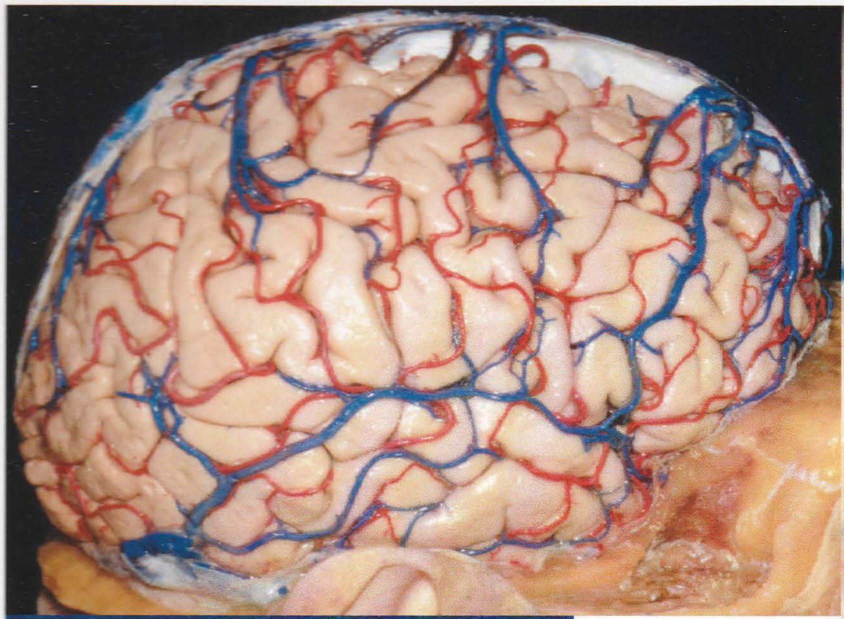
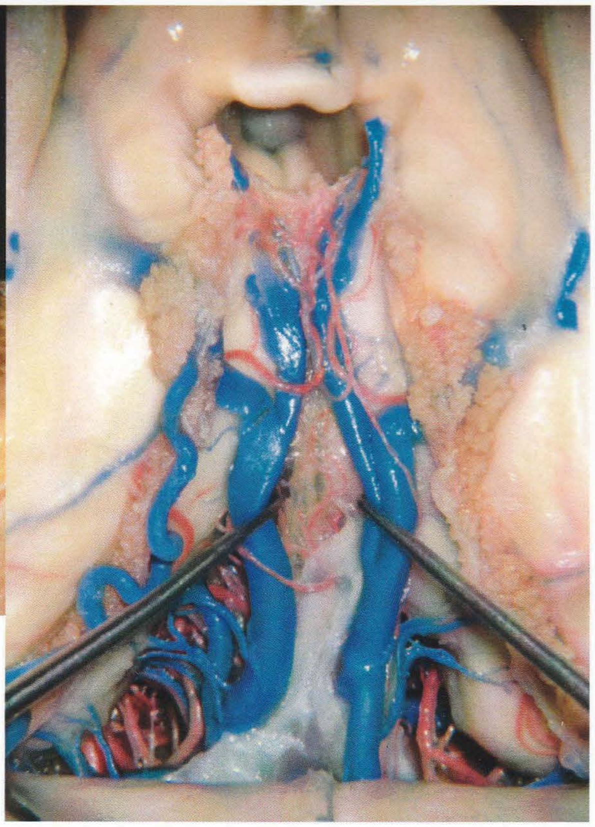
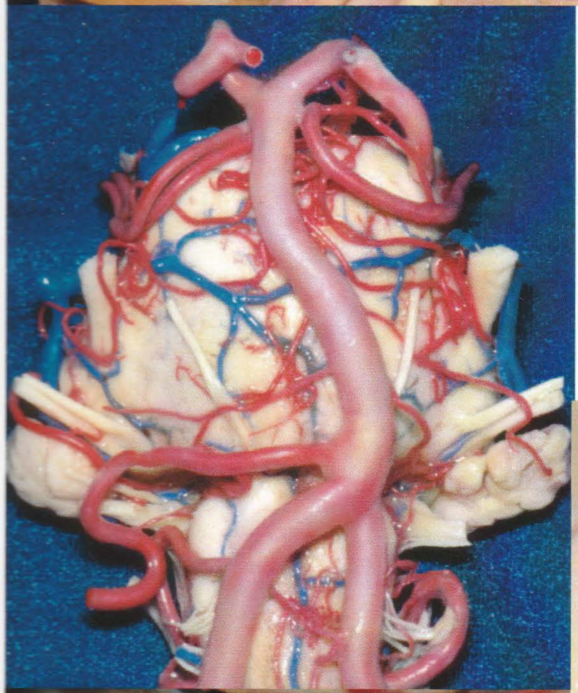
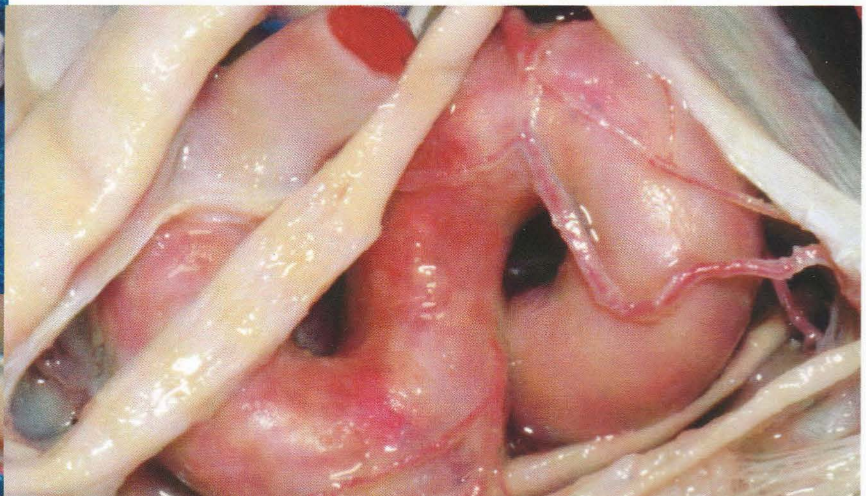


