Neurovascular Anatomy (2):
Posterior Circulation Anatomy
Contents:
Neurovascular Anatomy

➢ Arterial supply of the brain
  ▪ Anterior circulation
  ▪ Posterior circulation
➢ Arterial supply of the spinal cord
➢ Venous system of the brain
Neurovascular Anatomy (2):

Anatomy of the Posterior Circulation

➢ Vertebral artery

➢ Basilar artery

➢ Blood supply of diencephalon, brainstem and cerebellum
Vertebral Artery

- Arise from the 1st part of subclavian artery
- Course posteromedially to reach the transverse foramen of C6 vertebra
- Run along the foramina then lie on the posterior arch of atlas (C1)
- Through the dura, join with each other at pontomedullary junction

Flemming KD, Jones LK. Mayo Clinic neurology board review: Basic science and psychiatry for initial certification. 2015
Vertebral Artery

- Divided into 4 parts

  - V1: Ostium to transverse foramen of C6
  - V2: Travels cephalad from C6 to C1
  - V3: Lies on the posterior arch of C1 (atlas)
  - V4: Pierces dura, merges together at pontomedullary junction
Fig. 4.5 Frontal 2D view following right vertebral artery injection. There is a normal appearance of the cervical vertebral artery extending approximately to the vertebral-basilar junction.

FIGURE KEY
1 vertebral artery
2 muscular branches
3 radiculomedullary feeder to anterior spinal artery
4 PICA
C1 first cervical vertebrae
C2 second cervical vertebrae
MRI Correlation

Right Common Carotid Artery

Left Common Carotid Artery

Brachiocephalic Trunk

Left Subclavian Artery

Left Brachiocephalic Vein
MRI Correlation

Right Vertebral Artery

Left Vertebral Artery

Vertebral Artery

Epicranial aponeurosis

Occipital belly (occipitalis) of occipitofrontalis muscle

Greater occipital nerve (medial branch of dorsal ramus of C2 spinal nerve)

Occipital artery

Third occipital nerve (medial branch of dorsal ramus of C3 spinal nerve)

Semispinalis capitis and Splenius capitis muscles in posterior triangle of neck

Posterior auricular artery

Great auricular nerve (cervical plexus C2, 3)

Lesser occipital nerve (cervical plexus C2, 3)

Sternocleidomastoid muscle

Rectus capitis posterior minor muscle

Rectus capitis posterior major muscle

Semispinalis capitis muscle (cut and reflected)

Vertebral artery (horizontal segment)

Obliquus capitis superior muscle

Suboccipital nerve (dorsal ramus of C1 spinal nerve)

Descending branch of occipital artery

Obliquus capitis inferior muscle

Greater occipital nerve (dorsal ramus of C2 spinal nerve)

Splenius capitis muscle (cut and reflected)

Third occipital nerve (dorsal ramus of C3 spinal nerve)

Longissimus capitis muscle

Splenius cervicis muscle

Semispinalis cervicis muscle

Branches of vertebral artery

- Muscular arteries
- Segmental medullary arteries
  - Forming anterior & posterior spinal arteries
- Meningeal arteries
- Perforating branches to medulla
- Anterior spinal artery
- Posterior inferior cerebellar artery (PICA)
Variation of VA

- Asymmetry due to
  - Vertebral arterial hypoplasia
  - Absence of vertebral artery
  - Termination into the PICA
  - Dominance: Left 45%, right 30%, co-dominant 25%

- Variations
  - Complete/partial VA duplication
  - VA fenestration
  - Variable origin
    - Aortic arch origin of left VA (5%)
    - 2nd part of subclavian artery
    - External carotid artery
  - Variable orientation of ostium

https://radiopaedia.org
Abnormal course of left VA

- Partial duplication of VA
- ECA origin of left VA
- Aortic arch origin of left VA
Vertebral Artery Dissection

Normal Condition:
- Vertebral artery
- Atlas
- Axis

Condition with Rotation:
- Stretching and compression injury of the vertebral artery between the atlas and axis vertebrae
- Transverse processes

