WHITE MATTER OF CEREBRAL HEMISPHERES

THE INTERNAL CORE OF THE CEREBRAL HEMISPHERES COMPOSED OF MYELINATED NERVE FIBRES

- ASSOCIATION FIBRES
- COMMISSURAL FIBRES
- PROJECTION FIBRES

ASSOCIATION FIBRES

CONNECTS DIFFERENT PARTS OF CEREBRAL CORTEX OF THE SAME HEMISPHERE TO EACH OTHER

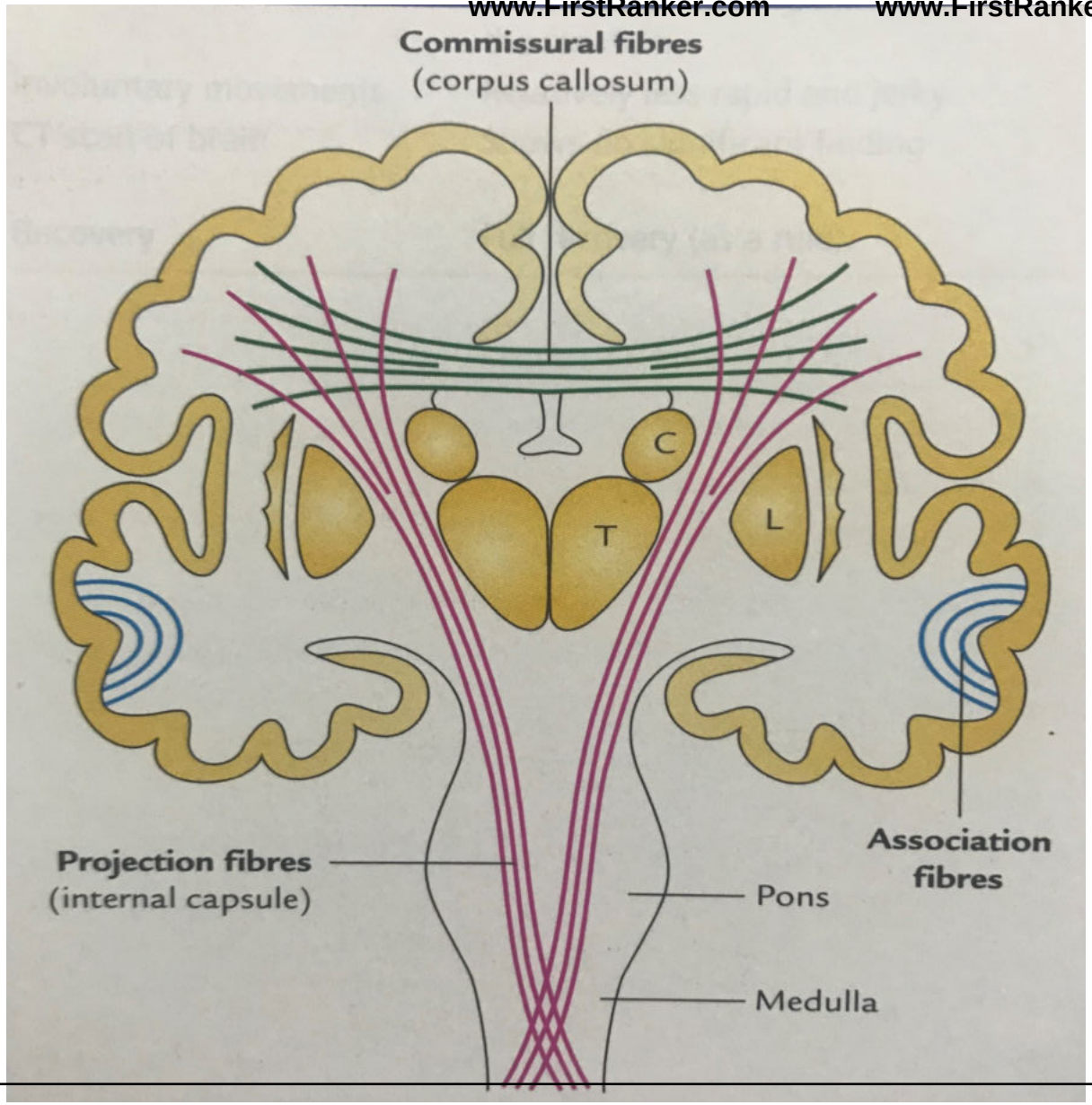
- SHORT ASSOCIATION FIBRES
- LONG ASSOCIATION FIBRES

COMMISURAL FIBRES

CROSS THE MIDLINE AND CONNECT THE IDENTICAL PARTS OF THE TWO HEMISPHERES

PROJECTION FIBRES

CONNECT THE CEREBRAL CORTEX TO OTHER REGIONS OF CENTRAL NERVOUS SYSTEM BELOW IT BY ***ASCENDING (CORTICOPETAL***) AND ***DESCENDING(CORTICOFUGAL)*** FIBRES