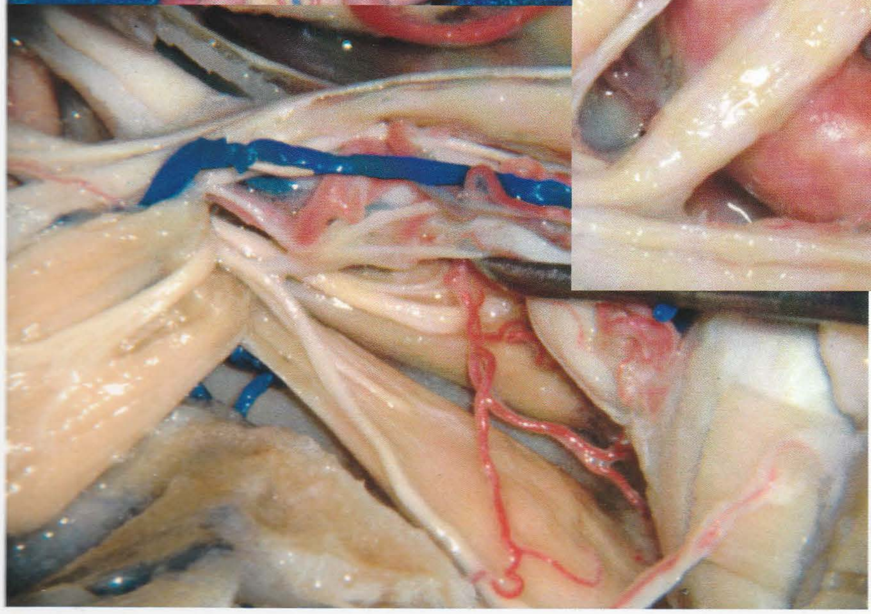




Microsurgical Approaches to the Brain, Ventricles, and Skull Base

JUNE 6 – 10, 2011





Dr. Stephen B. Lewis
Dr. Albert L. Rhoton, Jr.
Course Directors
Department of Neurosurgery
University of Florida

