

Blood Supply of the Brain

This mini file contains all the information mentioned during the lecture, if you're studying from here, make sure to go back and study the syndromes in the last few slides of the lecture.

* Anterior circulation (vertebrobasilar) → 30%

* Posterior circulation (internal carotid artery) → 70%

Arteries that share in the circle:

- ACA
- PCA
- A. communicating
- P. communicating

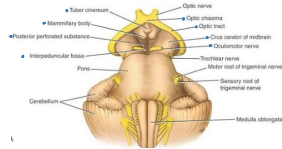
* Boundaries of the IPF:

anterior: optic chiasm and the decussation of the optic tracts

posterior: upper part of Pons

anterolateral: optic tract

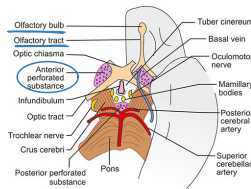
posterolateral: crus cerebri



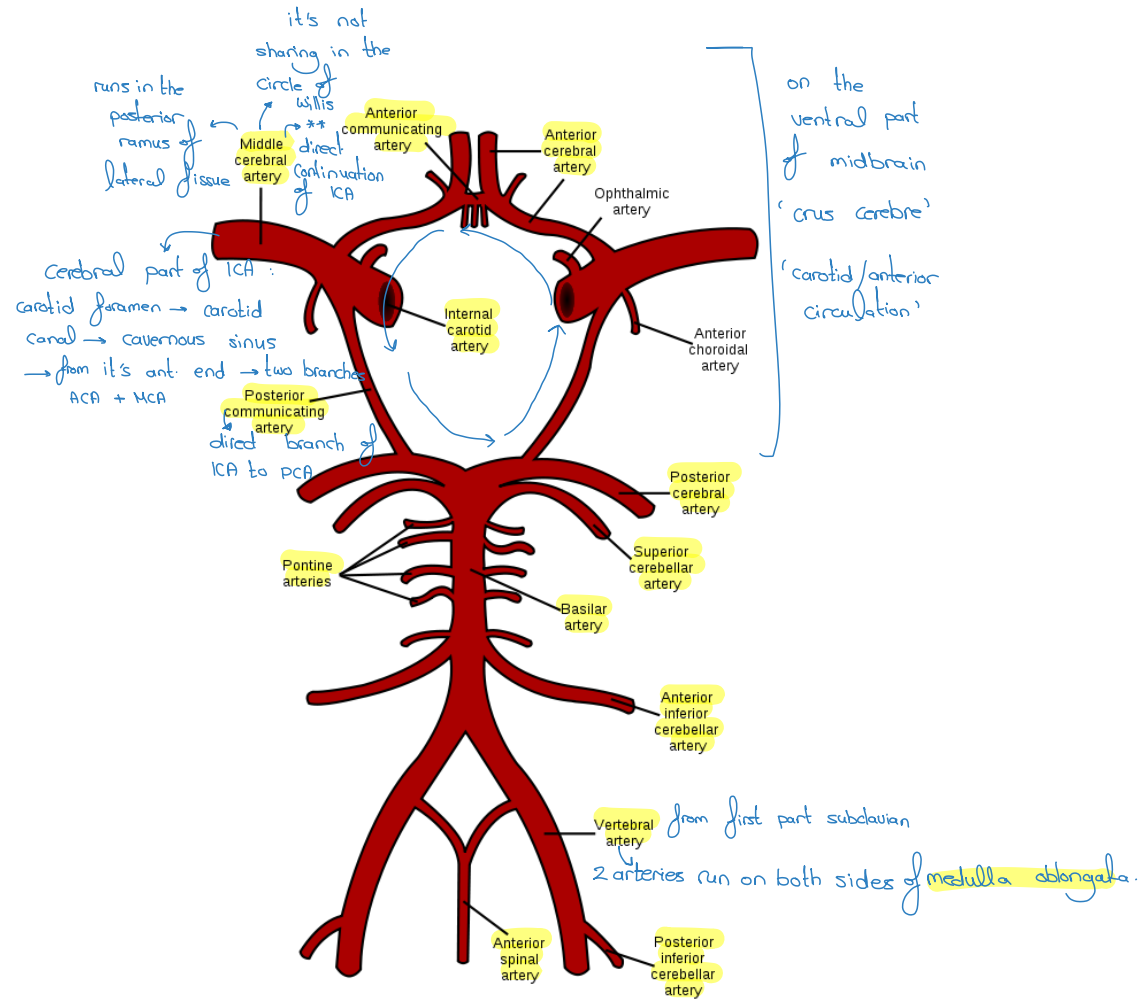
* Content:

