BRAINSTEM (PART 4)

Blood Supply

2 Subclavian As → 2 Vertebral As → Give single ant. spinal A (moves along ant. median fissure of spinal cord & medulla)

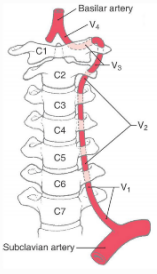
↓

Continue through transverse foramina of cervical vertebra

↓

at C_1 it curves up, forward, medially then enters foramen magnum

↓



unite with another vertebral A forming basilar A

- → Ant. inf. cerebellar A (AICA) (supplies inf. surface of cerebellum)
- → Sup. cerebellar As (supply sup. surface of pons & cerebellum)

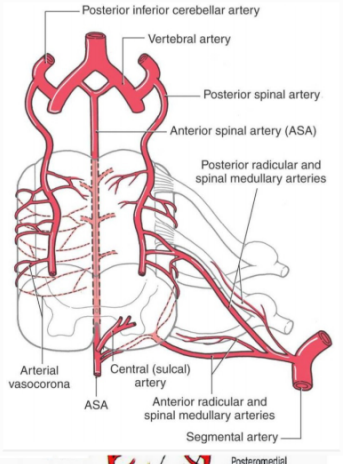
↓

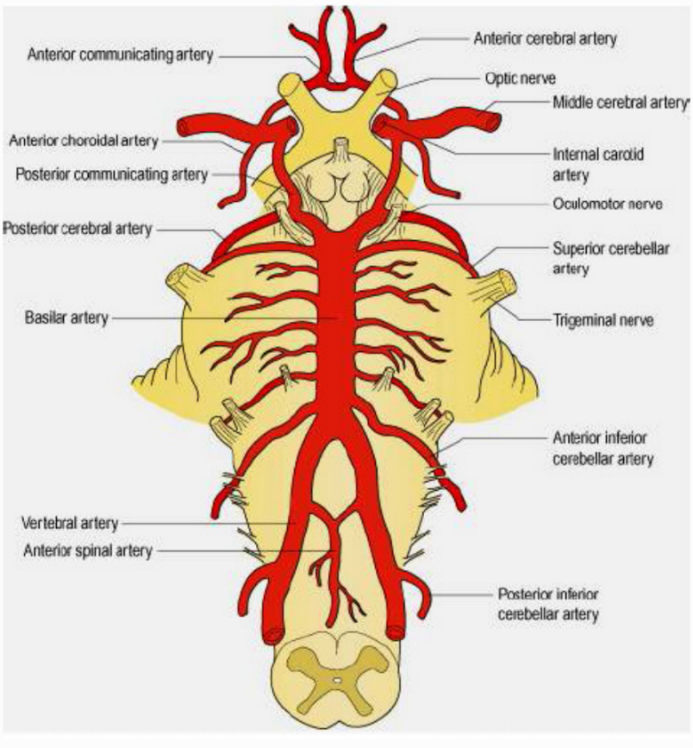
moves along basilar groove on pons & gives pontine branches (supply pons)

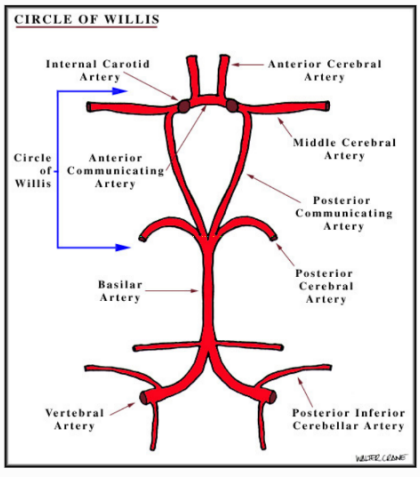
↓

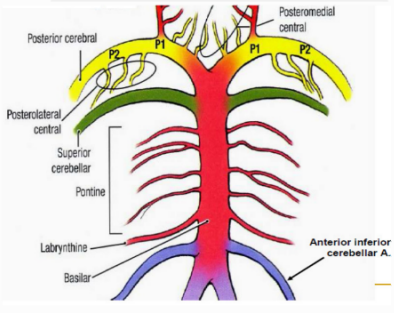
divides into 2 post. inf. cerebellar As (PICA)

- → gives post. spinal A
- ← recieves post. communicating A from circle of willis