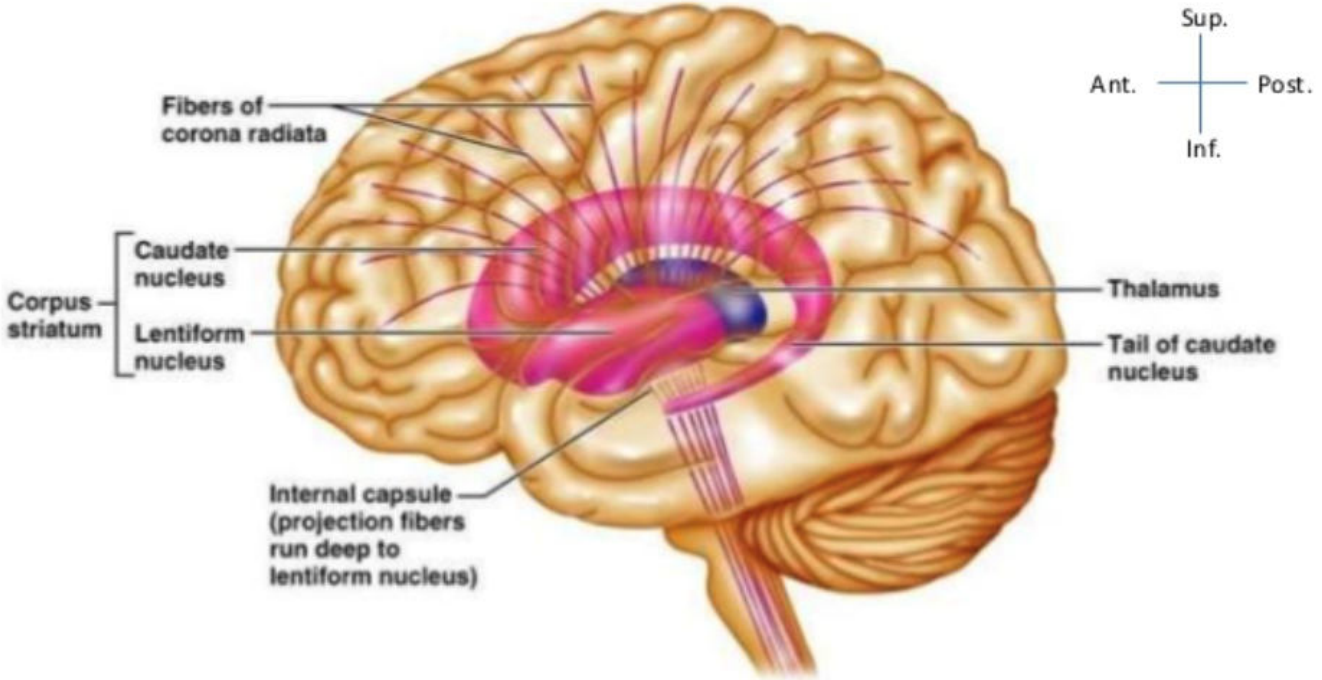
INTERNAL CAPSULE

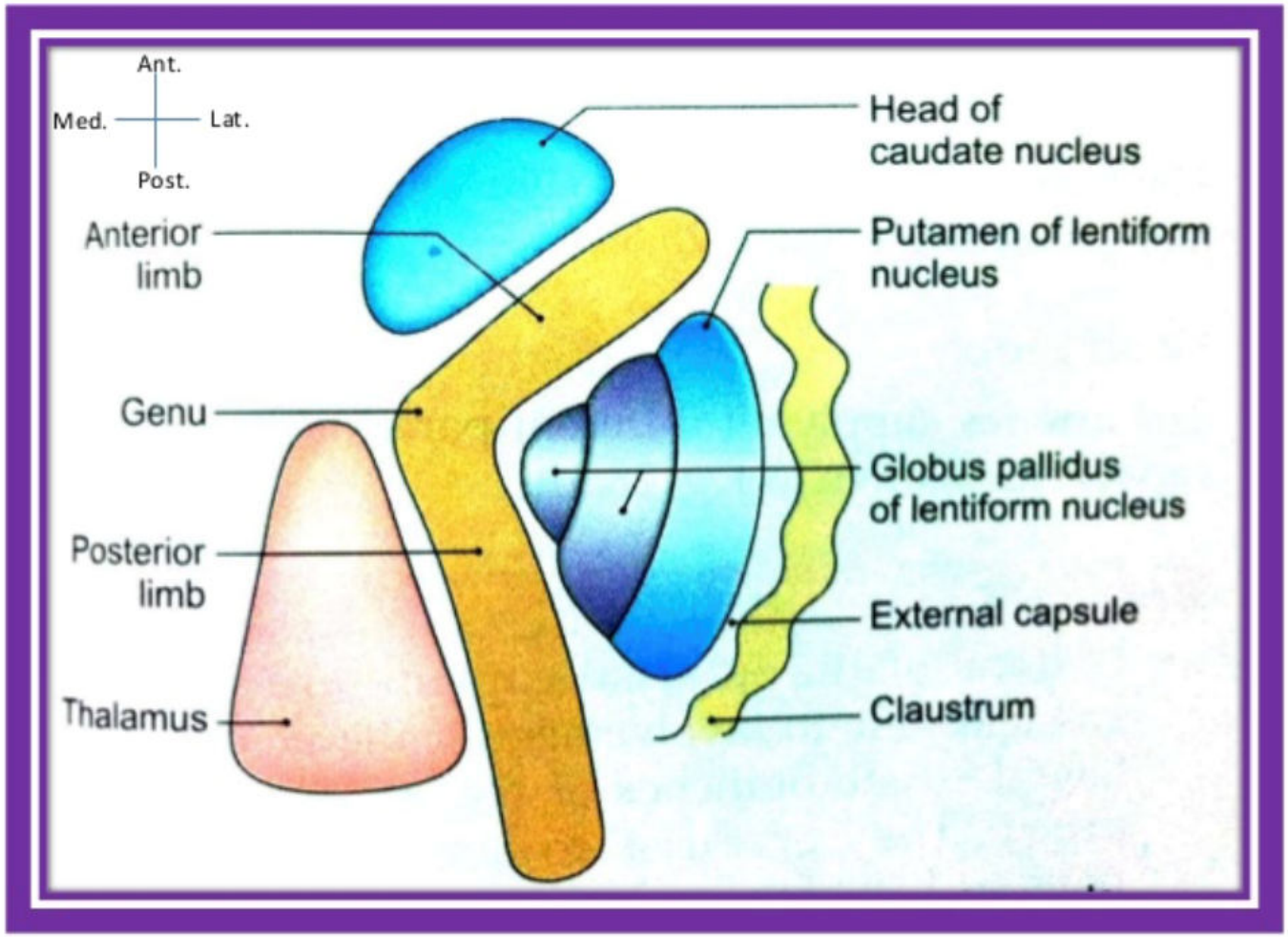
- Compact bundle of projection fibres
- Situated in the **inferomedial** part of each cerebral hemispheres.
- Projects from the cerebral cortex to interconnect with subcortical centres in the brainstem and spinal cord and with the thalamus.