- 1) mammillary body
- 2) tuber cinereum + infundibulum but not the pituitary
- 3) oculomotor nerves
- 4) posterior perforated substance made by branches of PCA to supply central structures (basal nuclei + internal capsule).

* Anterior perforated substance made by ACA (2 in no.) on both ends of the olfactory tracts, between the two olfactory stria, also to supply central structures.



Circle of Willis (in the interpeduncular fossa)



Internal Carotid Artery

- Upon exiting the cavernous sinus, the ICA extends through the meninges to become the supraclinoid segment

- The supraclinoid or cerebral ICA bends posteriorly and laterally between the oculomotor (III) and optic (II) nerves

- **Branches:**

- Ophthalmic A

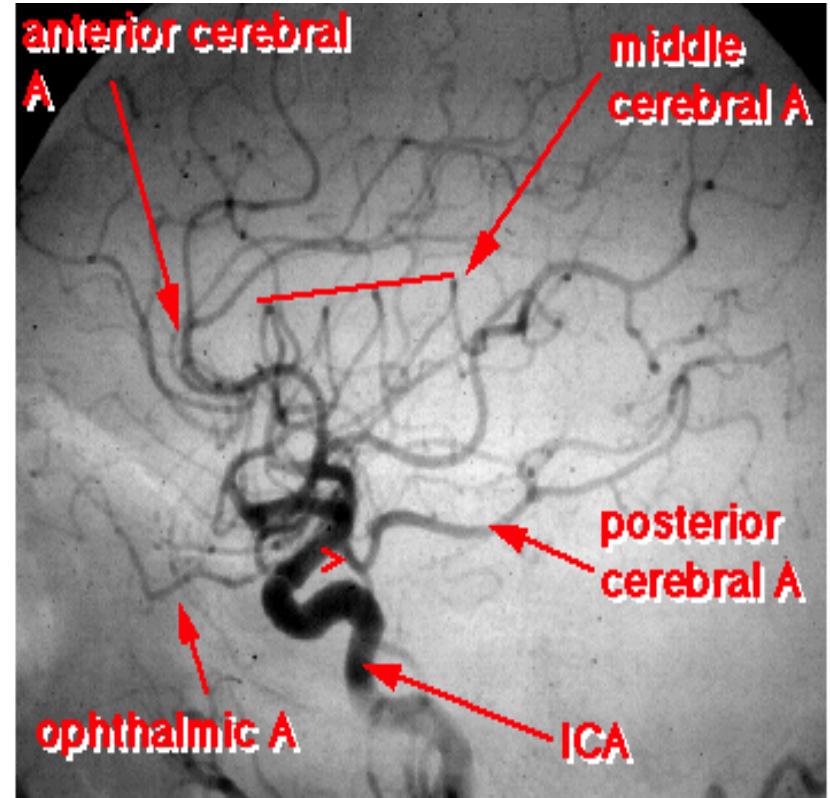
- A to the anterior pituitary and stalk

- posterior communicating artery (PCoA).

→ choroid plexus of the lateral ventricle.