Anterior (front) view
Rotational Vertebral Artery Occlusion (Bow Hunter’s Syndrome)
Effects of Neck Position on Vertebral Artery

Neck extension compresses VA between skull and C1

Neck rotation compresses VA at C1-C2

Small communicating arteries

Brain stem ischemia

Small VA on one side

Hot arms divert VA blood to subclavian arteries
Subclavian Steal Syndrome

- Presence of occlusion of proximal subclavian artery
- Blood flowing down the ipsilateral VA to supply the arm
- Usually asymptomatic, or syncope/vertigo
- Atherosclerosis
- Caucasian, women > men
Posterior Inferior Cerebellar Artery

- 5 segments:
  - Anterior medullary
  - Lateral medullary (forming caudal loop)
  - Tonsillomedullary
  - Telovelotonsillar (choroid point)
  - Cortical branches

Branches

- Small perforating medullary branches
- Tonsillohemispheric branch
- Inferior vermian branch

**Occasionally, branch off the AICA in the common stem**
Figure 2.55. Lateral view of the vertebral artery. Hypoplasia of the vertebral artery (large, wide short arrow) distally to the origin of the posterior inferior cerebellar artery (PICA). Vermian branches (small arrowhead) and hemispheric branches (large arrowhead) of the PICA. Blush of the choroidal plexus of the fourth ventricle (long arrow). Artery of the cerebellar falx (open, wide arrows) with a typical pattern projecting more anteriorly than the hemispheric branches of the PICA.
Posterior Inferior Cerebellar Artery

Supply
- Posteroinferior cerebellar hemisphere (*up to great horizontal fissure*)
- Inferior portion of vermis
- Lower part of medulla (50%)
- Inferior cerebellar peduncle
Development of Nervous System

**Medial brainstem syndrome**
- Affect motor

**Lateral brainstem syndrome**
- Affect sensation

http://www.ultratwistersgym.com/Resources/Nervous/Nervous.html
### Brainstem Syndromes

<table>
<thead>
<tr>
<th>Cranial nerve involvement</th>
<th>Long tract signs</th>
<th>Other brainstem features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medial</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midbrain: CN 3,4</td>
<td>Corticospinal tract</td>
<td>MLF</td>
</tr>
<tr>
<td>Pons: CN 6</td>
<td>Corticobulbar tract</td>
<td>Medial lemniscus (for lower brainstem)</td>
</tr>
<tr>
<td>Medulla: CN 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lateral</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midbrain: none</td>
<td>Lateral spinothal tract</td>
<td>Cerebellar tract</td>
</tr>
<tr>
<td>Pons: CN 5,7,8</td>
<td>Spinal tract of N.V</td>
<td>Medial lemniscus (for upper brainstem)</td>
</tr>
<tr>
<td>Medulla: CN 9,10,11</td>
<td>Descending autonomic tr.</td>
<td>Hearing pathway</td>
</tr>
</tbody>
</table>

**Medial:** ‘4Ms’
- **Motor nuclei:** 3,4,6,12
- **Motor pathway**
- **Medial lemniscus**
- **MLF** INO

**Lateral:** ‘4Ss’ plus
- **Spinothalamic tract** contralat
- **Sensory tract of N.V** Ipsilat
- **Sympathetic tract** Horner
- **Spino cerebellar tract**
- **Plus** CN5,7,8,9,10,11, vestibular
Medulla

1: Pyramidal tract
2: Inferior olivary nuc. Complex
3: Medial lemniscus
4: MLF
5: Inferior cerebellar peduncle (restiform body)
6: Hypoglossal nucleus (XII)
7: Inferior salivatory nuc. (IX)
8: Nucleus & tractus solitaries
9: Vestibular nuclei
10: Ambiguus nucleus
11: Nuc. of spinal tract of N.V
12: Spinothalamic tract
13: Descending sympathetic tract