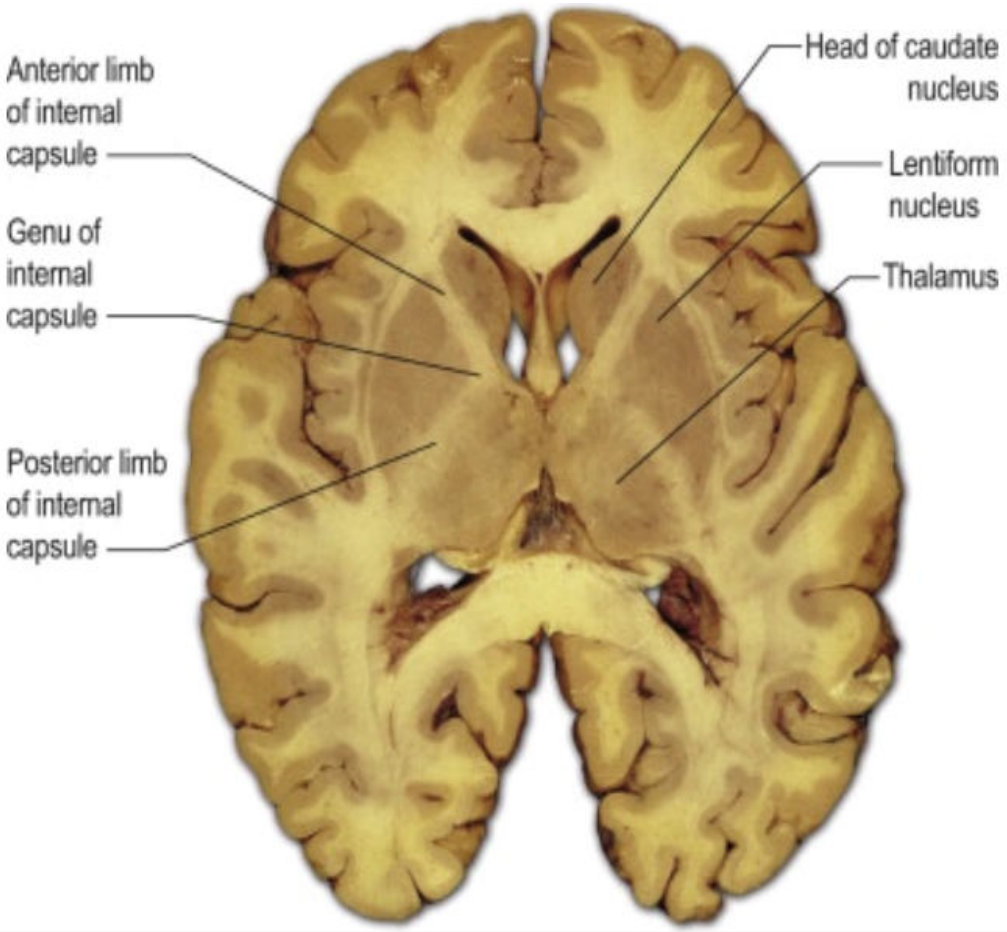
RELATIONS

- Fans out rostrally to form ***CORONA RADIATA***
- Condense caudally as ***CRUS CEREBRI*** of Midbrain.
- Medially ***Thalamus*** and ***Caudate nucleus***
- Laterally ***Lentiform nucleus***

