Neurocranium

Craniocerebral topography

compiled by:

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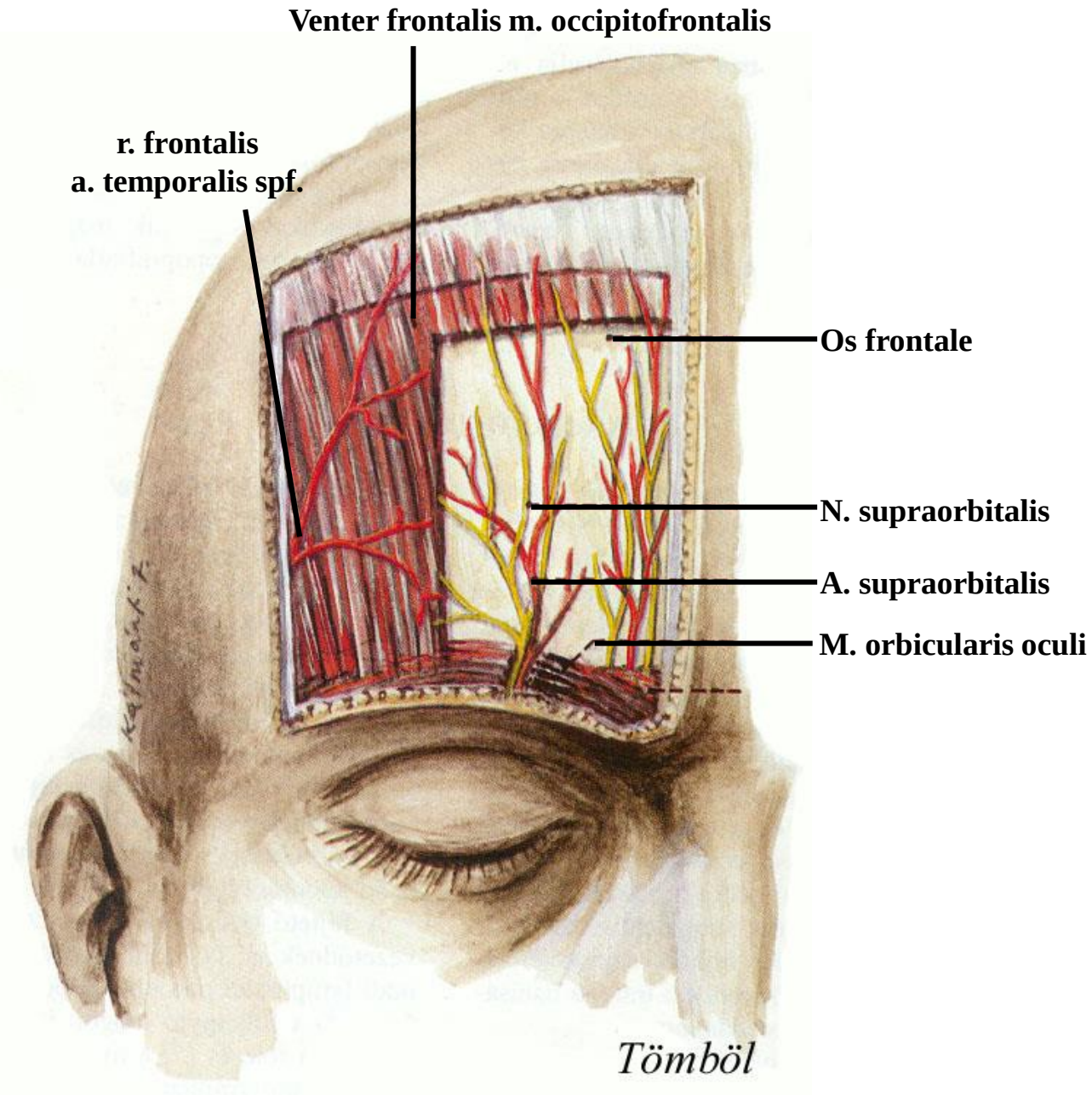
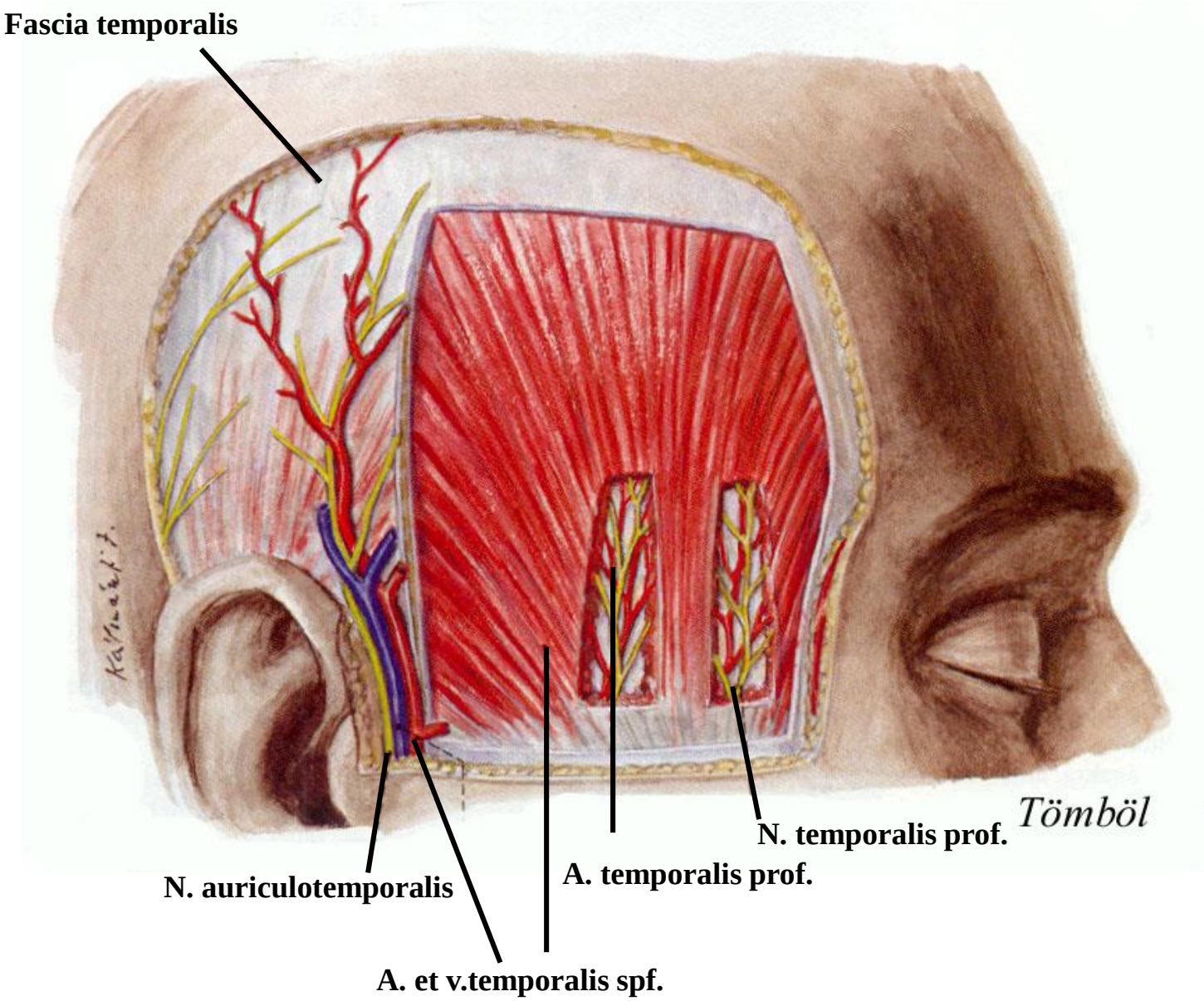
with the collaboration of

