brain of slender lorises since focus on the brain was beyond the scope of his thesis.

Hence in this study an attempt is made to provide more information on the cortical sulci of the brain of Slender lorises, as a preliminary step to the cytoarchitectonic parcellation and electrophysiological mapping dealt with in the subsequent chapters of this thesis.

MATERIALS AND METHODS

The brains of all the 23 animals, employed in the various investigations presented in this thesis were utilised for morphological studies. Of these 11 were adult males, 9 were adult females, one was one year old female, one was 6 months old male and one was 3 months old male (Table-1). All the animals were perfused percardium with
normal saline (8.5 gm of Na Cl in one litre of distilled water) followed by 10% formal saline (8.5 gm of Na Cl + 100 ml of formalin + 900 ml of distilled water) under barbitone anaesthesia at a dose of 28 mgs/Kg of body weight. The perfused animal was then left in a jar containing 10% formal saline for one week for allowing the hardening of the brain. After taking the various measurements of the body including the skull (Table 2 & 3) the brains were taken out. The blood vessels and the pia mater covering the cortex were removed carefully under the dissecting microscope to aid the study of the sulcal pattern.

The brain specimens were weighed after blotting the fixative and the volume of the brains were determined by water displacement method. The various measurements of the brain were also taken using a sliding calipers (Table-4).

The brain specimens were then photographed in the standard views viz. lateral, superolateral and medial surfaces of the hemisphere as well as superior, inferior, anterior and posterior views of the whole brain. By projecting the negatives of the respective brains at 10 times magnification, the cortical sulcal pattern observed in each cerebral hemisphere was marked onto a millimeter graph paper. The composite
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pattern of the cerebral cortical sulci was prepared by superimposing the tracings of the individual brains. In addition, models of the brains were prepared using synthetic dental impression rubber for preparing the mould and dental acrylic cement for preparing the casts. The models thus prepared were also used for the morphological study.

**Observations**

**General Features**

The dura mater covering the brain was thick, whereas the arachnoid and pia mater were thin and delicate. The pia mater dipped into the sulci and fissures carrying the blood vessels along with them. The weight of the brain ranged from 5.18 gms to 5.56 gms in adults, whose body weight ranged from 200 gms to 310 gms (Table 2 & 4). The ratio between the brain and body weight ranged from 1/42 to 1/56 (Table 4). In the 3 months, 6 months and 1 year old specimens, where the body weight ranged from 30 gms to 160 gms (Table-1) the brain weight showed a range of 3.8 gms to 4.4 gms (Table-4). The ratio between brain weight and body weight in these young animals ranged from 1/8 to 1/36 (Table-4).
Cerebral hemispheres

In the superior view, the outline of the cerebral hemispheres is oval. The posterior half of the cerebral hemisphere forms an arc of a circle, where as the anterior part near the frontal lobe is narrow (Plate 3, Fig. 12). The olfactory bulbs (olb) project 2 to 3 mm beyond the front pole of the cerebral hemispheres in adults (Plate 3, Fig. 12 & 13). In the young animal the olfactory bulbs did not protrude beyond the frontal pole and could not be seen from superior view (Plate 4, Fig. 20).

The cerebral hemispheres are separated by a median sagittal fissure which lodges the falx cerebri containing superior and inferior sagittal venous sinuses. This fissure starts from the point where the olfactory bulbs come in contact with the cerebral hemisphere and ends posteriorly where the superior vermis comes in contact with cerebral hemisphere (Plate 3 Fig. 8 & 12). While the frontal pole of the cerebral hemisphere could be located the occipital pole could not be identified because of the divergence of the superomedial borders of the cerebral hemispheres posteriorly (Plate 3, Fig. 12 and Plate 4, Fig. 20). The angle of divergence of the superior median border varied from
PLATE - 3

EXTERNAL MORPHOLOGY OF THE BRAIN OF AN ADULT SLENDER LORIS

Fig. 8. Right lateral view of the brain.
Fig. 9. Left lateral view of the brain.
Fig. 10. Right superolateral view of the brain.
Fig. 11. Left superolateral view of the brain.
Fig. 12. Superior view of the brain.
Fig. 13. Base of the brain.
Fig. 14. Anterior view of the brain.
Fig. 15. Posterior view of the brain.

