

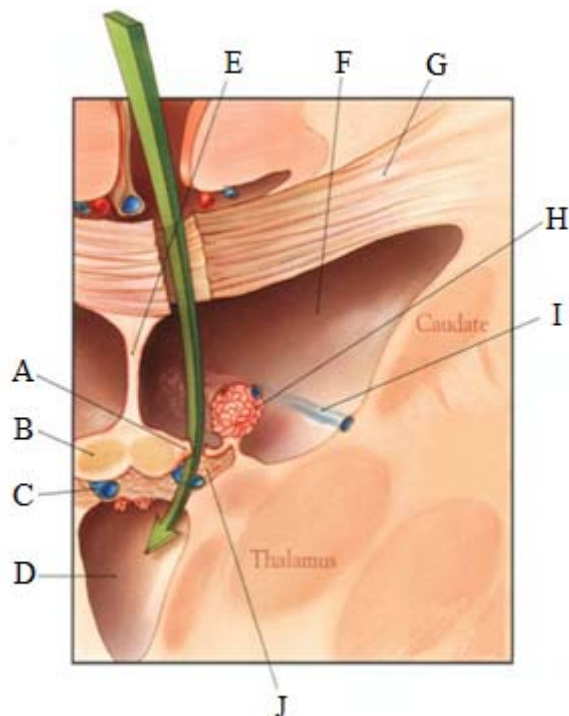
## EANS/UEMS European examination in neurosurgery

### Part I and II

Variants of questions with answers (compilation - Vyacheslav S. Botev, Department of Neurosurgery, M.Gorky Donetsk National Medical University)

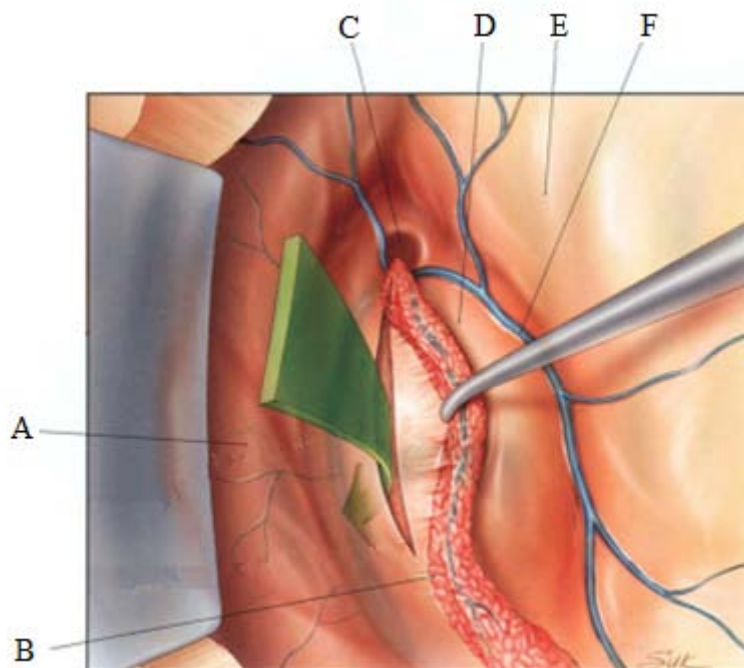
### Surgical approaches

For questions 1 to 10, the figure illustrates the transchoroidal approach into the third ventricle. Identify the following structures.



1. Tela choroidea
2. Choroid plexus
3. Fornix
4. Third ventricle
5. Lateral ventricle
6. Septum pellucidum
7. Internal cerebral vein
8. Tenia Fornicis
9. Thalamostriate vein
10. Corpus callosum

For questions 11 to 16, the figure illustrates the transchoroidal approach into the third ventricle. Identify the following structures.



11. Foramen of Monro
12. Caudate
13. Choroid plexus
14. Septum pellucidum
15. Thalamostriate vein
16. Thalamus

17. Consider the concept of “5-5-5.” [3]

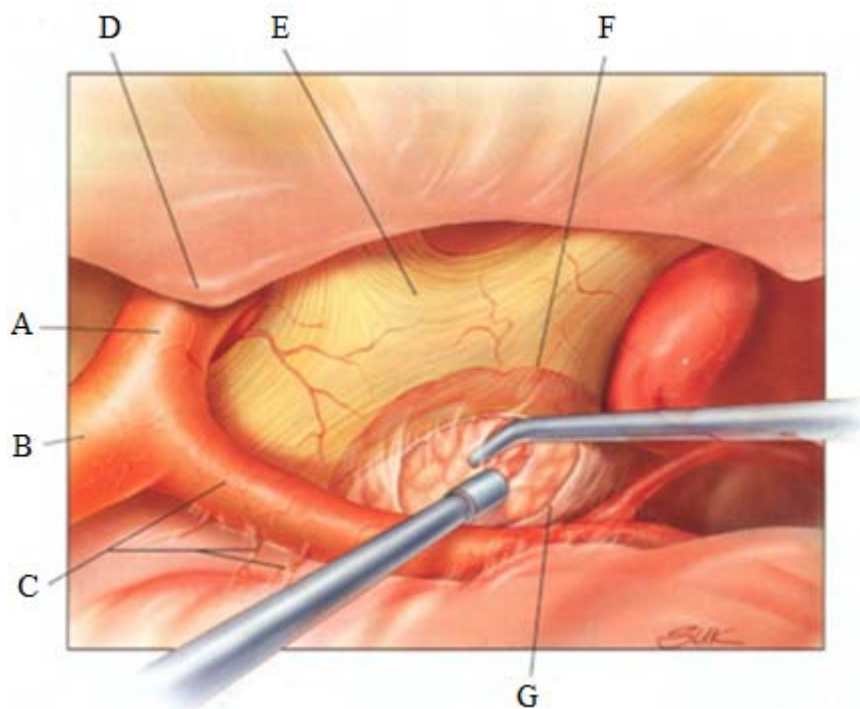
A.

1. This relates to the (...) incision
2. For a linear (...) incision
3. For access to the (...).

B.

1. The first number relates to the mm medial to the (...) (...).
2. The second number relates to the (...) (...) the notch.
3. The third number relates to the (...) (...) the notch.

For questions 18 to 24, the figure illustrates the transchoroidal approach into the third ventricle. Identify the following structures.



18. Optic chiasm
19. Tumor outline
20. Lamina terminalis
21. Middle cerebral artery
22. Anterior clinoid process
23. Anterior cerebral a. & lenticulostriate aa.
24. Internal carotid artery

25. Matching. <sup>[3]</sup>

Match the incision with the objective.

Incision: ① 5-6-4, ② 5-5-5, ③ 5-4-6

Objective: approach for

- A. The fifth nerve
- B. Hemifacial spasm
- C. Glossopharyngeal neuralgia
- D. Microvascular trigeminal decompression
- E. Vestibular schwannoma

26. Location of the inferior margin of the transverse sinus can be estimated <sup>[3]</sup>

- A. To be (...) (...) (...) above the
- B. (...) (...).