Pre-olivary:
CN.XII

Post-olivary:
CN.IX, X, XI
## PICA Syndrome (Wallenburg)

### Clinical features: ‘4S plus’

<table>
<thead>
<tr>
<th>Tract</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinal tract of N.V Spinothalamic tract</td>
<td>• Loss of pain/temperature sensation of ipsilateral face &amp; contralateral body (alternating hemianesthesia)</td>
</tr>
<tr>
<td>Spinocerebellar</td>
<td>• Ipsilateral cerebellar sign</td>
</tr>
<tr>
<td>Sympathetic tract</td>
<td>• Ipsilateral Horner syndrome</td>
</tr>
<tr>
<td>Plus</td>
<td></td>
</tr>
<tr>
<td>• CN.IX, X</td>
<td>• Dysphonia, dysarthria, dysphagia, absence of gag reflex</td>
</tr>
<tr>
<td>• CN.XI</td>
<td>• Ipsilateral shoulder drooping, difficulty turning head contralaterally</td>
</tr>
<tr>
<td>• Vestibular nucleus</td>
<td>• Vertigo, N/V, head impulse test</td>
</tr>
<tr>
<td>• Area postrema</td>
<td>• Persistent vomiting/hiccup (rare)</td>
</tr>
</tbody>
</table>

[Image of MRI scan showing brain structures]
Variations of PICA

A  Normal
B  AICA & PICA in common stem
C  Anastomosis between AICA & PICA
D  VA terminates into PICA
E  Distal PICA give rise the tonsillar loop to supply contralateral tonsil
F  Interhemispheric anastomosis
Anterior Spinal Artery (Dejerine syndrome)

Clinical features: ‘3M’

<table>
<thead>
<tr>
<th>Motor pathway</th>
<th>Motor nuclei of CN.XII</th>
<th>Medial lemniscus</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Contralateral hemiparesis</td>
<td>• Ipsilateral tongue deviation/fasciculation</td>
<td>• Contralateral loss of fine touch/proprioception</td>
<td>• Upbeat nystagmus</td>
</tr>
</tbody>
</table>

Motor pathway:
- Contralateral hemiparesis
- Hemiplegia cruciata
- Flaccid quadriplegia

Motor nuclei of CN.XII:
- Ipsilateral tongue deviation/fasciculation

Medial lemniscus:
- Contralateral loss of fine touch/proprioception

Others:
- Upbeat nystagmus

Source: Stephen G. Waxman
Clinical Neuroanatomy, Twenty-Eighth Edition
www.accessmedicine.com
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Figure 1: T2 weighted axial image through the medulla showing heart-shaped hyperintense area.
Contralateral hemiplegia

Ipsilateral hemiplegia

Hemiplegia cruciata

Paraplegia

Quadriplegia

Arm Leg

Medulla

Upper extremities

Lower extremities

Cranial nerves

Cerebellum

Pyramidal decussation

Medullocervical junction

Lat. corticospinal tract

C1

C2
Hemimedullary infarction
(Babinski-Nageotte syndrome, medullary tegmental paralysis)

- Combined medial & lateral medullary infarction
- Reported in the case of vertebral artery dissection/stenosis
Dorsal Medullary Syndrome

- Occlusion of medial branch of PICA
- Involvement of vestibular nuclei & restiform body (ICP)
- N/V, vertigo, ataxia to the affected side
- Ipsilateral gaze-evoked nystagmus