Upwards: corona radiata
Downwards: crus cerebri of the midbrain

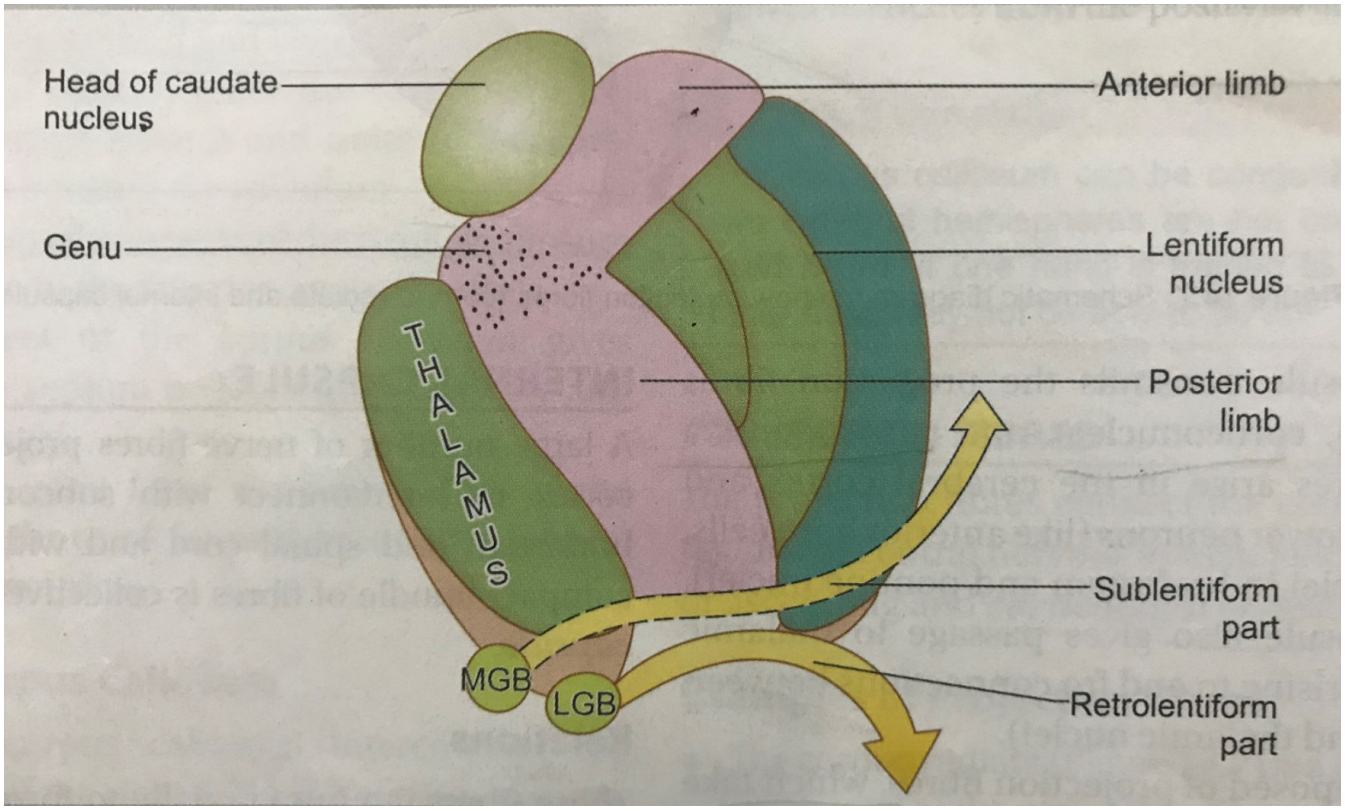






PARTS OF INTERNAL CAPSULE

- ANTERIOR LIMB
- POSTERIOR LIMB
- GENU
- RETROLENTIFORM PART
- SUBLENTIFORM PART



ANTERIOR LIMB

- Lies between the caudate nucleus medially and the anterior part of lentiform nucleus laterally
- Fibres to and from the anterior part of frontal lobe passes through the anterior limb

POSTERIOR LIMB AND GENU

- ***Posterior limb*** lies between the thalamus medially and the posterior part of the lentiform nucleus laterally
- ***Genu*** is the bend between the anterior and the posterior limb with concavity to the lateral side
- Fibres to and from the posterior part of the frontal lobe and a greater part of the parietal lobe passes through genu and posterior limb.

RETROLENTIFORM PART

- Behind the posterior end of the lentiform nucleus
- Fibres to and from the occipital lobe and the rest of the parietal lobe passes through the retrolentiform part

SUBLENTIFORM PART

- Passes below the lentiform nucleus
- Fibres to and from the temporal lobe passes through sublentiform part

CONSTITUENT FIBRES OF INTERNAL CAPSULE

- ASCENDING FIBRES(SENSORY FIBRES)- These are predominantly thalamocortical fibres which go from the thalamus to all parts of the cerebral cortex(constitutes most of the **Thalamic radiation.**
- DESCENDING FIBRES(MOTOR FIBRES)- Also called the centrifugal fibres

ASCENDING FIBRES

- ***ANTERIOR THALAMIC RADIATION***

  anterior and dorsomedial nuclei of thalamus
  anterior limb → frontal thalamic peduncle → frontal cortex

- ***SUPERIOR THALAMIC RADIATION***

  ventroposterolateral nuclei of thalamus →
  genu and posterior limb of capsule →
  superior/dorsal thalamic peduncle →
  somatosensory area.

- These fibres are the third order sensory neurons responsible for conveying somesthetic sensations to cerebral cortex.

- ***POSTERIOR THALAMIC RADIATION***

  lateral geniculate body → retrolentiform part → posterior/caudal thalamic peduncle → occipital lobe
- This includes the OPTIC RADIATION to the visual cortex

- ***INFERIOR THALAMIC RADIATION***

  medial geniculate body → sublentiform part → ventral thalamic peduncle → temporal lobe
- This include the AUDITORY RADIATION to the acoustic area of cerebral cortex.

DESCENDING FIBRES

- CORTICOPONTINE FIBRES
- PYRAMIDAL FIBRES
- EXTRAPYRAMIDAL FIBRES
- CORTICOTHALAMIC FIBRES

CORTICOPONTINE FIBRES

- Originates from all of the lobes of the cerebral hemispheres and .
- About 2/3rd of the total fibre component.
- They relay in the ipsilateral pontine nuclie cross the midline to relay in the cortex of the opposite cerebellar hemisphere – CORTIOCO PONTO CEREBALLAR pathway.