27. Complete the following regarding the superior sagittal sinus (SSS): <sup>[3]</sup>

- A. The risk in sacrifice of the SSS is (...) (...).
- B. True or False.
  - It almost always occurs with sacrifice of
    1. The posterior third
    2. The middle third
    3. The anterior third

28. Describe the transcallosal approach to the third ventricle. <sup>[3]</sup>

- A. The superior sagittal sinus (SSS) is often to the (...) of the sagittal suture.
- B. The cranial opening should be
  1. (...) anterior to the coronal suture
  2. and (...) behind it.
- C. The two cingulate gyri may be adherent in the midline and can be mistaken for the (...) (...).
- D.
  1. The corpus callosum has a distinct (...) color.
  2. It is located beneath the paired (...) arteries.
- E. The opening is usually made between the (...) (...) arteries.
- F. The trajectory of dissection is from the
  1. (...) (...).
  2. The (...) (...) (...).
  3. The (...) of (...) lies along this line.
- G.
  1. It is helpful to fenestrate the (...) (...)
  2. To prevent it from (...) into the ventricle
  3. Especially in a case of (...) (...).

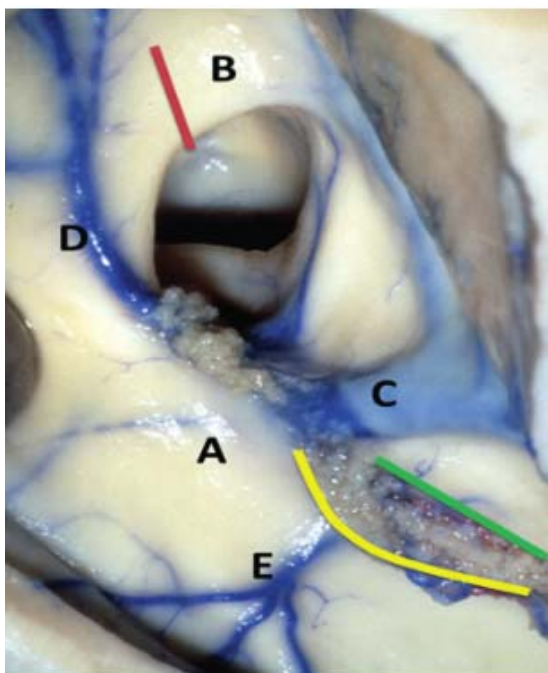
29. How can you tell which ventricle you are in? <sup>[3]</sup>

- A. The foramen of Monro is located (...).
- B. If the choroid plexus goes to the left to enter the foramen of Monro you are in the (...) ventricle.
- C. If you see no choroid plexus and no veins you may be in a (...) (...) (...).
- D. The safe way to enlarge the foramen of Monro is posteriorly between the (...) (...) and the (...).

30. Complete the following about approaches to the third ventricle: <sup>[3]</sup>

- A. The interhemispheric approach runs risk of injury to (...) (...).
- B. Which may produce (...).
- C. The anterior transcallosal approach runs risk of injury to (...) (...).
- D. Which may produce problem with (...) (...) (...) and (...) (...).
- E. The transcortical approach is
  1. Made through the (...) (...) gyrus.
  2. This is about the same spot used for (...) (...) (...).
  3. Called (...) point.

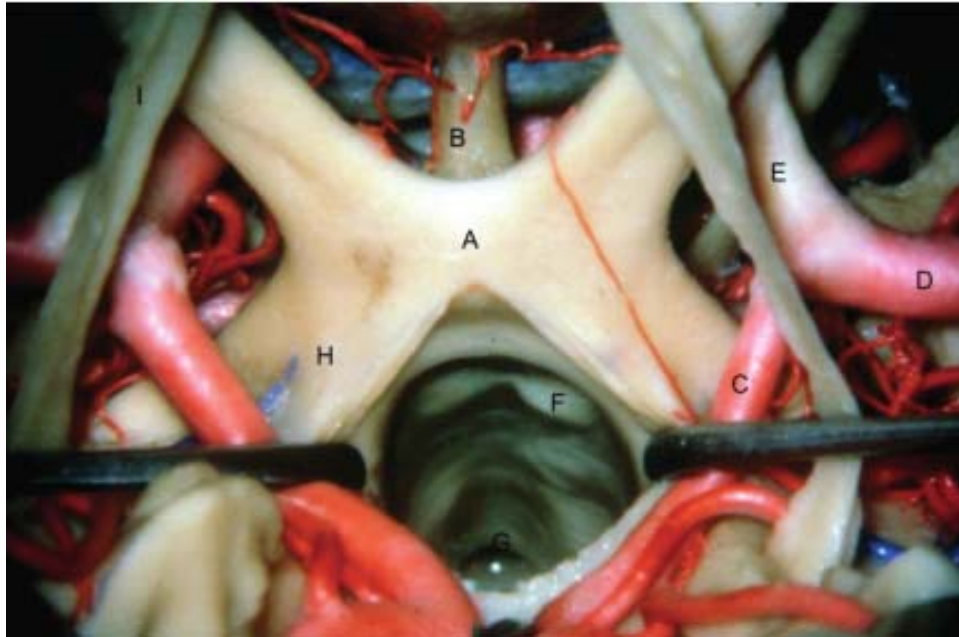
31.



1. Can you label the structures?
2. What structure can you see through the foramen of Monro?
3. What ventricle has been exposed? Which side?
4. Through which colored line would you choose to access the third ventricle? Yellow? Red? Green?
5. How do you preserve the thalamostriate vein?

## Anterior Fossa: The Subfrontal Approach

32.



1. Identify the labeled structures.
  2. What is the name of the membrane that was removed below structure A on the figure that gives access to the third ventricle?
  3. What term is used when it is difficult to access the above membrane due to the fact that structure A is too posterior (as in suprasellar tumor resection, for example)?
  4. What surgical approaches give access to this view?
33. What is meant by the term subfrontal approach and what are its most common variations?
34. What areas can be exposed with the extended subfrontal approach?
35. How inferior is the craniotomy performed and what are the landmarks for the osteotomies?
36. Once the frontal sinus has been opened, how can infections be prevented?
37. How is the frontal dura containing the frontal lobes separated from the dural base without injury to the superior sagittal sinus (SSS)?
38. The subfrontal approach can give access to the interpeduncular cistern; what is the structure that needs to be respected while gaining access to this region and why?
39. What is the most common transient complication of approaches that include removal of the roof of the orbit?

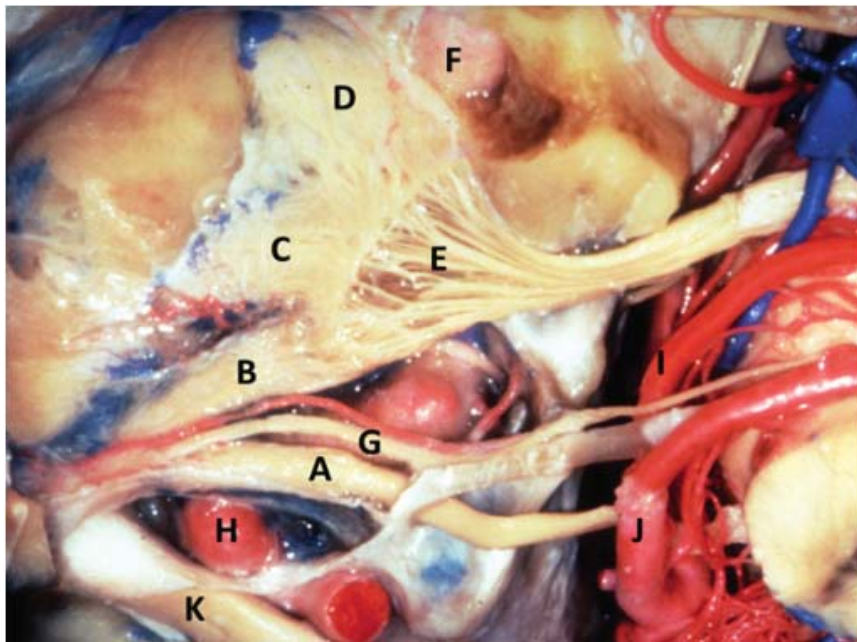
40. The first maneuver to release pressure from the optic nerves is unroofing the optic canal. What is the general direction of the optic canal from the perspective of this approach?