KEY TO ABBREVIATIONS

C Cerebellum
lp Sulcus intraparietalis
M Medulla oblongata
O Sulcus Orbitalis
Obb Olfactory bulb
P Pituitary body
PaFl Paraflocculus
r Sulcus rectus
ra Fissura rhinalis anterior
rp Fissura rhinalis posterior
S Sylvian fissure
sc Spinal cord
tm Sulcus temporo-medialis
ts Sulcus temporalis superior
Plate 4
External
MORPHOLOGY OF THE BRAIN OF A YOUNG SLENDER LORIS

Fig. 16. Right lateral view of the brain
Fig. 17. Left lateral view of the brain
Fig. 18. Right superolateral view of the brain
Fig. 19. Left superolateral view of the brain
Fig. 20. Superior view of the brain
Fig. 21. Base of the brain
Fig. 22. Anterior view of the brain
Fig. 23. Posterior view of the brain

Note: The features are less prominent in comparison to the adult brain.

KEY TO ABBREVIATIONS

C Cerebellum r Sulcus rectus
1p Sulcus intraparietalis ra Fissura rhinalis anterior
M Medulla oblongata rp Fissura rhinalis posterior
O Sulcus orbitalis
Olb Olfactory bulb S Sylvian fissure
P Pituitary body sc spinal cord
PaFl Paraflocculus tm Sulcus temporomedianus
ts Sulcus temporalis superior
PLATE - 5

MEDIAL AND INFEROMEDIAL SURFACES
OF THE CEREBRAL HEMISPHERES

Adult Brain

Fig. 24. Medial view of the left hemisphere
Fig. 25. Medial view of the right hemisphere
Fig. 26. Inferomedial view of the left hemisphere
Fig. 27. Inferomedial view of the right hemisphere

3 MONTHS OLD BRAIN

Fig. 28. Medial view of the left hemisphere
Fig. 29. Medial view of the right hemisphere
Fig. 30. Inferomedial view of the left hemisphere
Fig. 31. Inferomedial view of the right hemisphere

KEY TO ABBREVIATIONS

cg  Sulcus cinguli
Olb  Olfactory bulb
pc  Paracalcarine fissure
rc  Retrocalcarine fissure
brain to brain. This angle ranged from 50 to 65 degrees in adults, while in young animals this angle measured about 80 degrees (Plate 3, Fig. 12 and Plate 4, Fig. 20). Between this diverged occipital ends of the cerebral hemispheres a small portion of the vermis of the cerebellum is seen.

The cerebral hemispheres of the slender loris which form the largest subdivision of the brain presents a superolateral, inferior and medial surfaces. The superolateral surface is separated from the medial surface by the superomedial border and from the inferior surface by inferolateral and orbital borders. The superolateral surface exhibits only a few sulci. The prominent sulcus seen on this surface is the Sylvian fissure ($) (Plate 3, Fig. 10 & 11). This fissure starts from the inferior surface and runs laterally and dorsally to reach the superolateral surface where it runs upwards and backwards to end about 7 mm away from the midline. The Sylvian fissure divides the cerebral cortex into an anterosuperior and posteroinferior parts (Plate 3, Fig. 8 & 9).
The anterosuperior subdivision of the cerebral cortex is almost smooth except for the sulcus rectus (r) which runs anteroposteriorly for varying lengths of 1 to 3 mm (Plate 3, Fig. 10 & 11). Even this sulcus; in some specimens, is represented only by a vascular groove which gains entry from the frontal pole (Plate 3, Fig. 14).

The intraparietal sulcus (1p) situated 4 mm lateral to superomedial border and running parallel to it in such a way that the rostral part of it is situated in the anterosuperior subdivision and the caudal half is situated in the posteroinferior subdivision of the cerebral hemisphere (Plate 3, Fig. 10 & 12). The rostral end of this sulcus which curves laterally lies about 9 mm from the midline while the caudal end of this sulcus which sometimes curves medially lies close to the midline. The caudal end in some specimens presents a forked appearance (Plate 3, Fig. 12). In some other specimens the caudal end become continuous with the sulcus lunatus (1) (Plate 3, Fig. 12). The sulcus lunatus (1) demarcating the occipital lobe from the rest of the hemisphere runs medially to reach the superomedial border of the cerebral hemisphere. In some specimens which do not exhibit a well marked sulcus lunatus a vascular groove connecting the caudal end of the intraparietal sulcus (1p) occupies the position of the sulcus lunatus (Plate 3, Fig. 12).
The superior temporal sulcus (ts) situated caudal to
the Sylvian fissure and running parallel to it divides the
temporal lobe into an anterior and posterior portions (Plate
3, Fig. 8 & 9). Away from the superior end of the superior
temporal sulcus and running at an angle directed towards the
intraparietal sulcus is a small medial temporal sulcus (tm)
(Plate 3, Fig. 10 & 11).

