KARNATAKA RADIOLOGY EDUCATION PROGRAM

CEREBRAL Arterial ANATOMY OF THE BRAIN- 3

The intracranial circulation can be conveniently divided into anterior and posterior circulation, on the basis of internal carotid artery and vertebral artery supply respectively.

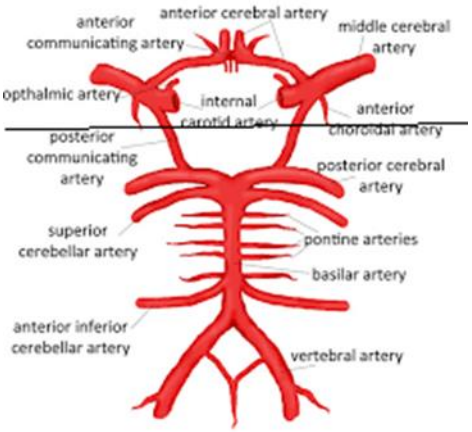
Anterior circulation [intracranial ICA]

- **anterior choroidal artery**
- **anterior cerebral artery (ACA)**
- **medial lenticulostriate arteries**
- **middle cerebral artery (MCA)**
- **lateral lenticulostriate arteries**

Posterior circulation [vertebrobasilar]

- **posterior cerebral artery (PCA)**
- **posterior choroidal arteries**
- **basilar artery**
- **superior cerebellar artery (SCA)**
- **anterior inferior cerebellar artery (AICA)**
- **posterior inferior cerebellar artery (PICA)**

Anterior



Posterior

Anterior Circulation

Anterior choroidal artery

The anterior choroidal artery originates from the internal carotid artery.
Rarely it arises from the middle cerebral artery.
The territory of the anterior choroidal artery encompasses part of the hippocampus, the posterior limb of the internal capsule and extends upwards to an area lateral to the posterior part of the cella media.

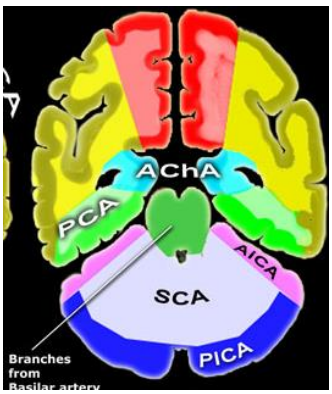
The whole area is rarely involved in AChA infarcts.

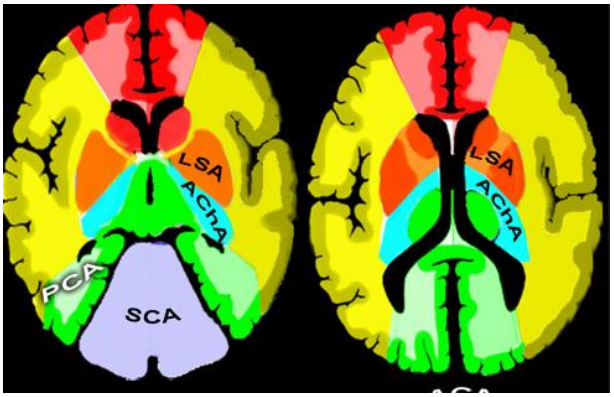
The posterior limb of the internal capsule also receives blood from the lateral lenticulostriate arteries.

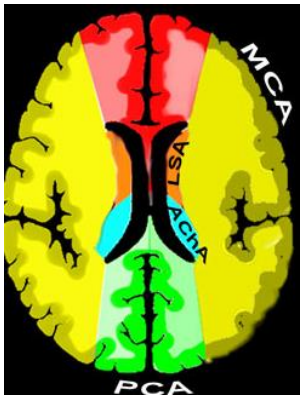
Segments

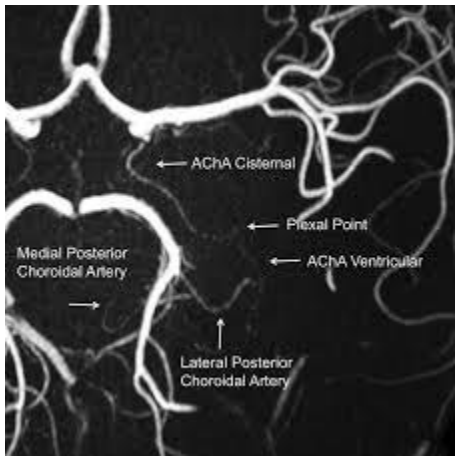
The AChA can be divided into two segments:

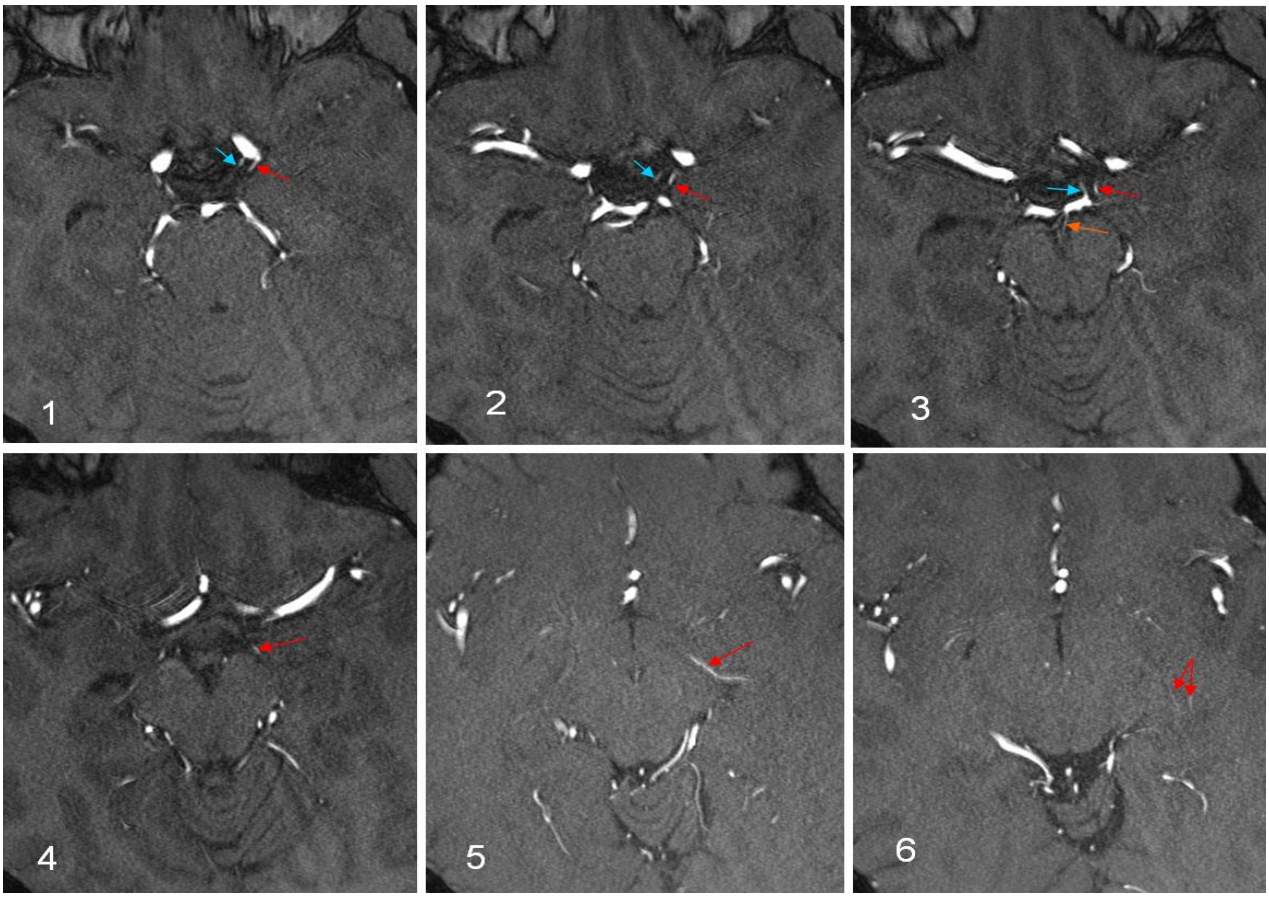
- **cisternal segment: extends from its origin until the choroidal fissure; measures ~2.5 cm (range 1.5-3.5 cm) in length. It passes through carotid cistern, crural cistern and ambient cistern before reaching the choroidal fissure 6,7.**
- **intraventricular segment: after entering the choroidal fissure**