41. Does the anterior cranial fossa need to be reconstructed?

## Middle Fossa

### The Middle Fossa Approach

42.



1. What cranial fossa is exposed in this figure?

2. Can you name the labeled structures?

3. Which nerve passes between the superior cerebellar artery and the posterior cerebral artery?

4. Which portion of the cavernous sinus is pierced by the third cranial nerve?

5. What approaches can lead to this exposure?

43. What areas can be reached through a middle fossa approach?

44. When the condyle of the mandible has to be resected, what deficit is expected?

45. What is the most important landmark in the middle fossa to safely control the petrous carotid?

46. How can the petrous ICA be controlled if needed during removal of lesions of the middle and infratemporal fossa?

47. Approaching clival lesions through this approach at times requires removal of the tympanic bone; what are the landmarks to do it safely without injuring the eustachian tube?

48. What are the risks associated with this maneuver? What structure is at risk?

49. How can the sphenoid sinus be approached through the middle fossa approach?

50. What are the most common complications of the middle fossa approach?

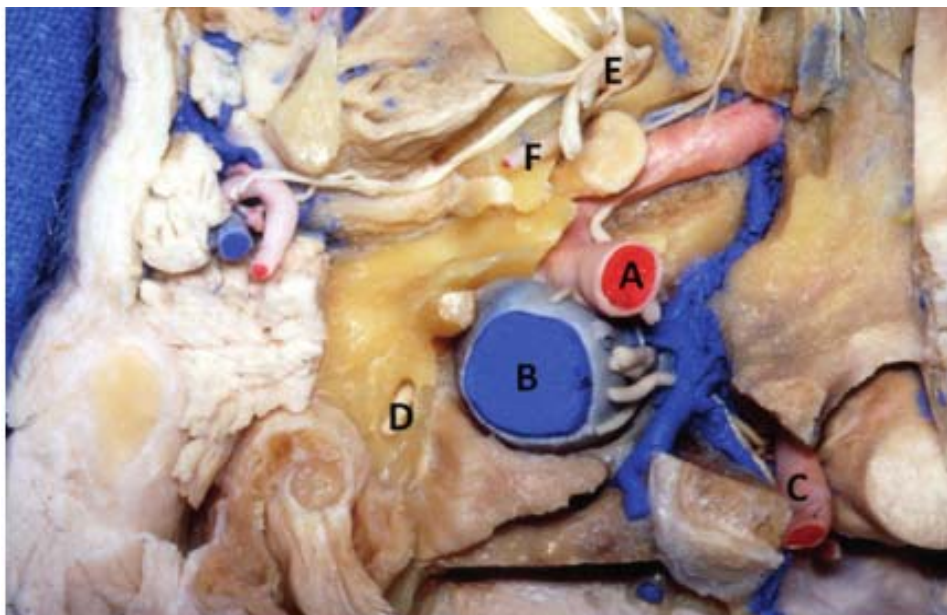
51. When elevating the dura from the petrous pyramid, what are the landmarks to be reached?

52. The extradural zygomatic middle fossa approach is preferred for surgical removal of trigeminal schwannoma. What are its advantages?

53. In lesions of the middle fossa involving the tentorium, which cranial nerve is at risk of injury?

54. What surgical maneuver improves basal exposure in the middle fossa approach?

55.



1. What area are you looking at?

2. Can you label the structures?

3. Through what foramina do these structures exit?

4. What nerves exit through the jugular foramen?

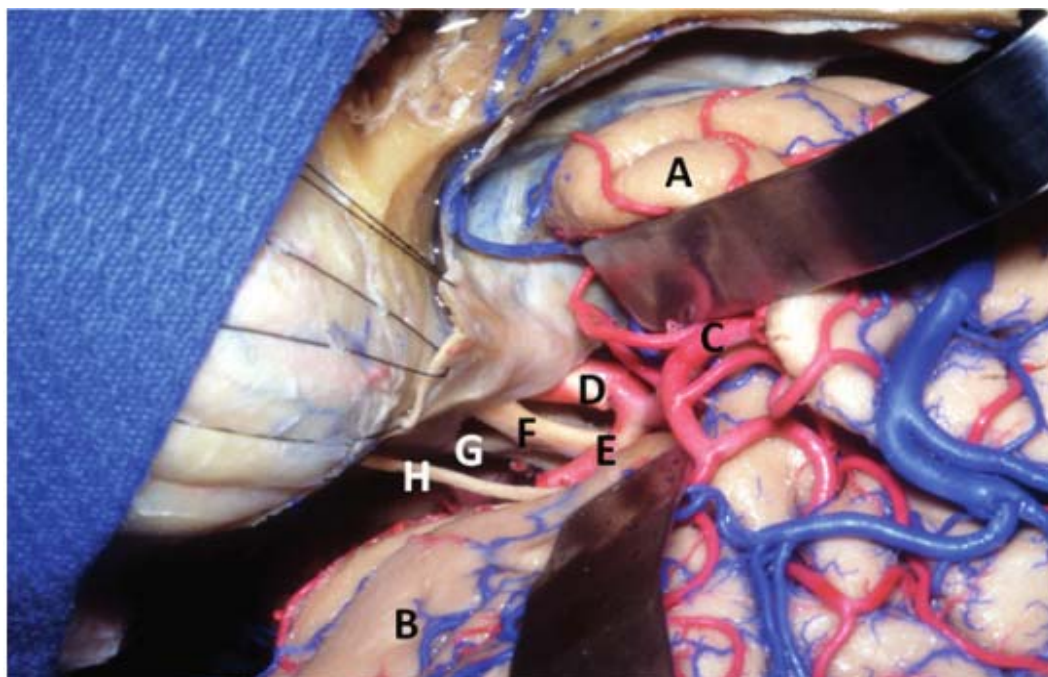
5. What two sinuses join together to form the internal jugular vein?

6. What are the five major branches of the intracranial intradural internal carotid artery?



## The Cranio-Orbitozygomatic Approach

56.



1. What approaches will get you to this view?
2. What nerve is at risk during the inferior limb of the skin incision of this approach?
3. Can you label the lobes of the brain seen in this image (A and B)?
4. Can you label the arteries seen in this image (C, D, and E)?
5. Can you label the nerves seen in this image (F, G, and H)?