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Horizontal saccade</th>
<th>Vertical saccade</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omnipause neurons</td>
<td>Nucleus raphe interpositus</td>
<td>Nucleus raphe interpositus</td>
<td>Pons</td>
</tr>
<tr>
<td>Burst neurons</td>
<td>PPRF</td>
<td>riMLF</td>
<td>Pons (horizontal saccade)</td>
</tr>
<tr>
<td>Neural integrators</td>
<td>Nucleus propositus hypoglossi</td>
<td>Interstitial nucleus of</td>
<td>Midbrain (vertical saccade)</td>
</tr>
<tr>
<td></td>
<td>Medial vestibular nucleus</td>
<td>Cogal</td>
<td>Medulla/pons (horizontal saccade)</td>
</tr>
<tr>
<td>Cranial nerves</td>
<td>III and VI</td>
<td>III and IV</td>
<td>Midbrain and pons</td>
</tr>
</tbody>
</table>

riMLF - Rostral interstitial medial longitudinal fasciculus, PPRF - Para pontine reticular formation

https://en.wikipedia.org
Neurol India. 2016; 64(1): 121-8
J Clin Mov Disord. 2015; 2: 14
Submedullary Syndrome (Opalski syndrome)

- Involvement of lateral medulla below the level of motor decussation
- Ipsilateral weakness with contralateral hemianesthesia (like upper C lesion)
- No facial weakness!!
- Presence of palatal/tongue palsy, Horner syndrome, gaze-evoked nystagmus

https://en.wikipedia.org
Neurol India. 2016; 64(Suppl S1): 113-4
J Clin Diag Research. 2014; 8(7): MD05-MD06
Neurovascular Anatomy (2):
Anatomy of the Posterior Circulation

- Vertebral artery
- Basilar artery
- Blood supply of diencephalon, brainstem and cerebellum
Basilar Artery

- Run along the basilar groove on the ventral surface of pons
- Terminated at the pontomesencephalic junction

Branches of basilar artery
- Paramedian: Pontine artery
- Short circumferential branches
- Long circumferential branches:
  - Anterior inferior cerebellar (AICA)
  - Labyrinthine artery
  - Superior cerebellar artery (SCA)
- Terminal branches
  - Posterior cerebral artery (PCA)
1: Vertebral artery
17: Anterior spinal a.
2: PICA
3: Basilar artery
4: AICA
5: SCA
6: PCA
7: 6.2
8: Posterior temporal branch of PCA
9: 2v
10: 5h
11: 11
12: **
13: 3
14: 14
15: 3
16: 5
17: 17

Variation of BA

- BA fenestration & other variable fusion
- Persistent carotid-basilar artery anastomoses

http://radiopaedia.org
1: Pyramidal tract
2: Pontocerebellar fibers
3: Medial lemniscus
4: MLF
5: Inferior cerebellar peduncle
5a: Middle cerebellar peduncle (brachium pontis)
6: Abducens nucleus (VI)
6a: Paramedian pontine reticular formation (PPRF)
7: Facial motor nucleus (VII)
8: Superior salivatory nuc (VII)
9: Nucleus & tractus solitarius
10: Vestibular nuclei
11: Nuc. of spinal tract of N.V
12: Spinothalamic tract
13: Descending sympathetic tract
Dorsal Pontine Syndrome

• Occlusion of perforating branches of pontine arteries

1. Internuclear ophthalmoplegia (INO)
   • Involvement of MLF
   • Unable to adduct the ipsilateral eye in conjugate eye movement to contralateral side

2. One-and-a-half syndrome
   • Involvement of MLF & PPRF
   • If involves CN.VII – called ‘eight-and-a-half syndrome’
Dorsal Pontine Syndrome

- Occlusion of perforating branches of pontine arteries

1. Internuclear ophthalmoplegia (INO)
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2. One-and-a-half syndrome
   - Involvement of MLF & PPRF
   - If involves CN.VII – called ‘eight-and-a-half syndrome’

3. Foville syndrome
   - Involvement of PPRF, CN.VII, pyramidal tract
   - Contralateral hemiparesis
   - Ipsilateral LMN facial palsy
   - Unable to gaze ipsilaterally
Ventral Pontine Syndrome

4. Raymond syndrome
- Involvement of pyramidal tract & CN.VI
- Contralateral hemiparesis
- Ipsilateral weakness of LR (alternating abducens hemiplegia)

5. Millard-Guber syndrome
- Involvement of pyramidal tract, CN.VI, VII
- Same as Raymond syndrome + ipsilateral LMN facial weakness