Alán Alpár and Gábor Baksa

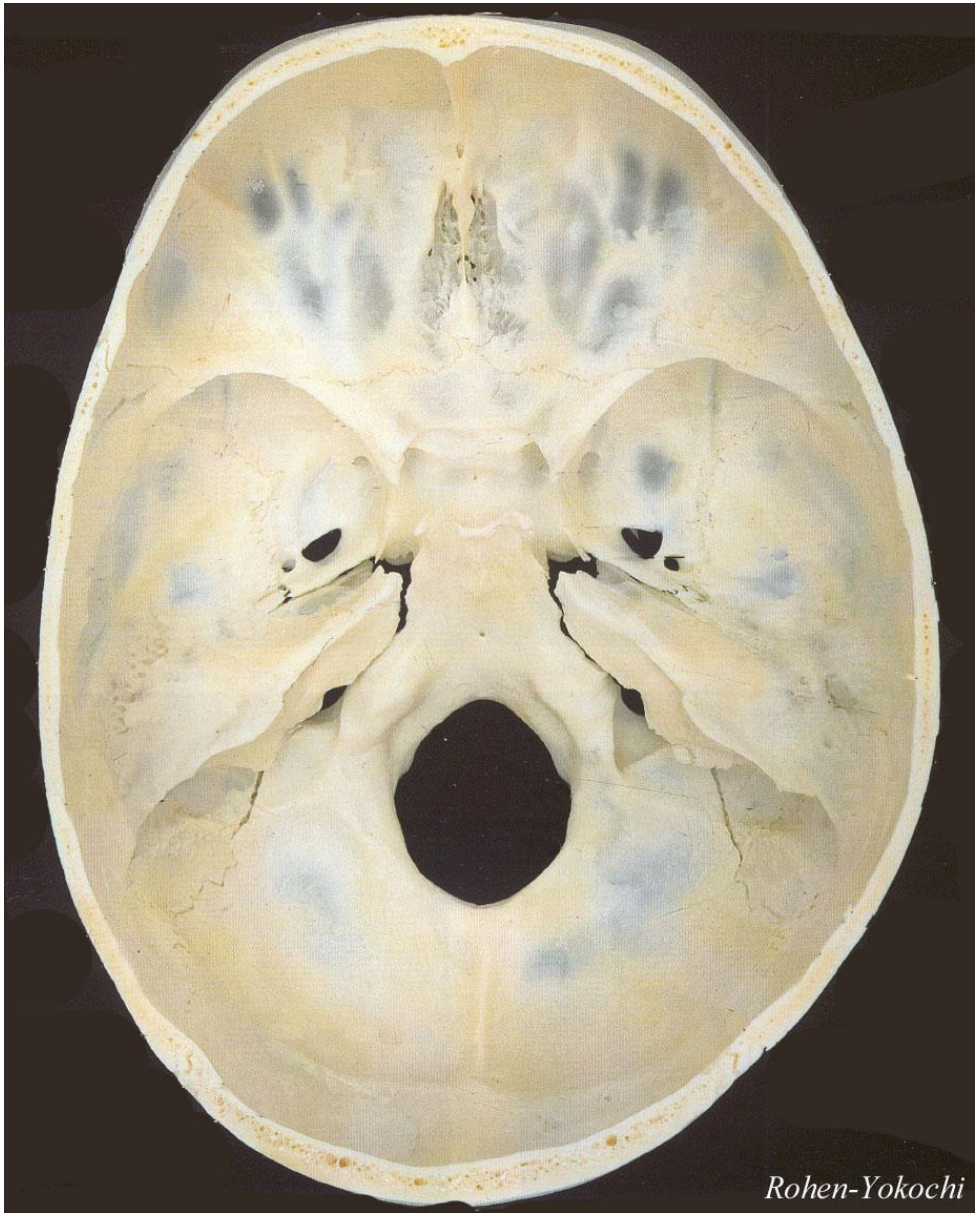
Frontal region

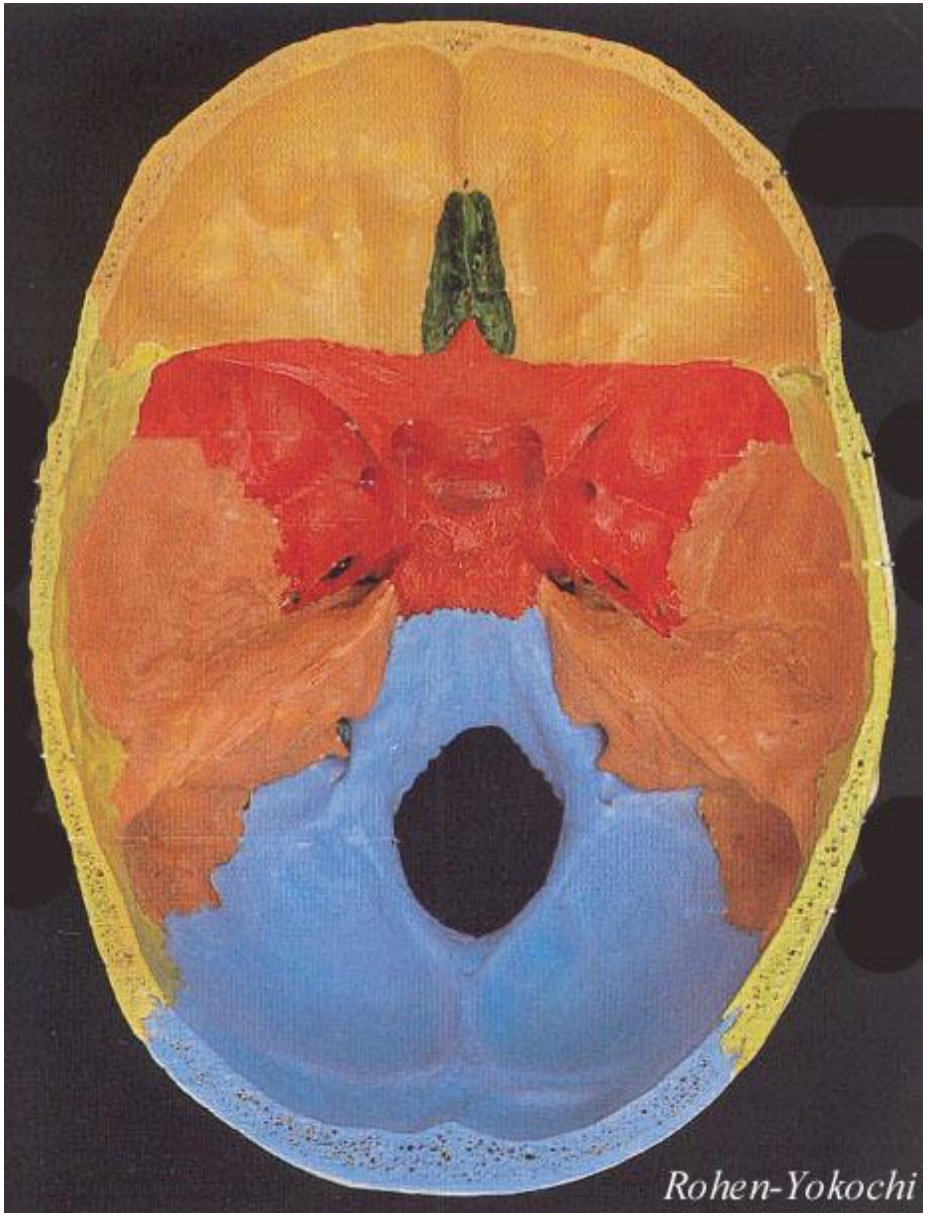


Temporal region

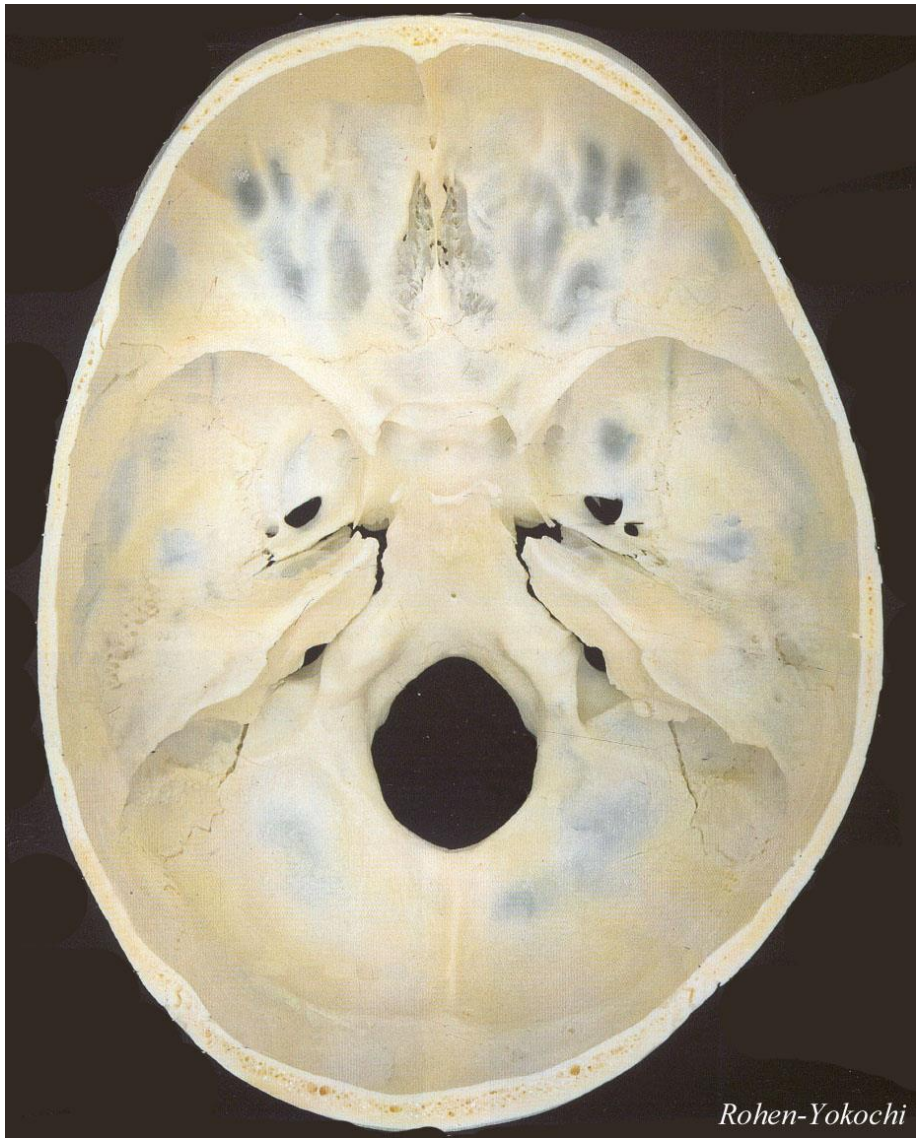


Internal cranial base

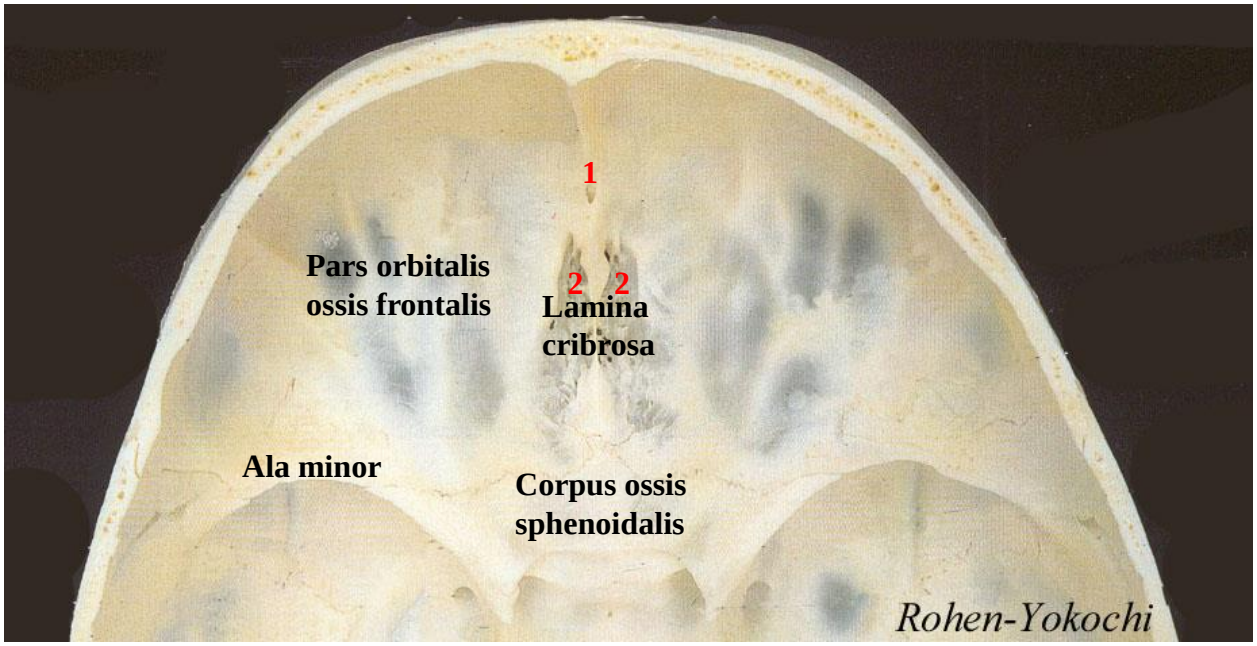


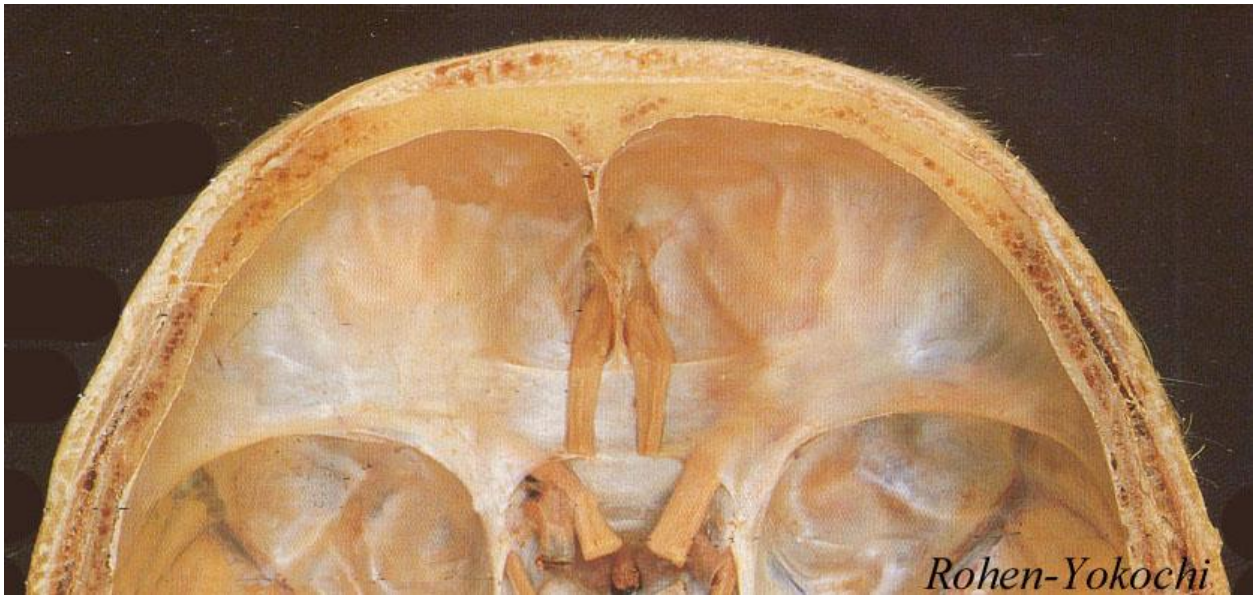


Internal cranial base



Internal cranial base - Anterior cranial fossa *(scala anterior)*

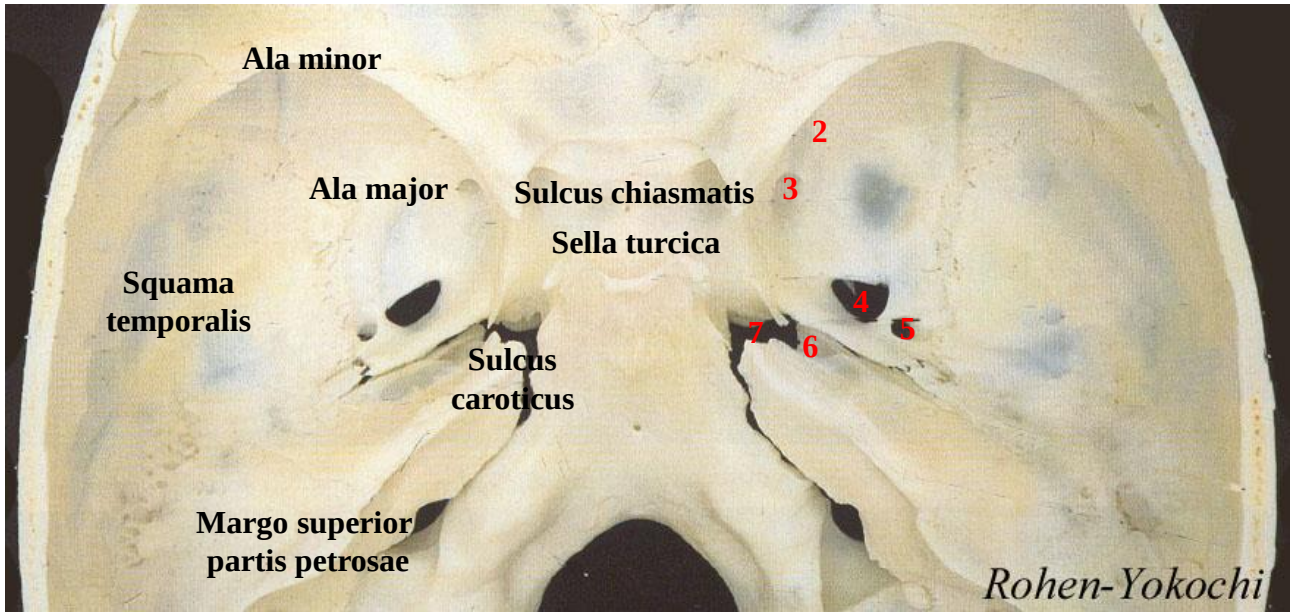


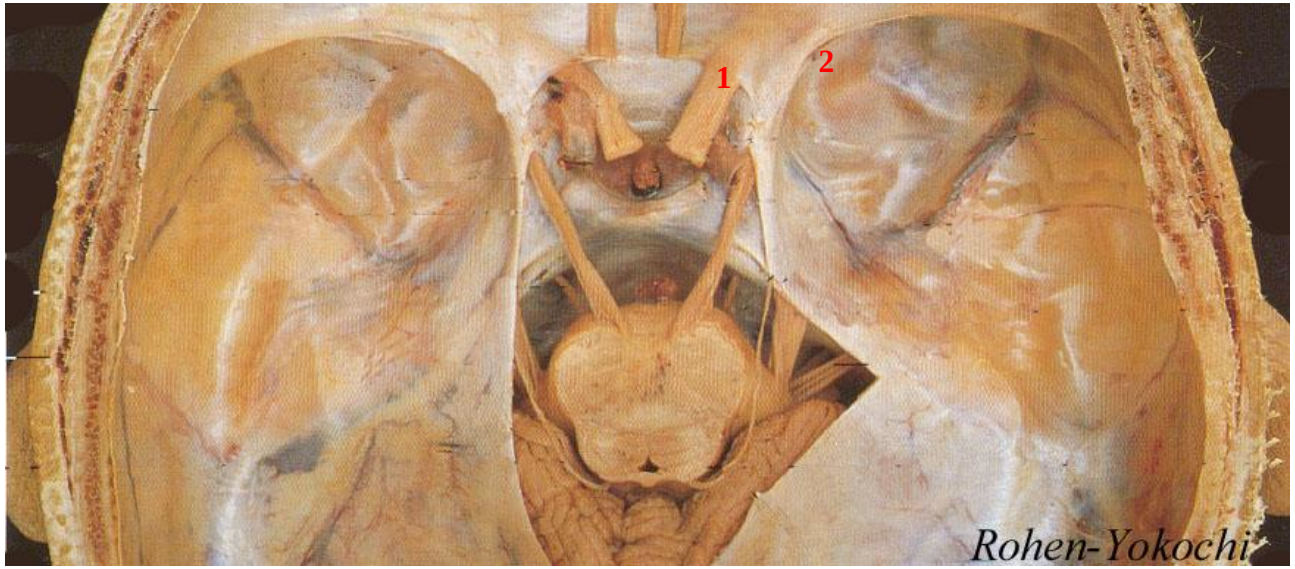


1. **Foramen caecum**
   (Dural process, little vein)

2. **Lamina cribrosa**
   (Fila olfactoria,
   a. et n. ethmoidalis anterior)

Internal cranial base – Middle cranial fossa *(scala media)*





1. **Canalis opticus**
   (n. opticus, a. ophtalmica)

2. **Fissura orbitalis superior**
   (nn. III., IV., V/1 et VI., v. ophtalmica superior)

3. **Foramen rotundum**
   (V/2)

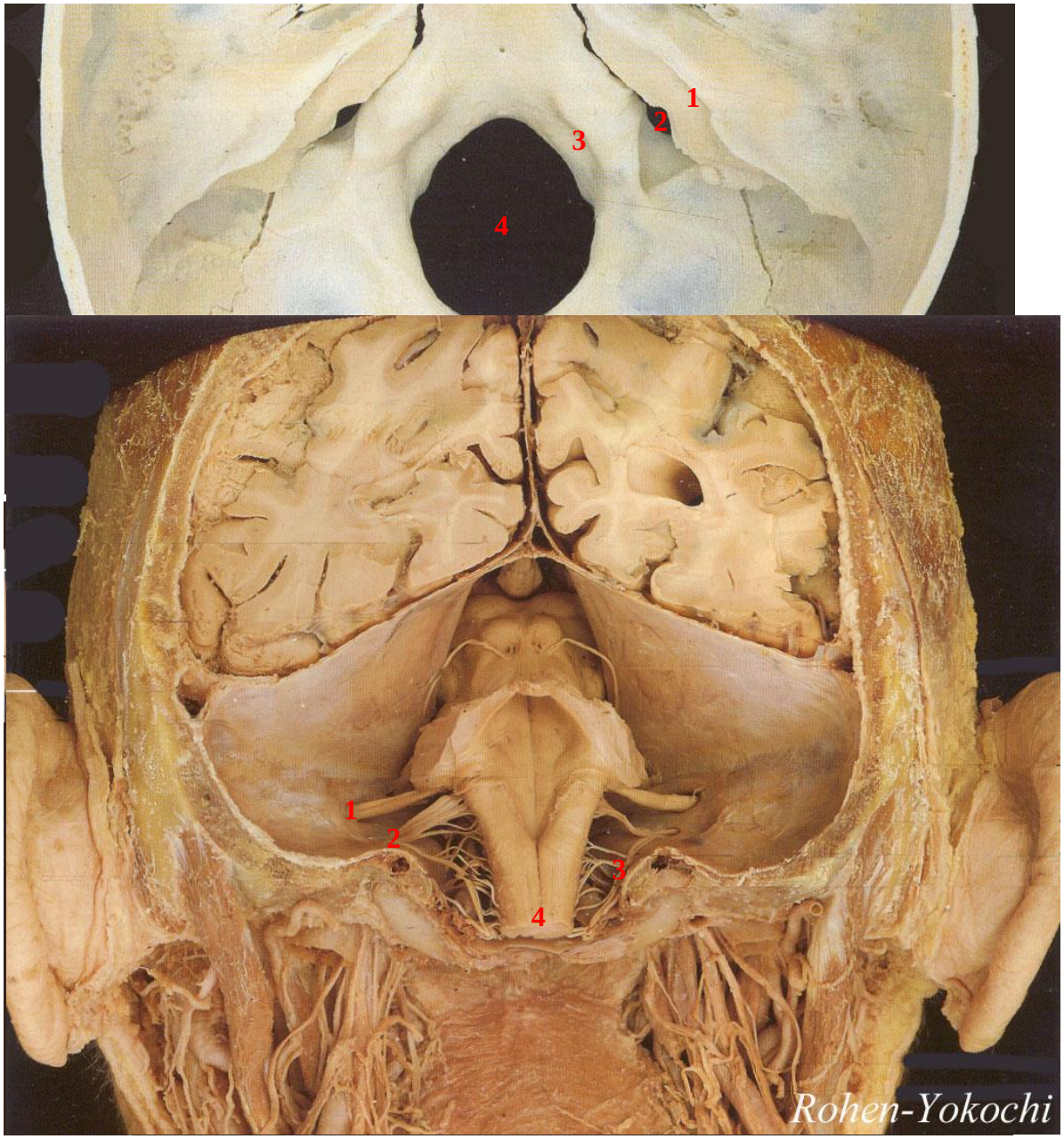
4. **Foramen ovale**
   (V/3), a. meningea parva

5. **Foramen spinosum**
   (a. meningea media, n. spinosus)

6. **Canalis caroticus**
   (a. carotis interna, plexus caroticus internus)

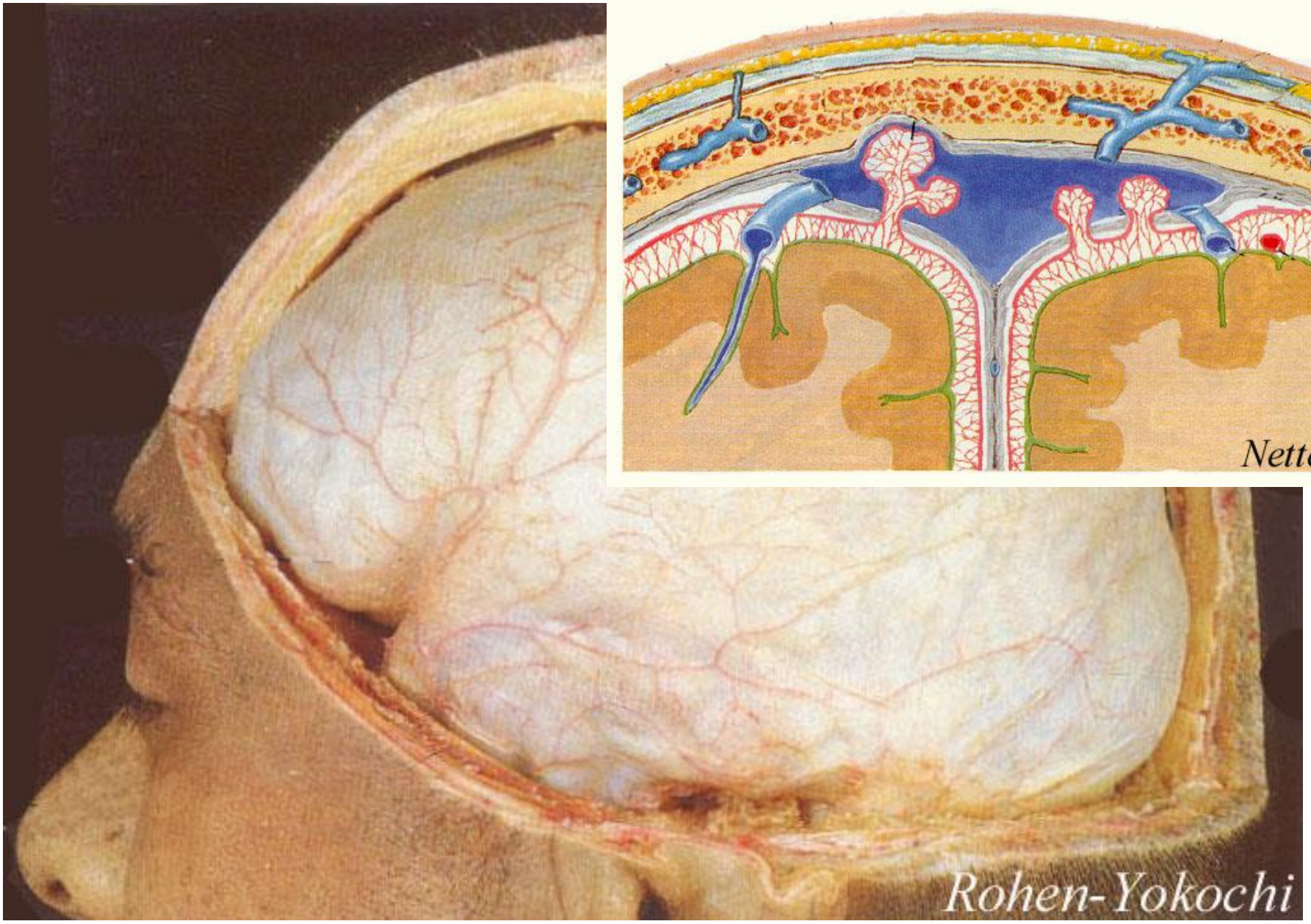
7. **Fissura sphenopetrosa - foramen lacerum**
   (nn. petrosus major et minor)

Internal cranial base - Posterior cranial fossa *(scala posterior)*

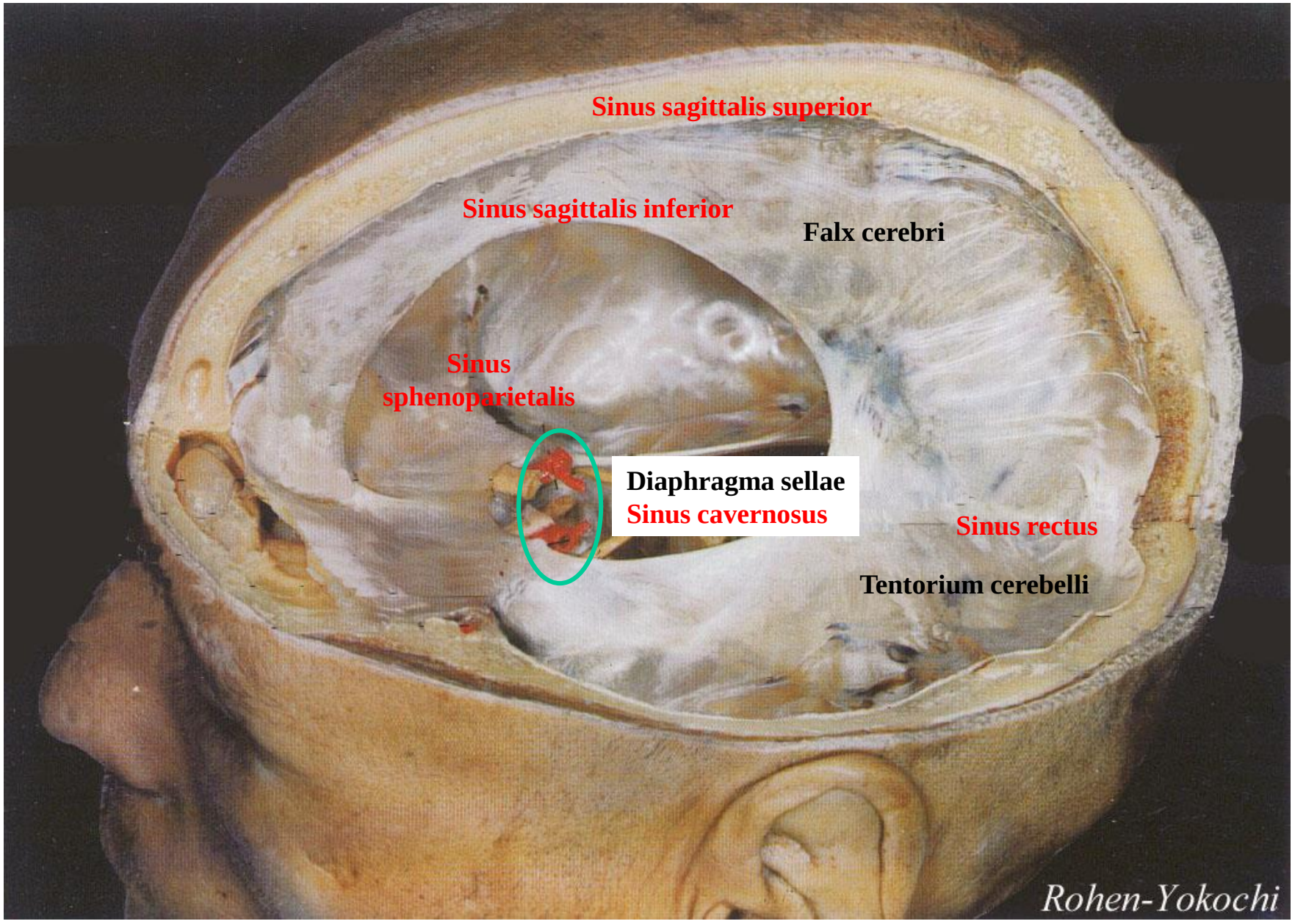


1. **Porus acusticus internus**
   (nn. VII. et VIII., a. labyrinthi)
2. **Foramen jugulare**
   (nn. IX., X. et XI., a. meningea posterior;
   sinus sigmoideus > vena jug. int.)
3. **Canalis nervi hypoglossi**
   (n. XII)
4. **Foramen magnum**
   (Med. spinalis, radix spinalis n. XII., aa. vertebrales, a. spinalis ventralis plexus basilaris)

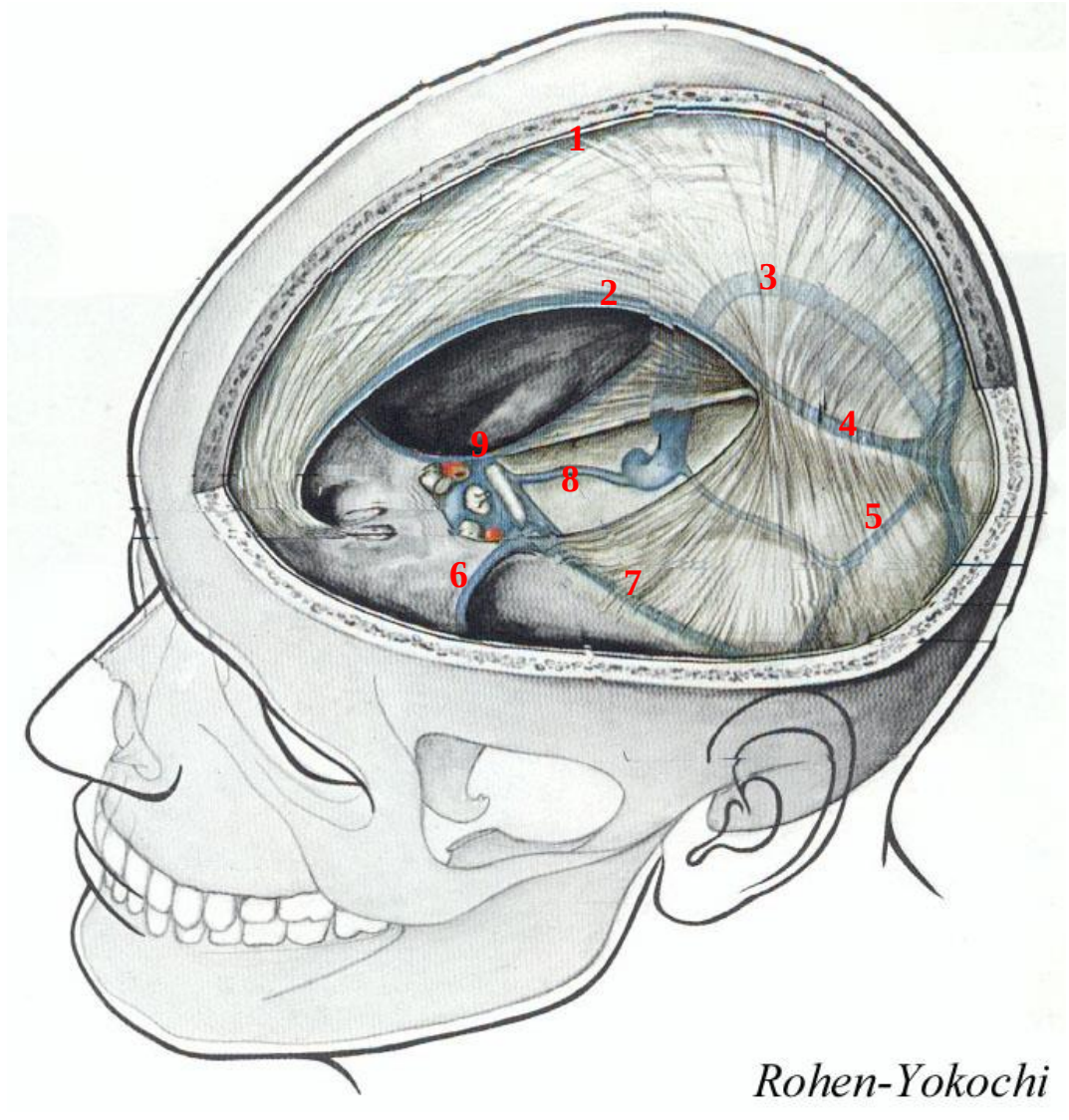
Intracranium *(craniocerebral topography)*



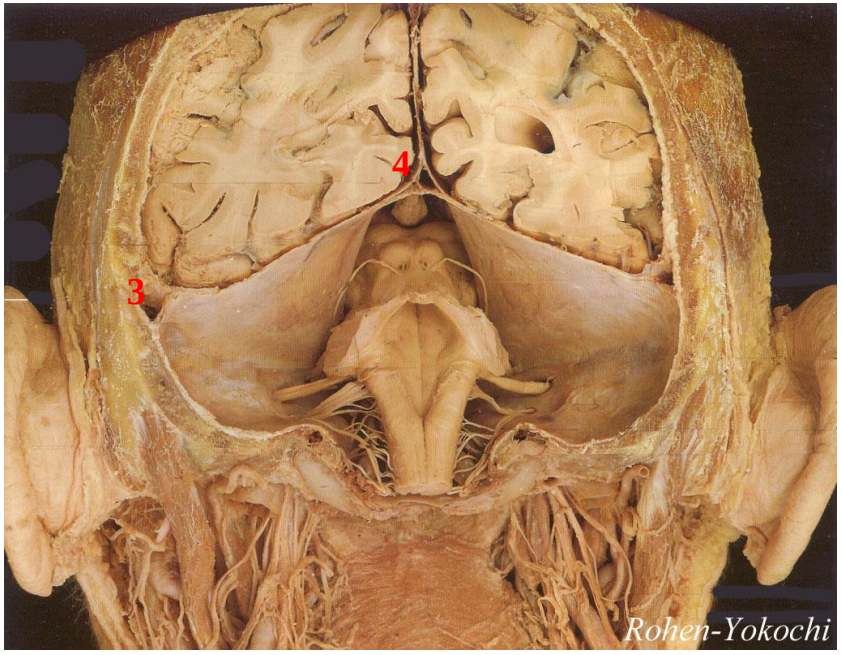
Intracranium *(craniocerebral topography)*