57. What does the cranio-orbitozygomatic (COZ) approach involve?

58. What are the primary advantages of the COZ approach?

59. What lesions can be treated using the COZ approach?

60. What medial landmark can be used as a medial limit for the craniotomy anteriorly, while performing a COZ approach?

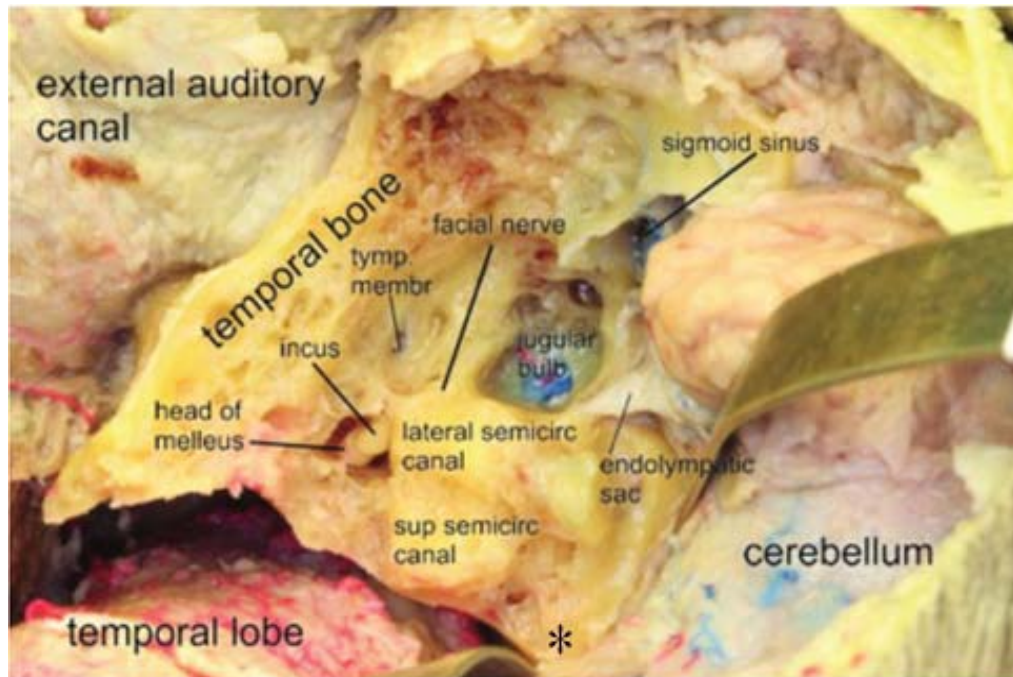
61. What complication can arise from excessive compression of the orbital apex during the COZ approach?

62. What complication can arise from lack of reconstruction of the orbital roof/wall at the end of the COZ approach?

63. If the original bone cannot be used for reconstruction of the orbital wall, how can this be circumvented in the COZ approach?

## The Petrosal Approach (Anterior, Posterior, and Combined)

64.



1. What approach is illustrated by this anatomical prosection?
  2. Which structure is represented by the “\*”?
  3. When drilling through the mastoid air cells of the petrous temporal lobe, how does one identify the semicircular canals?
  4. Once the petrous apex is identified and drilled down, what membranous structure can be cut to further the exposure?
  5. When cutting through the above structure, which cranial nerve should one be cognizant of and avoid injuring?
  6. Name some lesions that can be approached by this described approach.
65. What is the petrosal approach?
66. What is the difference between the anterior and posterior petrosal approaches?
67. What are some of the indications for the anterior petrosal approach?
68. What are some of the indications for the posterior petrosal approach?
69. When is the combined petrosal approach used?
70. When performing a mastoidectomy, how are the semicircular canals and facial nerve differentiated from the mastoid air cells?
71. What are some key steps in the closure in a posterior petrosal approach?
72. Where is the tentorium sectioned in the petrosal approach?

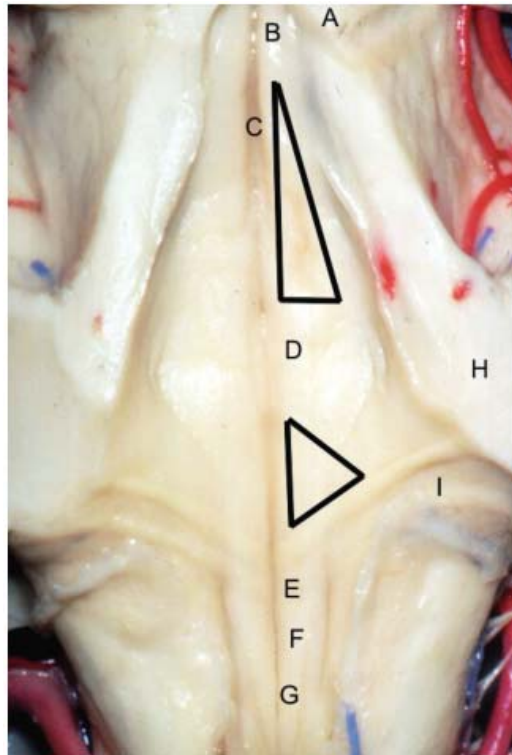
73. What are the advantages of the petrosal approach as compared with the retrosigmoid approach?

74. Around which venous sinus are burr holes made when performing the petrosal approach?

75. What is the anatomical structure located within the mastoid above which it is safe to drill the mastoid air cells without having to worry about injuring the facial nerve or semicircular canals?

### Posterior Fossa and Craniocervical Junction Acoustic Schwannomas and the Retrosigmoid Approach

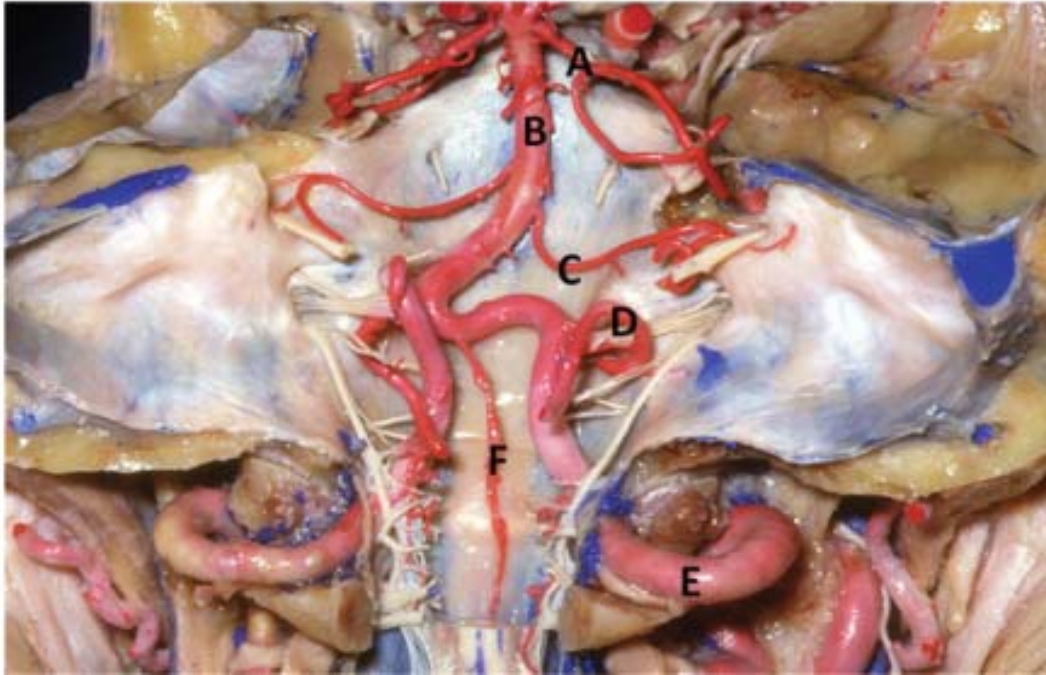
76.