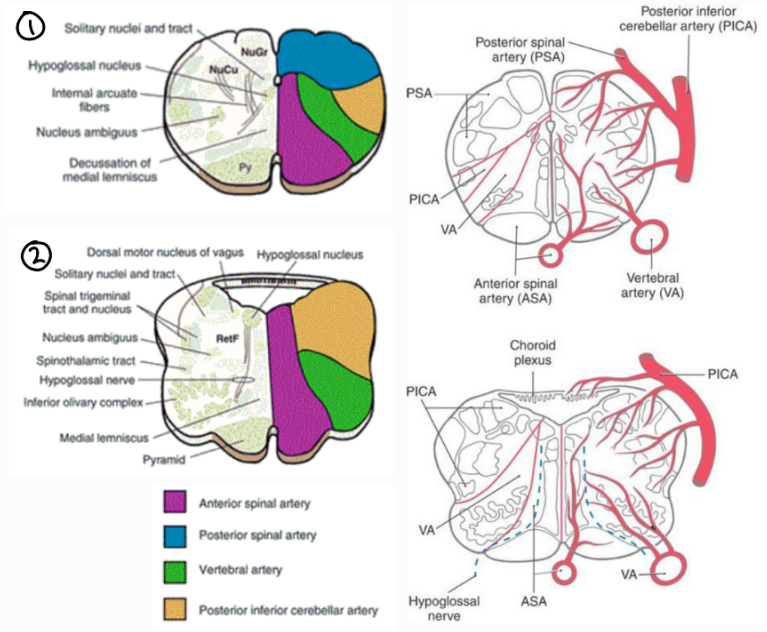
* circle of willis formed by 2 As in cranial cavity:
  1. ICA
  2. basilar A

* Supply of medulla & pons: ant. spinal, post. inf. cerebellar As
* Supply of midbrain: post. cerebral, sup. cerebellar, basilar As

* Supply of medulla:

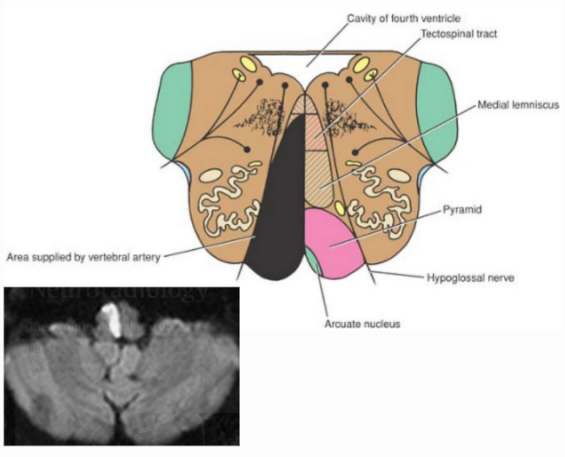
① level of closed medulla (lower)
- ant. spinal A (ASA) → midline
- vertebral A → lat. to ASA
- PICA & post. spinal A (PSA) → posterolat.

② level of open medulla (upper)
- PSA doesn't supply here
- Cavity is 4th ventricle



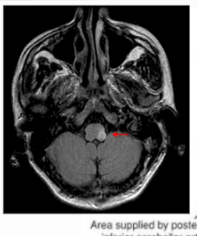
Medial medullary Syndrome (Dejerine Syndrome)

- Cause: lesion in ASA → loss of blood supply to midline
- Symptoms:
  1. contralat. hemiparesis (ant. aspect of midline is occupied by pyramids, corticospinal tracts & decussation hasn't happened yet)
  2. contra lat. loss of proprioception, fine touch, vibratory sense (damaged medial lemniscus, decussation happened)
  3. ipsilat. tongue protrusion (hypoglossal root/nucleus injury)
  4. alternating hemiplegia
     - ↳ contra lat. limb paralysis (UMN lesion, ✓ decussation)
     - ↳ ipsilat. facial paralysis (LMN lesion, X decussation)



Lateral medullary Syndrome: (Wallenberg Syndrome)

- Cause: lesion in PICA → loss of blood supply to posterolat. aspect
- Symptoms:
  1. contra lat. loss of pain & temp sense from body (anterolat. system (ALS), decussation happened)
  2. ipsilat. loss of pain & temp sense from face (spinal trigeminal tract & nucleus)
  3. vertigo & nystagmus (vestibular nuclei)
  4. ipsilat. loss of taste (solitary tract & nucleus, recieves taste sensations from CN 9, 10, 11)