Intracranium *(craniocerebral topography)*

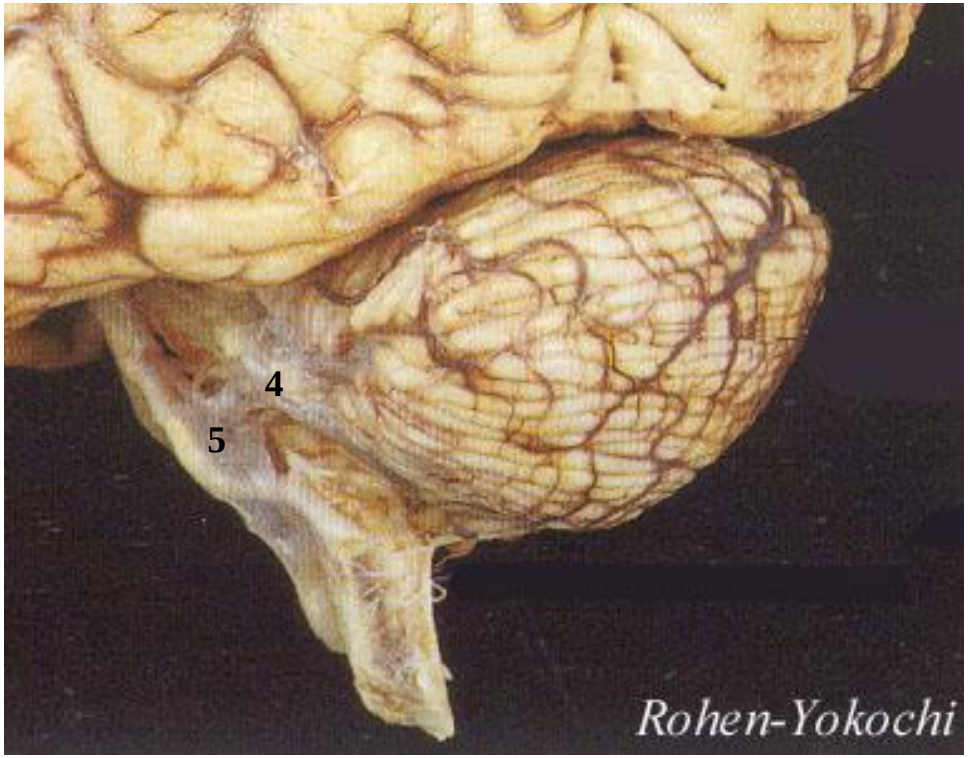


1. Sinus sagitalis superior
2. Sinus sagittalis inferior
3. Sinus transversus
4. Sinus rectus
5. Sinus occipitalis
6. Sinus sphenoparietalis
7. Sinus petrosus superior
8. Sinus petrosus inferior
9. Sinus cavernosus



Intracranium - Cisternae

1. **Cisterna cerebellomedullaris (magna)**
2. **Cisterna venae magnae**
3. **Cisterna interpeduncularis**
4. **Cisterna pontis lateralis**
5. **Cisterna pontis medialis**



Main target areas for surgical approaches

- Clivus
- Cavernous sinus and sella
- Orbit
- Internal acoustic meatus and posterior petrous surface
- Jugular fossa

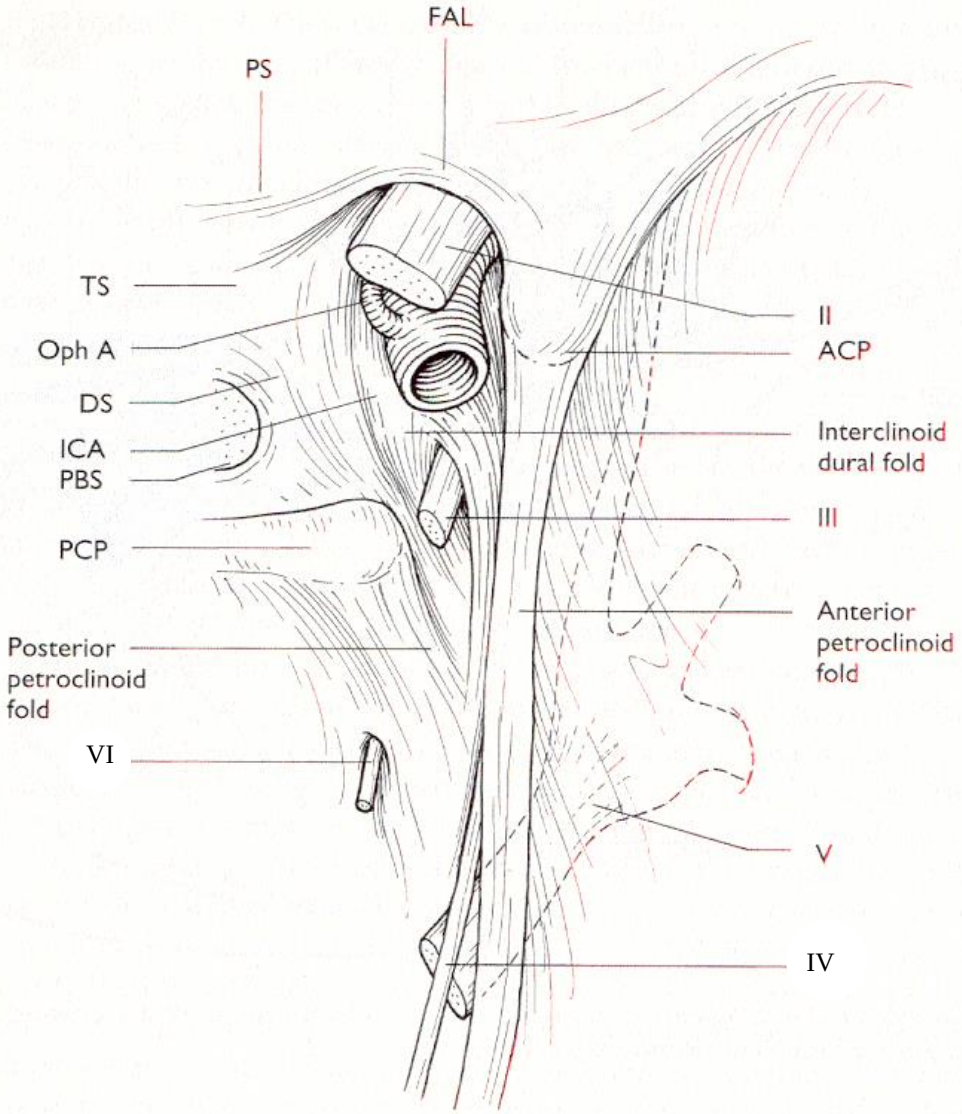


Figure 2-2. The anatomic structure and dural folds of the walls of the cavernous sinus as viewed from above.

FAL - Lig. falciforme
PS - Planum sphenoidale
TS - Tuberculum sellae
II - N. opticus
Oph A - A. ophthalmica
ACP - Proc. clinoideus ant.
DS - Diaphragma sellae
ICA - A. carotis int.
PBS - Hypophysisnyél (Pituitary stalk)
III - N. oculomotorius
VI - N. abducens
V - N. trigeminus
IV - N. trochlearis

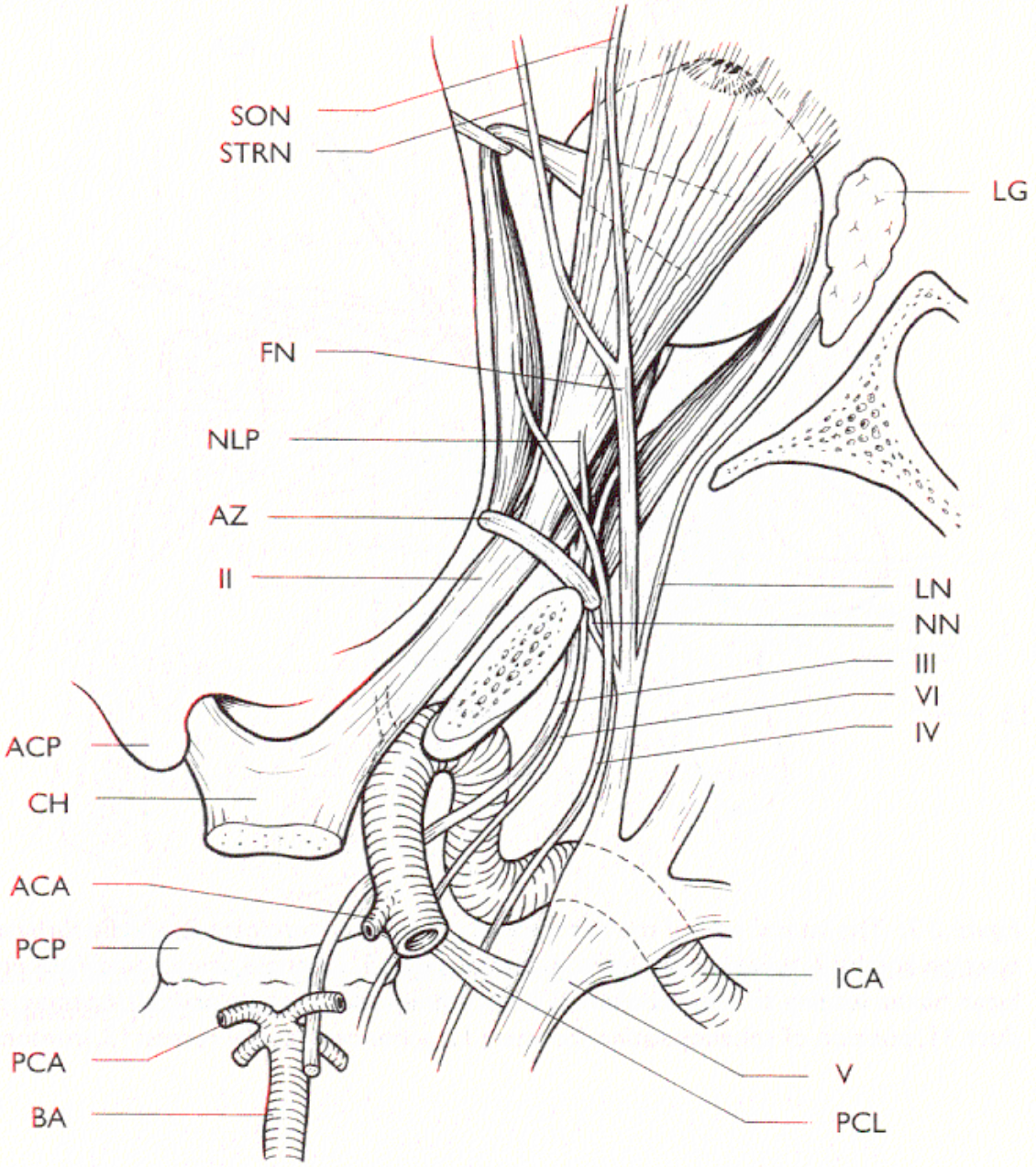


Figure 2-6. The distribution of nerves in relation to the cavernous sinus and orbit.

SON - N. supraopticus
STRN - N. supratrochlearis
LG - Gl. lacrimalis
FN - N. frontalis
NLP - Ramus m. levat. palp. sup
AZ - Annulus tendineus (Zinni)
II - N. opticus
LN - N. lacrimalis
NN - N. nasociliaris
III - N. oculomotorius
VI - N. abducens
ACP - Proc. clinoideus ant.
IV - N. trochlearis
CH - Chiasma opticum
ACA - A. cerebri ant.
PCP - Proc. clinoideus post.
ICA - A. carotis int.
PCA - A. cerebri post.
V - N. trigeminus
BA - A. basilaris
PCL - Lig. petroclinoideum

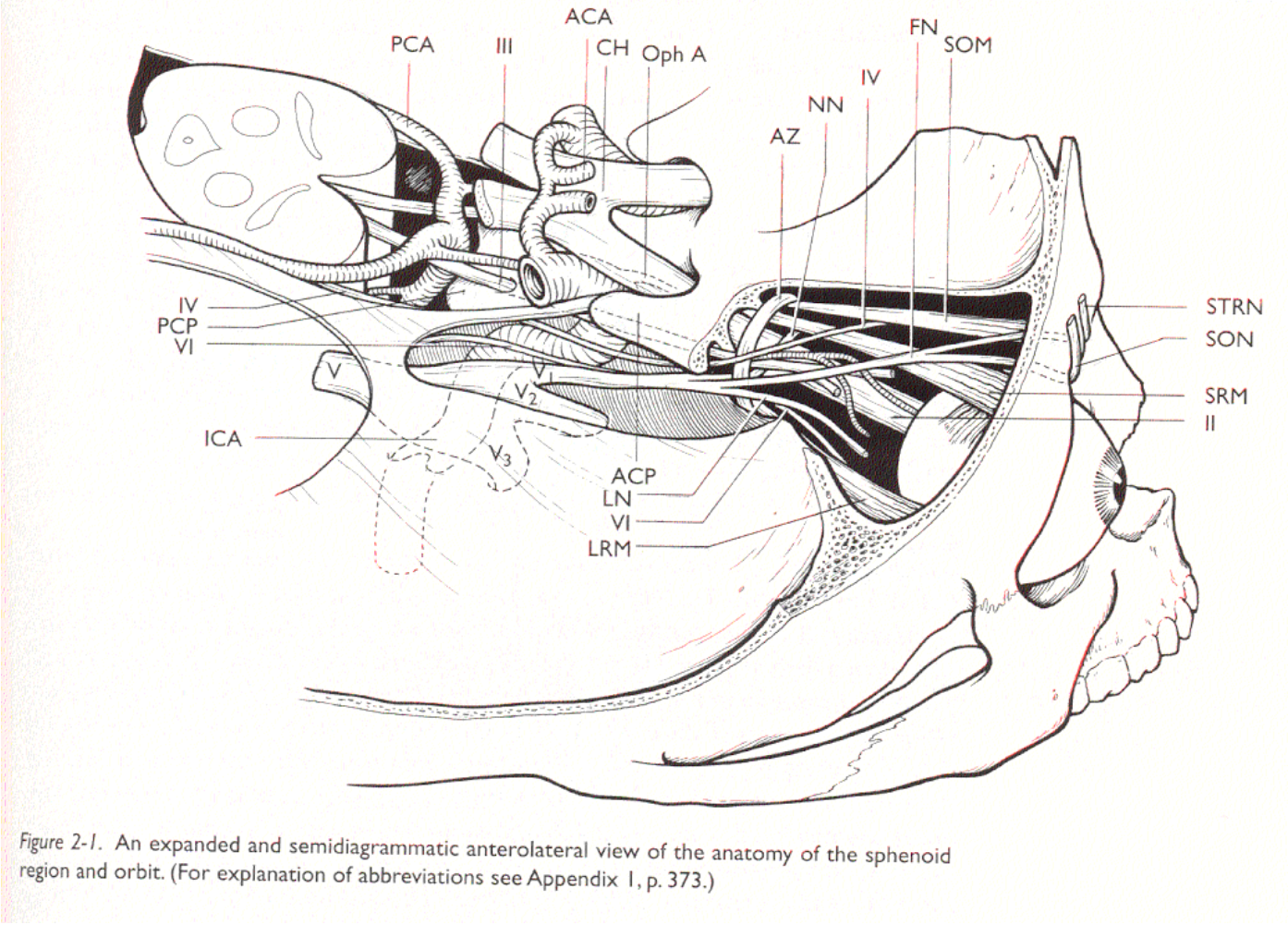


Figure 2-1. An expanded and semidiagrammatic anterolateral view of the anatomy of the sphenoid region and orbit. (For explanation of abbreviations see Appendix 1, p. 373.)

IV - N. trochlearis
PCP - Proc. clinoideus post.
VI - N. abducens
V - N. trigeminus
ICA - A. carotis int.
PCA - A. cerebri post.
III - N. oculomotorius
V_1, V_2, V_3 - Trigeminal divisions
ACA - A. cerebri ant.

CH - Chiasma opticum
Oph A - A. ophthalmica
ACP - Proc. clinoideus ant.
LN - N. lacrimalis
VI - N. abducens
LRM - M. rectus lat.
AZ - Annulus tendin. Zinni
NN - N. nasociliaris
IV - N. trochlearis

FN - N. frontalis
SOM - M. obliquus sup.???
STRN - N. supratrochlearis
SON - N. supraorbitalis
SRM - M. rectus sup.
II - N. opticus

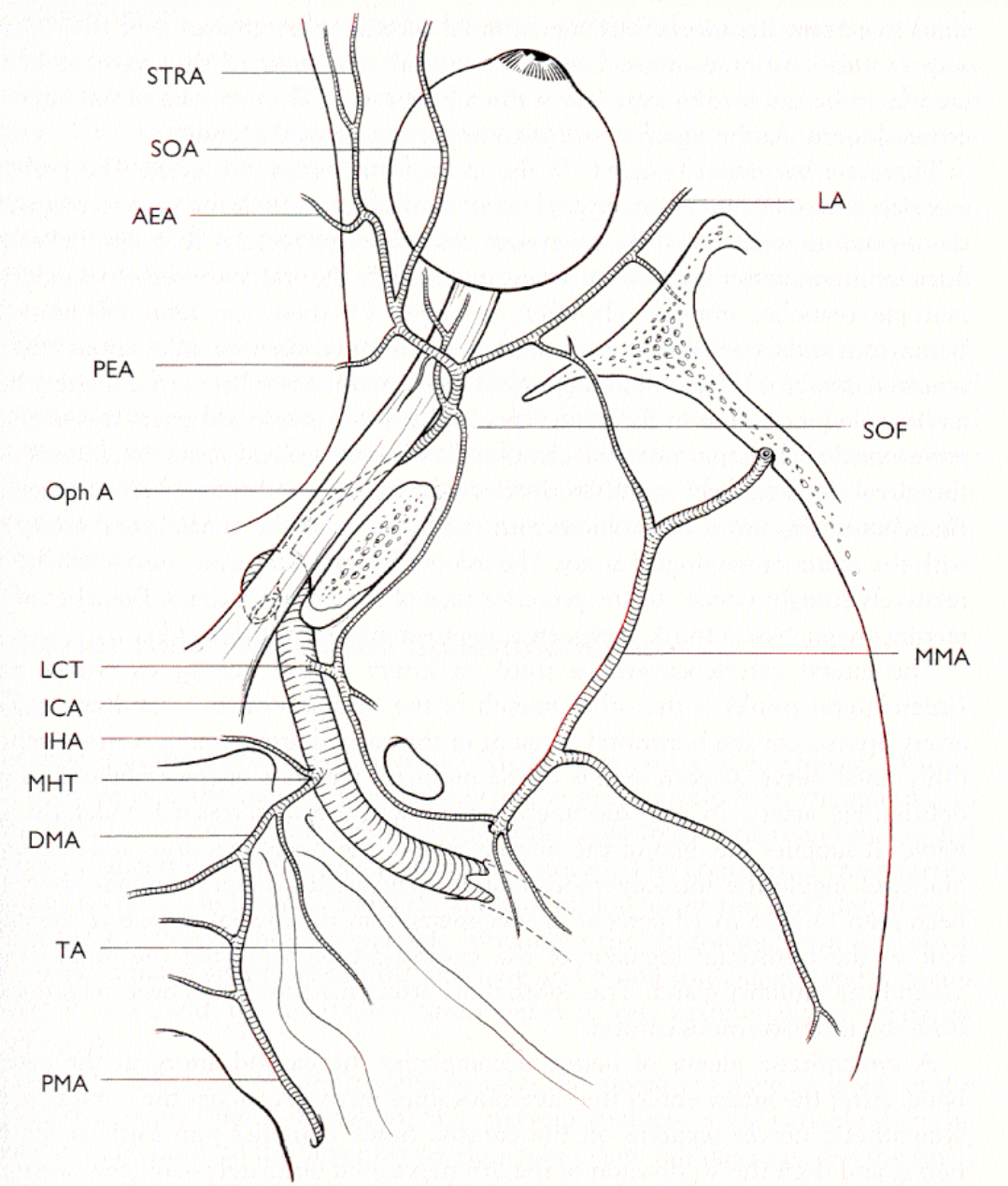


Figure 2-4. A typical distribution of arteries in relation to the cavernous sinus and orbit.

STRA - A. supratrochlearis
SOA - A. supraorbitalis
AEA - A. ethmoidalis ant.
LA - A. lacrimalis
PEA - A. ethmoidalis post.
SOF - Fissura orbitalis sup.
Oph A - A. ophthalmica
MMA - A. meningea media
LCT - Truncus cortico-cavern. lat.
ICA - A. carotic int.
IHA - A. hypophysialis inf.
MHT - Truncus meningohypophys.
DMA - A. meningea dors.
TA - A. tentorialis
PMA - A. meningea post.

Linea stylohamularis (stylohamular line)

Stylomastoid foramen (facial nerve)
Styloid process (stylopharyngeus m., stylohyoid m., stylohyoid ligament, styloglossus m., stylomandibular ligament; there is also a stylopharyngeal septum extending from the process to the lateral pharyngeal wall)
Jugular foramen (internal jugular vein, nerves IX–XI)
Carotid canal (carotid artery)
Petrotympanic fissure (chorda tympani)
Sphenoid spine
Foramen spinosum (middle meningeal artery)
Eustachian tube
Foramen ovale (mandibular nerve)
Levator and tensor velum palatini muscles

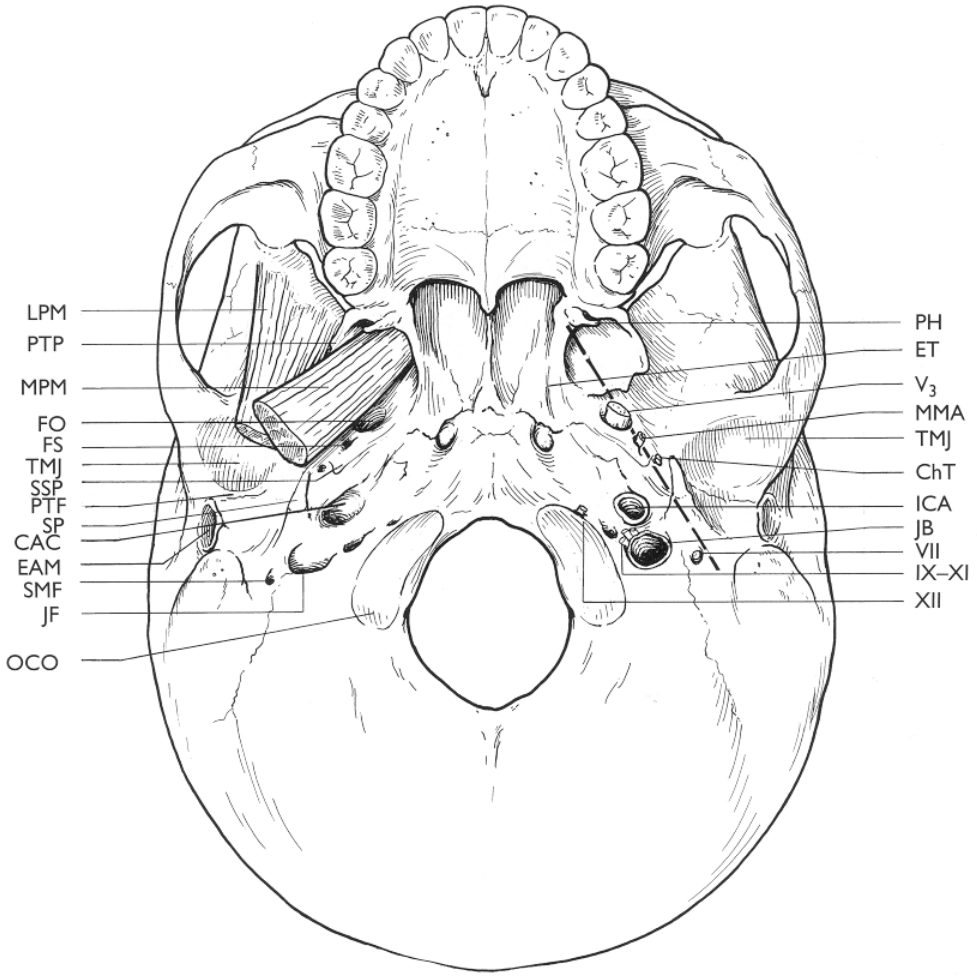


Figure 2-12. The most important anatomic structures in the infratemporal fossa are located medial to the stylohamular line, which is indicated here by solid dashes.