- anterior choroidal artery (AChA)

- bifurcating into the ACA and MCA



> = posterior communicating A

VERTEBRAL ARTERY

BRANCHES:

1. **ANTERIOR + POSTERIOR SPINAL A.**

2. **PICA (posterior inferior cerebellar artery)**

3. **Medullary branches**

→ goes to the cerebellum & the medulla (Wallenberg syndrome / lateral medullary syndrome)

→ The most important artery in supplying the cerebellum.

BASILAR ARTERY BRANCHES:

1. **AICA (Anterior inferior cerebellar artery)**

2. **INTERNAL AUDITORY A.**

3. **SUPERIOR CEREBELLAR A.**

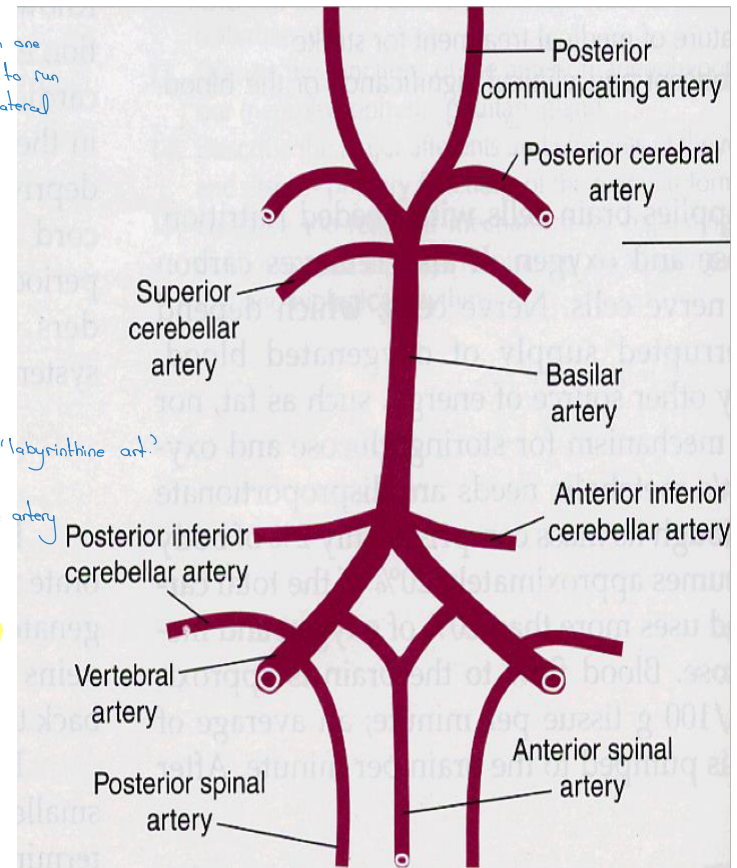
4. **POSTERIOR CEREBRAL A.**

5. **MEDULLARY AND PONTINE PERFORATING ARTERIES**

anterior spinal artery:

two small branches of the vertebral to run in the anterior median fissure. it supplies the anterior 2/3 of the spinal cord.

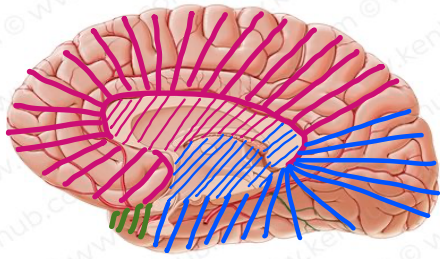
two arteries each emerge from one vertebral artery to run in the posterolateral sulcus.



ACA

PCA

MCA



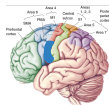
- 1 ACA supplies the cortex until the parieto-occipital fissure
- 2 Corpus callosum except the splenium.
- 3 Septum plucidum as a whole. 4 fornix

PCA supplies:

- 1 Thalamus, 2 pineal gland,
 - 3 splenium, 4 occipital pole,
 - 6 medial side of temporal lobe
- except the temporal pole.