1. What area are you looking at in this figure?
2. Identify the labeled structures
3. What do the two triangles represent?
4. Does this view show the roof or the floor of the fourth ventricle?
5. What surgical approaches give access to this view?

77. What are the three approaches used most commonly to treat acoustic schwannomas?

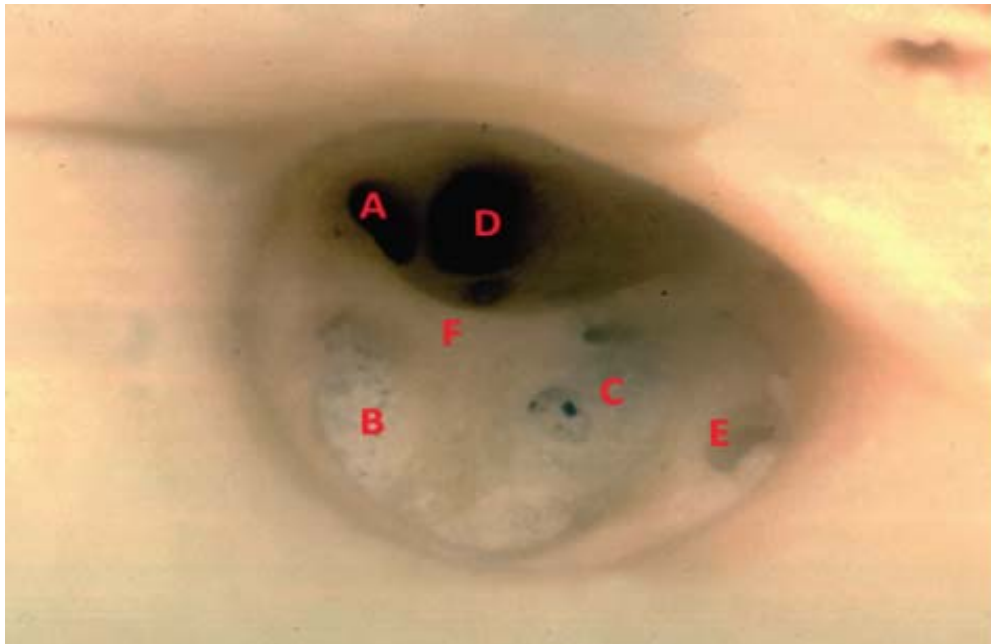
78. When is the translabyrinthine approach typically indicated?
  79. When is the middle fossa approach typically indicated?
  80. When is the retrosigmoid approach typically indicated?
  81. What are typical complications encountered with the retrosigmoid approach?
  82. How is a cerebrospinal fluid leak prevented in the retrosigmoid approach?
  83. How is a cerebrospinal fluid leak treated once it occurs in the retrosigmoid approach?
- 84.



1. Can you label the arteries present in this image?
2. What areas of the brainstem do these vessels supply?
3. What are the main neurovascular structures contained within the prepontine cistern?
4. What are the main neurovascular structures contained within the premedullary cistern?
5. What are the vascular structures contained within the supracerebellar cistern?
6. What is the relation between the C1 nerve root and the vertebral artery (VA)?
7. What are the two intradural segments of the VA?
8. What anatomical structure demarcated those two segments?

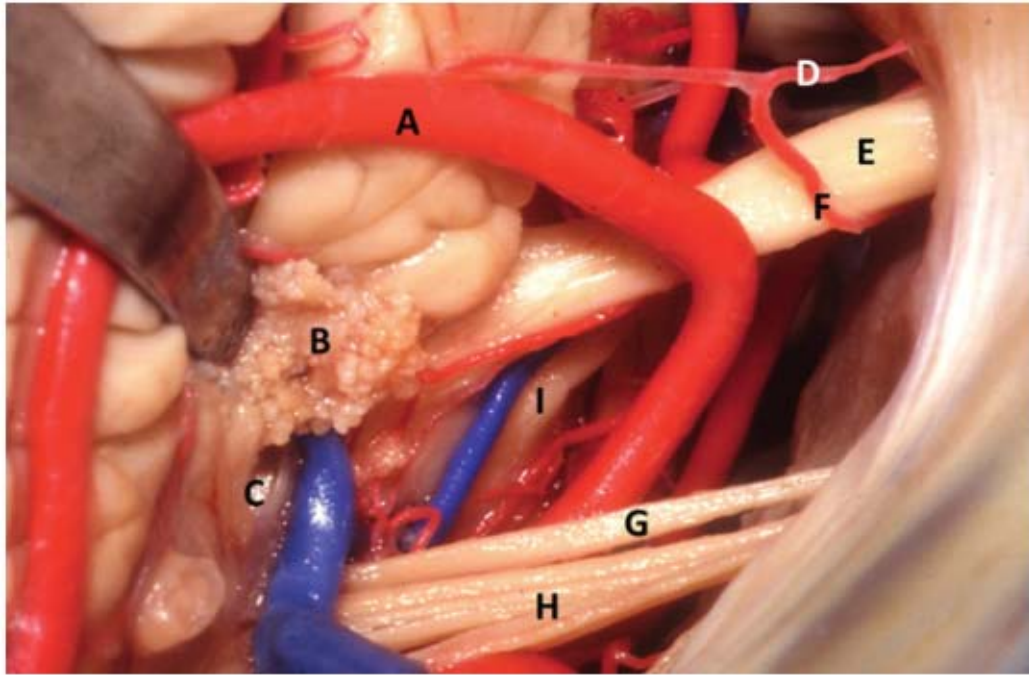
## The Far Lateral Approach

85.



1. What are we looking at in this figure?
  2. Which side?
  3. Can you name the structures labeled?
  4. What structure passes through the singular foramen?
  5. What other branches can originate from the inferior vestibular nerve?
86. What lesions are typically treated using the far lateral approach?
  87. What are two possible incision shapes for the far lateral approach?
  88. What dorsal muscles are typically dissected?
  89. What ventral muscles are typically dissected?
  90. How is a vertebral artery localized during the opening?
  91. What is the relation of the hypoglossal nerve to the vertebral artery intradurally?
  92. How can more ventral exposure be obtained at the level of the C1 and C2 spinal cord after the dura is opened?
  93. How much bone from the occipital condyle can be safely removed without destabilizing the occipitocervical junction?
  94. What are some complications with this approach?
  95. How is vertebral artery injury managed intraoperatively?

96.



1. What area are you looking at in this figure?
2. Can you name the labeled structures?
3. What approach should you use in hemifacial spasm to decompress the facial nerve near the brainstem?