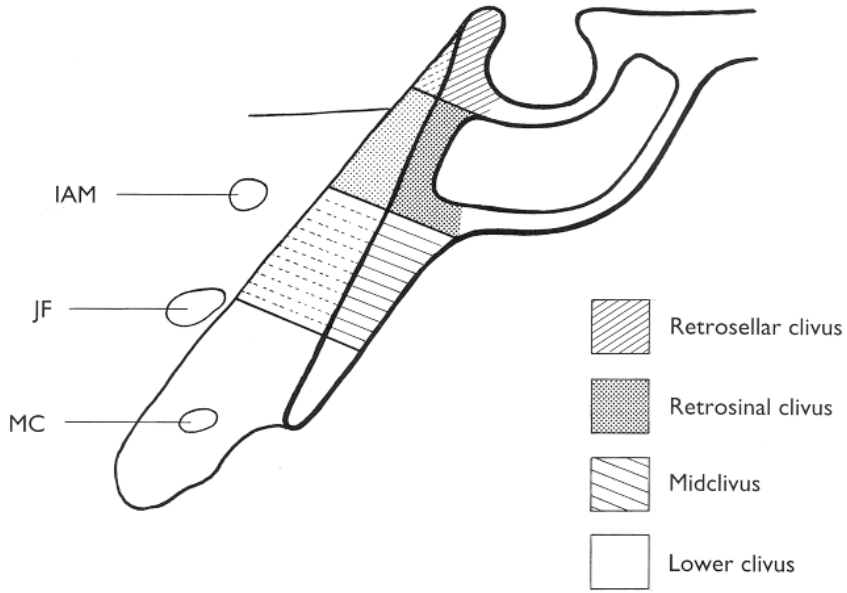


Figure 1-12. The areas of the clivus for the purpose of defining the surgical approaches in Table 1-3. (For explanation of abbreviations see Appendix 1, p. 373.)

Table 1-3. Approaches to the Clivus

	Midline Extradura	Extradural Extending Laterally	Intradural[a]
Retrosellar	Subtemporal Transcavernous	Subtemporal Transcavernous	Subtemporal Trans-Sylvian Presigmoid/parapetrosal
Retrosphenoid	Trans-sphenoidal Basal frontal Transethmoidal	Subtemporal transpetros apex Transcavernous Extended transethmoidal	Subtemporal transpetrous apex Presigmoid/parapetrosal
Midclivus	Basal frontal Le Fort 1 maxillotomy Extended transethmoidal Transoral/transpalatal	Subtemporal-infratemporal Extended transmaxillary Facial translocation	Transcochlear Transpetrous Presigmoid/parapetrosal
Lower clivus	Transoral	Subtemporal-infratemporal Transcondylar/transjugular Transmandibular	Extreme lateral

[a]For small intradural lesions an anterior transclival approach may be appropriate (see text).

Sinus cavernosus (cavernous sinus)

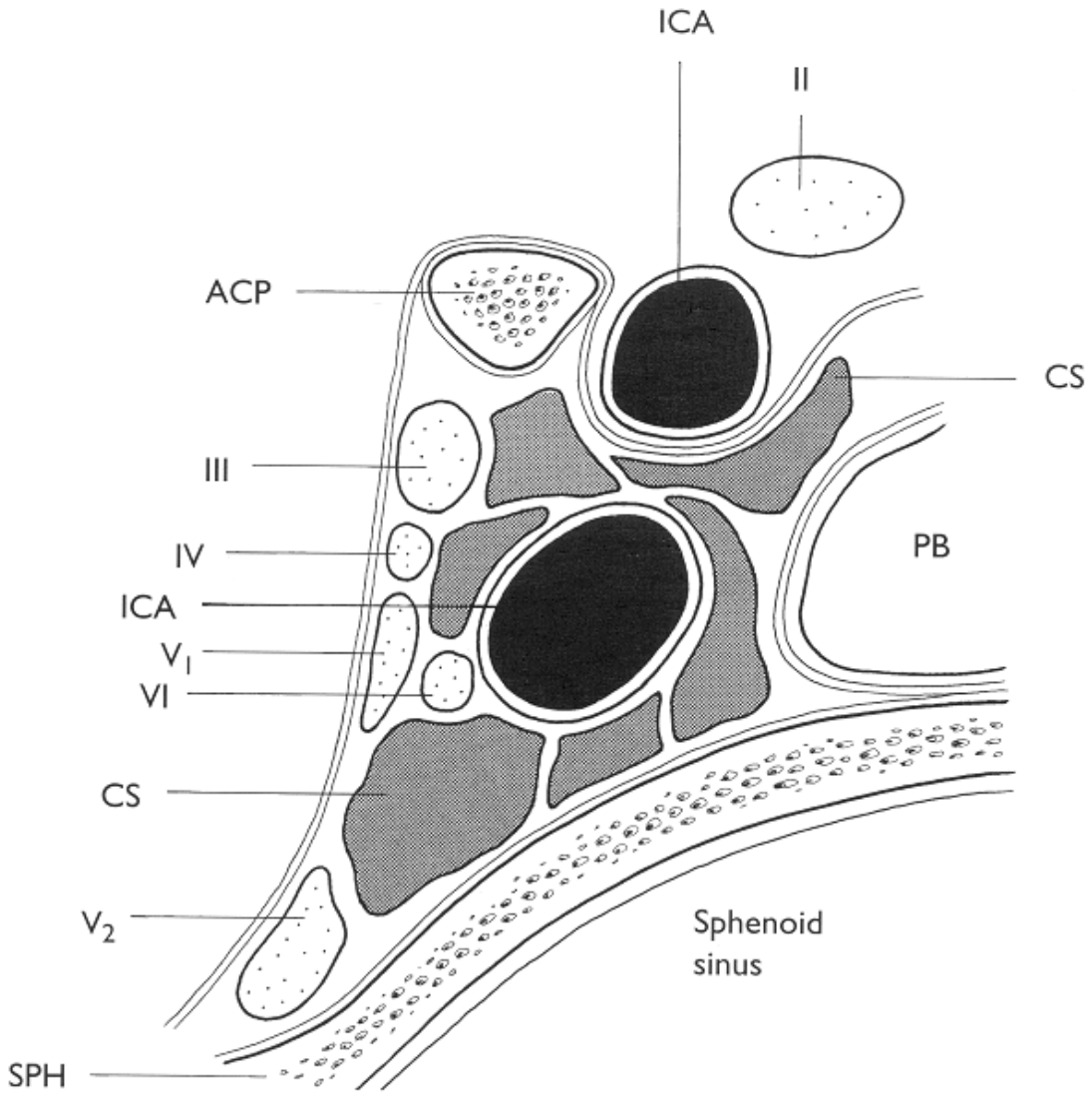
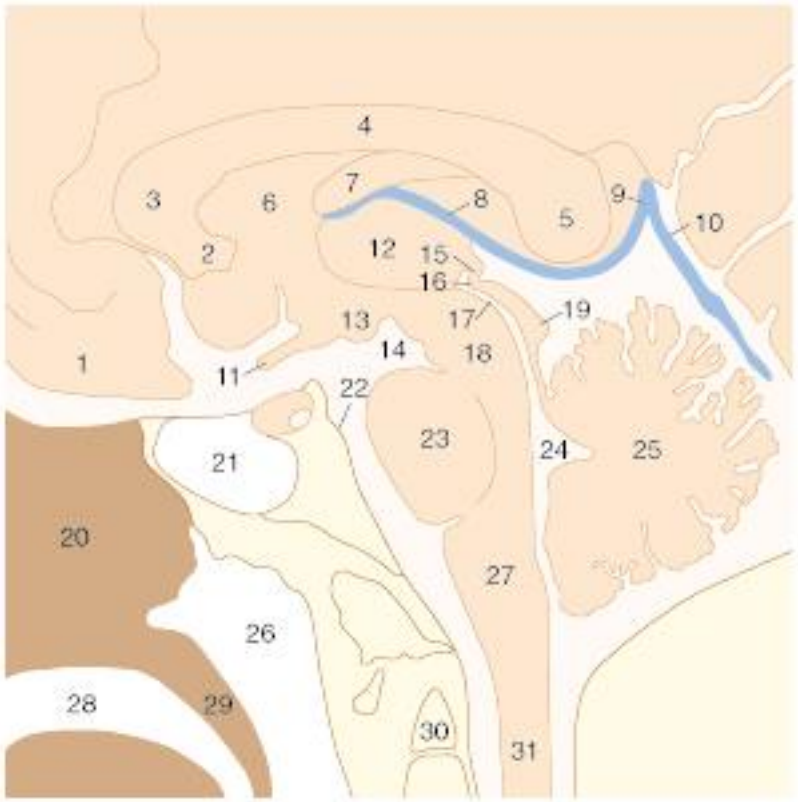


Figure 2-8. A coronal section at the level of the anterior clinoid process showing the superolateral relations of the sphenoid sinus.

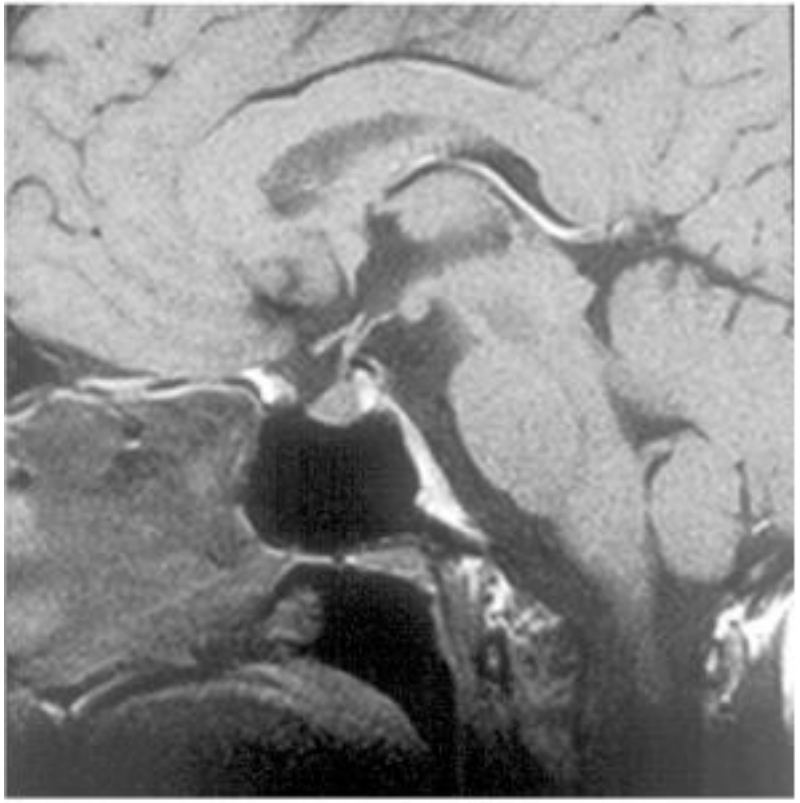
Sagittal MRI of sella

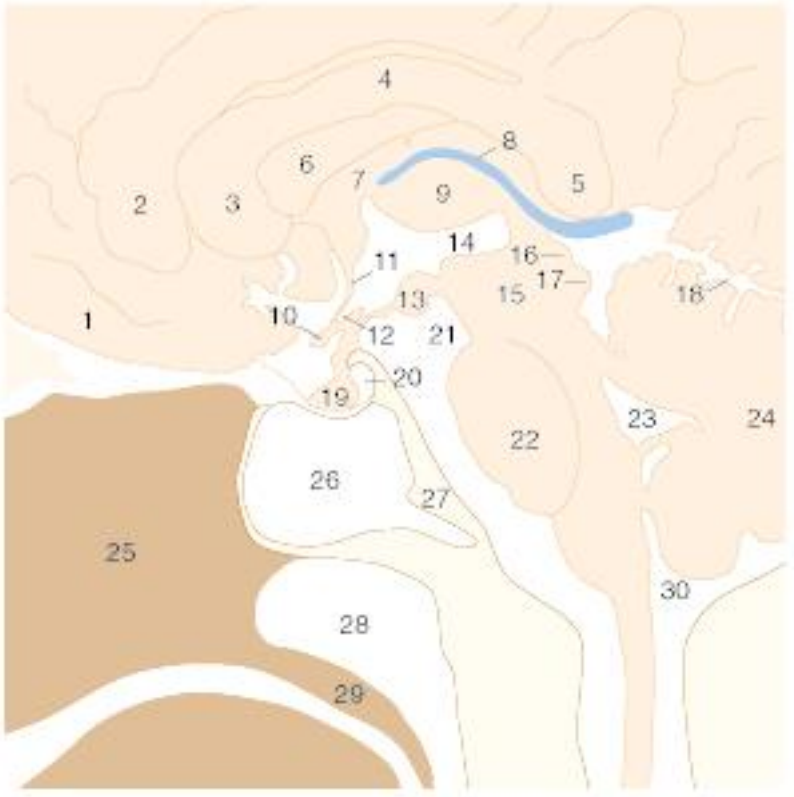


1.Lobus frontalis
2. Rostrum corporis callosi
3. Genu corporis callosi
4. Truncus corporis callosi
5.Splenium corporis callosi
6. Septum pellucidum
7. Fornix
8. Vena cerebri interna
9. Vena cerebri magna (Galeni)
10. Sinus rectus
11. Chiasma opticum
12. Thalamus
13. Corpus mamillare
14. Fossa et cisterna interpeduncularis
15. Commissura habenularum
16. Commissura posterior
17. Aquaeductus cerebri
18. Mesencephalon
19. Tectum, Corpora quadrigemina
20. Cavum et septum nasi
21. Sinus sphenoidalis
22. Clivus
23. Pons
24. Ventriculus quartus
25. Cerebellum
26. Nasopharynx
27. Medulla oblongata
28. Cavum oris
29. Palatum molle
30. Dens axis
31. Medulla spinalis

H10

Sagittal MRI of sella

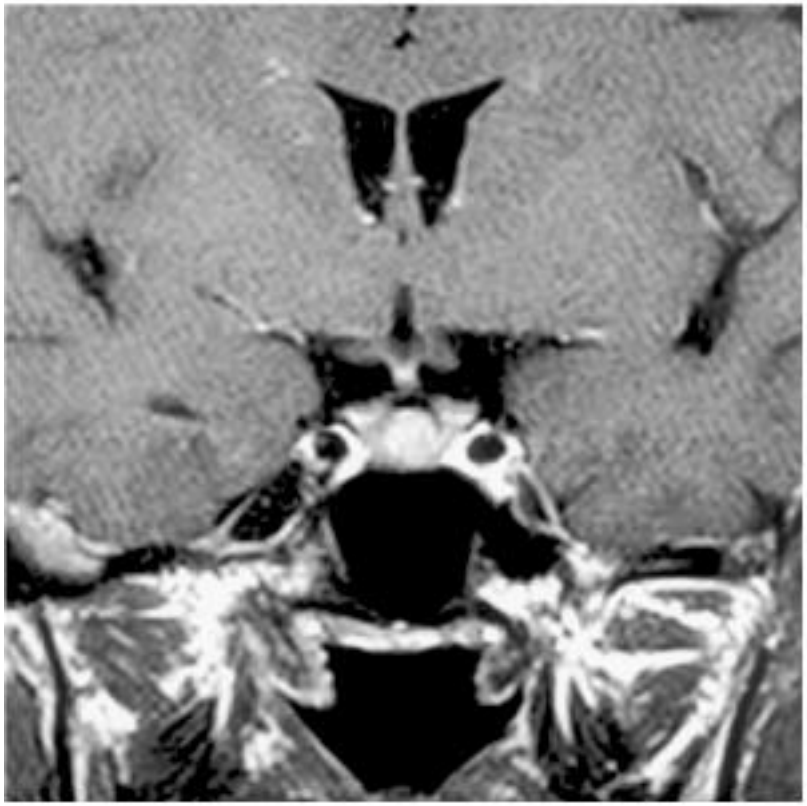


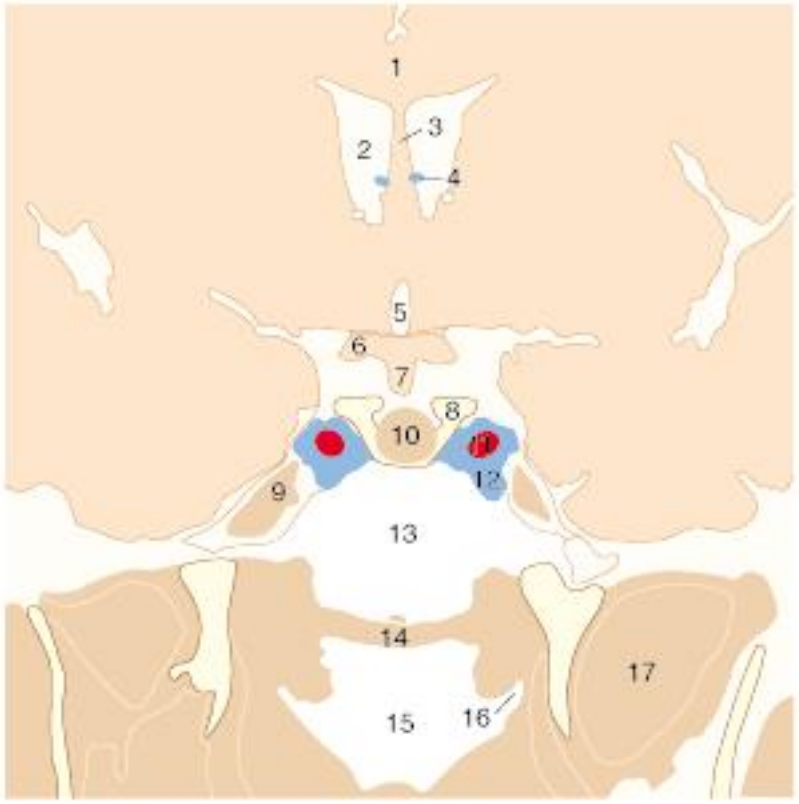


H9

1. Lobus frontalis
2. Gyrus cinguli
3. Genu corporis callosi
4. Truncus corporis callosi
5. Splenium corporis callosi
6. Septum pellucidum
7. Columna fornicis
8. Vena cerebri interna
9. Thalamus
10. Chiasma opticum
11. Lamina terminalis
12. Recessus opticus
13. Corpus mamillare
14. Ventriculus tertius
15. Mesencephalon
16. Colliculus sup.
17. Colliculus inf.
18. Tentorium cerebelli
19. Glandula pituitaria (lobus ant.)
20. Glandula pituitaria (lobus post.)
21. Fossa et cisterna interpeduncularis
22. Pons
23. Ventriculus quartus
24. Cerebellum
25. Cavum et septum nasi
26. Sinus sphenoidalis
27. Clivus
28. Nasopharynx
29. Palatum molle
30. Cisterna cerebellomedullaris

Sagittal MRI of sella

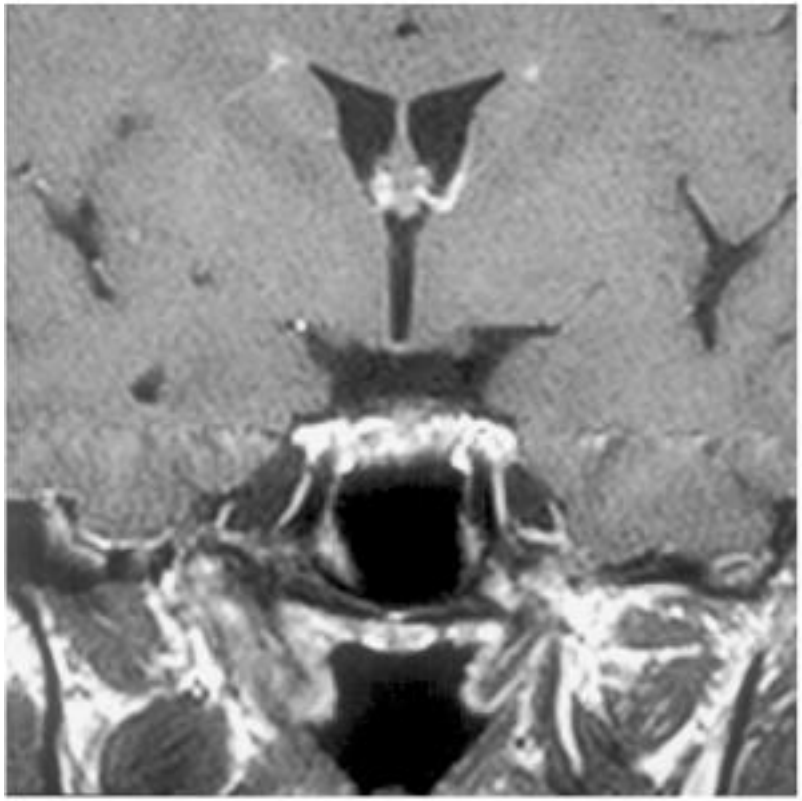


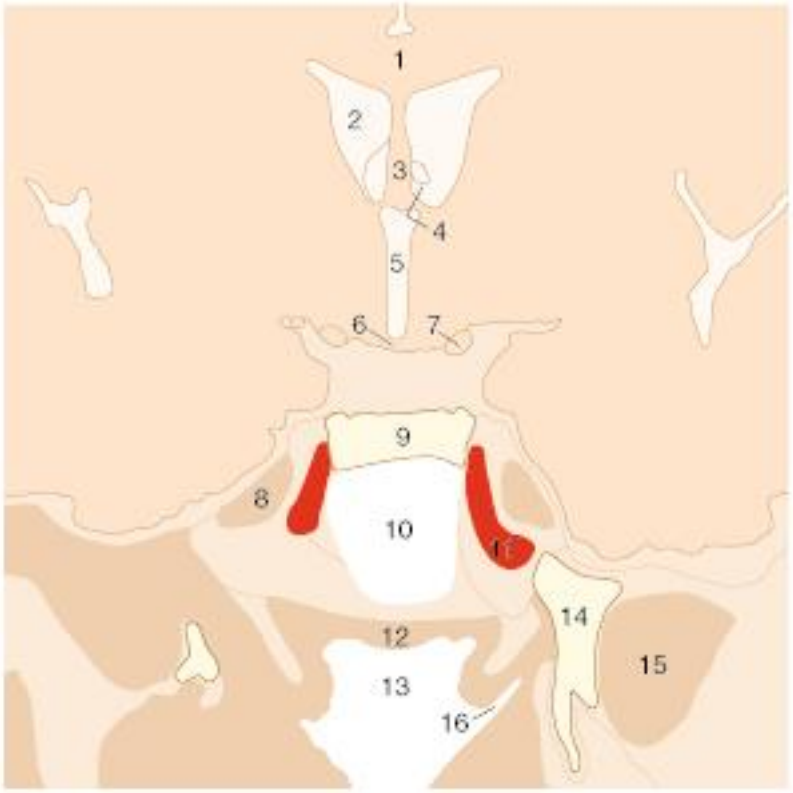


H14

1. Corpus callosum
2. Ventriculus lateralis (cornu anterius)
3. Septum pellucidum
4. Vena septi pellucidi
5. Recessus opticus ventriculi tertii
6. Chiasma opticum
7. Hypophysial stalk / Hypophysenstiel
8. Proc. clinoideus post.
9. Cavum trigeminale
10. Glandula pituitaria (lobus post.)
11. A. carotis int.
12. Sinus cavernosus
13. Sinus sphenoidalis
14. Fornix pharyngis
15. Nasopharynx
16. Ostium pharyngeum tubae auditivae
17. M. pterygoideus lateralis