HÜSEYİN BİÇEROĞLU
FLORİDA 2011

Microsurgical Approaches to the Brain, Ventricles, and Skull Base

Department of Neurological Surgery
University of Florida McKnight Brain Institute
Gainesville, Florida

June 6-10, 2011

Course Directors

Stephen B. Lewis, M.D., FRACS
Albert L. Rhoton, Jr., M.D.

Honored Lecturers

Jeffrey A. Bennett, M.D.
James Evans, M.D.
Juan C. Fernandez-Miranda, M.D.
William A. Friedman, M.D.
Harry van Loveren, M.D.
Carolina Martins, M.D., Ph.D.
Anthony T. Yachnis, M.D.

Manual Prepared by

Eduardo R. Seoane, M.D.

and

Albert L. Rhoton, Jr., M.D.
R.D. Keene Family Professor

Course Instructors

Magdy A. Osman, M.D., Ph.D.
Akin Akakin, M.D.
Huseyin Biceroglu, M.D.
Baris Kucukyuruk, M.D.
Maria Peris-Celda, M.D.
Yusuke Takemura, M.D.
Rowan Valentine, M.D.

Illustrations by

Margaret E. Barry, M.A., C.M.I.

Manuscript Preparation

Laura A.H. Dickinson

University of Florida McKnight Brain Institute

CEREBRAL HEMISPHERES

In the course of this section you should identify all of the following structures.

Surfaces

- Superolateral
- Medial
- Basal

Borders

- Superomedial
- Inferolateral
- Medial occipital
- Medial orbital

Superolateral Surface

- Lateral sulcus (Sylvian fissure)
  - Stem along sphenoid ridge
  - Anterior horizontal ramus } Broca's Area
  - Anterior ascending ramus } Broca's Area
  - Posterior ramus
  - Insula in floor
- Central sulcus – Little behind nasion-inion midway point. Seventy-degree angle with median plane.
- Frontal lobe
  - Precentral gyrus and sulcus
  - Superior frontal gyrus and sulcus
  - Middle frontal gyrus
  - Inferior frontal gyrus
  - Pars orbitalis
  - Pars triangularis
  - Pars opercularis
- Parietal lobe
  - Central sulcus to line connecting preoccipital incisura and parieto-occipital sulcus
  - Postcentral sulcus
  - Postcentral gyrus
  - Intraparietal sulcus
  - Superior parietal lobule
  - Inferior parietal lobule
  - Supramarginal gyrus around Sylvian fissure
  - Angular gyrus around superior temporal sulcus
  - Arcus tempora-occipitales around inferior temporal sulcus
- Temporal lobe
  - Below lateral sulcus back to preoccipital notch
  - Anterior pole convex forward from pterion to midpoint
  - Superior temporal sulcus
  - Inferior temporal sulcus
  - Superior, middle and inferior temporal gyri
  - Superior, temporal gyrus blends into transverse temporal gyri which extends anterolateral from circular sulcus

Table of Contents

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Occipital lobe
- Behind preoccipital notch and parieto-occipital sulcus
- Transverse occipital sulcus
- Lateral occipital sulcus
- Superior and inferior occipital gyri

Insula
- Surrounded by circular sulcus
- Opercula of insulae
  - Frontal operculum – inferior frontal gyrus and precentral gyrus
  - Parietal operculum – postcentral gyrus and inferior parietal lobule
  - Temporal operculum – superior temporal and transverse temporal gyri
- Pyramidal shape – apex at anterior perforated substance (Limen insulae)
- Central sulcus of insula
- Long and short gyri
- Superficial to claustrum and putamen