⑤ hoarsness & dysphagia (nucleus ambigous, roots of CN 9, 10, nucleus ambigous is a motor nucleus for CN 9, 10, 11 & has LMNs supplying pharynx & larynx muscles ipsilaterally)
⑥ ipsilat. horner syndrome (hypothalamofossal fibers / lat. medullary reticulospinal tract injury (symp. injury) → ptosis, miosis, anhidrosis)

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vascular lesions of PSA

- Symptoms:
  ① ipsilat. loss of proprioception & vibratory sense (PCML system, nucleus gracilis & cuneatus)
  ② ipsilat. loss of pain & temp. sensation from face (trigeminal nucleus)

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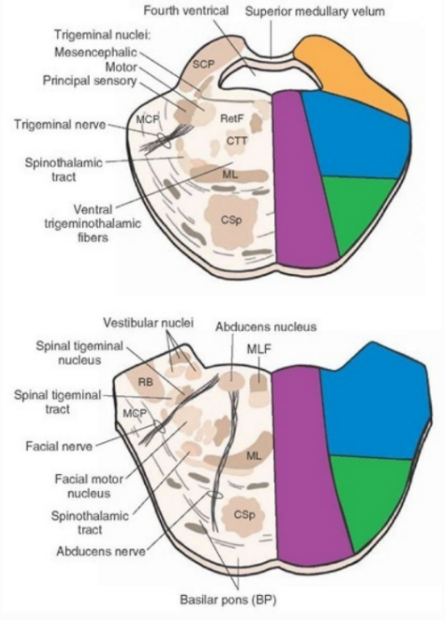
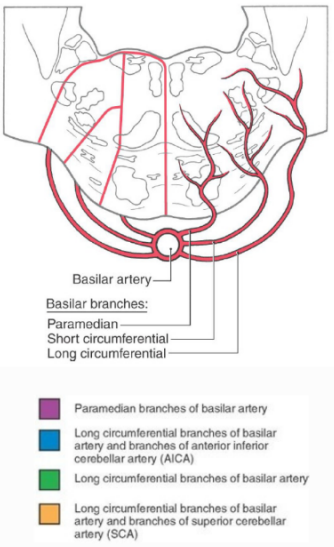
* pons supply:

① inf. level (caudal)
- paramedian branches of basilar A → midline structures
- Circumferential branches of basilar A & AICA → lat. structures

② Sup. level (mid pontine, level of trigeminal nucleus)
- Sup. Cerebellar A (SCA) → post. part





Fouille Syndrome

- Cause: occlusion of paramedial branches
- Symptoms:
  ① ipsilat. abducens N paralysis (cranial N)
  ② contralat. hemipariesis (corticospinal fibers, decussate in lower part of medulla) (long tracts)
  ③ variable contralat. sensory loss (various degrees of medial lemniscus damage)

Millard Gulber Syndrome

- Cause: damage including facial N root & corticospinal tract (lat.)
- Symptoms: Contralat. hemipariesis & ipsilat. paralysis of face

Syndrome of midpontine base

- Cause: occlusion of paramedial & short circumferential branches
- Symptoms:
  1. contralat. hemiparesis (corticospinal fibers)
  2. ipsilat. loss of pain & temp sense & paralysis of mastication muscles (sensory (lat.) & motor (med) trigeminal roots, nuclei)
  3. ataxia (middle cerebellar peduncle fibers)

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*hallmark of brain stem vascular lesions
1. ipsilat. cranial N sign
2. contralat. long tract sign

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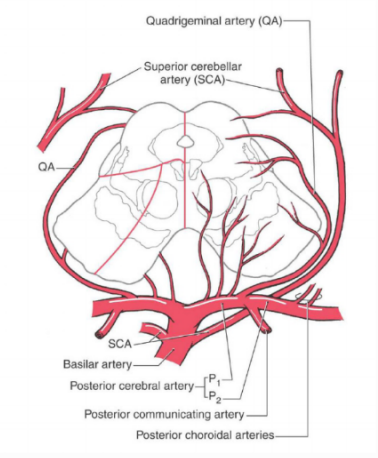
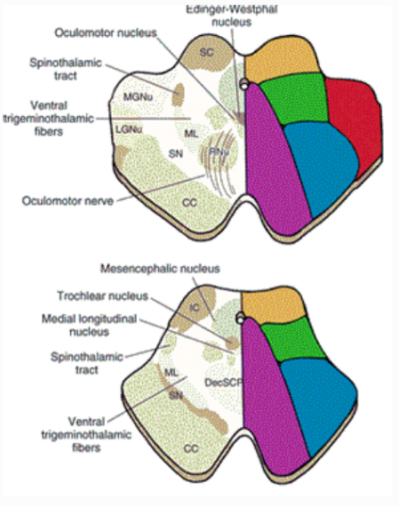
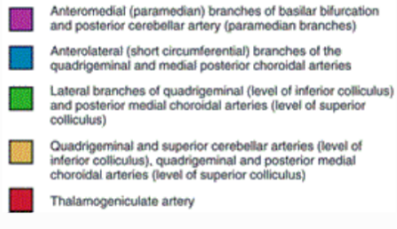
*midbrain supply