Sagittal MRI of sella

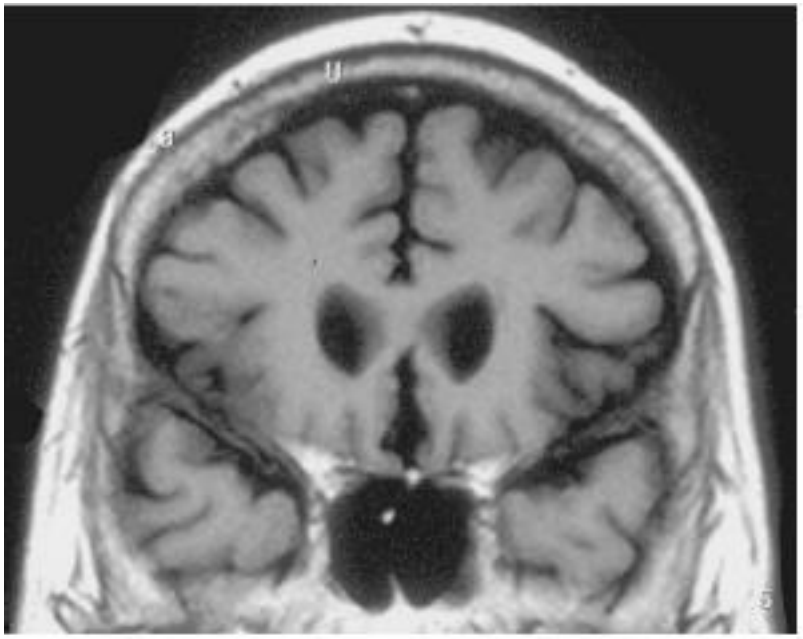


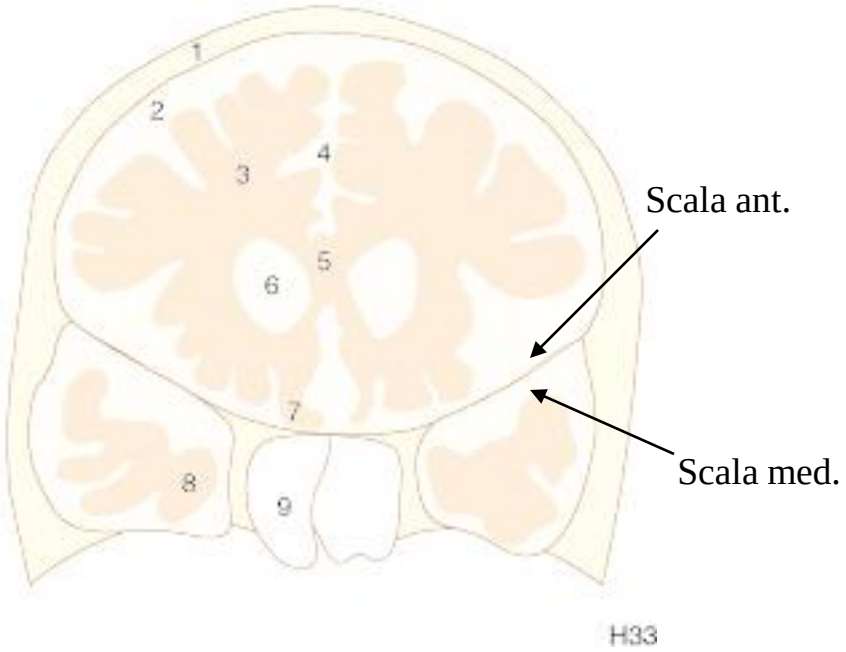


H15

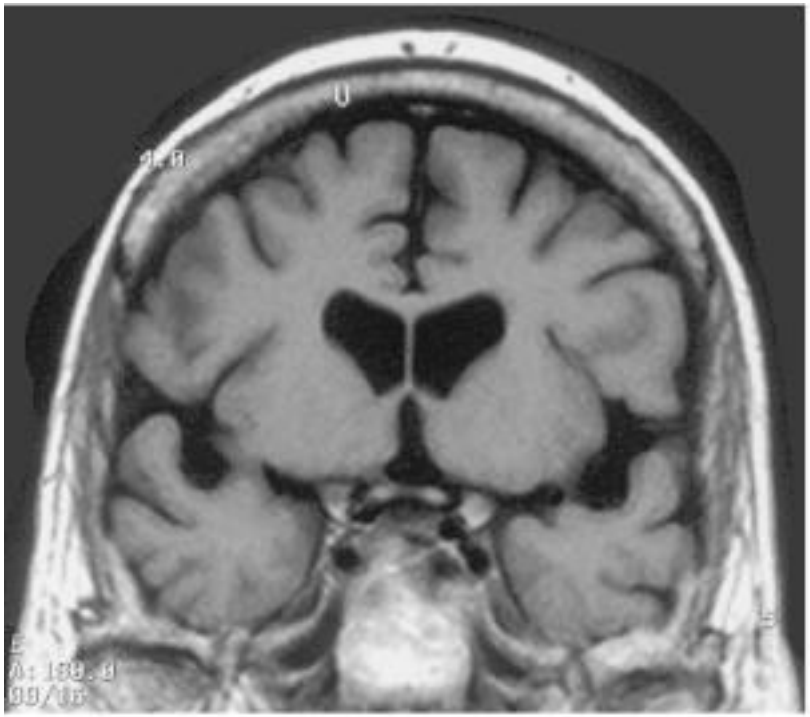
1. Corpus callosum
2. Ventriculus lateralis (cornu ant.)
3. Septum pellucidum
4. Foramen interventriculare
5. Ventriculus tertius
6. Tuber cinereum
7. Tractus opticus
8. Cavum trigeminale
9. Dorsum sellae
10. Sinus sphenoidalis
11. A. carotis int.
12. Fornix pharyngis
13. Nasopharynx
14. Proc. pterygoideus
15. M. pterygoideus lat.
16. Ostium pharyngeum tubae auditivae

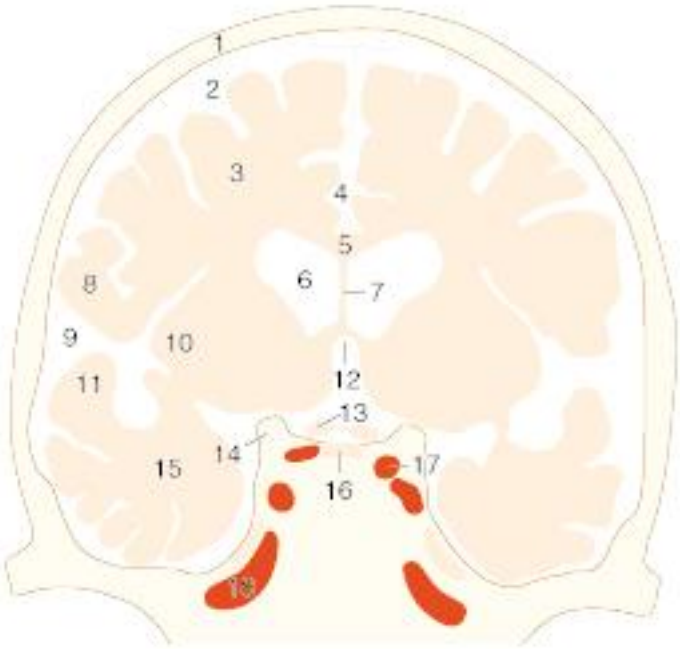
T1-weighted coronal MRI



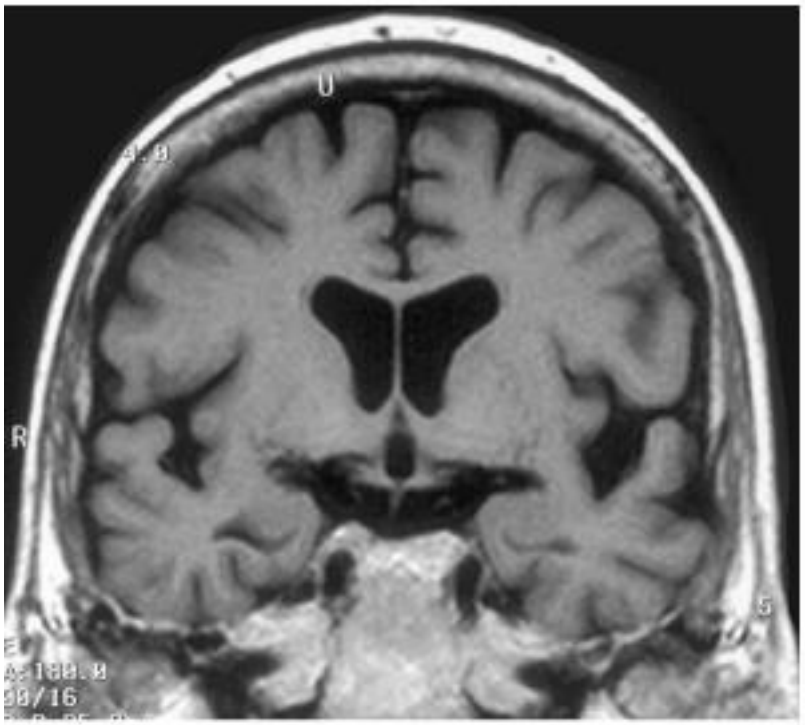


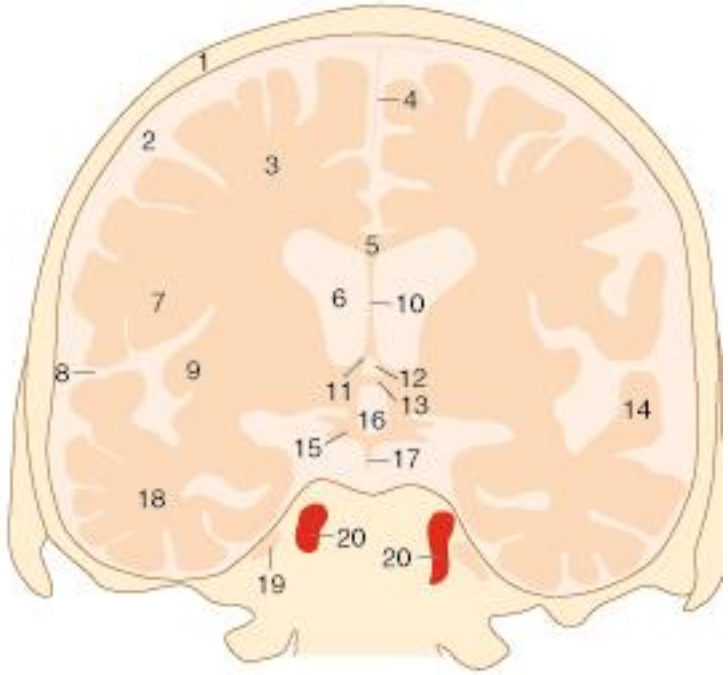
1. Calvaria
2. Cavum subdurale et subarachnoidale
3. Lobus frontalis
4. Falx cerebri et fissura longitudinalis cerebri
5. Genu corporis callosi
6. Ventriculus lat., cornu ant.
7. Gyrus rectus
8. Lobus temporalis
9. Sinus sphenoidalis





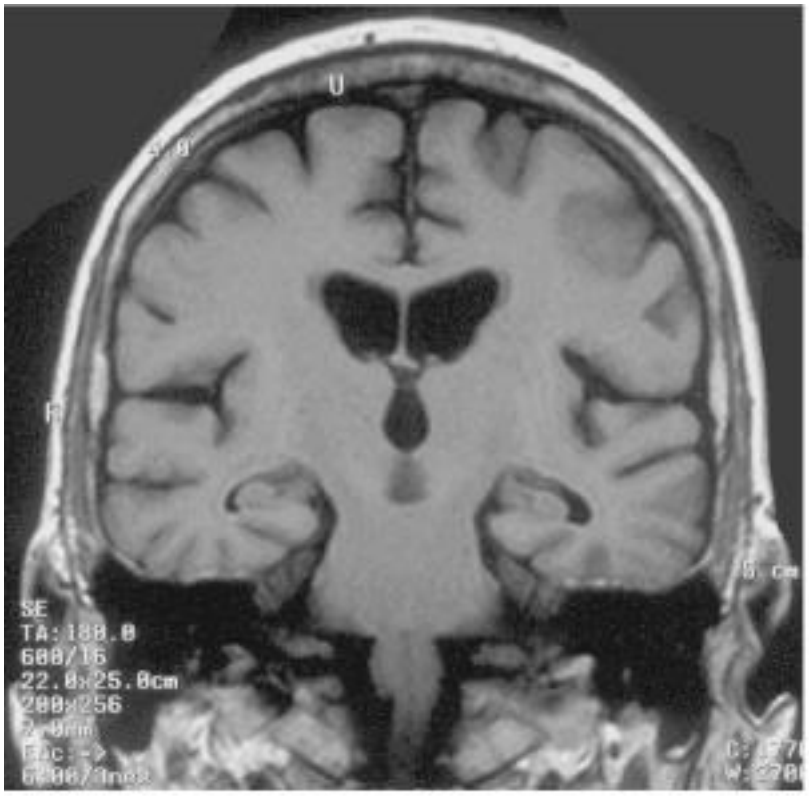
H34

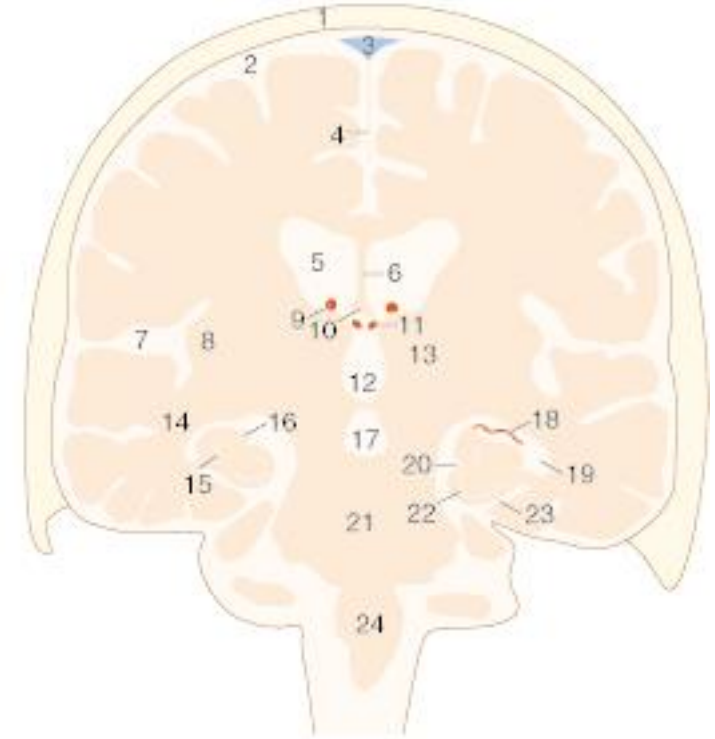




H35

T1-weighted coronal MRI

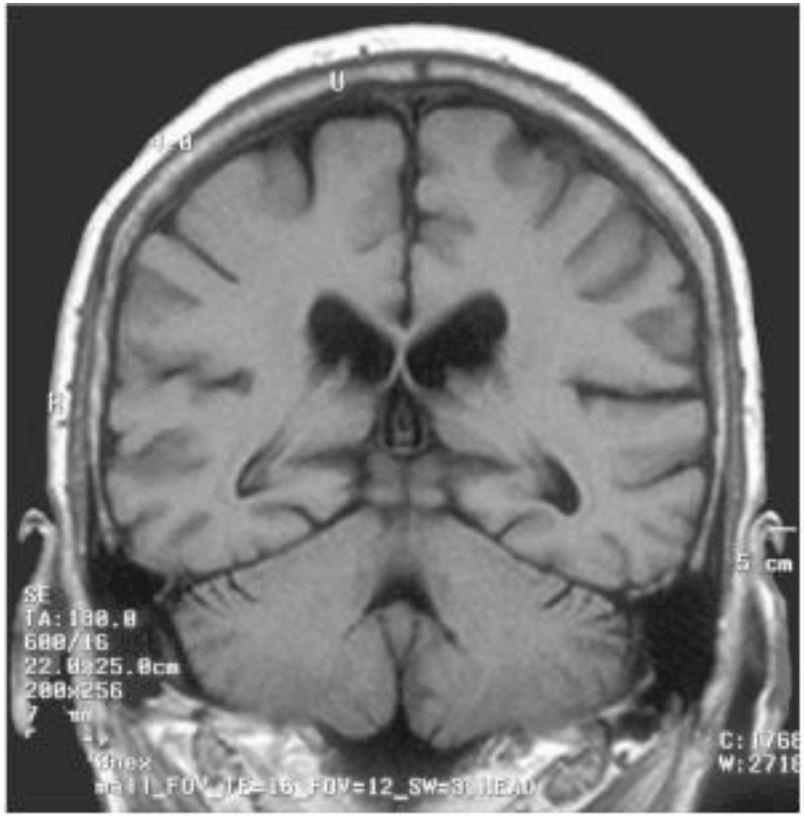


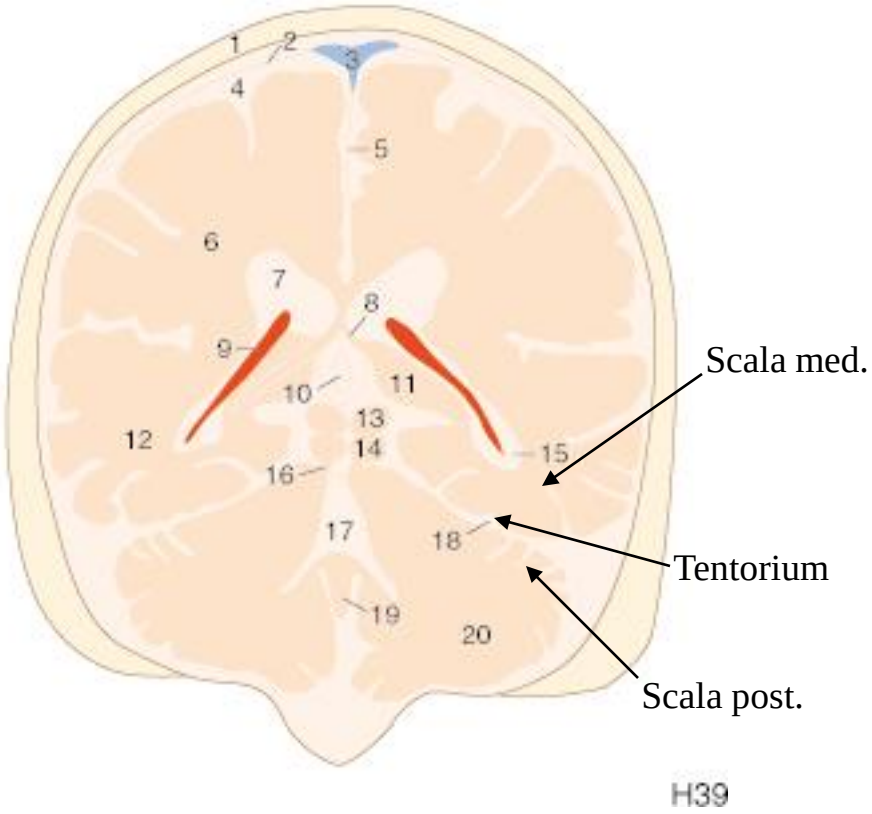


H36

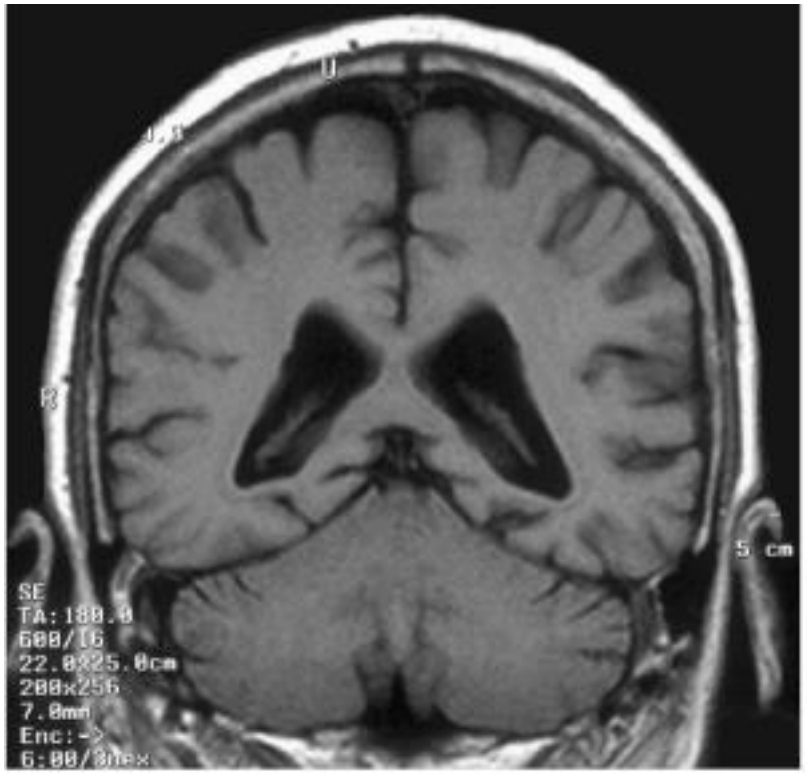
1. Calvaria
2. Cavum subdurale et subarachnoidale
3. Sinus sagittalis sup.
4. Falx cerebri
5. Ventriculus lat.
6. Septum pellucidum
7. Sulcus lateralis
8. Insula
9. Plexus choroideus ventr.lat.
10. Columna fornicis
11. Tela choroidea ventr. tertiii
12. Ventr. tertius
13. Thalamus
14. Lobus temporalis
15. Hippocampus
16. Fimbria hippocampi
17. Fossa interpeduncularis
18. Plexus choroideus ventr. lat. (cornu inf.)
19. Ventriculus lat., cornu inf.
20. Sulcus hippocampi
21. Pons
22. Gyrus parahippocampalis
23. Sulcus collateralis
24. Medulla oblongata