Medial Surface

Corpus callosum – rostrum, genu, body and splenium
Septum pellucidum between fornix and corpus callosum
Paraterminal gyrus
Post olfactory sulcus
Anterior paraolfactory sulcus
Subcallosal area (Paraolfactory gyrus)
Cingulate sulcus – crosses superomedial margin behind central sulcus
Medial frontal gyrus
Paracentral lobule
Cingulate gyrus – continue around splenium through isthmus to parahippocampal gyrus
Parieto-occipital sulcus
Calcarine sulcus – Calcar avis
Cuneus
Precuneus

Inferior Surface

Anterior (Orbital) part
- Olfactory sulcus – above olfactory tract
- Gyrus rectus
- H-shaped orbital gyri – anterior, posterior, medial, lateral

Posterior part
- Faces middle fossa and tentorium
- Collateral and occipitotemporal sulci
- Rhinal sulcus – lateral to uncus
- Lingula – between calcarine and collateral sulci
- Parahippocampal gyrus blends into uncus
- Medial occipitotemporal gyrus between collateral and occipitotemporal sulci
- Lateral occipitotemporal gyrus blends into inferior temporal gyrus

Microsurgical Approaches to the Brain, Ventricles, and Skull Base
June 6-10, 2011
Course Schedule

Monday, June 6

6:30 – 8:00 a.m.	*Registration and Breakfast – Room LG-110*
7:00 – 8:00 a.m.	**Plenary Session** High-Definition Fiber Tractography and Parafascicular Surgery **Lecture – Dr. Juan Carlos Fernandez-Miranda**
8:00 – 8:30 a.m.	Anatomy: Skull Base Relations, Orbitozygomatic etc. **Lecture – Dr. Albert L. Rhoton, Jr.**
8:30 – 9:00 a.m.	2-Piece OZ, Anatomical Considerations **Lecture – Dr. Stephen B. Lewis**
9:00	*Break and Transition to Laboratory, Room L1-151*
9:15 – 12:00 p.m.	**Participant Dissection** – Right side, 2-Piece OZ, Anterior Clinoidectomy **Instructor scope – All Faculty**
12:15 – 12:45 p.m.	*Luncheon Lecture: Surgical Pathology* **Lecture – Dr. Anthony T. Yachnis**
1:00 – 2:00 p.m.	Anatomy: Routes to Basilar Apex **Lecture – Dr. Albert L. Rhoton, Jr.**
2:00	*Break and Transition to Laboratory, Room L1-151*
2:15 – 5:00 p.m.	**Participant Dissection** – Left side, 1-Piece, Transsylvian, Remove Cranium, Suture Exam **Instructor scope – All Faculty**

** Complete Monday's Evaluation **

Place in Box: Classroom or Laboratory

** ** ** ** **

6:15 - 8:30 p.m. Dinner, Downtown Gainesville
Hippodrome Theater

Microsurgical Approaches to the Brain, Ventricles, and Skull Base
June 6-10, 2011
Course Schedule

Tuesday, June 7

6:30 – 8:00 a.m.	*Registration and Breakfast – Room LG-110*
7:00 – 8:00 a.m.	**Plenary Session** Microsurgical Anatomy of the Dural Arteries **Lecture – Dr. Carolina Martins**
8:00 – 9:00 a.m.	Anatomy: Lateral & 3rd Ventricles **Lecture – Dr. Albert L. Rhoton, Jr.**
9:00	*Break and Transition to Laboratory, Room L1-151*
9:15 – 12:00 p.m.	**Participant Dissection** –Right side, Open Choroidal Fissure, T/C Approach to 3rd Ventricle, Quadrigeminal & Ambient Cisterns **Instructor scope – All Faculty**
12:15 – 12:45 p.m.	*Luncheon Lecture: Radiologic Evaluation of Skull Base Pathology* **Lecture – Dr. Jeffrey A. Bennett**
1:00 – 1:30 p.m.	Anatomy: Coronal Sections **Lecture – Dr. Albert L. Rhoton, Jr.**
1:30 – 2:00 p.m.	Temporal Lobectomy, Amygdala **Lecture – Dr. Albert L. Rhoton, Jr.**
2:00	*Break and Transition to Laboratory, Room L1-151*
2:15 – 5:00 p.m.	**Participant Dissection** – Coronal Sections , Temporal Lobectomy, Supratentorial, Exam of Pineal Region **Instructor scope – All Faculty**