6. Locked-in syndrome (bilat ventral pontine)
- Involvement of bilateral corticospinal & corticobulbar tracts, CN.VI
- Spares the reticular formation
- Quadriplegia, aphonya, impairment of horizontal eye movement
- But spares vertical eye movement & blinking
Lateral Pontine Syndrome

- Occlusion of perforating branches of long circumferential branches

7. Marie-Foix syndrome
- Involvement of pyramidal tract, spinothalamic tract & cerebellar connections
- Contralateral hemiparesis
- Contralateral hypoesthesia
- Ipsilateral cerebellar ataxia
### Syndromes

<table>
<thead>
<tr>
<th>Syndrome</th>
<th>MLF</th>
<th>PPRF</th>
<th>Abducens nerve</th>
<th>Facial nerve</th>
<th>Corticospinal tract</th>
<th>MCP</th>
<th>Spinothalamic tract</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. INO</td>
<td>✓</td>
<td></td>
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<tr>
<td>2. One-and-a half</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. Eight-and-a half</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
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<td></td>
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<tr>
<td>3. Foville</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>4. Raymond</td>
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<td>✓</td>
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<tr>
<td>5. Millard-Guber</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>7. Marie-Foix</td>
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<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Anterior Inferior Cerebellar Artery

**Branches**
- Internal acoustic (labyrinthine) a.
- Medial branch
- Lateral branch

**Supply**
- Inferolateral portion of pons
- Middle cerebellar peduncle
- Flocculus
- Anteroinferior surface of the cerebellum
**AICA Syndrome**

<table>
<thead>
<tr>
<th>Clinical features: ‘4S plus’</th>
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<tr>
<td><strong>Spinal tract of N.V</strong></td>
</tr>
<tr>
<td>Spinothalamic tract</td>
</tr>
<tr>
<td>• Loss of pain/temperature</td>
</tr>
<tr>
<td>sensation of ipsilateral</td>
</tr>
<tr>
<td>face &amp; contralateral</td>
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<tr>
<td>body (alternating</td>
</tr>
<tr>
<td>hemianesthesia)</td>
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<tr>
<td><strong>Spinocerebellar (MCP)</strong></td>
</tr>
<tr>
<td>• Ipsilateral cerebellar</td>
</tr>
<tr>
<td>sign</td>
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<tr>
<td><strong>Sympathetic tract</strong></td>
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<tr>
<td>• Ipsilateral Horner</td>
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<tr>
<td>syndrome</td>
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<tr>
<td><strong>Plus</strong></td>
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<tr>
<td>• CN.VII</td>
</tr>
<tr>
<td>• CN.VIII</td>
</tr>
<tr>
<td>• Vestibular nucleus</td>
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<tr>
<td>• Ipsilateral LMN facial</td>
</tr>
<tr>
<td>palsy, loss of corneal</td>
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<tr>
<td>reflex</td>
</tr>
<tr>
<td>• Ipsilateral complete</td>
</tr>
<tr>
<td>sensorineural hearing</td>
</tr>
<tr>
<td>loss</td>
</tr>
<tr>
<td>• Vertigo, N/V, nystagmus,</td>
</tr>
<tr>
<td>head impulse test</td>
</tr>
</tbody>
</table>

[http://radiopaedia.org](http://radiopaedia.org)
Labyrinthine Artery

- Usually originates from the AICA (85%), BA (15%) or VA (5%)
- Main arterial supply to vestibular apparatus & cochlea
- 2 branches
  - Anterior vestibular artery
  - Cochlear artery

Internal acoustic meatus anatomy

7up, coke down
is a mnemonic to remember the relative position of nerves inside the internal auditory canal (IAC).
- BB: Bill's bar
- FC: Fallopian crest
- SVN: Superior vestibular nerve
- IVN: Inferior vestibular nerve
- 7: Facial (VII) nerve
- C: Cochlear nerve

http://radiopaedia.org
Superior Cerebellar Artery

Supply
- Parts of midbrain
- Superior & middle cerebellar peduncles
- Whole superior surface of cerebellar hemispheres down to the great horizontal fissure
- Superior vermis