Vascular grooves

Numerous vascular markings are also seen on the supero-
lateral surface of the cerebral hemisphere. In the antero-
superior part there are three vascular grooves, medial, middle
and lateral, running from the frontol pole backwards (Plate 3,
Fig. 14). The medial groove is seen lying about 1 mm
away from the median sagittal fissure and almost running paral-
lel to it, while the middle groove is seen in relationship
to the sulcus rectus (Plate 3, Fig. 12). The lateral vas-
cular marking approximately corresponds to the illdefined
orbital border of the cerebral hemisphere which separates
the superolateral surface from the orbital surface.

Occasionally the upper end of the Sylvian fissure is
seen connected to the anterior end of the intraparietal sulcus
by a vascular groove (Plate 3, Fig. 10).
The vascular markings seen on the posteroinferior part of the cerebral hemisphere, unlike those seen on the anterosuperior part, are less prominent and more numerous (Plate 3, Fig. 11). Of these a groove extending from the caudal end of the intraparietal sulcus (Ip) towards the superomedial border and the vascular groove connecting the superior temporal sulcus (Ts) with the Sylvian fissure (S) are more often seen (Plate 3, Fig. 10 & 12).

The Orbital Surface

The orbital surface of the cerebral hemisphere which is partly directed laterally could be seen in both the inferior and the lateral views. This surface presents a V shaped orbital sulcus (O) measuring 1 to 1.5 mm in length (Plate 3, Fig. 13 & 14). In some specimens this sulcus is not well marked and appears as a dimple. Close to the midline and in relationship to the anterosuperior part of the orbital surface is the pear shaped olfactory bulb (Ob) measuring 6 to 8 mm in length and 4 to 5 mm in width in the adult; 5.6 mm in length and 4 mm in breadth in the young one. The right and left olfactory bulbs are separated in the midline by the median sagittal fissure through which the single anterior cerebral artery runs to reach the medial surface of the brain.
The fissure rhinalis anterior (ra) separates the olfactory bulb (Olb) from the orbital surface of the cerebral cortex (Plate 3, Fig. 8 & 9). Caudally it separates the pyriform area from the cerebral cortex before it reaches the Sylvian fissure and continues with the fissure rhinalis posterior (rp). Both the anterior and posterior rhinalis fissures are primary fissures since they demarcate the archipallium from the neopallium.

The tentorial surface

The tentorial surface of the cerebral cortex is relatively smooth except for the presence of the retrocalcarine (rc) and hippocampal fissures (h) (Plate 5, Fig. 26). From a point 2 mm caudal to the splenium of the corpus callosum, the paracalcarine fissure (pc) runs upwards towards the superomedial border for about 4 to 5 mm on the medial surface while the retrocalcarine fissure (rc) runs towards the occipital pole on the inferior surface (Plate 5, Fig. 24 to 31).

Medial Surface

The prominent sulcus seen on the medial surface is the sulcus cinguli (cg) which runs anteroposteriorly parallel to the corpus callosum. This sulcus divides the medial surface of the cerebral cortex into an inferior part named cingulate
gyrus belonging to archipallium and a superior part belonging to the neopallium. The paracalcarine sulcus (pc) which is one of the components of the calcarine complex runs vertically about 2 mm behind the splenium of the corpus callosum (Plate 5, Fig. 24 & 25).

**Vascular grooves**

The vascular grooves seen on the medial surface are caused by the anterior cerebral artery and its branches (Plate 5, Fig. 24 & 25). The groove caused by the anterior cerebral artery ascends up vertically in front of the anterior commissure before it breaks up into two branches one running over the corpus callosum and the other slightly above and parallel to it.