** Complete Tuesday's Evaluation **

Place in Box: Classroom or Laboratory

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Microsurgical Approaches to the Brain, Ventricles, and Skull Base
June 6-10, 2011
Course Schedule

Wednesday, June 8

6:30 – 8:00 a.m.	*Registration and Breakfast – Room LG-110*
7:00 – 8:00 a.m.	**Plenary Session** Endoscopic Transnasal Surgery **Lecture – Dr. Jim Evans**
8:00 – 9:00 a.m.	Anatomy: Anterior Cranial Fossa & Sella / Endonasal **Lecture – Dr. Albert L. Rhoton, Jr.**
9:00	*Break and Transition to Laboratory, Room L1-151*
9:15 – 12:00 p.m.	**Participant Dissection** – Anterior CF - Subfrontal Extradural Dissection. Endoscope work station **Instructor scope – All Faculty**
12:00 – 12:30 p.m.	*Luncheon*
12:30 – 1:30 p.m.	Surgical Approaches to the MCF / Cavernous Sinus **Lecture – Dr. Harry R. van Loveren**
1:30 – 2:00 p.m.	Anatomy: Cavernous Sinus **Lecture – Dr. Albert L. Rhoton, Jr.**
2:15	*Break and Transition to Laboratory, Room L1-151*
2:15 – 5:00 p.m.	**Participant Dissection** –Right side, Subtemporal Cavernous Sinus, Anterior Petrosectomy **Instructor scope – All Faculty**

** Complete Wednesday's Evaluation **

Place in Box: Classroom or Laboratory

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Microsurgical Approaches to the Brain, Ventricles, and Skull Base
June 6-10, 2011
Course Schedule

Thursday, June 9

6:30 – 8:00 a.m.	*Registration and Breakfast – Room LG-110*
7:00 – 8:00 a.m.	**Plenary Session** Stereotactic Radiosurgery Options for Cerebrovascular Disorders & Skull Base Tumors **Lecture – Dr. William A. Friedman**
8:00 – 8:30 a.m.	Anatomy: Temporal Bone **Lecture – Dr. Albert L. Rhoton, Jr.**
8:30 – 9:00 a.m.	Lateral Approaches to the Posterior Fossa – Suboccipital, Presigmoid, and Combined Approaches **Lecture – Dr. Stephen B. Lewis**
9:00	*Break and Transition to Laboratory, Room L1-151*
9:15 – 12:00 p.m.	**Participant Dissection** – Left side, Presigmoid Approaches, Retrolabyrinthine, and Translabyrinthine Exposures **Instructor scope – All Faculty**
12:15 – 12:45 p.m.	*Luncheon Lecture: Case Discussion, "What Would You Do?"* **Lecture – Dr. Stephen B. Lewis**
1:00 – 1:30 p.m.	Anatomy: Posterior Fossa (Retrosigmoid, 2D) **Lecture – Dr. Albert L. Rhoton, Jr.**
1:30 – 2:00 p.m.	The Far Lateral Approach to FM **Lecture – Dr. Stephen B. Lewis**
2:00	*Break and Transition to Laboratory, Room L1-151*
2:15 – 5:00 p.m.	**Participant Dissection –** Right side, Far Lateral Approach with Transcondylar Extension **Instructor scope – All Faculty**