T1-weighted coronal MRI





1. Calvaria
2. Cavum subdurale
3. Sinus sagittalis sup. et dura mater
4. Cavum subarachnoidale
5. Falx cerebri
6. Lobus parietalis
7. Ventriculus lat. pars centralis
8. Crus fornicics
9. Plexus choroideus
10. Corpus pineale et recessus suprapinealis
11. Pulvinar thalami
12. Lobus temporalis
13. Colliculus sup.
14. Colliculus inf.
15. Ventriculus lat., cornu inf.
16. Pedunculus cerebellaris sup.
17. Ventriculus quartus
18. Tentorium cerebelli
19. Vermis cerebelli
20. Hemispherium cerebelli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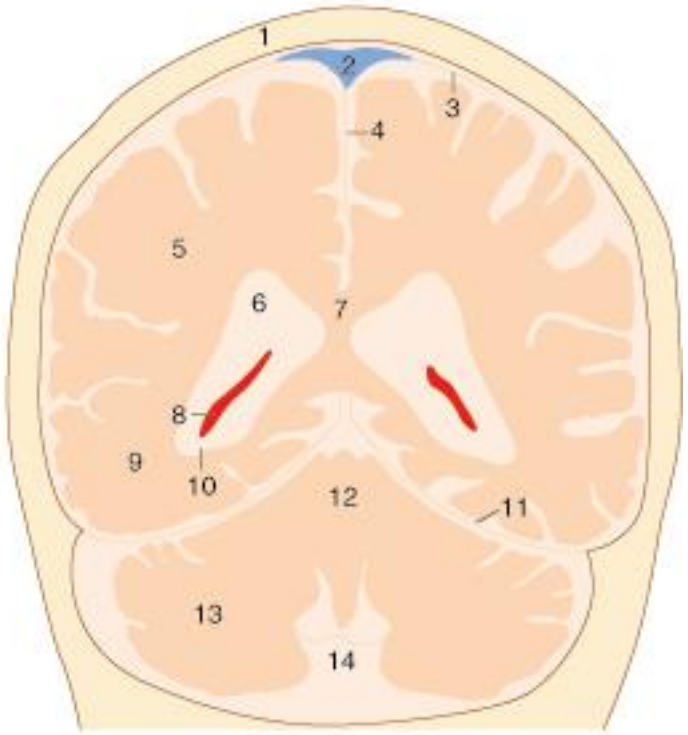
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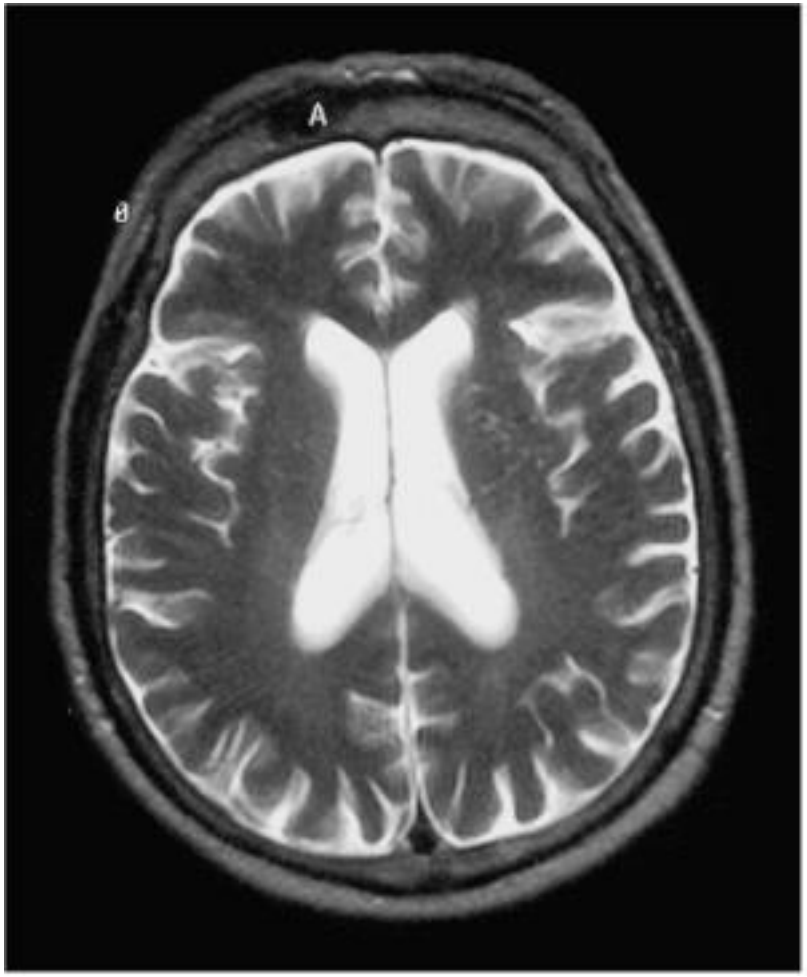
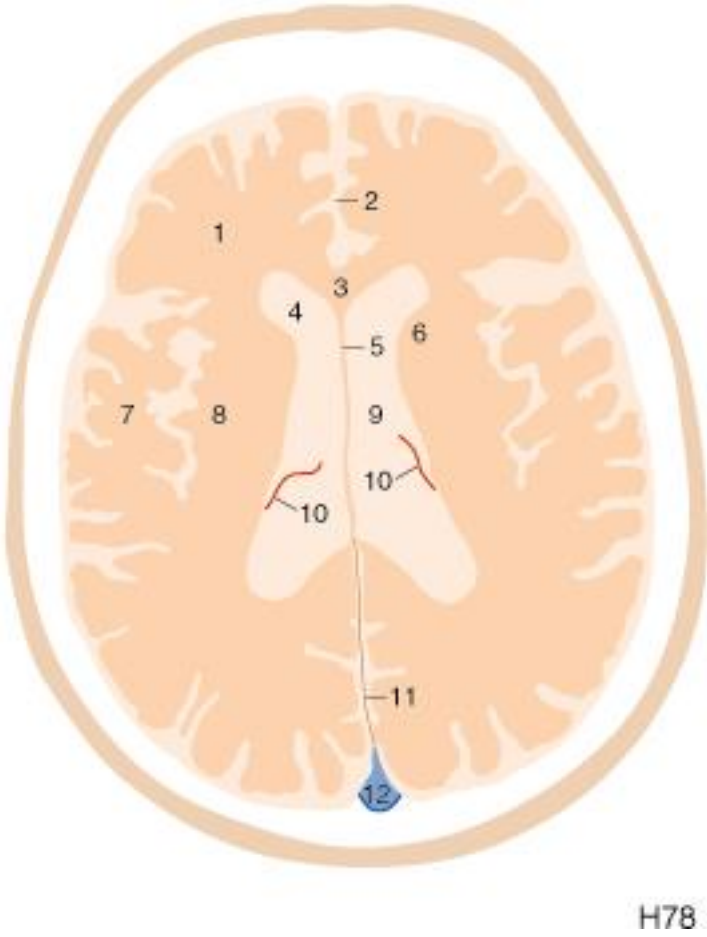
H40

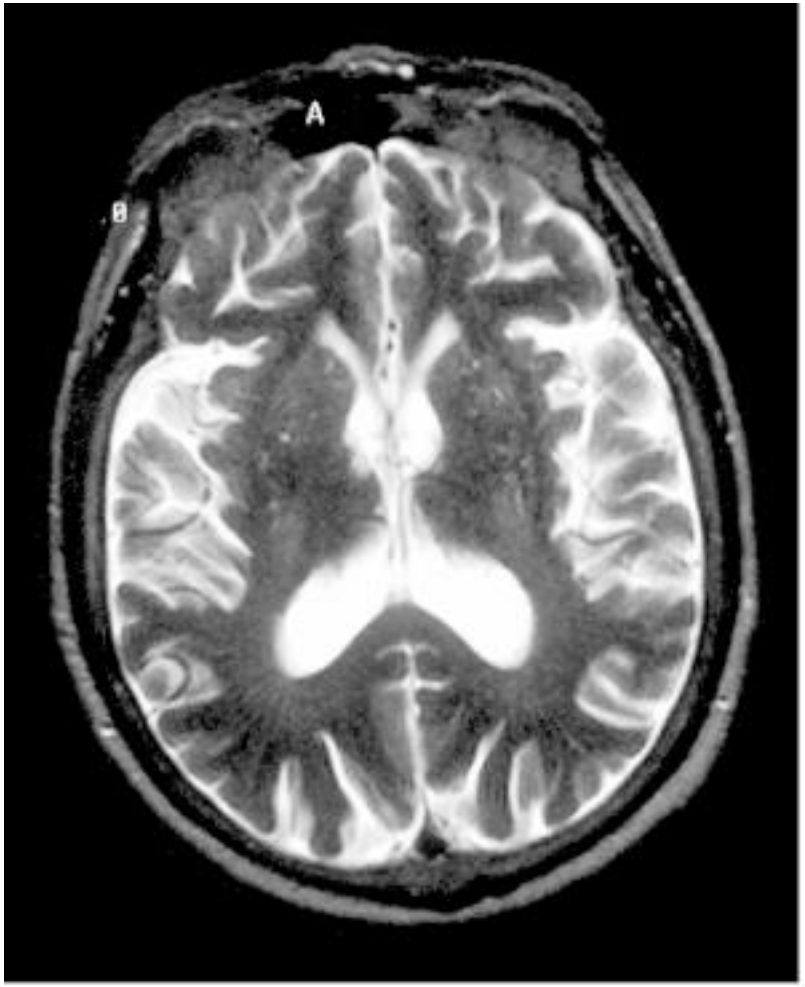
T2-weighted axial MRI

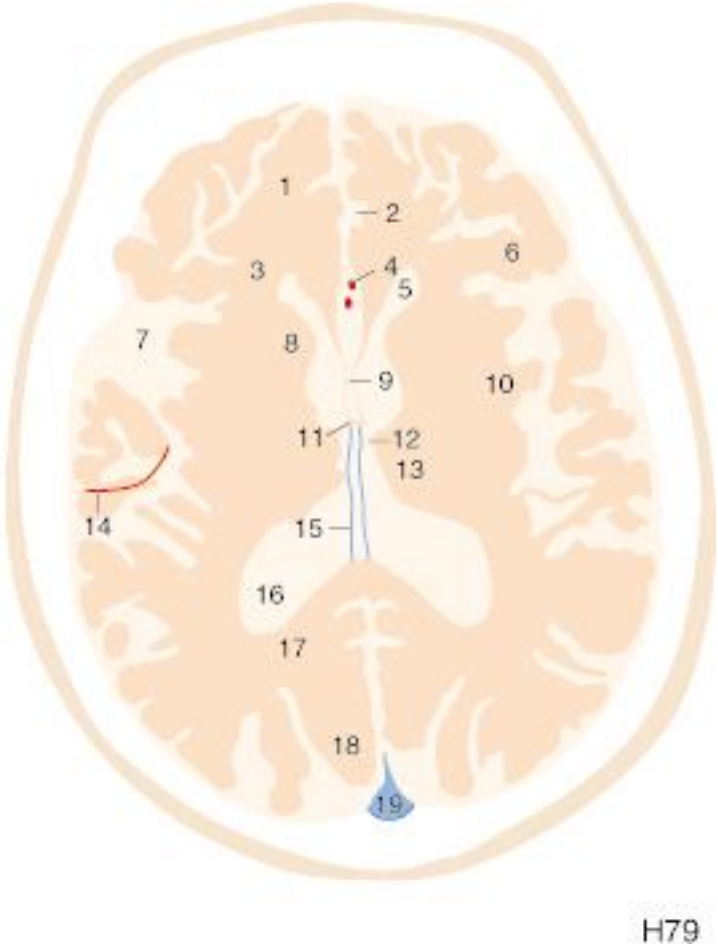




1. Lobus frontalis
2. Fissura longitudinalis cerebri
3. Genu corporis callosi
4. Ventriculus lat. cornu ant.
5. Septum pellucidum
6. Caput nuclei caudati
7. Operculum temporale
8. Insula
9. Ventriculus lateralis, pars centralis
10. Plexus choroideus
11. Falx cerebri
12. Sinus sagittalis sup.

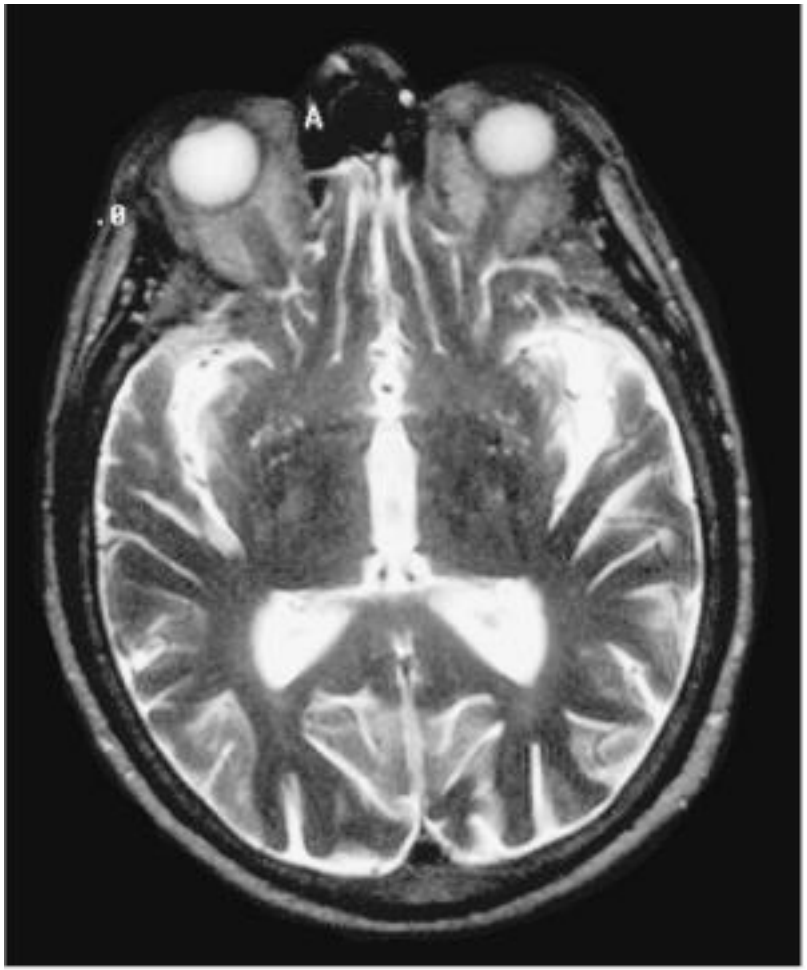
T2-weighted axial MRI

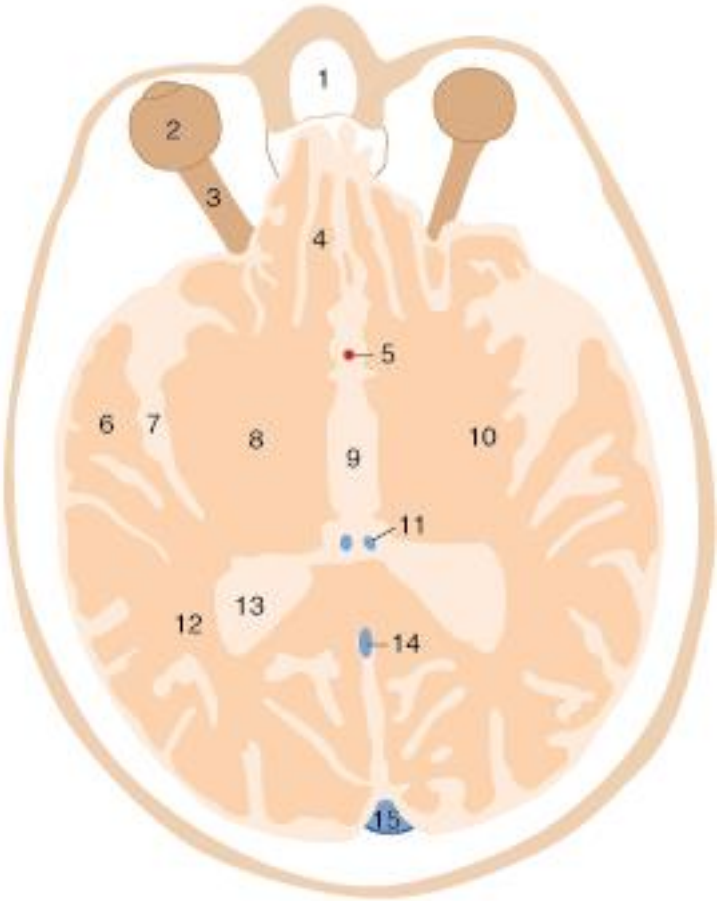




1. Gyri orbitales
2. Fissura longitudinalis cerebri et falx cerebri
3. Forceps minor
4. A. cerebri ant.
5. Ventriculus lat., cornu ant.
6. Operculum frontale
7. Fossa lateralis
8. Caput nuclei caudati
9. Septum pellucidum
10. Gyri insulares
11. Fornix
12. Foramen interventriculare
13. Thalamus
14. A. cerebri media
15. Vena cerebri interna
16. Ventriculus lat.
17. Forceps maior
18. Lobus occipitalis
19. Sinus sagitalis sup.

T2-weighted axial MRI

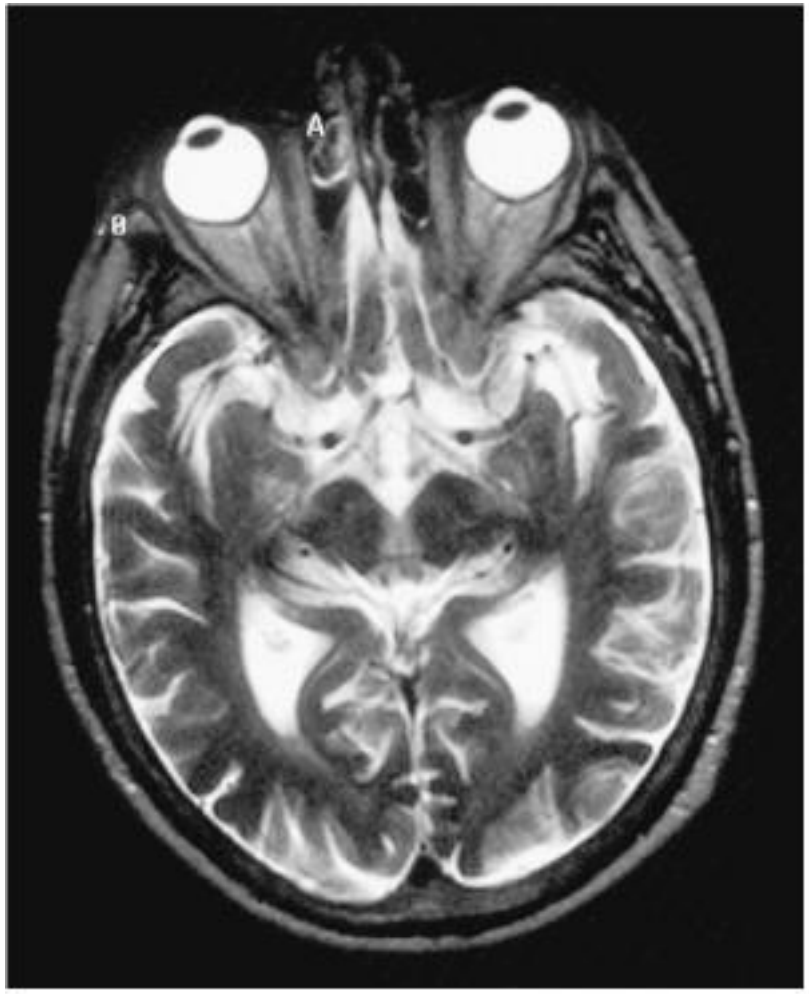


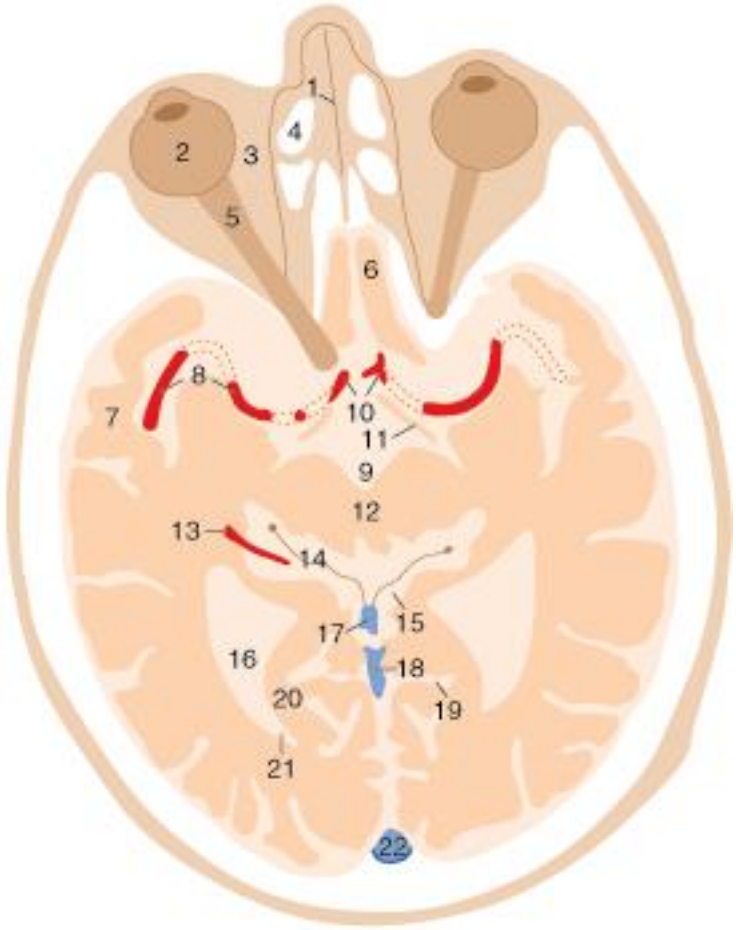


H80

1. Cavum nasi
2. Bulbus oculi
3. Nervus opticus
4. Gyrus rectus
5. A. cerebri ant.
6. Operculum temporale
7. Sulcus lateralis
8. Thalamus
9. Ventriculus tertius
10. Gyri insulares
11. Vena cerebri interna
12. Forceps maior
13. Trigonum collaterale
14. Sinus rectus
15. Sinus sagittalis sup.