- ***FRONTOPONTINE FIBRES-*** Passes through anterior limb genu and the posterior limb.
- ***PARIETOPONTINE FIBRES-***Passes mainly through the retrolentiform part and some through sublentiform part
- ***TEMPOROPONTINE FIBRES-***Passes through the sublentiform part.
- ***OCCIPITOPONTINE PART-***Passes through the retrolentiform part.

PYRAMIDAL FIBRES

- ***CORTICONUCLEAR FIBRES-***

Synapse with contralateral motor nuclei of the cranial nerve which innervate the muscles of the head and neck muscles.

Occupies the genu of the internal capsule

- ***CORTICOSPINAL FIBRES-***

Synapse with the anterior horn cells of the opposite half of the spinal cord which innervate the muscles of the upper limb , trunk and lower limb

Forms several discrete bundle in the anterior 2/3rd of the posterior limb

Fibres of upper limb are most anterior followed by trunk and lower limb

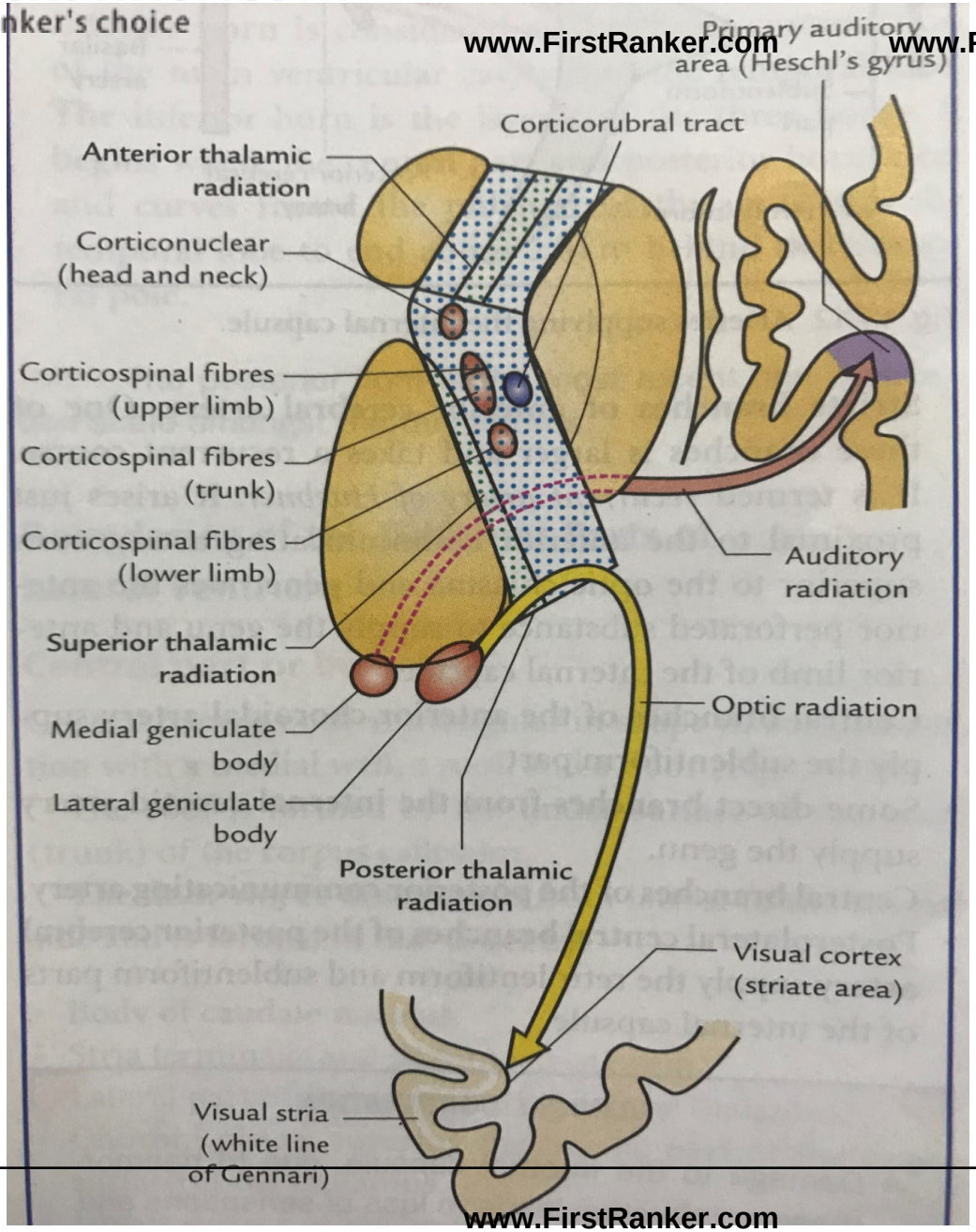
EXTRAPYRAMIDAL FIBRES

- ***CORTICOSTRIATE FIBRES-*** Terminates in the CORPUS STRIATUM-
- ***CORTICORUBRAL FIBRES-*** Terminates in the RED NUCLEUS-POSTERIOR LIMB
- ***CORTICORETICULAR FIBRES-*** Terminates in the RETICULAR NUCLIE-POSTERIOR LIMB AND GENU
- ***CORTICOTECTAL FIBRES-*** Terminates in the TECTAL NUCLIE-RETROLENTIFORM PART

CORTICOTHALAMIC FIBRES

These passes from various parts of the cerebral cortex to the thalamus and forms a part of the ***Thalamic radiation.***

- ***FRONTOTHALAMIC FIBRES-***ANTERIOR LIMB
- ***PARIETOTHALAMIC FIBRES-***GENU AND POSTERIOR LIMB
- ***TEMPOROTHALAMIC FIBRES-***SUBLENTIFORM PART
- ***OCCIPITOTHALAMIC FIBRES-***RETROLENTIFORM PART