** Complete Thursday's Evaluation **

Place in Box: Classroom or Laboratory

** ** ** ** **

6:30 - 9:00 p.m. Photo Session and Gala Dinner
Hilton, Century Ballroom B

Friday, June 10

7:30 – 8:00 a.m.	*Registration and Breakfast – Room LG-110*
8:00 – 8:30 a.m.	Anatomy: Approaches to the Brain Stem and Posterior Fossa **Lecture – Dr. Albert L. Rhoton, Jr.**
8:30 – 9:00 a.m.	Anatomical Basis of the Far Lateral Approach and its Extensions **Lecture – Dr. Carolina Martins**
9:00	*Break and Transition to Laboratory, Room L1-151*
9:15 – 12:15 p.m.	**Participant Dissection** – Approaches to the Pineal Region 4th Ventricle **Instructor scope – All faculty**
12:15	*Adjourn*

** Complete Friday's Evaluation &
General Evaluation **

Place in Box: Classroom or Laboratory

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~ Thank You ~

Cerebral Hemispheres and Lateral Ventricles

Microsurgical Approaches to the Brain, Ventricles, and Skull Base

GENERAL INFORMATION

June 6-10, 2011

REGISTRATION

Course Registration will be at the Registration Table located in the Lobby of the McKnight Brain Institute every morning starting at **6:30 a.m.** Monday through Thursday and at **7:30 a.m.** on Friday morning.

LECTURES AND DISSECTIONS

Lectures will take place in Room LG – 110 on the ground floor.

Dissections will take place in the Surgical Research and Training Laboratory (SRTL), Room L1-151 on the first floor.

MESSAGE CENTER

A telephone Message Center will be available from Monday through Friday during the regular office hours of 8:00 a.m. to 5:00 p.m., EST. The message center is the Department of Neurosurgery's main office: 1-352-273-9000. All messages will be delivered directly to the physician.

TRANSPORTATION

Transportation will be provided to and from the Hilton University of Florida Hotel and Conference Center. Please gather in the Lobby of the Hilton by the main entrance.

The Shands Shuttle will depart from the Hilton Monday through Thursday at **6:25 a.m.** SHARP and on Friday at **7:25 a.m.** SHARP.

The Shands Shuttle will depart from the McKnight Brain Institute each afternoon at **5:15 p.m.** and, at the conclusion on Friday, at **12:15 p.m.**

CONTINUING MEDICAL EDUCATION CREDITS

The University of Florida College of Medicine is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

The University of Florida College of Medicine designates this educational activity for a maximum of 40 hours in Category 1 credit towards the AMA Physician's Recognition Award. Each physician should claim only those hours of credit that he/she actually spent in the educational activity.

POLICIES

No Smoking

Smoking is not permitted in any room or area of the McKnight Brain Institute.
The University of Florida is a non-smoking campus.

Cerebral Hemispheres and Lateral Ventricles

1. The dura covering the cerebrum has been removed while preserving the superior sagittal sinus. Identify the cortical branches of the anterior, middle, and posterior cerebral arteries and their area of confluence. Note that the veins draining into the anterior portion of the superior sagittal sinus are directed backwards in the direction of flow, while the ones emptying into the posterior portion of the sinus are directed forward against the direction of flow. Locate the site on the frontal and occipital regions which have the lowest number of bridging veins emptying into the superior sagittal sinus. Select the site along the edge of the sagittal sinus at which you would do a transcallosal approach to the lateral and third ventricles, and an occipital-transtentorial approach to the pineal region.

2. The pattern of venous drainage on the lateral surface of the right and left hemispheres can vary greatly. The predominant drainage can be to the sagittal sinus, sylvian fissure, or to the vein of Labbé. Note the difference in patterns of venous drainage of the lateral surface of the hemisphere seen in Figures 1 and 2.