1)Ostium of the A Choroidal artery lateral and distal to the PCOM (blue)
2) Cisternal portion of the A Chor.
3) Lateral course in the perimesencephalic cistern at level of PCOM / PCA confluence. Even medial choroidal artery (orange) can be seen on a 3-T
4) Entrance into the choroidal fissure
5) In the choroidal fissure, in plane of scan
6) Branching to feed choroid plexus

ANTERIOR CEREBRAL ARTERY

Smaller terminal branch of Internal carotid artery.
Course: Each artery is directed above the optic nerve. It enters the median longitudinal fissure of the brain, where it is connected to the corresponding artery of the opposite side by anterior communicating artery. It curves backwards round the genu. Runs on the upper surface of the corpus callosum as far as the splenium where it anastomoses with a branch of posterior cerebral artery.

Segments

The anterior cerebral artery is divided into five segments 8-10:

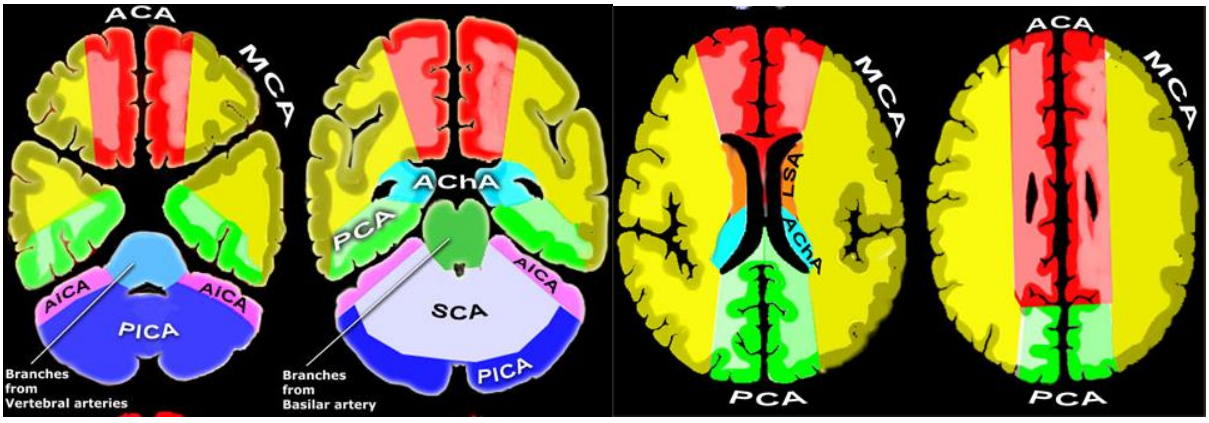
A1: horizontal or pre-communicating segment originating from the terminal bifurcation of the internal carotid artery, extending ~14 mm in length terminates at the anterior communicating artery

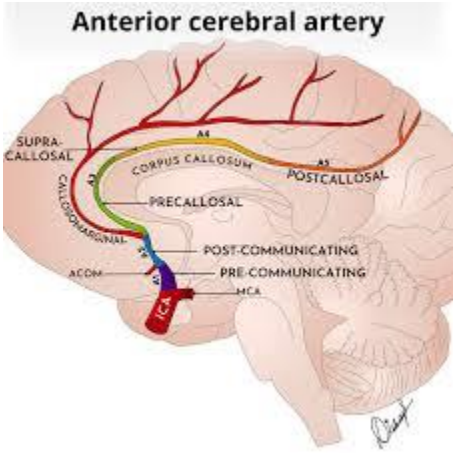
A2: vertical, post-communicating or infracallosal segment originating at the anterior communicating artery, extending anterior to the lamina terminalis and along the rostrum of the corpus callosum terminates either at the junction of the rostrum and genu of the corpus callosum at the apex of the dorsal convex arch, or at the origin of the callosomarginal artery