### Answers

- |                           |   |
|---------------------------|---|
| 1. Tela choroidea         | J |
| 2. Choroid plexus         | H |
| 3. Fornix                 | B |
| 4. Third ventricle        | D |
| 5. Lateral ventricle      | F |
| 6. Septum pellucidum      | E |
| 7. Internal cerebral vein | C |
| 8. Tenia Fornicis         | A |
| 9. Thalamostriate vein    | I |
| 10. Corpus callosum       | G |

- |                         |   |
|-------------------------|---|
| 11. Foramen of Monro    | C |
| 12. Caudate             | E |
| 13. Choroid plexus      | B |
| 14. Septum pellucidum   | A |
| 15. Thalamostriate vein | F |
| 16. Thalamus            | D |

17. Consider the concept of “5-5-5.”

“5-5-5” incision (5 mm medial, extending 5 cm up to 5 cm down), used for approach to seventh / eighth nerve complex:

- microvascular decompression for hemifacial spasm,
- small vestibular schwannoma.

A.

1. This relates to the **skin** incision.
2. For a linear **paramedian** incision.
3. For access to the **CPA**.

B.

1. The first number relates to the mm medial to the **mastoid notch**.
2. The second number relates to the **cm above** the notch.
3. The third number relates to the **cm below** the notch.

- |   |   |
|---|---|
| 18. Optic chiasm                                | E |
| 19. Tumor outline                               | F |
| 20. Lamina terminalis                           | G |
| 21. Middle cerebral artery                      | B |
| 22. Anterior clinoid process                    | D |
| 23. Anterior cerebral a. & lenticulostriate aa. | C |
| 24. Internal carotid artery                     | A |
| 25. Matching.                                   |   |

1. “5-6-4” incision (incision placed 5 mm medial to mastoid notch, extending from 6 cm above notch to 4 cm below). High enough to expose transverse sinus:

- for approach to fifth nerve: microvascular decompression for trigeminal neuralgia.

2. “5-5-5” incision (5 mm medial, extending 5 cm up to 5 cm down), used for approach to seventh / eighth nerve complex.

3. “5-4-6” incision (5 mm medial, extending 4 cm up to 6 cm down): used for approach to lower cranial nerves:

- glossopharyngeal neuralgia.

Match the incision with the objective.

Incision: ① 5-6-4, ② 5-5-5, ③ 5-4-6

Objective: approach for

- |   |   |
|---|---|
| A. The fifth nerve                        | ① |
| B. Hemifacial spasm                       | ② |
| C. Glossopharyngeal neuralgia             | ③ |
| D. Microvascular trigeminal decompression | ① |
| E. Vestibular schwannoma                  | ② |

26. Location of the inferior margin of the transverse sinus can be estimated

- A. To be **two finger breadths** above the  
 B. **Mastoid notch**.

27. Complete the following regarding the superior sagittal sinus (SSS):

- A. The risk in sacrifice of the SSS is **venous infarction**.  
 B. True or False.

It almost always occurs with sacrifice of

- |                        |              |
|------------------------|--------------|
| 1. The posterior third | <b>true</b>  |
| 2. The middle third    | <b>true</b>  |
| 3. The anterior third  | <b>false</b> |

28. Describe the transcallosal approach to the third ventricle.

- A. The superior sagittal sinus (SSS) is often to the **right** of the sagittal suture.  
 B. The cranial opening should be  
 1. **Two third** anterior to the coronal suture.  
 2. and **one third** behind it.  
 C. The two cingulate gyri may be adherent in the midline and can be mistaken for the **corpus callosum**.  
 D.  
 1. The corpus callosum has a distinct **white** color.  
 2. It is located beneath the paired **pericallosal** arteries.  
 E. The opening is usually made between the **paired pericallosal** arteries.  
 F. The trajectory of dissection is from the  
 1. **Coronal suture**.  
 2. The **external auditory meatus**.  
 3. The **foramen of Monro** lies along this line.  
 G.  
 1. It is helpful to fenestrate the **septum pellucidum**.  
 2. To prevent it from **bulging** into the ventricle.  
 3. Especially in a case of **colloid cyst**.



29. How can you tell which ventricle you are in?

- A. The foramen of Monro is located **medially**.
- B. If the choroid plexus goes to the left to enter the foramen of Monro you are in the **right** ventricle.
- C. If you see no choroid plexus and no veins you may be in a **cavum septum pellucidum**.
- D. The safe way to enlarge the foramen of Monro is posteriorly between the **choroid plexus** and the **fornix**.

30. Complete the following about approaches to the third ventricle:

- A. The interhemispheric approach runs risk of injury to **bilateral cingulate gyrus**.
- B. Which may produce **transient mutism**.
- C. The anterior transcallosal approach runs risk of injury to **bilateral fornices**.
- D. Which may produce problem with **short-term memory** and **new learning**.
- E. The transcortical approach is
  1. Made through the **middle frontal** gyrus.
  2. This is about the same spot used for **external ventricular drain** .
  3. Called **Kocher** point.

31.

1. A. Body of fornix
  - B. Column of fornix
  - C. Thalamostriate vein
  - D. Septal vein (anterior)
  - E. Septal vein (posterior)
2. The massa intermedia.
3. The lateral ventricle.

The right side. Pay attention to the thalamostriate vein (C), because it serves as the indicator. If the thalamostriate vein is at the right side of the choroid plexus, you are in the right ventricle and vice versa.

4. Via the yellow line or tenia fornix (transchoroidal approach). You do not want to go through the green line, which is the tenia thalami, as this approach will lead you to encounter multiple vascular structures. By going through the red line, you will disrupt the fornix, which may lead to memory loss.
5. By not disrupting the attachments of the choroid plexus to the vein or the thalamus!

## Anterior Fossa: The Subfrontal Approach

### 32.

1. A. Optic chiasm
- B. Pituitary stalk
- C. Anterior cerebral artery
- D. Middle cerebral artery
- E. Internal carotid artery
- F. Mamillary body
- G. Aqueduct of Sylvius
- H. Optic tract
- I. Olfactory tract
2. Lamina terminalis.
3. Postfixed chiasm.
4. Anterior transcallosal approach, subfrontal approach, cranio-orbital, or extended pterional approach.

**33.** The subfrontal approach includes a bifrontal craniotomy, and, depending on the site of the lesion that is being addressed, can also include removal of the supraorbital rims alongside with the anterior aspect of both orbital roofs.

### 34.

1. Anterior cranial fossa
2. Middle and posterior fossa between the petrous and cavernous ICA
3. Foramen magnum
4. Anterior portion of the third ventricle

**35.** Down to the level of the anterior cranial fossa, performing a cut at the nasofrontal suture through the frontal sinus. This provides a view flush with the fossa without any obstruction.

### 36.

1. Exenteration of the mucosa and opening of the posterior wall of the sinus into the cranial cavity.
2. Packing of the nasofrontal ducts with fat or muscle.

**37.** This is done by ligation of the inferior portion of the SSS and sharp dissection toward the falx.

38. The Lilliequist membrane, which protects important vascular structures, including the basilar and posterior cerebral arteries and perforators from the posterior circulation.
39. Swelling of the tissues surrounding the orbit, especially if the periorbita was violated during the dissection from the orbital roof.
40. The optic canals is directed downward and outward at an angle of 45 degrees.
41. No. Reconstruction is not always necessary, especially if a vascularized pericranial flap is used for closure.