   Identify the lettered veins:

   A. ____________________ **C.** ____________________
   B. ____________________ **D.** ____________________

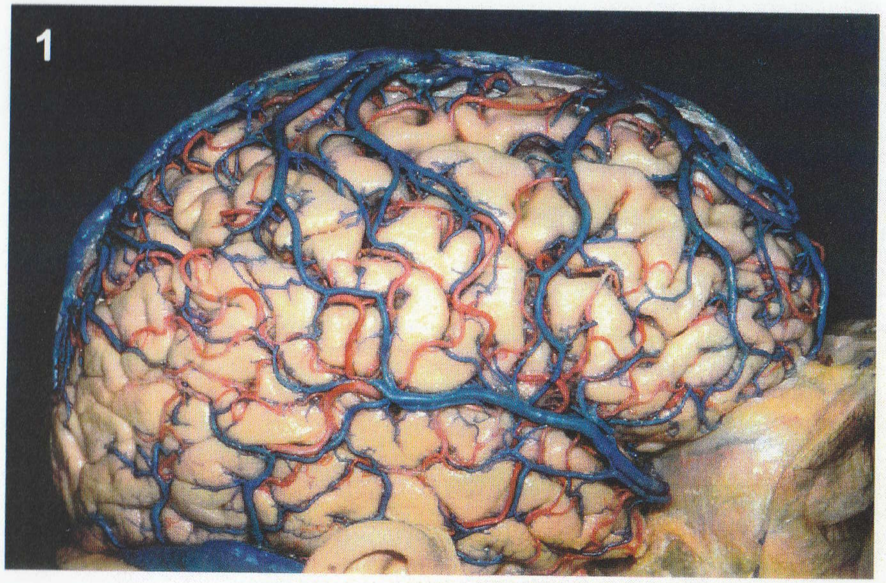
3. Note the relationship of the lambdoid, coronal, and squamosal sutures to the surface of the cerebral hemisphere.

   The pterion is located near the junction of what four bones?

   A. ____________________ **C.** ____________________
   B. ____________________ **D.** ____________________

4. **Identify the lettered sulci and gyri on the lateral surface of the cerebral hemisphere.**