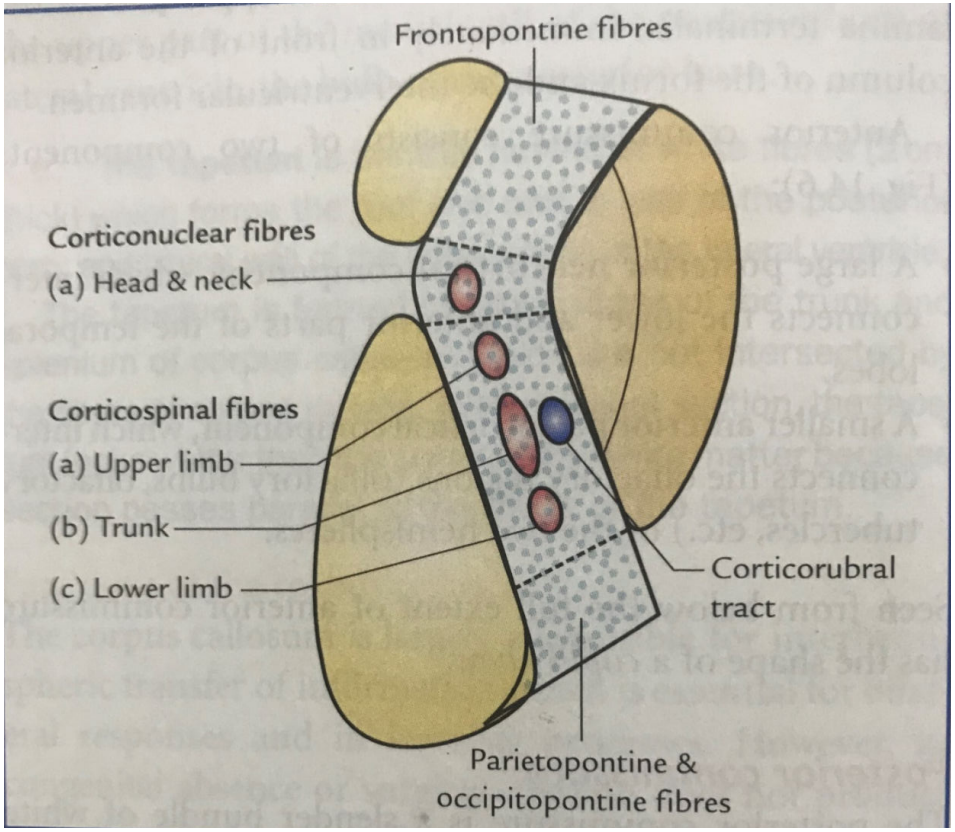


Table 14.1 | Fibres in Internal Capsule

Part	Motor fibres	Sensory fibres
Anterior limb	• Frontopontine fibres • Frontothalamic fibres	Anterior thalamic radiation
Genu	• Frontopontine fibres • Corticonuclear fibres • Corticoreticular fibres • Parietothalamic fibres	Superior thalamic radiation
Posterior limb	• Frontopontine fibres • Corticospinal fibres • Corticorubral fibres • Corticoreticular fibres • Parietothalamic fibres	Superior thalamic radiation
Retrolentiform part	• Parietopontine fibres • Occipitopontine fibres • Corticotectal fibres • Occipitothalamic fibres	Posterior thalamic radiation (optic radiation)
Sublentiform part	• Parietopontine fibres • Temporopontine fibres • Temporothalamic fibres	• Inferior thalamic radiation • Acoustic radiation

ARTERIAL SUPPLY OF THE INTERNAL CAPSULE

- MEDIAL AND LATERAL STRIATE BRANCH OF MIDDLE CEREBRAL ATERY
- RECURRENT BRANCH OF THE ANTERIAL CEREBRAL ARTERY
- ANTERIAL CHOROIDAL ARTERY
- DIRECT BRANCHES FROM INTERNAL CAROTID ARTERY
- BRANCHES FROM POSTERIOR COMMUNICATING ARTERY