### Middle Fossa

#### The Middle Fossa Approach

42.

1. Middle cranial fossa, right side.
2. A. Third nerve
  - B. Trigeminal nerve ( $V_1$ ): ophthalmic
  - C. Trigeminal nerve ( $V_2$ ): maxillary
  - D. Trigeminal nerve ( $V_3$ ): mandibular
  - E. Gasserian ganglion
  - F. Internal carotid: petrous portion
  - G. Trochlear nerve
  - H. Internal carotid: cavernous portion
  - I. Superior cerebellar artery
  - J. Posterior cerebral artery
  - K. Optic nerve
3. Third nerve.
4. Posterior and superior.
5. Middle fossa approach, anterior petrosal approach, subtemporal approach.

43. The middle fossa approach with its variants and extension can be safely used to approach lesions of the petrous apex, infratemporal and pterygopalatine fossa, clivus, and sphenoid region.

44. It is usually tolerated very well. At times the patient can have a slight difficulty chewing on the side of the condylectomy.

45. The greater superficial petrosal nerve usually lies 0.5 cm superiorly to the horizontal segment of the carotid artery.
46. In two ways: either at the neck or by the unroofing of the petrous ICA and inflation of a Fogarty balloon compressing the artery.
47. Lateral to the genu of the petrous ICA, the tensor tympani muscle is directly above the Eustachian tube. After the bone flap of middle fossa craniotomy is turned additional bone is rongeuired to have an exposure flush with floor of the temporal fossa.
48. Excessive force can fracture the external auditory meatus.
49. Drilling the bone between  $V_2$  and  $V_3$  provides access to the lateral compartment of the sphenoid sinus.
50. Lesion to the ICA, CSF leak through the Eustachian tube or sphenoid, malocclusion.
51. The internal acoustic meatus and the crest at the ridge of the pyramid.
52. The extradural middle fossa approach allows for a multiplicity of working angles and the possibility of reaching and safely removing infratemporal, intramaxillary, intrasphenoidal, intraorbital, cavernous sinus, and posterior fossa extensions (through the enlarged mouth of Meckel's cave).
53. The trochlear.
54. The zygoma is detached using the B1 drill attachment with oblique anterior cuts through the malar eminence and the through the root posteriorly. The temporal muscle is detached at the level of the superior temporal line and reflected down with the zygoma to access the middle fossa.
- 55.
1. Skull base, jugular foramen region.
  2. A. Internal carotid artery
    - B. Internal jugular vein
    - C. Vertebral artery
    - D. Facial nerve
    - E. Cranial nerve  $V_3$
    - F. Anterior branch of the middle meningeal artery

3. The above structures exit respectively through the following foramina:
  - A. Carotid canal
  - B. Jugular foramen
  - C. Foramen magnum
  - D. Stylomastoid foramen
  - E. Foramen ovale
  - F. Foramen spinosum
4. • Cranial nerve IX
  - Cranial nerve X
  - Cranial nerve XI
5. • Inferior petrosal sinus
  - Sigmoid sinus
6. • Ophthalmic artery
  - Posterior communicating artery
  - Anterior choroidal artery
  - Anterior cerebral artery
  - Middle cerebral artery

### The Cranio-Orbitozygomatic Approach

#### 56.

1. Frontotemporal pterional, extended pterional, cranio-orbital, and cranio-orbitozygomatic approaches.
2. The frontalis branch of the facial nerve.
3. A. Temporal pole
  - B. Frontal lobe
4. C. Middle cerebral artery (MCA)
  - D. Internal carotid artery
  - E. Anterior cerebral artery (ACA)
5. F. Cranial nerve II: right optic nerve
  - G. Cranial nerve II: left optic nerve
  - H. Cranial nerve I: olfactory nerve

57. It involves a craniotomy centered around the pterion that is further extended to include the superior and lateral orbital wall as well as the vertical and sometimes the horizontal part of the zygoma.

58. This approach brings the structures in the base of the anterior and middle fossa in closer proximity to the surface and facilitates their being reached via multiple directions, while obviating the need for retraction of the brain.

59.

- Tumors such as sphenoid wing meningioma, clinoidal or cavernous sinus meningiomas, craniopharyngioma, or large pituitary adenomas
- Complex aneurysms of the circle of Willis such as complex anterior communicating artery aneurysms or basilar apex aneurysms
- Certain craniosynostosis and cranial deformities.

60. The craniotomy should not extend beyond the supraorbital notch, as beyond that notch typically the frontal sinuses are entered.

61. Bradycardia may be experienced secondary to the oculocardiac reflex when excessive compression is performed along the orbital apex.

62. Enophthalmos.

63.

- On certain occasions due to the use of the high- speed drill or rongeurs the orbital roof or lateral wall may be thinned down to the point where it cannot be reconstructed primarily at the end of the procedure.
- In such cases titanium mesh with or without a combination of synthetic bone agents may be used to reconstruct the superior and lateral wall of the orbit to prevent enophthalmos postoperatively.

### The Petrosal Approach (Anterior, Posterior, and Combined)

64.

1. The posterior petrosal approach.
2. The petrous apex.
3. In most cases, while drilling the air cells, one goes through aerated bone, and the bone becomes much denser when reaching the semicircular canals.
4. The tentorium.
5. The trochlear nerve.
6. • Petrosal and petroclival meningiomas
  - Other tumors of the posterior and middle skull base, such as epidermoids, bony tumors, chordomas, chondrosarcomas, etc.

- Certain aneurysms and vascular malformations of the posterior circulation: basilar apex and basilar trunk aneurysms, vertebral basilar aneurysms, superior cerebellar aneurysms, and anterior inferior cerebellar aneurysms.

This approach also affords access to the lateral aspect of the brainstem such as in cases of laterally extending cavernous angiomas of the brainstem.

**65.** It is an approach centered on the petrous temporal bone that enables access to the region of the clivus and petrous apex.

**66.**

- The anterior petrosal approach provides exposure and access to lesions mainly located in the middle fossa, cavernous sinus, and upper clivus.

- The posterior petrosal approach provides access to lesions of the posterior fossa laterally, the cerebellopontine angle, and the lower clivus.

**67.**

- Tumors involving the cavernous sinuses area and upper clivus such as meningioma, dermoids, epidermoids, schwannoma, and other extraaxial skull-based tumors of the middle fossa.

- Low-lying basilar apex aneurysms and other aneurysms of the posterior circulation at the level of the upper clivus.

**68.**

- Extraaxial tumors located in the lateral aspect of the posterior fossa such as petroclival or tentorial meningioma, vestibular schwannoma or other lower cranial nerve schwannoma, dermoids, epidermoids, and other lower clival skull-based tumors.

- Intraaxial tumors involving the brainstem along its anterior or anterolateral aspect

- Certain aneurysms and vascular lesions located in the lateral aspect of the posterior fossa such as per the vertebrobasilar junction or basilar trunk aneurysms.

**69.** This approach is used in cases of tumors or lesions extending from the middle fossa to the posterior fossa such as the speno-petroclival meningioma or other extensive type of surgical skull-based disease.