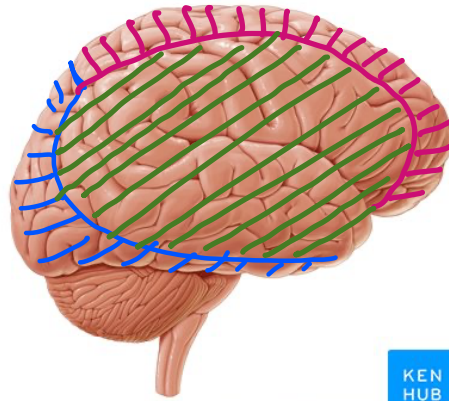
- * Area 4 → by ACA + MCA
 - supplies area that controls leg
 - supplies area that controls arm

* Bcz the body is represented up-side-down on the cortex, if the lower part of area 4 is affected on the lateral surface, muscles of the face will be paralysed.



- * Anterior part of paracentral lobule → motor to lower limb
- * Posterior part → sensory to lower limb

* Lesion of (ACA) in this area will cause loss of motor + sensory function of the lower limb + incontinence (as it controls the sphincters).



www.kenhub.com



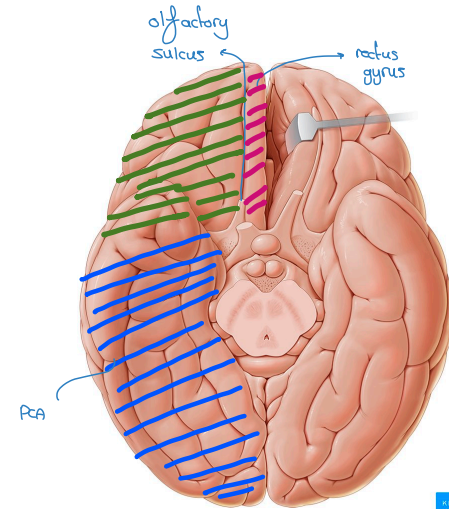
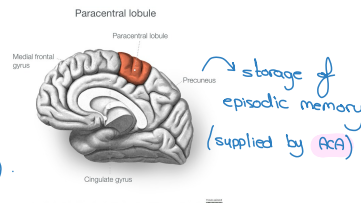
Most of the lateral surface is supplied by the MCA, except the upper 1 inch by ACA, lower 1 inch by PCA.

Occipital pole also by PCA.

Temporal pole by MCA.

Frontal pole by ACA.

- * lesion of MCA will cause loss of sensation in the contralateral part of the body due to the damage of area 312. 'contralateral hemianesthesia'



www.kenhub.com



medial to the olfactory sulcus → ACA
lateral to it + temporal pole + uncus → MCA

- * Lesion affecting area 6 causes apraxia and loss of coordination of big muscles.
- * Lesion of middle frontal gyrus (MCA affected), both eyes will go to the same side of the lesion, as normally this area moves eyes to the contralateral side.
- * Lesion of inferior frontal gyrus causes motor aphasia.
- * Lesion of Wernicke's area causes sensory aphasia. ('unable to understand spoken or written words').
- * Both are supplied by MCA, and they're mainly on the left side.
- * If the parietal association area (area 5+7) is damaged, this will lead to astereognosis, where sensory information is not understood.

* Lesion affecting **supramarginal area** of **Wernicke's** only → **difficulty repeating words**.

* **angular gyrus** lesion → **acalculia + agraphia** (can't calculate or distinguish or continue graphs).

Edit:

* **Area 41 + 42** on temporal lobe lesion → acute hearing loss on both sides but mainly on the **opposite** side

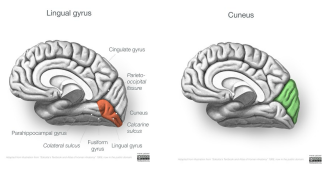
* The rest of temporal lobe lesion → ① **can't understand what's heard** (auditory association area damage).
 ② **memory deficits** (hippocampus has dual blood supply **MCA + PCA**, so affected by strokes in both).