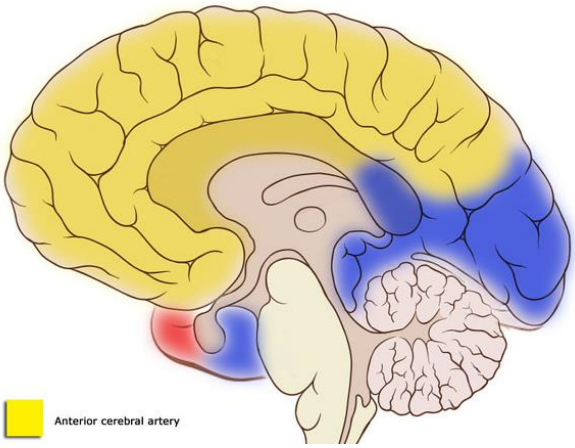
A3: precallosal segment extends around the genu of the corpus callosum, or originates distal to the origin of the callosomarginal artery terminates where the artery turns directly posterior above the body of the corpus callosum

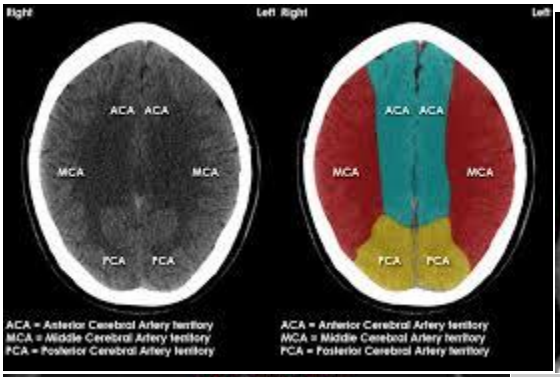
A4: supracallosal segment above the body of the corpus callosum anterior to the plane of the coronal suture

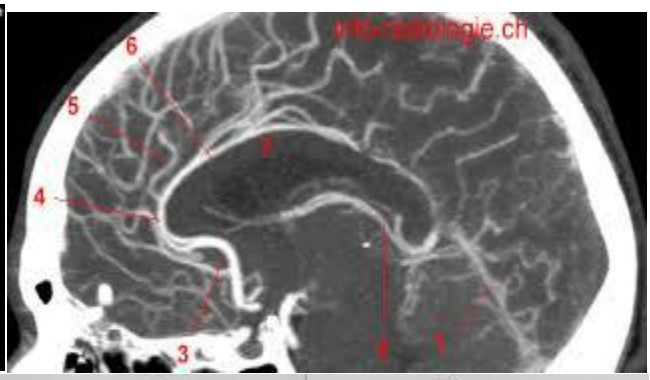
A5: postcallosal segment above the body of the corpus callosum posterior to the plane of the coronal suture.




Anterior cerebral artery
SUPRA-CALLOSAL
A4
CORPUS CALLOSUM
A5
POSTCALLOSAL
A3
CALLOSOMARGINAL
PRECALLOSAL
A2
POST-COMMUNICATING
ACOM
A1
PRE-COMMUNICATING
MCA
ICA