**70.** The density of the bone changes when proceeding with drilling the mastoid air cells with a diamond burr. When the area appears to be of higher bone density, this usually means that the semicircular canals or the facial canal have been reached.

71.

- The pericranial graft (or fascia lata) is typically harvested to close the dura in a watertight fashion so as to prevent CSF leaks.
- A fat graft is harvested from the abdomen or thigh and laid over the mastoidectomy defect.
- The superficial wall of the mastoidectomy may be reconstructed with titanium plates or bone substitutes.
- Closure of the soft tissue and skin is done in layers with a running nylon suture for the skin.
- A tight mastoidectomy dressing is then applied to the scalp to prevent pseudomeningocele formation.

72. It is typically sectioned behind the trochlear nerve.

73.

1. Minimal retraction into the cerebellum and temporal lobe
2. Shorter distances to the clivus
3. More direct visualization of the anterior and lateral aspect of the brainstem
4. Preservation of the venous structures such as the sigmoid sinus and vein of Labbé.

74. The transverse sinus.

75. The antrum.

## Posterior Fossa and Craniocervical Junction Acoustic Schwannomas and the Retrosigmoid Approach

76.

1. Posterior view of the brainstem.
2. A. Inferior colliculus  
B. Trochlear nucleus  
C. Median sulcus  
D. Abducens nucleus/facial colliculus  
E. Hypoglossal trigone  
F. Vagal trigone  
G. Area postrema  
H. Middle cerebellar peduncle  
I. Inferior cerebellar peduncle
3. They represent the surgical safe entry zones into the brainstem. The superior one represents the suprafacial triangle and the inferior one the infrafacial triangle.
4. The floor.



5. Midline suboccipital approach, transvermian approach, telovelar approach.

77.

1. Retrosigmoid
2. Middle fossa
3. Translabyrinthine

78. When there is no functional hearing on the side ipsilateral to tumor.

79. In cases of small intracranial tumors.

80. In most cases of acoustic schwannoma, especially in those schwannomas that are large, in a patient with functional hearing or with compression of the brainstem.

81. Cerebellar contusion, hydrocephalus, damage to the brainstem with vegetative state, cranial nerve injury including hearing loss, facial nerve injury, loss of facial sensation, lower cranial nerve injury with dysphagia and dysphonia, cerebrospinal fluid leak, tumor recurrence or regrowth, cosmetic defects.

82.

- A watertight dural closure must be completed with the use of a pericranial graft or other dural replacement such as fascia lata or synthetic graft.
- Tisseel fibrin glue or other type of sealants are typically applied over to dura.
- Hydrocephalus should be managed with ventriculostomy or shunt placement to decrease the transmural pressure of CSF along the dural opening.
- The mastoid air cells must be adequately sealed with bone wax when performing mastoidectomy, and a fat graft can be harvested and placed along the mastoid area.
- The skin is closed in a watertight fashion using a running or a running and interlocking nylon suture.
- The head should be wrapped tightly with a mastoid dressing to prevent pseudomeningocele formation.

83.

Treatment measures are described from simple to more complex:

- The patient's head is elevated and the skin closure is reinforced.
- The patient is kept dry with diuretic agents such as acetazolamide.
- In the event that the leak persists after 24 to 48 hours, a lumbar drain should be placed.
- A CT scan of the head should also be obtained to evaluate for hydrocephalus or pseudomeningocele as well as for the need of ventriculostomy placement in such cases.

- If these measures are unsuccessful, then wound revision surgery and better watertight closure with sealants and fascial grafts should be considered.

## 84.

1. A. Superior cerebellar artery  
B. Basilar artery  
C. Anterior inferior cerebellar artery  
D. Posterior inferior cerebellar artery  
E. Vertebral artery  
F. Anterior spinal artery
2. • Superior cerebellar artery:
  - Cerebellar cortex, white matter, and central nuclei
  - Superior cerebellar peduncle
  - Inferior colliculus
  - Pontine tegmentum
  - Anterior inferior cerebellar artery
  - Anterior inferior cerebellum, including central nuclei
  - Lower pons
  - Upper medulla
  - Posterior inferior cerebellar artery
  - Posterior hemisphere, inferior vermis and central nuclei of cerebellum
  - Choroid plexus of fourth ventricle
  - Dorsolateral medulla
3. • Basilar artery
  - Anterior inferior cerebellar artery
  - Trigeminal nerve
  - Abducens nerve
4. • Vertebral arteries
  - Anterior spinal artery
  - Posterior inferior cerebellar artery
  - Hypoglossal nerve
5. • Superior cerebellar artery branches
  - Superior vermian vein
  - Precentral cerebellar vein
6. The C1 nerve root courses along the lower surface of the vertebral artery between the artery and the groove on the posterior arch of the atlas.
7. • Lateral medullary
  - Anterior medullary
8. The preolivary sulcus.

## The Far Lateral Approach

### 85.

1. The internal acoustic meatus.
2. Right side.
3. A. Facial canal
  - B. Cochlear area
  - C. Inferior vestibular area
  - D. Superior vestibular area
  - E. Singular foramen
  - F. Transverse crest
4. The singular branch of the inferior vestibular nerve, which innervates the posterior ampullae.
5. A saccular and sometimes a utricular branch.

### 86.

- Foramen magnum tumors such as meningiomas, schwannomas, chordomas, brainstem gliomas, etc.
- Certain vascular lesion such as aneurysm or arteriovenous malformations of the posterior circulation located laterally such as posterior inferior cerebellar artery (PICA) aneurysms or vertebral artery aneurysms
- Other lesions of the craniovertebral junction.

### 87.

1. An S-shaped incision that is dorsal to the sternocleidomastoid muscle and mastoid tip extending from above the pinna down to the C4 level.
2. A curved or “hockey-stick” type incision with a short-limb extending from the mastoid tip behind the pinna, the long limb along the mid -line, and the superior limb at about the level of the transverse sinus.

88. The splenius capitis, the semispinalis, and the longissimus capitis.

89. The levator scapula and the scalene muscles.

90. The artery is typically found ventral to the C2 nerve root at the C1-C2 interspace just caudal to the inferior oblique muscle.

91. The hypoglossal nerve typically lies dorsal to the artery.

92. At the dentate ligaments, as these two levels can be cut.

93. About one third.

**94.**

- Occipitocervical instability requiring fusion and instrumentation
- Vertebral artery injury
- Injury to lower cranial nerves or the brainstem
- Cerebrospinal fluid leak with resultant wound healing problems, pseudomeningocele, or meningitis
- Spinal cord injury.

**95.**

1. In cases where it is the nondominant artery, the artery may be ligated and sacrificed.
2. In cases where it is the dominant artery or if the contralateral artery is absent, then the artery needs to be repaired. This may be done either via primary anastomosis or by using an interposition graft such as the saphenous vein.

**96.**

1. The right cerebellopontine angle, viewed from posterior retroauricular approach.
2. A. AICA  
B. Flocculus  
C. Foramen of Luschka  
D. Subarcuate artery  
E. Cranial nerve VIII  
F. Labyrinthine artery  
G. Cranial nerve IX  
H. Cranial nerve X  
I. Facial nerve
3. The infrafloccular approach; it is easier with an exposure inferior to the flocculus.

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