* Lesion of **insula** (supplied by **MCA**) → **loss of taste sensation** (area 43)

* Lesion of **medial frontal area + prefrontal cortex** (supplied by **ACA**) → **personality changes**

* **Cuneus & Lingula** supplied by **PCA**



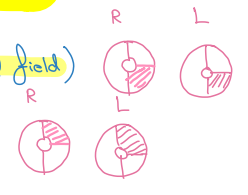
* Primary visual area sees the **contralateral visual field**
 ↳ **area 17** on calcarine fissure

* Lesion of **right PCA** causes **Left homonymous hemianopia**

Edit:

* Lesion affecting **cuneus** only on **right** → **inferior quadrantanopia** (of the **opposite visual field**)

* Lesion affecting **lingual gyrus** only (on **right**) → **superior quadrantanopia** (of the **opposite visual field**)



↳ Both with **macular sparing** (as it's supplied by **PCA + MCA**)

* Lesion of **corpus callosum** → **split brain** or **neglect syndrome**

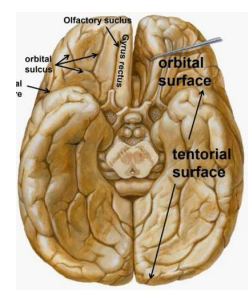
* Lesion of **thalamus** → **all sensation will be affected**

* Lesion of **MCA** affects **amygdala** (present in the **uncus**, which's supplied by **MCA**).

* **Hippocampus** → largely by **PCA** but also **MCA**.

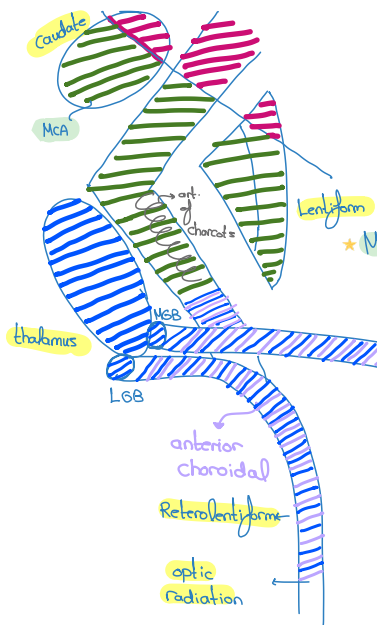
* **Orbital surface**: medial half → **ACA**
 lateral half → **MCA**

* **Tentorial surface** → mainly **PCA**



Blood supply of internal capsule

* Certain branch of the ACA called 'current artery of hubnar' supplies the anterior part of caudate.



* ACA gives medial striate branches to:
 anterior part of corpus striatum → bt putamen & caudate.
 [anterior part of caudate, lentiform, anterior limb of internal capsule]

* MCA gives lenticulostriate artery (AKA: lateral striate) for: the rest of caudate & lentiform & post. part of anterior limb + genu + most of post. limb.

* PCA gives: retrolentiform, sublenticiform, most post part of post. limb.
 and those structures are also supplied by 'anterior choroidal artery' branch of ICA.

* ICA also gives a direct branch to the genu of the internal capsule.

* anterior limb → fibre-pontine, limbic system fibres → lesion will lead to personality changes

* Artery of Charcot (artery of cerebral hemorrhage) if ruptured it will affect fibres of post. limb leading to CL hemiplegia + CL hemianaphesia
 usually ruptures in hypertension.

* Lesion of genu → paralysis of muscles of the face & neck (corticobulbar fibres run in it).

* genu has dual blood supply; if the MCA is occluded; muscles of face are not completely affected.

MCA ICA branch

Epidural hemorrhage → middle meningeal artery → biconvex in shape (on CT-scan), usually associated with fractures

Subdural hemorrhage → bridging veins → crescentic in shape (on CT-scan), not associated with fractures

Subarachnoid hemorrhage → ruptured aneurysm.