Branches
- Perforating branches
  - To pons, midbrain, inf colliculus
- Lateral branch (largest one)
  - Hemispheric branches
- Superior vermian artery

Variations
- Frequently duplication 28%
- Triplication 2% (rarely absent)
- Common stem with PCA

https://www.pinterest.com
http://www.neurosurgery-blog.com/archives/tag/trigeminal-neuralgia
## SCA Syndrome

**Clinical features: ‘4S plus’ ...??**

<table>
<thead>
<tr>
<th><strong>Spinal tract of N.V</strong>&lt;br&gt;Spinothalamic tract</th>
<th>• Loss of pain/temperature sensation of ipsilateral face &amp; contralateral body (alternating hemianesthesia)</th>
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<tr>
<td><strong>Sympathetic tract</strong></td>
<td>• Ipsilateral Horner syndrome</td>
</tr>
<tr>
<td><strong>Plus</strong></td>
<td></td>
</tr>
<tr>
<td>• Lateral lemniscus</td>
<td>• Contralateral sensorineural hearing loss</td>
</tr>
<tr>
<td>• Unknown</td>
<td>• Ipsilateral choreiform movement</td>
</tr>
<tr>
<td>• Unknown</td>
<td>• Ocular contrapulsion</td>
</tr>
</tbody>
</table>

![CT scans of brain](https://radiologyassistant.nl)

http://www.neuroradiologycases.com/
1: Pyramidal tract (cerebral peduncle)
2: Substantia nigra
3: Upper level = Red nucleus
   Lower level = Decussation of superior cerebellar peduncle (brachium conjunctivum)
4: Dentatorubrothalamic tract
5: Medial lemniscus
6: Superior colliculus
7: Cerebral aqueduct
7a: Periaqueductal gray
8: Edinger-Westphal nucleus
9: Oculomotor nuclear complex
10: MLF
11: Fascicles of CN.III
12: Spinothalamic tract
13: Descending sympathetic tract

CN.III: Exit at interpeduncular fossa
Vascular supply of midbrain

- Paramedian vessels from PCA
- Circumferential arteries:
  - Quadrigeminal artery (from PCA)
  - Superior cerebellar artery
  - Posterior choroidal artery
  - Anterior choroidal artery (in some)
Nothnagel’s syndrome
- Ipsilateral oculomotor palsy with dilated pupils
- Prominent cerebellar signs (asynergia, ataxia, dysmetria, dysdiadochokinesia)

Benedikt’s syndrome
- Ipsilateral oculomotor palsy with dilated pupils
- Contralateral tremor, hemichorea, hemiathetosis (red nucleus)

Parinaud’s syndrome
- Upward gaze palsy
- Large pupils with light-near dissociation
- Convergence-retraction nystagmus

Weber’s syndrome
- Ipsilateral oculomotor palsy with dilated pupils
- Contralateral hemiplegia

**Claude’s : cerebellar element in Nothnagel’s and Benedikt’s syndromes**
Top of the Basilar Artery

- Usually embolic
- Infarction of the midbrain, thalamus & portions of the temporal/occipital lobes

| Eye movements | • Unilateral/bilateral paralysis of upward/downward gaze
|               | • Abnormal convergence, convergence-retraction nystagmus. Collier’s sign, skew deviation |
| Pupillary abn. | • Small & reactive, large or midposition & fixed |
| Behavioral     | • Somnolence, sleep-wake cycle disturbance
|               | • Peduncular hallucinosis, memory difficulties, agitated delirium |
| Visual defects | • Hemianopia, cortical blindness, Balint’s syndrome |
Neurovascular Anatomy (2): Anatomy of the Posterior Circulation

- Vertebral artery
- Basilar artery
- Blood supply of diencephalon, brainstem and cerebellum
**Blood Supply of the Thalamus**