**Internal structures**

The striking feature of the lateral ventricle is the presence of a small posterior horn extending into the occipital lobe of the cerebral hemisphere. Corpus callosum, the largest of the commissures connecting the right and left hemispheres is about 8 mm in length and occupies approximately the middle third of the cerebral hemispheres (Plate 5, Fig. 24 & 25). The rostral end does not present the characteristic rostrum observed in other higher primates. The anterior commissure
and the fornix are quite large. The septum pellucidum is very thick and stretches between the corpus callosum and fornix. Inferiorly the septum pellucidum is also attached to the anterior commissure, the place at which the lamina terminalis become confluent with the septum pellucidum. The septum pellucidum is very thick and inferiorly it is attached to the dorsal surface of the optic chiasma. The thalamus is large and oval in shape with an extensive interthalamic connexus. The lateral geniculate body lies ventrolateral to thalamus resting on the lateral surface of the crus cerebri. In the hypothalamic region the mamillary bodies do not exhibit the characteristic swellings. The third ventricle is mainly confined to the hypothalamic region because of the extensive interthalamic connexus.

**Mid Brain**

Mid brain, the cranial most subdivision of the brain stem is hidden from the view by the overlapping temporal lobes of the cerebrum, large hypophysis cerebri and bulging pons. A small caudal part of the crus cerebri however is seen in the inferior view, lateral to which the lateral geniculate body resting on the lateral surface of the crus cerebri could also be seen (Plate 6, Fig. 32). When the temporal lobes are pulled apart, the upper part of crus cerebri and the optic tract running around it to reach the lateral geniculate body
could be seen. Similarly when the occipital lobes are pulled out the dorsal surface of the superior colliculus could be seen. However, the dorsal surface of the inferior colliculus could not be seen since it is in contact with the central lobe overlapped by the culmen of the cerebellum (Plate 6, Fig. 34).

**Pons**

The pons is broader and shorter than the medulla oblongata (Plate 3, Fig. 13). Its ventral surface is grooved in the middle for the basilar artery, while on either sides it presents a highly arched appearance. Its dorsal surface along with the dorsal surface of the medulla forms the floor of the fourth ventricle.

**Medulla**

The medulla, separated from the pons by a transverse ridge (Plate 3, Fig. 13) is broad and flat near the upper end and becomes narrow and cylindrical caudally. The broad upper part is the open part of the medulla, the dorsal surface of which forms part of the floor of the IV ventricle. An angulation is seen between the medulla and the beginning of cervical part of spinal cord (Plate 3, Fig. 8 & 9). This angle ranges from 120 to 140 degrees in adult brains.
In young animals (Plate 4, Fig. 16 & 17) this angle is more acute and is about 90 degrees.

The ventral surface of medulla presents a well marked anterior median fissure which starts at the upper border of the medulla and runs down to become continuous with the anterior median fissure of the spinal cord (Plate 6, Fig. 32). The beginning of the basilar artery lies in the upper part of this fissure. On either side of this fissure, at the upper part of the medulla the pyramids could be seen as longitudinal elevations. The elevations become less prominent in the closed part of medulla as the pyramidal fibres decussate to the opposite side. In the upper part of the medulla lateral to pyramid is a prominent transverse line. This line limits the caudal end of the trapezoid body (Plate 6, Fig. 32). The olivary body which lies caudal to the trapezoid body does not form surface projection. The dorsal surface of the medulla shows a median sulcus on either side of which the gracile and cuneate swellings are seen.

**Cranial nerves**

Olfactory nerves arise from the ventral surface of the olfactory bulb in bundles which are arranged in rows along the medial and lateral borders of the olfactory bulb. Optic nerves which are not traversed by central artery of the
PLATE - 6

DIAGRAM OF BASE OF THE BRAIN AND CEREBELLM OF SLENDER LORIS

Fig. 32. Base of the brain showing the attachment of the cranial nerves.

Fig. 33. Superior view of the cerebellum.

Fig. 34. Median sagittal section through the vermis of the cerebellum.

Fig. 35. Inferior view of the cerebellum.

KEY TO ABBREVIATIONS

CL Central lobe
CU Culmen
FP Fissura prima
FPPr Fissura praeoculomotoris
FS Fissura seconda
IC Inferior colliculus
L Lingula
ML Middle lobe of cerebellum
N Nodule
PCF Precentral fissure of cerebellum
PPr Prepyramidal fissure
PaFl Paraflocculus

I Olfactory nerve
II Optic nerve
III Oculomotor nerve
IV Trochlear nerve
V Trigeminal nerve
VI Abducent nerve
VII Facial nerve
VIII Vestibulo cochlear nerve
IX Glossopharyngeal nerve
X Vagus nerve
XI Accessory nerve
XII Hypoglossal nerve
retina, form the optic chiasma just caudal to olfactory bulb. The optic chiasma is 3 mm in breadth and its dorsal surface is connected to anterior commissure by a thin membrane, the lamina terminalis. The posterolateral end of the optic chiasma is continuous as optic tract which curves around the crus cerebri to reach the lateral geniculate body.