T2-weighted axial MRI

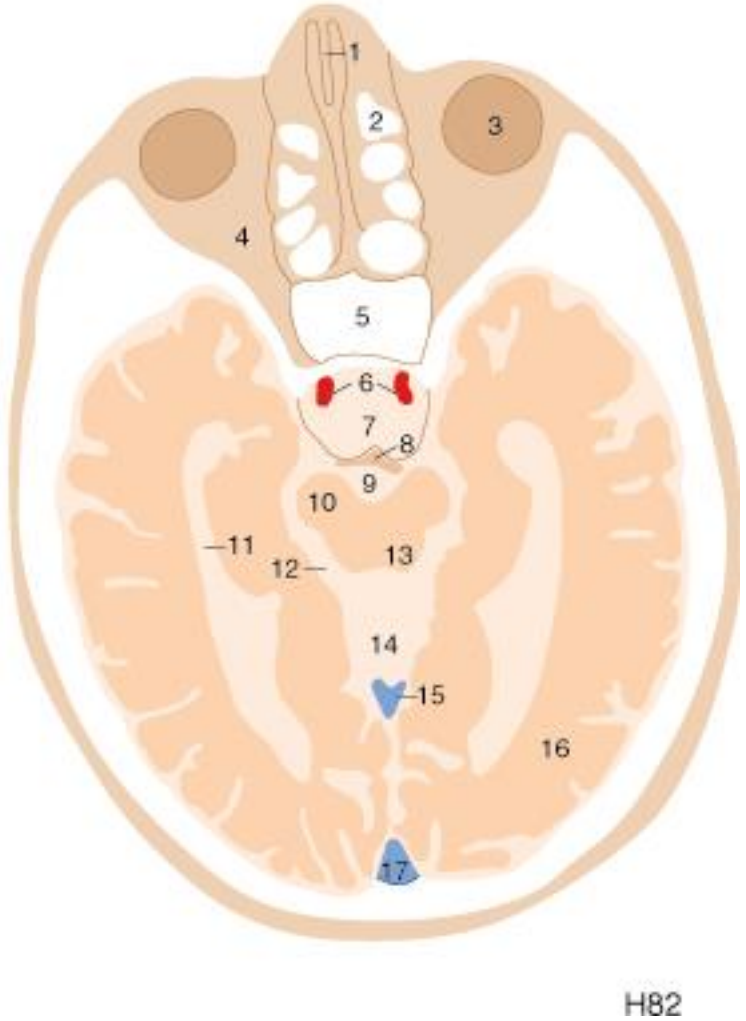




1. Septum nasi
2. Bulbus oculi
3. Orbita
4. Cellulae ethmoidales
5. Nervus opticus
6. Gyrus rectus
7. Lobus temporalis
8. A. cerebri med.
9. Fossa et cisterna interpeduncularis
10. A. cerebri ant.
11. Tractus opticus
12. Mesencephalon
13. A. cerebri post.
14. Cisterna ambiens
15. Cisterna venae magnae
16. Trigonum collaterale
17. Vena cerebri magna (Galeni)
18. Sinus rectus
19. Fissura calcarina
20. Calcar avis
21. Ventriculus lateralis, cornu posterius
22. Sinus sagittalis sup.

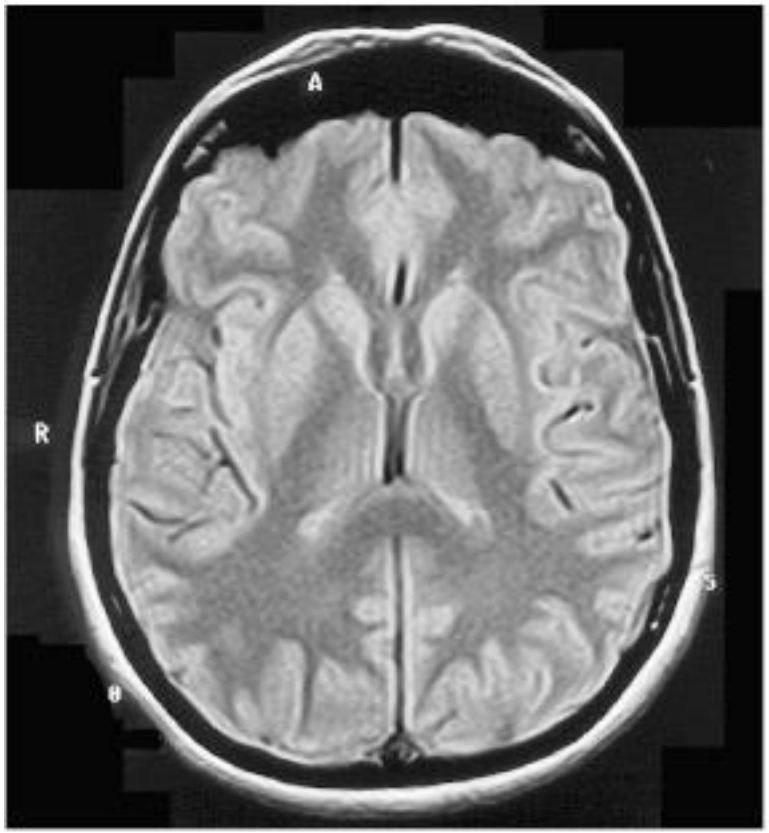
H81

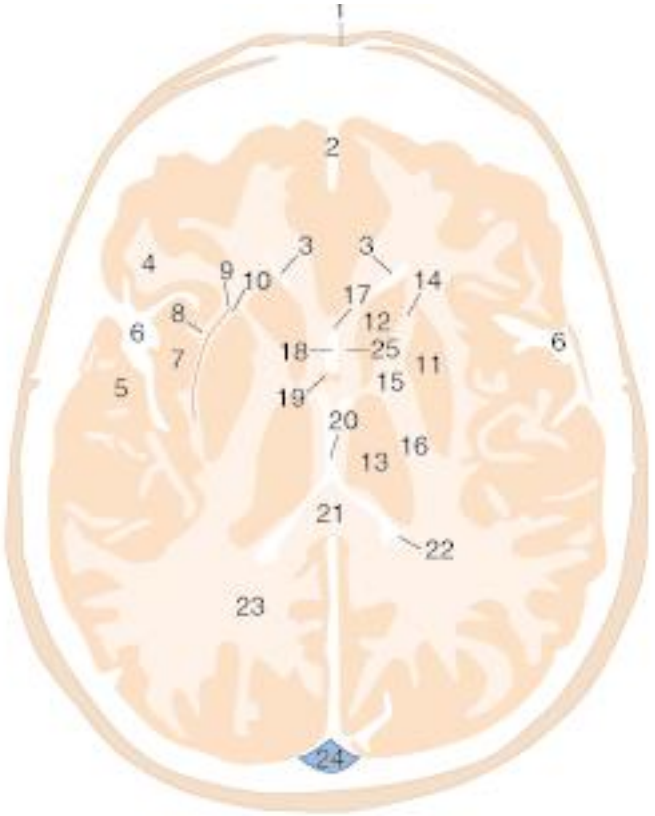
T2-weighted axial MRI



1. Septum nasi
2. Cellulae ethmoidales
3. Bulbus oculi
4. Orbita
5. Sinus sphenoidalis
6. A. carotis int.
7. Cisterna chiasmatis et infundibulum
8. Dorsum sellae
9. Fossa et cisterna interpeduncularis
10. Crus cerebri
11. Ventriculus lat., cornu inf.
12. Cisterna ambiens
13. Tectum mesencephali
14. Cisterna venae magnae
15. V. cerebri magna (Galeni)
16. Radiatio optica
17. Sinus sagittalis sup.

T1-weighted axial MRI of internal capsule

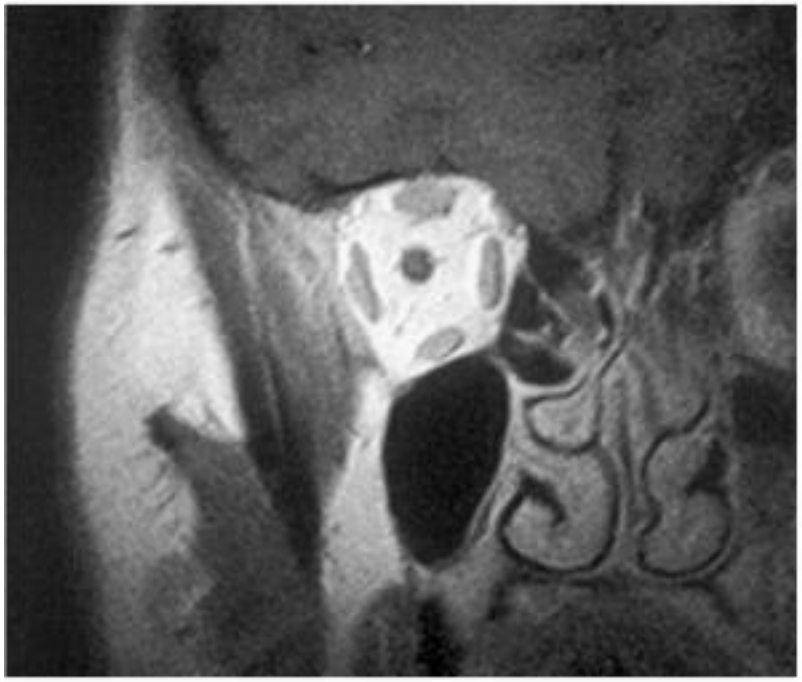


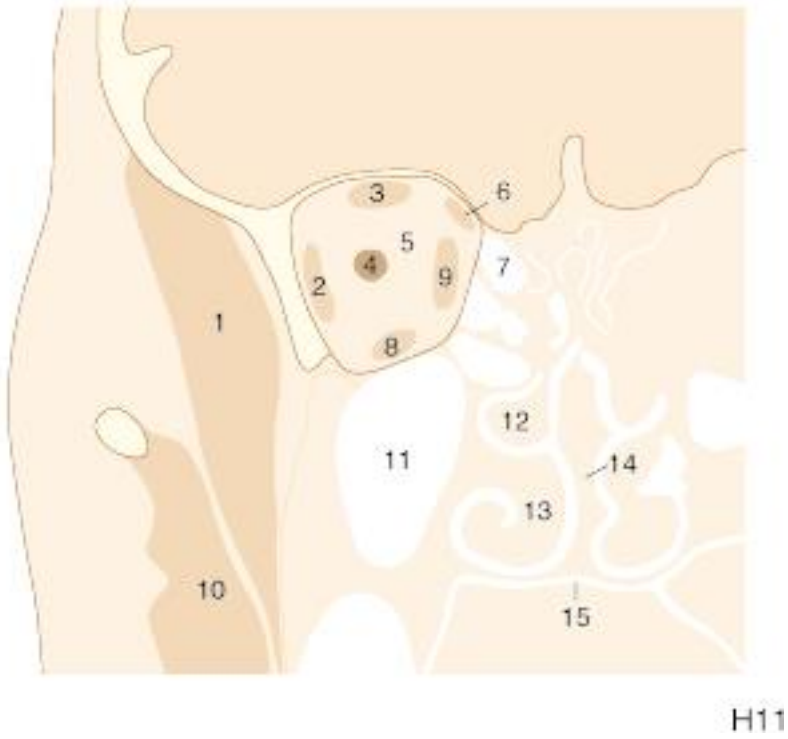


1. Stratum adiposum subcutaneum
2. Fissura longitudinalis
3. Ventriculus lat., cornu ant.
4. Operculum frontale
5. Operculum temporale
6. Fossa lateralis Sylvii
7. Insula
8. Capsula extrema
9. Claustrum
10. Capsula externa
11. Nucleus lentiformis
12. Caput nuclei caudati
13. Thalamus
14. Crus ant. capsulae internae
15. Genu capsulae int.
16. Crus post, capsulae int.
17. Rostrum corporis callosi
18. Cisterna pericallosa
19. Columnae fornicis
20. Ventriculus tertius et venae cerebri intt.
21. Splenium corporis callosi
22. Ventriculus lat.
23. Lobus occipitalis
24. Sinus sagittalis sup.
25. Area subcallosa

H1

Coronal MRI of the orbit

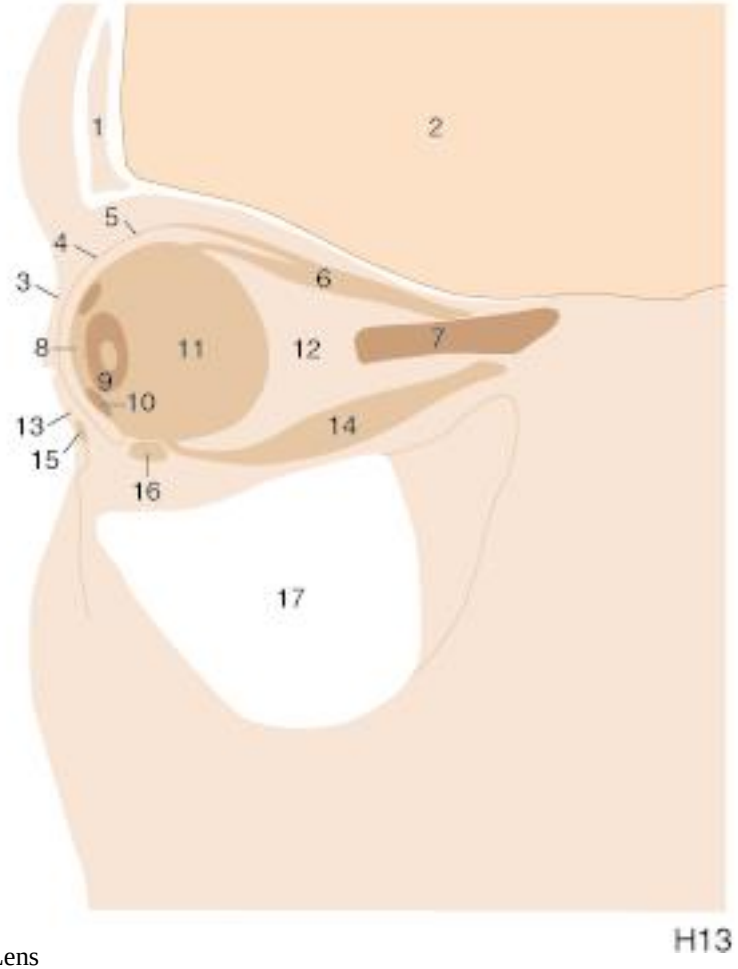




1. Temporalis muscle
2. Rectus laetralis muscle
3. Rectus superior and levator palpebrae superioris mmuscles
4. Optic nerve
5. Orbital fat pad
6. Obliquus superior muscle
7. Ethmoidal air cells
8. Rectus inferior muscle
9. Rectus medialis muscle
10. Zygomatic arch + masseter muscle
11. Maxillary sinus
12. Middle nasal concha
13. Inferior nasal concha
14. Nasal septum
15. Hard palate

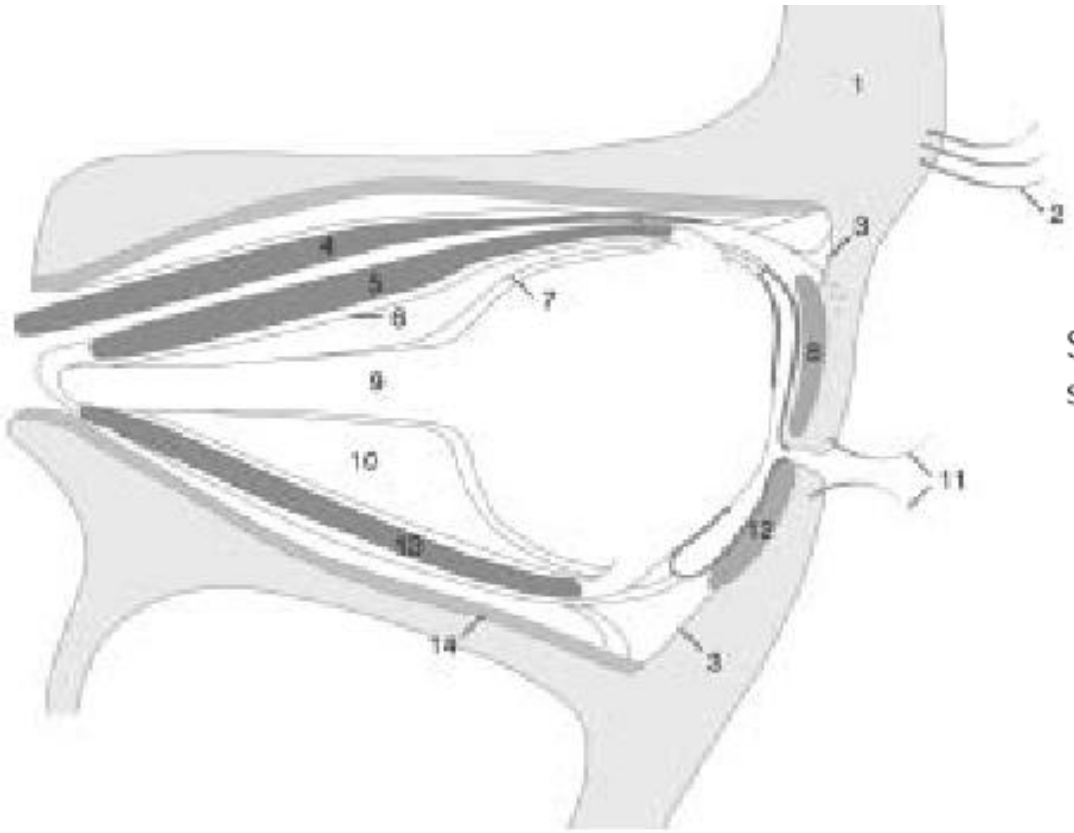
Csillag A, Atlas of Medical Imaging, Koenemann, Cologne, 1999

Sagittal MRI of the orbit



1. Frontal bone
2. Brain
3. Upper eyelid
4. Tarsal plate
5. Tendon of levator palpebrae sup. muscle
6. Rectus superior and levator palpebrae sup. muscles
7. Optic nerve
8. Anterior chamber of eye
9. Lens
10. Ciliary body
11. Vitreous
12. Orbital fat pad
13. Lower eyelid
14. Rectus inferior muscle
15. Orbicularis oculi muscle
16. Obliquus inferior muscle
17. Maxillary sinus

Csillag A, Atlas of Medical Imaging, Koenemann, Cologne, 1999

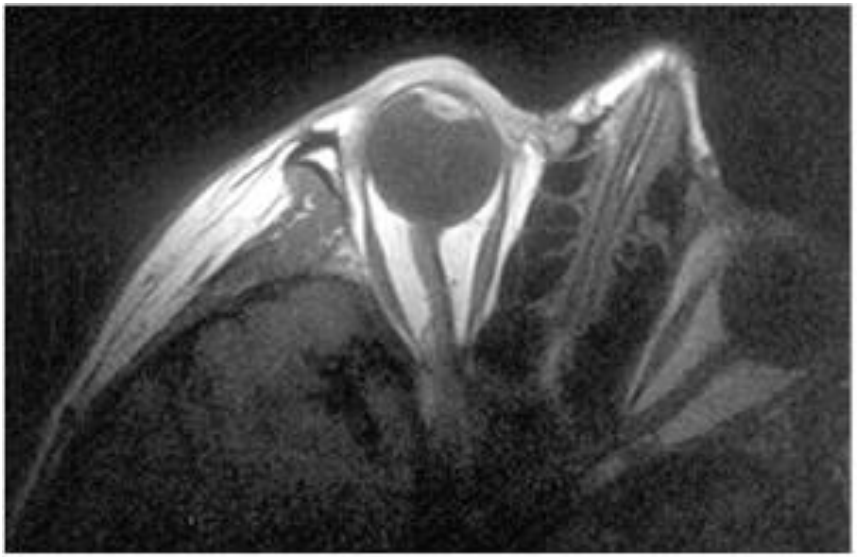


Schematic illustration of the fascial sheaths of the orbit. Sagittal section.

1. Frontal bone
2. Eyebrow (supercilia)
3. Orbital septum
4. Levator palpebrae superioris muscle
5. Superior rectus muscle
6. Fascial sheath of the superior rectus
7. Tenon's capsule
8. Superior tarsal plate
9. Optic nerve
10. Orbital fat
11. Eyelashes (cilia)
12. Inferior tarsal plate
13. Inferior rectus muscle
14. Periorbita

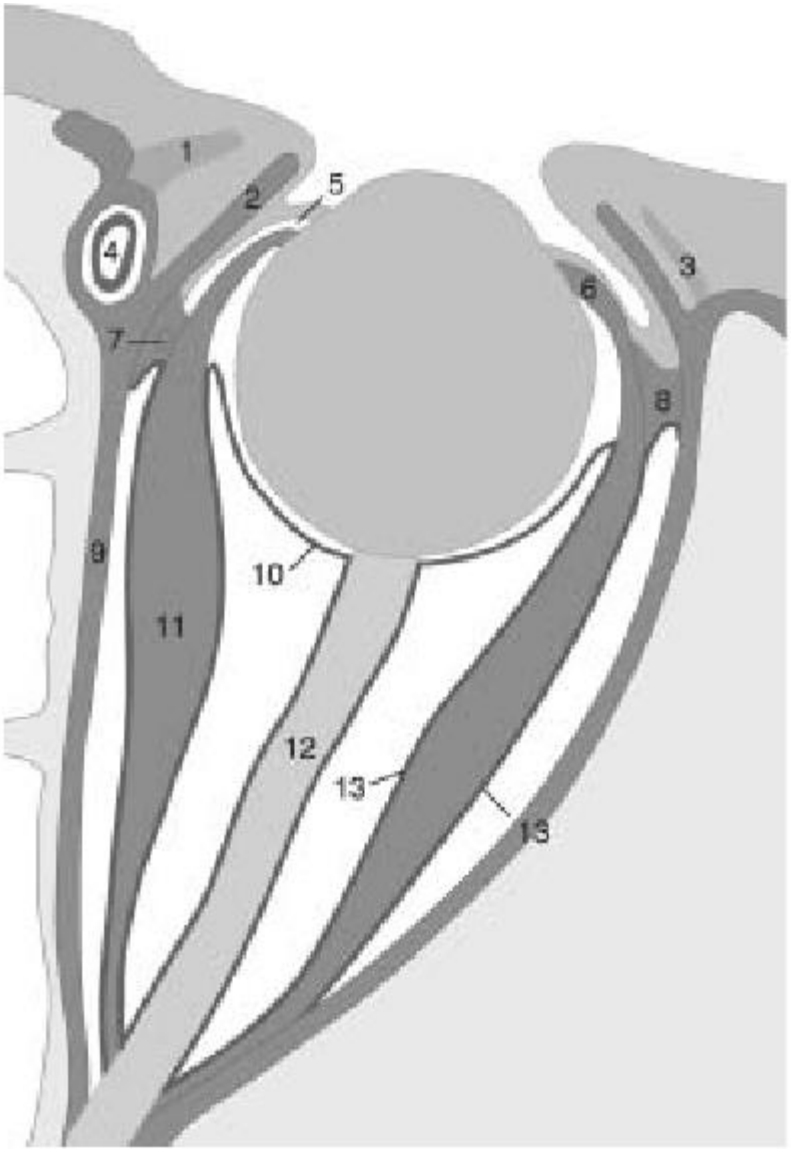
Csillag A, Atlas of the Sensory Organs, Humana, N.J. USA 2005

Axial MRI of the orbit



1. Iris
2. Zygomatic bone
3. Lens
4. Ciliary body
5. Medial check ligament
6. Eyeball (vitreous)
7. Rectus lateralis muscle
8. Optic nerve
9. Rectus medialis muscle
10. Orbital lamina
11. Orbital fat
12. Ethmoidal air cells

Csillag A, Atlas of Medical Imaging, Koenemann, Cologne, 1999

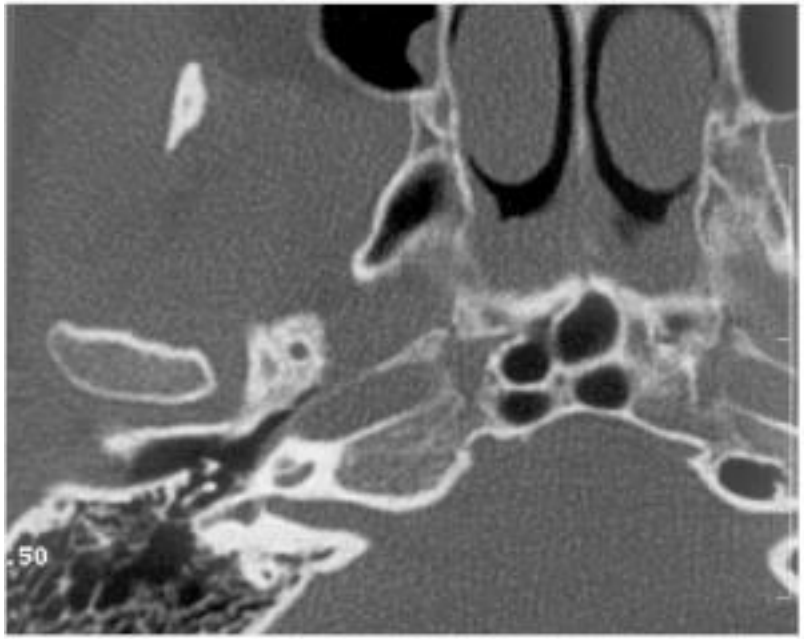


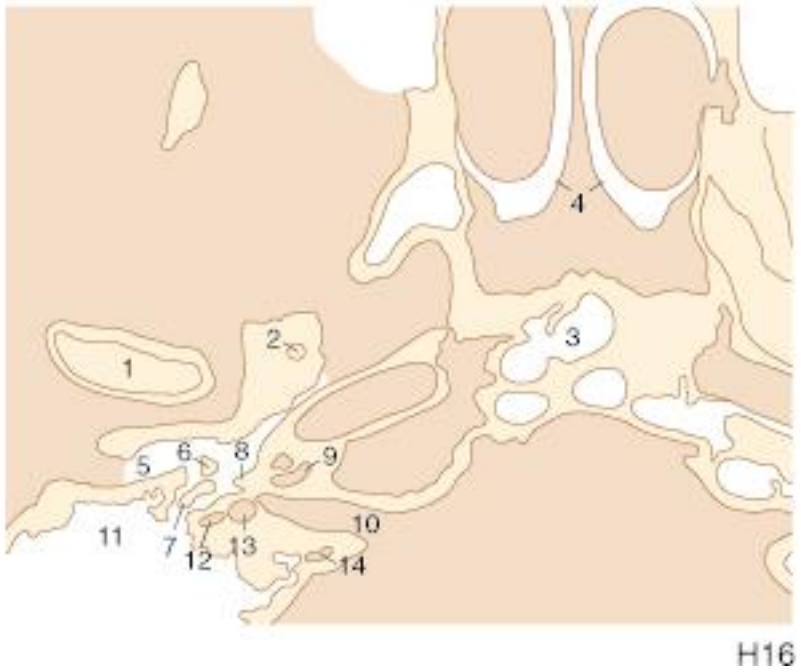
Schematic illustration of the fascial sheaths of the globe in relation to the extraocular muscles. Horizontal section (after Snell and Lemp).