Blood supply of thalamus

- Polar artery (from PComm)
- Paramedian artery (from P1)
- Thalamogeniculate artery
- Posteromedial choroidal artery
- Posterolateraal choroidal artery

**Structures:**
- Internal medullary lamina
- Posterior thalamoperforator
- Anterior thalamoperforator
- DM (dorsomedial nucleus)
- LG (lateral geniculate body)
- MG (medial geniculate body)

**Arteries:**
- Polar artery
- Paramedian artery
- Thalamogeniculate artery
- Posteromedial choroidal artery
- Posterolateraal choroidal artery

**Diagrams:**

A: Internal carotid a.
B: Posterior communicating a.
C: Posterior cerebral a.

Angiographic Correlation

3: Basilar artery
5: SCA
6: PCA
7: Posterior communicating a.
11: Anterior thalamoperforator
12: Posterior thalamoperforator
13: Posterior choroidal artery

Borden NM, Costantini JK.
Thalamic Vascular Syndromes

4 major vascular territories

- Tuberothalamic (polar artery)
- Paramedian
- Inferolateral
- Posterior choroidal

Thalamic Vascular Syndromes

1. Paramedian territory

- Clinical triads:
  - Somnolent apathy
  - Recent memory loss
  - Abnormality of vertical gaze (involvement of riMLF at the midbrain)

- Other clinical features
  - Transient LOC or akinetic mutism
  - Behavioral change (confusion, agitation, aggression, apathy, disorientation, mania, frontal like syndrome)
  - Occasional blepharospasm
  - Contralateral hemiataxia, asterixis or weakness
  - Delayed action tremor in contralateral limbs
  - Usually seen in the top of basilar artery occlusion

riMLF = rostral interstitial nucleus of MLF
2. Thalamogeniculate territory

- Territory: VP, VL nucleus, subthalamic nucleus
- Dejerine-Roussy syndrome:
  - Hemianesthesia (occasionally, proprioception is spared)
  - Transient slight hemiparesis
  - Hemiataxia/hemiataxia-hypesthesia syndrome
  - Lack of nonvolitional utilization of contralateral body (damaged ‘automatic’ pilot)
  - Dysequilibrium (‘thalamic astasia’)
  - Choreoathetoid movements
  - Athetoid posture (‘thalamic hand’)
  - Paroxysmal pain (‘thalamic pain’)
  - Homonymous hemianopia (often due to simultaneous medial occipital infarction)

3. Tuberothalamic territory (anterolateral)

- **Territory:** thalamopolar artery
- **Clinical features:**
  - Apathy, verbal preservation
  - Anterograde memory loss
  - Facial paresis for emotional movement
  - Occasionally, hemiparesis & VF defects (sensation spared)
  - Superimposition of temporally unrelated information
  - Dysphasia with left-sided lesions
  - Hemineglect & impaired visuospatial processing with right-sided lesion
4. Posterior choroidal artery territory

- **Territory:** LGB, pulvinar, posterior thalamus, small portion of hippocampus
- **Clinical features:**
  - Homonymous quadrantanopia, superior or inferior or horizontal sectoranopia, tubular or shaped-like a wedge
  - Decreased optokinetic nystagmus when moving the drum to the side of lesion
  - Hemisensory loss with mild hemiparesis
  - Mild hemiparesis, accompanied by sensory loss
  - Transcortical aphasia

Artery of Percheron
PICA = “Wallenburg’s syndrome”
Arterial Territories

- ACA
- MCA
- AICA
- PICA
- PCA
- SCA
- LSA
- ACHA

Branches from Vertebral arteries
Branches from Basilar artery
Blood Supply of Cerebellum

- Basilar artery
- Anterior spinal artery and paramedian branches of the vertebral artery
- Superior cerebellar artery
- Anterior inferior cerebellar artery
- Posterior inferior cerebellar artery

Vascular areas:
- Key: PICA territory, AICA territory, SCA territory

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