The oculomotor nerve emerges from the ventromedial surface of the crus cerebri (Plate 6, Fig. 32). The trochlear nerve emerges from the dorsal surface of the midbrain near the lower border of the inferior colliculus and winds around the cerebral peduncle lying in contact with the superior vermis of the cerebellum. It reaches the ventral aspect of the brain, where it is seen emerging between the lateral geniculate body and the superior border of the cerebellum (Plate 6, Fig. 32).

The motor and sensory components of the trigeminal nerve are attached to the lateral surface of the pons in such a way that the trigeminal nerve divides the pons into a smaller cranial and a larger caudal subdivisions.
The abducent nerve emerges out by 3 rootlets at the junction of the pons and pyramid of the medulla 1 mm lateral to the midline (Plate 6, Fig. 32). The forward course of this nerve makes a distinct groove on the ventral surface of the pons (Plate 6, Fig. 32).

The facial and vestibulocochlear nerves are attached lateral to corpus trapezoides. The glossopharyngeal, vagus and cranial part of accessory nerve emerge by 2 or 3 roots each from the lateral surface of the medulla from the postero-lateral groove. The cervical part of the accessory nerve arises by series of rootlets arranged in 3 bundles, which lie in between the dorsal and ventral roots of upper cervical spinal nerves. It courses upwards towards the upper part of medulla to join the cervical part of accessory nerve. The hypoglossal nerve emerges lateral to the pyramid by 5 rootlets (Plate 6, Fig. 32).

Cerebellum

The cerebellum lies on the dorsal aspect of the pons and upper part of medulla, being separated by the cavity of fourth ventricle. The surface of the cerebellum presents a foliated arrangement, the folia arranged transversely (Plate 6, Fig. 33). The cerebellum consists of two cerebellar hemispheres connected by a median structure, the vermis.
In the superior surface the vermis could not be identified clearly since the folia of vermis are continuous with that of the cerebellar hemispheres on either side (Plate 6, Fig. 33). In the inferior surface the vermis is clearly defined (Plate 6, Fig. 35).

The vermis of the cerebellum is divided into lingula, central lobe, culmen, declive, folium, pyramid, uvula and nodule (Plate 6, Fig. 34). Except the lingula all other vermian lobes have the lateral extensions which form the cerebellar hemispheres (Plate 6, Fig. 33 & 35).

The fissura prima on the superior surface divides the anterior lobe and middle lobe whereas the fissura seconda seen on the inferior surface separates the middle lobe and posterior lobe (Plate 6, Fig. 34). The anterior lobe forms the major part of the superior surface and is further subdivided by the præculminate and precentral fissures. The lingula is in contact with superior medullary velum and does not have lateral extension. The central lobe is in contact with the inferior colliculus and is overlapped by the culmen from the view (Plate 6, Fig. 34). The ala and quadrangular lobes form the lateral extensions of central lobe and culmen respectively.
The middle lobe has declive, folium, pyramid in the vermis and the posterior quadrangular lobe, ansiform lobe and biventral lobe in their lateral extensions. The posterior lobe is the smallest subdivision of the cerebellum, consisting of the uvula and nodula in its vermis and their hemispheric part being the paraflócculus and flocculus (Plate 6, Fig. 35).

DISCUSSION

The ratio between brain weight and body weight in slender lorises ranged from 1/42 to 1/56. This value for slow lorises varies from 1/20 to 1/96 (Krishnamurti, 1966). Similar consideration of the brain and body weight proportion in various primates, based on the data published by Stephan et al. (1981), reveal wide variation in the relative brain size among the living primates. Hence it is difficult to find a correlation between the brain and body weight proportion on one hand and the evolutionary status of the nervous system of the animal on the other. Similar conclusions were also arrived by Sholl (1956) and Radinsky (1977).

The macrosmatic nature of the adult brain is indicated by the large olfactory bulbs which project beyond frontal pole. However, in the young animal's brain the olfactory bulb does not protrude beyond the frontal pole. This indicates that
there is an elaboration of the olfactory system as the animal grows. This is in contrast to the findings of Kanagasuntheram et al. (1960) who observed that the size of the olfactory bulb is very large in the fetal galago and there is a stagnation in the growth of the olfactory bulb as the young one grows into adult.