1. Medial palpebral ligament
2. Orbital septum
3. Lateral palpebral ligament
4. Lacrimal sac
5. Tendon of medial rectus muscle
6. Tendon of lateral rectus muscle
7. Medial check ligament
8. Lateral check ligament
9. Periorbita
10. Tenon's capsule
11. Fascial sheath of medial rectus muscle
12. Optic nerve
13. Fascial sheath of lateral rectus muscle

Csillag A, Atlas of the Sensory Organs, Humana, N.J. USA 2005

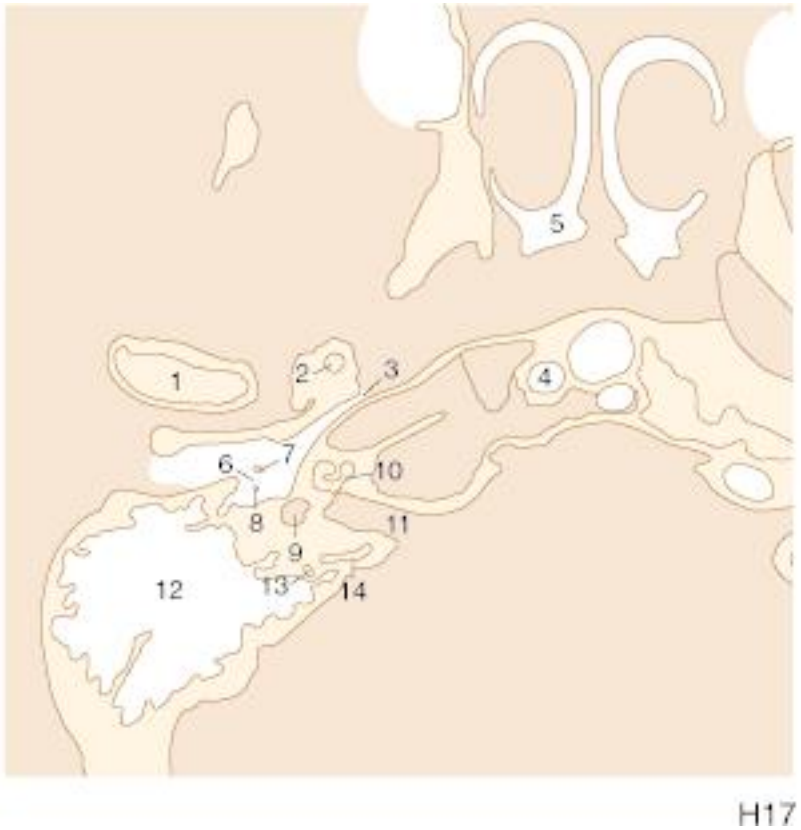
Axial CT of petrous temporal



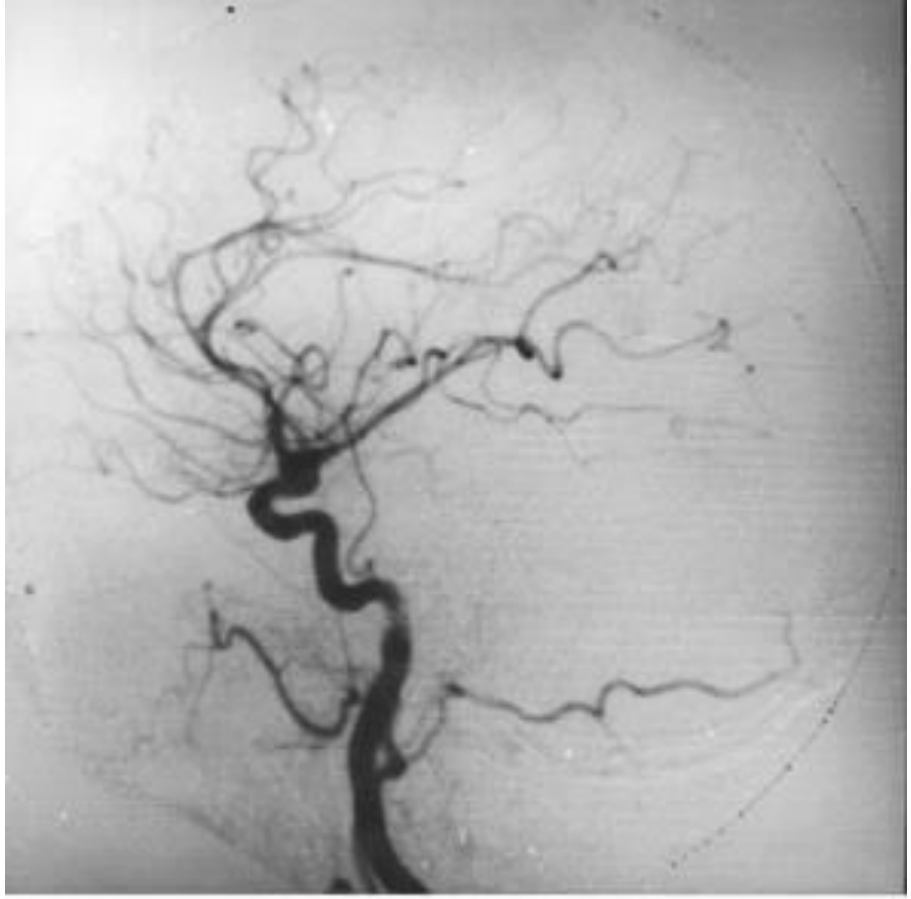


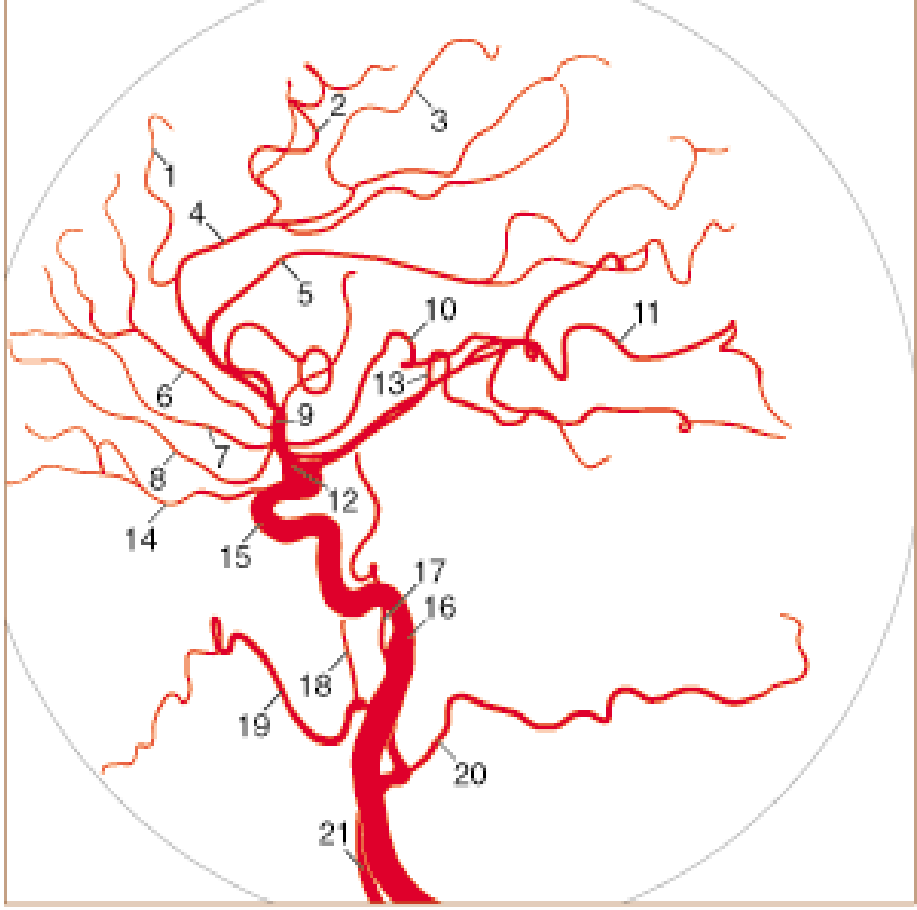
1. Head of mandible
2. Foramen spinosum
3. Sphenoidal sinus (partitioned)
4. Nasal cavity
5. External acoustic meatus
6. Malleus
7. Incus
8. Pyramidal eminence
9. Cochlea
10. Internal acoustic meatus
11. Mastoid air cells
12. Facial nerve canal
13. Vestibule
14. Posterior semicircular canal

Axial CT of petrous temporal



1. Head of mandible
2. Foramen spinosum
3. Auditory tube (Eustachian tube)
4. Sphenoidal sinus
5. Nasal cavity
6. Tympanic cavity
7. Malleus
8. Incus
9. Vestibule
10. Cochlea
11. Internal acoustic meatus
12. Mastoid air cells
13. Lateral semicircular canal
14. Posterior semicircular canal





Internal carotid artery DSA angiography lateral aspect

A. cerebri ant. (9.)

1. A. frontalis int. med.
2. A. frontalis int. post
3. A. centralis
4. A. calloso-marginalis
5. A. pericallosalis
6. A. frontopolaris
7. A. orbitofrontalis
8. A. frontobasalis

A. cerebri med. (12)

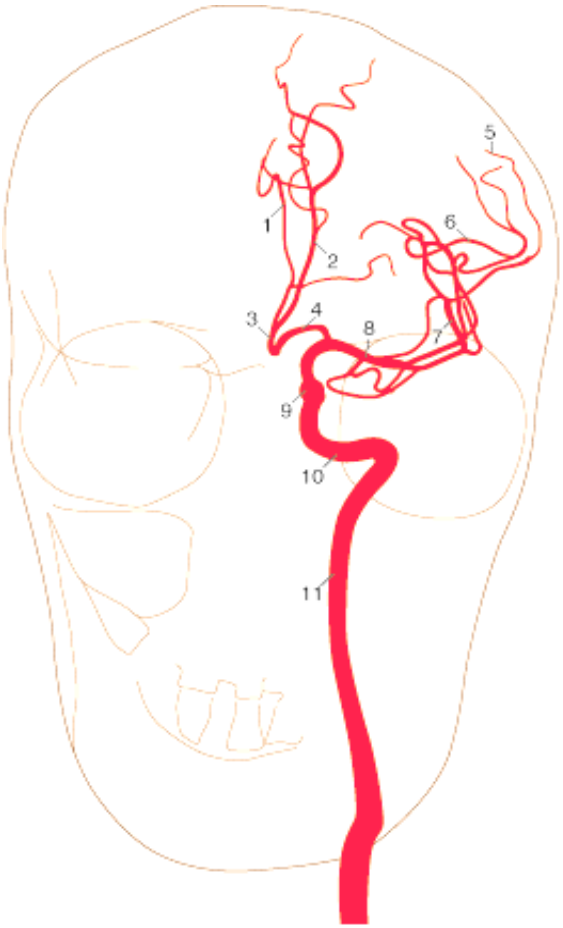
10. A. temporales ant. et med.
11. A. temporalis post.

A. carotis int. (16)

13. A. choroidea ant.
14. A. op hthalmica
15. Carotis syphon

A. carotis ext. (21)

17. A. temporalis spf.
18. A. palatina ascendens
19. A. facialis
20. A. occipitalis



H29

Internal carotid artery, angiography, anteroposterior (ap) aspect

A. cerebri ant.

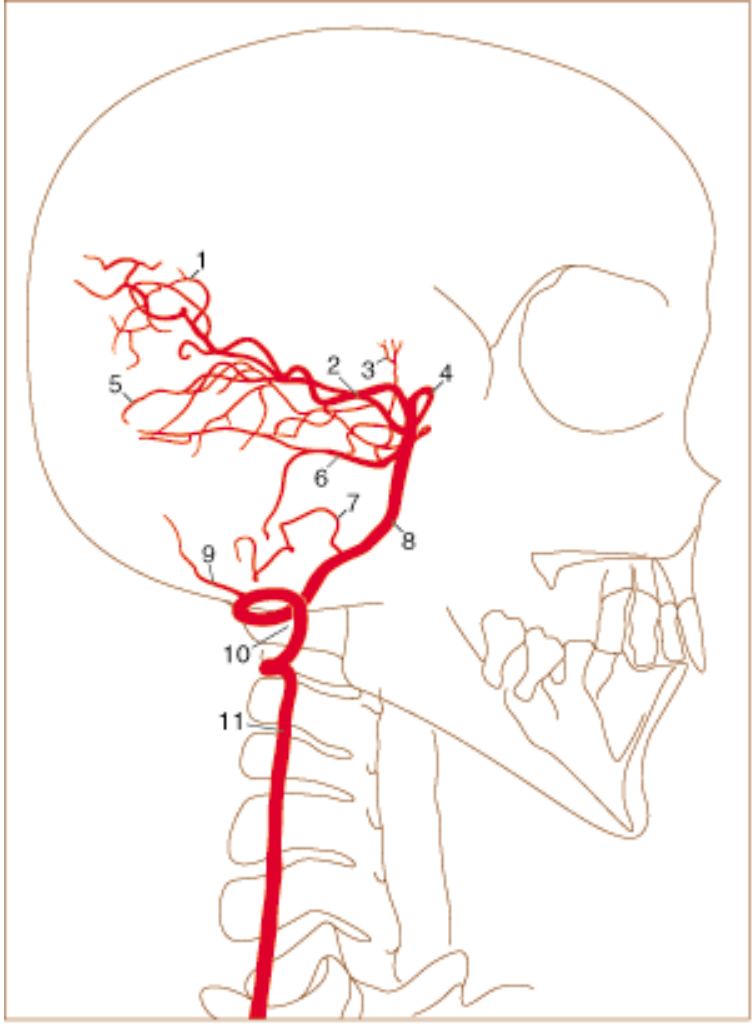
1. A. pericallosalis
2. A. callosomarginalis
3. Postcommunicating portion of a. cerebri ant.
4. Precommunicating portion of a. cerebri ant.

A. cerebri med.

5.. Rami parietales postt.
6. Portio opercularis
7. Portio insularis
8. Portio sphenoidalis

A. carotis int.

9. Carotis syphon
10. Portio petrosa
11. Portio cervicalis



Vertebral artery, angiography, lateral aspect

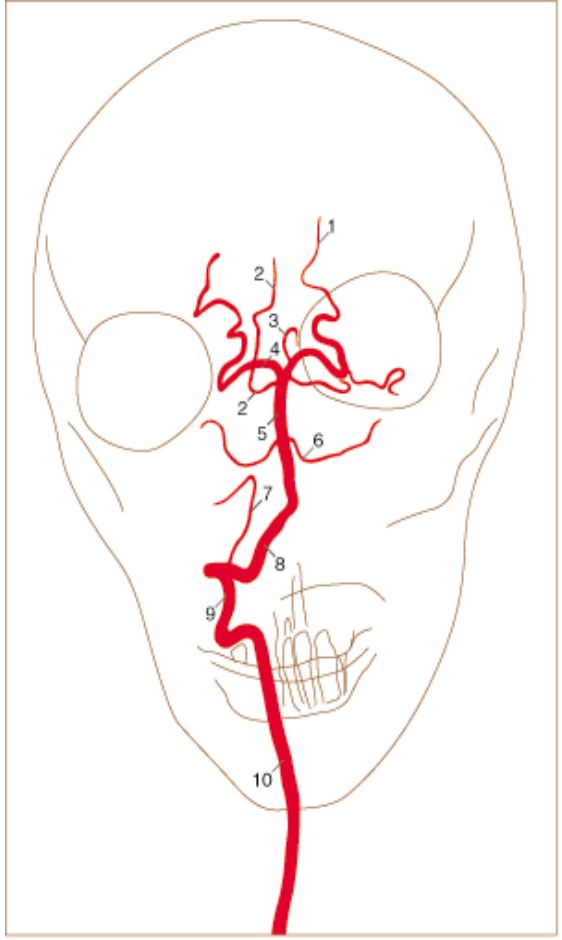
H19

A. basilaris

1. Rami parieto-occipitales
2. A. cerebri post. dext.
3. A. perforans thalami
4. A. cerebri post. sin.
5. A. occipitalis int (calcarina)
6. A. cerebelli sup.
7. A. cerebelli inf. ant.
8. A. basilaris

A. vertebralis

9. A. cerebelli inf. post.
10. Loop between the transverse foramina o of atlas and axis
11. Pars ascendens



H18

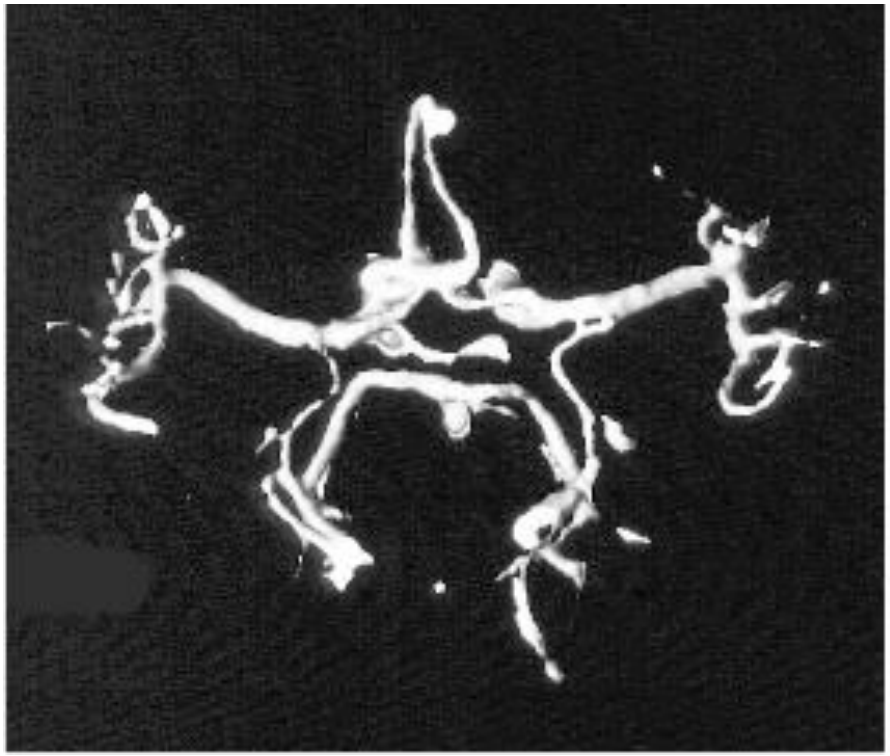
Vertebral artery, angiography, anteroposterior (ap) aspect

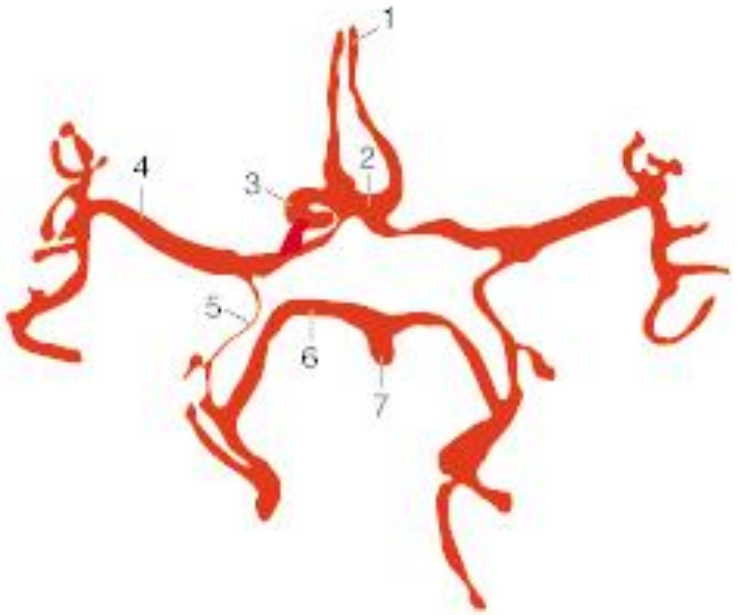
A. basilaris

1. Rami occipitales
2. A. cerebelli sup.
3. Rami perforantes thalami
4. A. cerebri post.
5. A. basilaris
6. A. cerebelli inf. ant.

A. vertebralis

7. A. cerebelli inf. post.
8. Pars intracranialis
9. Loop between transverse foramina of atlas and axis
10. Pars ascendens





Arterial circle of Willis

CT angiography, 3-D SSD reconstruction

1. A. cerebri ant.
2. A. communicans ant. (tágult)
3. A. carotis int.
4. A. cerebri media
5. A. communicans post.
6. A. cerebri post.
7. A. basilaris