Anterior cerebral artery


Right
Left Right
Left
ACA ACA
MCA
MCA
PCA PCA
ACA ACA
MCA
MCA
PCA PCA
ACA = Anterior Cerebral Artery territory
MCA = Middle Cerebral Artery territory
PCA = Posterior Cerebral Artery territory
ACA = Anterior Cerebral Artery territory
MCA = Middle Cerebral Artery territory
PCA = Posterior Cerebral Artery territory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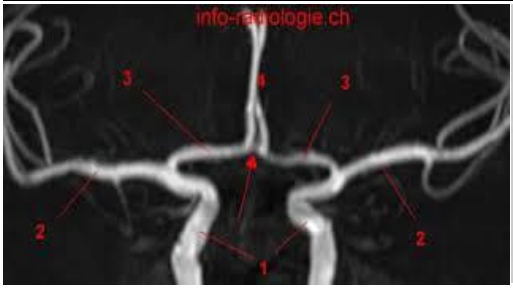
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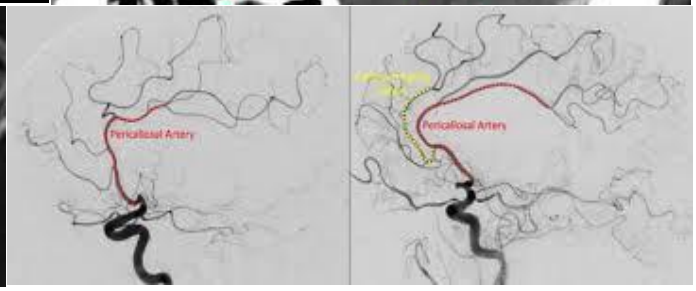
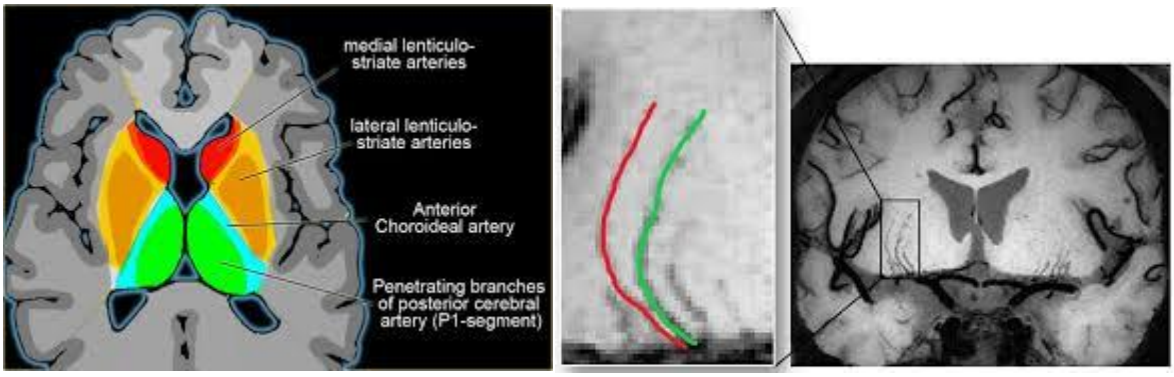
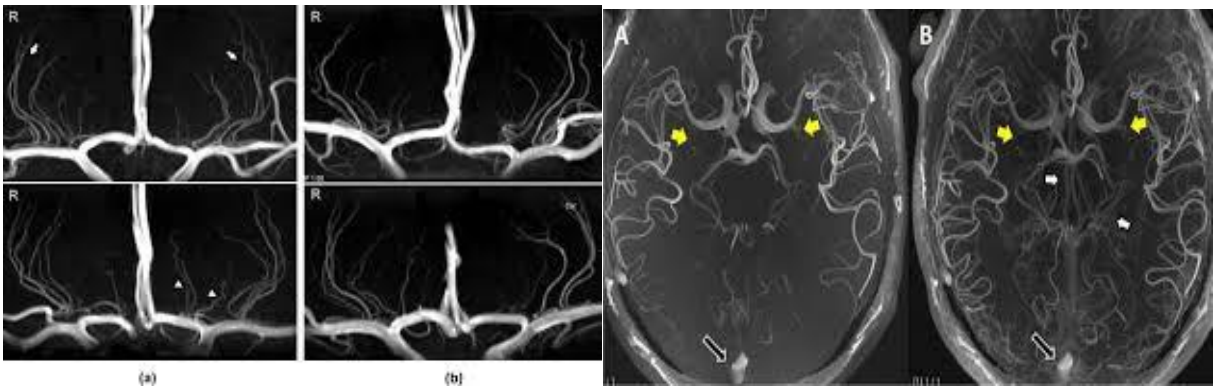

Pericallosal Artery
Pericallosal Artery

Lenticulo-striate arteries

The lateral LSA' s (in orange) are deep penetrating arteries of the middle cerebral artery (MCA). Their territory includes most of the basal ganglia.
The lateral lenticulostriate arteries arise from the proximal middle cerebral artery (MCA), usually from M1 segment, more rarely from the postbifurcation or M2 segment. They supply the lateral portion of the putamen and external capsule as well as the upper internal capsule

The medial LSA' s (indicated in dark red) arise from the anterior cerebral artery (usually the A1-segment). Heubner's artery is the largest of the medial lenticulostriate arteries and supplies the anteromedial part of the head of the caudate and anteroinferior internal capsule.