The fissura rhinalis anterior and posterior which separate the pyriform cortex from the neocortex, merge with the Sylvian fissure in slender loris. Since the operculization of the Sylvian fissure has not occurred due to non-elaboration of the frontal and temporal association areas, these rhinal fissures are exposed on the lateral surface. In this respect the slender loris shows an advanced evolutionary status than Galago senegalensis (Kanagasuntheram et al. 1960), where these fissures are not present and Daubentonia madagascariensis where the rhinal fissures do not meet the pseudosylvian fissure (Clark, 1934).

The cingulate sulcus seen on the medial surface of slender loris separating the archipallium from neopallium, is also present in slow loris (Krishnamurti, 1966). This sulcus is absent in Microcebus murinus (Clark, 1931) and Tarsius spectrum (Woollard, 1925).
The cerebral cortex of slender loris which exhibits sagittally oriented neocortical sulci appears to hold an advanced evolutionary status than Tupia minor (Clark; 1924); Tarsius spectrum (Hoollard, 1925) and Galago senegalensis (Kanagasuntheram et al; 1960) whose cortices are practically smooth. On the other hand when compared to the sulcal pattern exhibited by Perodicticus potto (Zuckerman et al. 1941) Nycticebus coucang (Krishnamurti, 1965) and Arctocebus calabarensis (Radinsky 1974), the slender loris appears to be less evolved since it does not possess portions of coronally placed neocortical sulci demarcating the somatic sensory and motor areas as seen in the above primates.

The presence of the sulcus rectus in the frontal lobe is a constant feature exhibited by slender loris. This sulcus is shown to be present also in Galago demidovi and Perodicticus potto (Zuckerman et al. 1941), Galago crassicaudatus, Perodicticus potto (Haines et al. 1974). The presence of this sulcus is considered as an indication of the commencement of differentiation of the frontal lobe, a progressive feature (Kappers et al. 1965).

The upper end of Sylvian fissure is not connected to intraparietal sulcus in slender loris unlike in slow lorises in which the Sylvian fissure continued into the intraparietal
sulcus (Krishnamurti, 1966). However there is a vascular groove which connects the Sylvian fissure and the anterior end of intraparietal sulcus in slender loris. The anterior end of the intraparietal sulcus which curves just in front of the Sylvian fissure is considered to be homologous of sulcus post-centralis inferior of the higher primates (Kappers et al. 1965). The presence of a lunate sulcus and calcarine fissure similar to those reported for slow lorises indicate the elaboration of the visual cortex in this nocturnal primate.

The corpus callosum in slender loris is very similar to that of Galago senegalensis (Kanagasuntheram et al. 1960) and Nycticebus coucang (Krishnamurti, 1966) in not having a rostrum. The presence of a thick septum pellucidum which becomes confluent with the lamina terminalis is a common feature shown by Loris tardigradus, Galago senegalensis (Kanagasuntheram et al. 1966) and Nycticebus coucang (Krishnamurti, 1966).

The large interthalamic connexus seen in slender loris is also seen in other prosimians such as lesser bush baby (Galago senegalensis) and slow loris (Nycticebus coucang), (Kanagasuntheram et al. 1963). Such a large interthalamic connexus is also reported to be present in both new world and old world monkeys (Kanagasuntheram, 1954).
The lateral geniculate body in slender loris has migrated more towards the ventral aspect of the thalamus than the other prosimians such as tree shrew, slow loris and lesser bush baby. In addition, the slender loris presents a combination of advanced and primitive features in the pattern of infolding of the layers of lateral geniculate body. Krishnamurti et al. (1982) have shown that there is a clear evidence for the onset of eversion of the ventral border of the lateral geniculate body, which is considered to be an advanced feature. This coupled with the observations on the presence of the lunate sulcus and the posterior horn of lateral ventricle recorded earlier indicate that the visual system is well developed in slender loris. The reason for the presence of such a well developed visual system in this nocturnal animal is not clear and according to Krishnamurti, (1980) this probably indicates an aberrant course of evolution.

A well marked corpus trapezoideum seen on the ventral surface of modulla in slender loris is also present in other prosimians such as Perodicticus potto, Galago senegalensis, Galago crassicaudatus and Nycticebus coucang (Haines et al. 1974)
The medulla oblongata presents an acute angle of about 45 degrees to the cervical part of the spinal cord. This angulation may be due to the shifting of the foramen magnum more rostrally which is considered as a progressive feature in the pathway of erect posture (Seth, 1966).