- STRIATE BRANCHES OF POSTERIAL CEREBRAL ATRERY

- The ***upper parts*** of the anterior limb genu and posterior limb- lateral and medial striate branches of middle cerebral artery.

CHARCOT ARTERY- larger lateral striate branch
more frequently ruptured
supplies posterior limb

- The ***lower parts*** are supplied as follows

  - Anterior limb- ***recurrent artery of Heubner***
  - Genu-direct branch from internal carotid and posterior communicating artery
  - Posterior limb-anterior choroidal artery and striate branch of posterior cerebral arery

- ***Retrolentiform part-*** anterior choroidal artery

- ***Sublentiform part-***anterior choroidal artery

Arteries Supplying the Interior of the Cerebral Hemisphere - Blood Supply of Central Nervous System

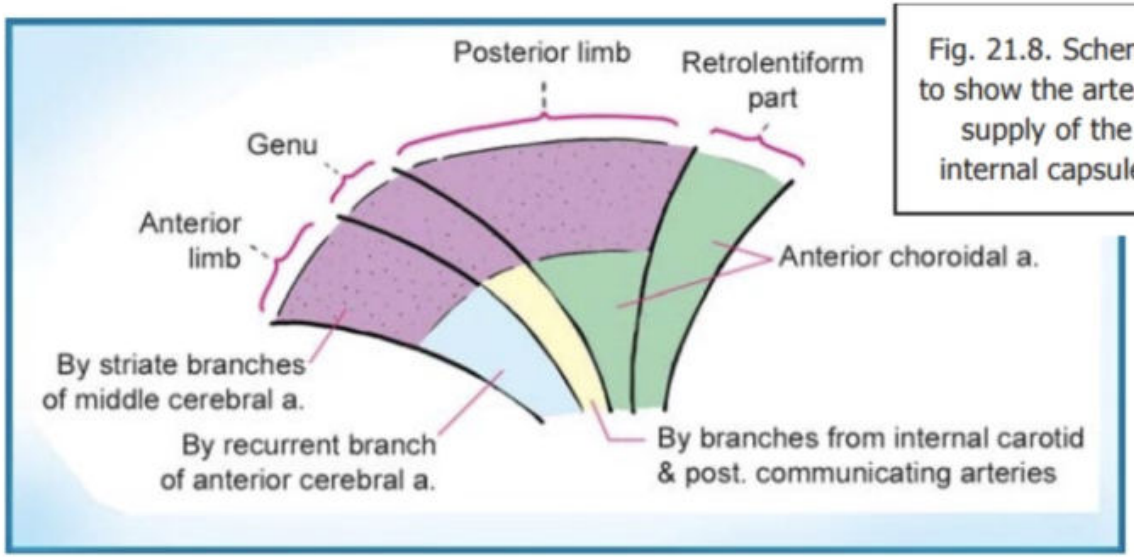


Fig. 21.8. Scheme to show the arterial supply of the internal capsule.

The main arteries supplying the internal capsule are the medial and lateral striate branches of the middle cerebral artery, the recurrent branch of the anterior cerebral, and the anterior choroidal artery.

THANK YOU