- basilar A direct branches
- quadrigeminal A (from basilar A at bifurcation & post. cerebellar A)
- sup. cerebellar A
- ant. choroidal A (from ICA)
- post. cerebral A (divided to P1 & P2) → med. post. choroidal A

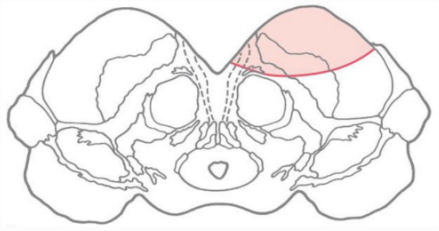


- paramedian branches → medial structures (occulomotor, trochlear, Edinger Westphal nuclei, motor fibers, red nucleus, medial part of substantia nigra & crus cerebri)
- post. cerebral & post. communicating As → give small branches to medial structures
- quadrigeminal, ant. choroidal, med. post. choroidal As → ventrolat. structures (lat. parts of crus & substantia nigra & medial lemniscus)
- quadrigeminal A → 1° supply of post. part (periqueductal gray, tectum, anterolat. system)
- medial branches of sup. cerebellar A → additional supply of post. part



- in level of sup. colliculus the most lat. parts are supplied by thalamogeniculate A (branch of post. cerebral A)

Weber Syndrome



- Cause: Occlusion of vessels of medial part of midbrain (oculomotor & crus cerebri)
- Symptoms:
  1. ipsilat. paralysis of extraocular muscles except lat. rectus & sup. oblique
  2. contralat. limb paralysis (decussation happens inferior)
  3. ipsilat. pupil dilatation (oculomotor N gives parasymp. fibers to constrictor papillae)
  4. contralat. weakness of facial muscles of lower half of face
     - ↳ crus cerebri has corticonuclear fibers (UMN) going to motor nucleus of facial N
     - ↳ cranial N recieve bilat. corticonuclear fibers, the part related to lower face only recieves from contralat. only, but if lesion was in lower level (LMN) it would be ipsilat.
  5. contralat. deviation of tongue when protruded (hypoglossal nucleus recieves bilat. fibers, but only contralat. in the part related to genioglossus muscle

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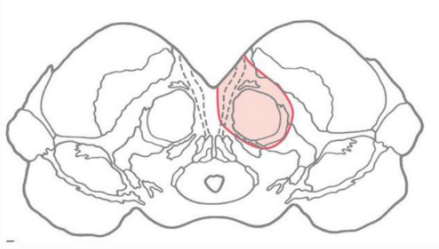
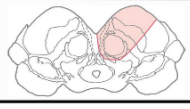
Claude Syndrome

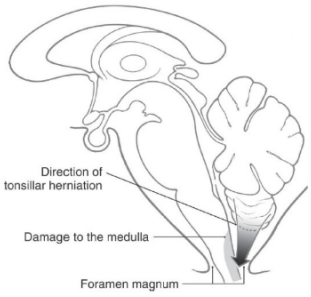


- Cause: Occlusion of vessels of medial part of midbrain (occulomotor & red nucleus)
- Symptoms:
  1. ipsilat. paralysis of eye muscles except lat. rectus & sup. oblique → eye directed down & lat.
  2. ipsilat. dilatation of pupil
  3. contralat. ataxia, tremor, incoordination (red nucleus recieves input from cerebellum (cerebellorubral tract) / levels slightly below red nucleus have sup. cerebellar peduncle decussation)

Benedikt Syndrome = weber + claude syndromes

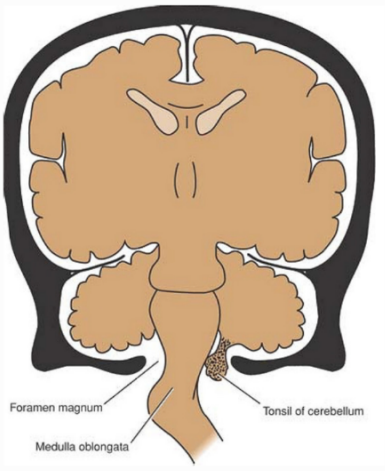


Tonsillar herniation



- cerebellar tonsils move down to foramen magnum → pressure on medulla (↑ intracranial pressure & occlusion to medullary As) → damage to ventrolat. reticular area (vital centers + motor & sensory def.)
- Causes: tumor or hemorrhage in post. cranial fossa
- Symptoms: HTN, ↑ ventilation, ↓ conciousness, change in HR & RR