MIDDLE CEREBRAL ARTERY

Larger terminal branch and direct continuation of the internal carotid artery.

Course: From the anterior perforated substance the artery passes laterally along the stem of the lateral sulcus. It extends backward and upward along the posterior ramus of the lateral sulcus and rests on the insular lobe.

Branches Of Middle Cerebral Artery

It gives off central and cortical branches.

Central branches:

Lenticulo-striate artery:

Medial striate artery

- **caudate nucleus**
- **internal capsule**

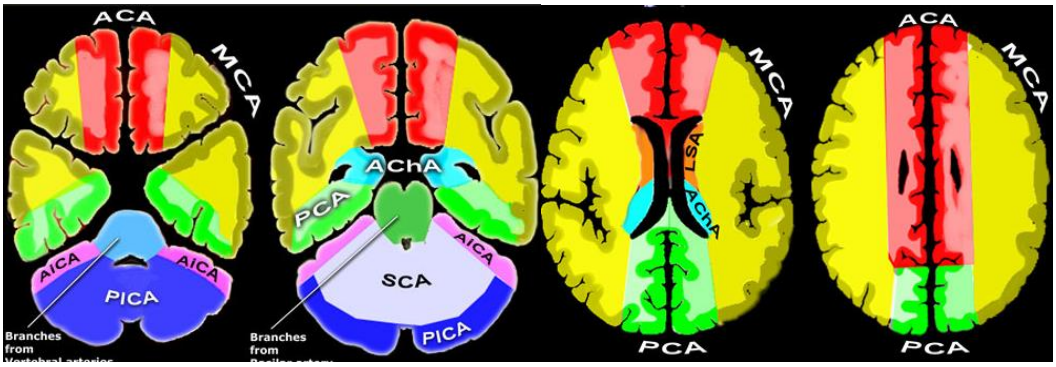
Lateral striate artery

caudate nucleus

The striate arteries are vulnerable to rupture in the presence of high blood pressure, hence described by Charcot as the 'arteries of cerebral haemorrhage'.

Cortical Branches of Middle Cerebral Artery

Anterior temporal artery
Orbito-frontal artery
Pre-Rolandic and Rolandic branches
Anterior and posterior parietal arteries
Posterior temporal arteries
Angular artery



The middle cerebral artery territory is the most commonly affected territory in a cerebral infarction, due to the size of the territory and the direct flow from the internal carotid artery into the middle cerebral artery, providing the easiest path for thromboembolism.

Clinical presentation

The neurological deficit will depend on the extent of the infarct and hemispheric dominance, and include: contralateral hemiparesis, contralateral hemisensory loss, hemianopia, aphasia: if the dominant hemisphere is involved; may be expressive in anterior MCA territory infarction, receptive in posterior MCA stroke, or global with extensive infarction, neglect: non-dominant hemisphere.

Segments

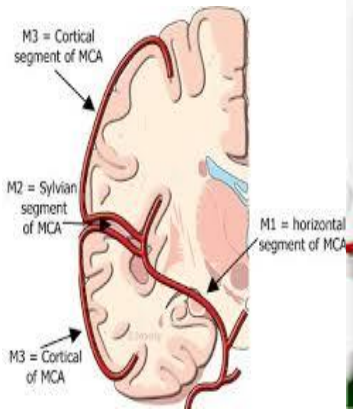
The MCA is divided into four segments:

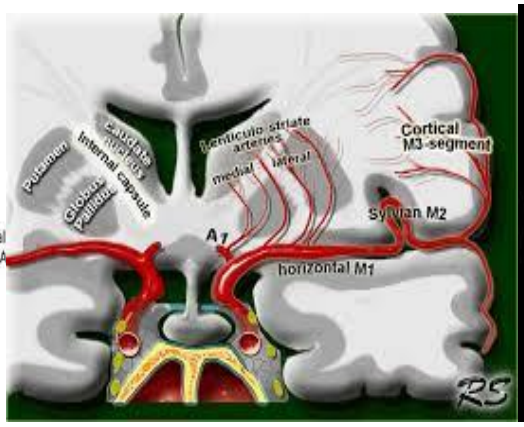
M1: sphenoidal or horizontal segment originates at the terminal bifurcation of the internal carotid artery courses laterally parallel to the sphenoid ridge , terminates at one of two points (controversial; see below note*): at the genu adjacent to the limen insulae at the main bifurcation

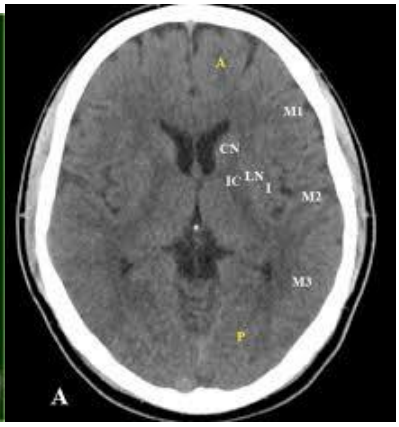
M2: insular segment originates at the genu/limen insulae or the main bifurcation courses posterosuperiorly in the insular cleft , terminates at the circular sulcus of insula, where it makes a right angle to hairpin turn

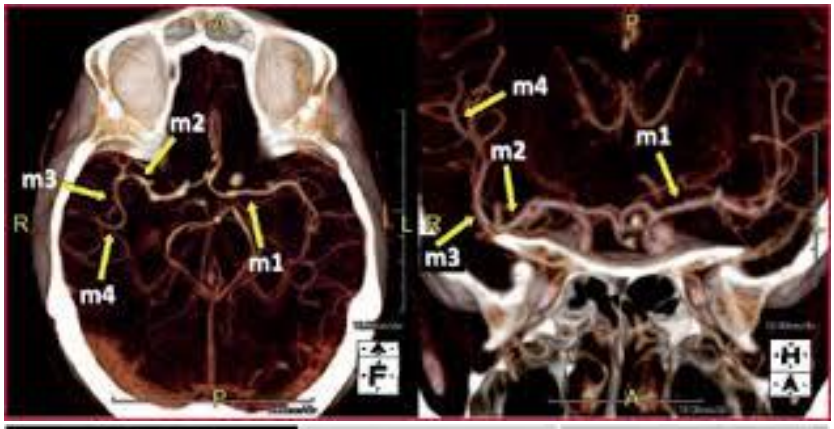
M3: opercular segment originates at the circular sulcus of the insula courses laterally along the frontoparietal operculum , terminates at the external/superior surface of the Sylvian fissure

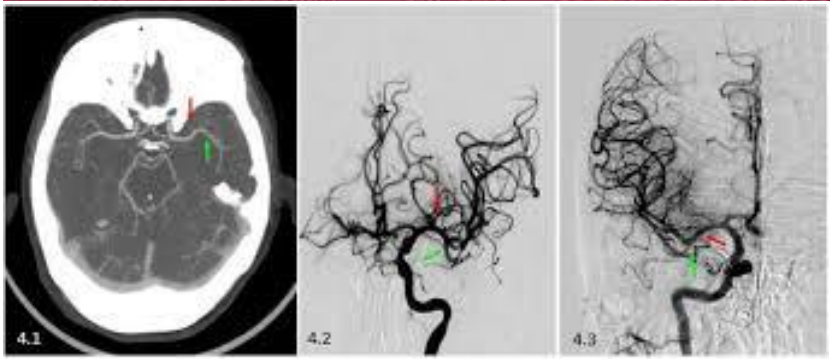
M4: cortical segment originates at the external/top surface of the Sylvian fissure courses superiorly on the lateral convexity , terminates at their final cortical territory.











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