Arnold Chiari Phenomenon



Cause: Congenital herniation of cerebellar tonsils & medulla through foramen magnum to vertebral canal

Symptoms:
less severe & may be asymptomatic, similar symptoms of tonsillar herniation but appear in older people

*treatment of arnold chiari is surgical & has good prognosis/ for tonsillar herniation it's directed to tumor or hemorrhage

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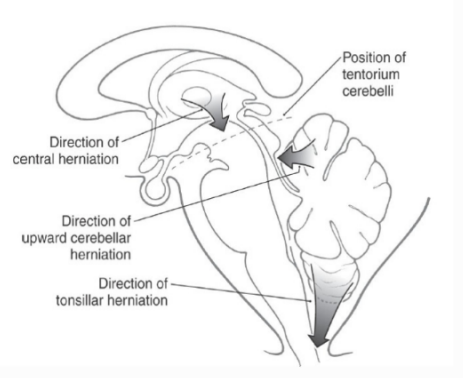
Central herniation

Cause: space occupying lesion in hemisphere (supratentorial compartment above tentorium cerebri) → ↑ intracranial pressure + forces diencephalon down through tentorial notch & into brainstem affecting midbrain mainly)



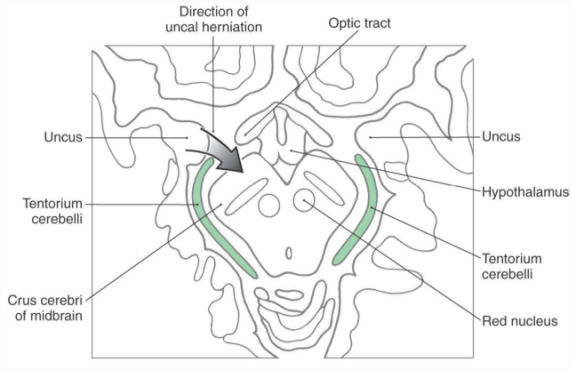
Symptoms:
① change in respiration, eye movement
② tachypnea & apnea
③ profound loss of motor & sensory fxn
④ propable loss of conciousness
⑤ decorticate posture (pressure affects fibers going to brainstem (UMN))
⑥ as herniation develops decerebrate may occure (dangerous sign as lesion is now close to vital centers)

Upward Cerebellar herniation

Cause: mass in post. Cranial fossa → force portions of cerebellum upward through tentorial notch & compress midbrain → occlusion of sup. cerebellar A branches + infarction of cerebellar structures or obstruction of cerebral aqueduct, hydrocephalus & ↑ intracranial pressure

Symptoms: vomiting, headache, lethargy, ↓ conciousness

Uncal herniation :



Cause: movement of uncus (anteromedial part of temporal lobe) down over edge of tentorium cerebelli → pressure on midbrain

Symptoms :

① early signs: ipsilat. pupil dilation & ipsilat. abnormal eye movement, ipsilat. double vision, contralat. limb weakness (corticospinal fibers & oculomotor N)

② later: respiration affected

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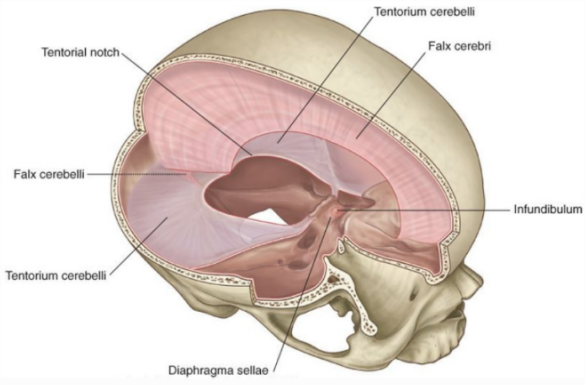
* falx cerebri → crescent shaped
  - ant: crista gali
  - post: tentorium cerebelli
* tentorium cerebelli → horizontal
  - anterolat: sup. part of petrous
  - anteromed.: free tentorial notch
  - post: occipital bone



by INSAF IYAD