   A. ____________________ **D.** ____________________
   B. ____________________ **E.** ____________________
   C. ____________________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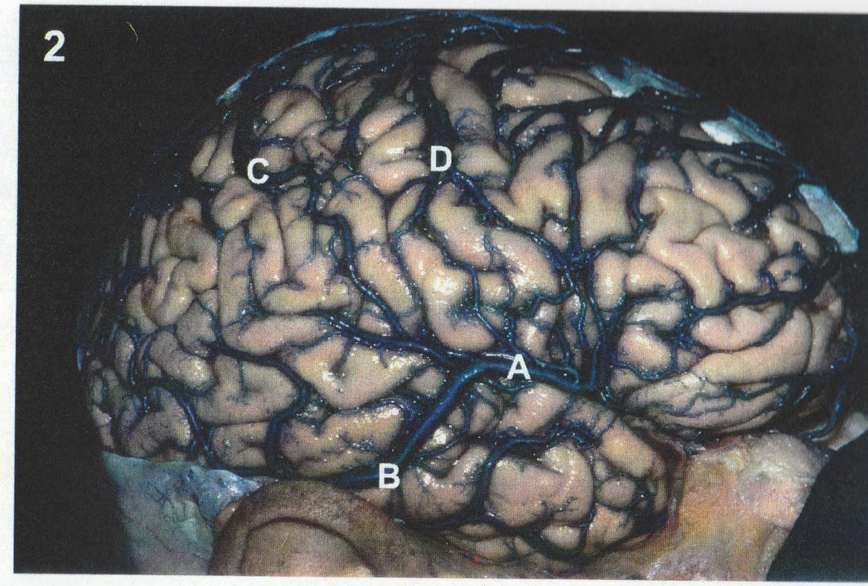
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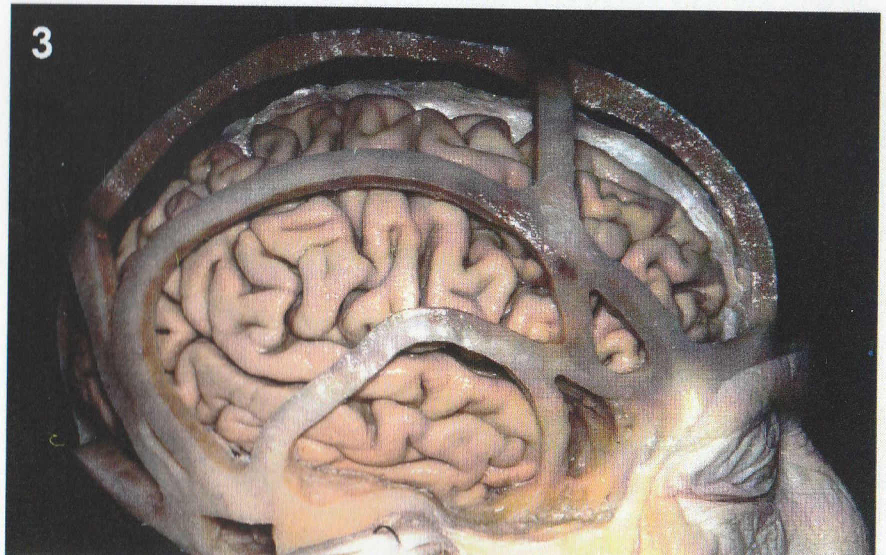
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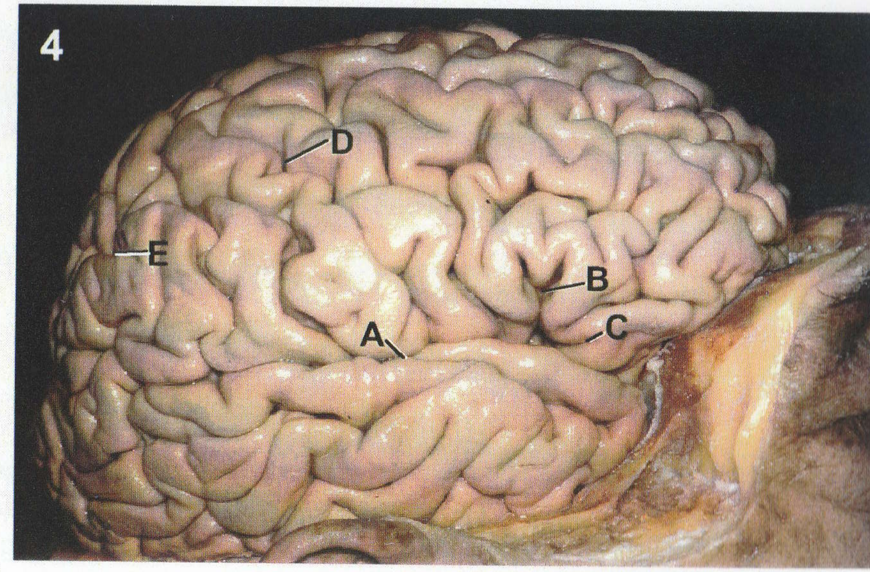
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5. The edge of the right frontal lobe adjacent to the interhemispheric fissure and in front of the precentral sulcus has a low density of bridging veins, making it a suitable site for a frontal transcallosal approach. The falx and the medial surface of the frontal lobe have been retracted to expose the lower margin of the falx, the inferior sagittal sinus, and the upper surface of the corpus callosum. Bridging veins may enter the inferior sagittal sinus.

Identify the lettered artery:

A. ______________________

6. A 2 cm incision in the corpus callosum, centered 2.5 cm behind the anterior edge of the genu of the corpus callosum, has been completed, and the margins of the callosal incision have been retracted to expose the foramen of Monro, choroid plexus attached along the choroidal fissure, and the lenticulostriate vein.

In completing the transcallosal exposure it is possible to open into either the right or the left lateral ventricle. If the thalamostriate vein is to the right of the choroid plexus in the body of the ventricle, into which ventricle have you opened?

A. ______________________

If the thalamostriate vein is to the left of the choroid plexus, you have opened into which lateral ventricle?

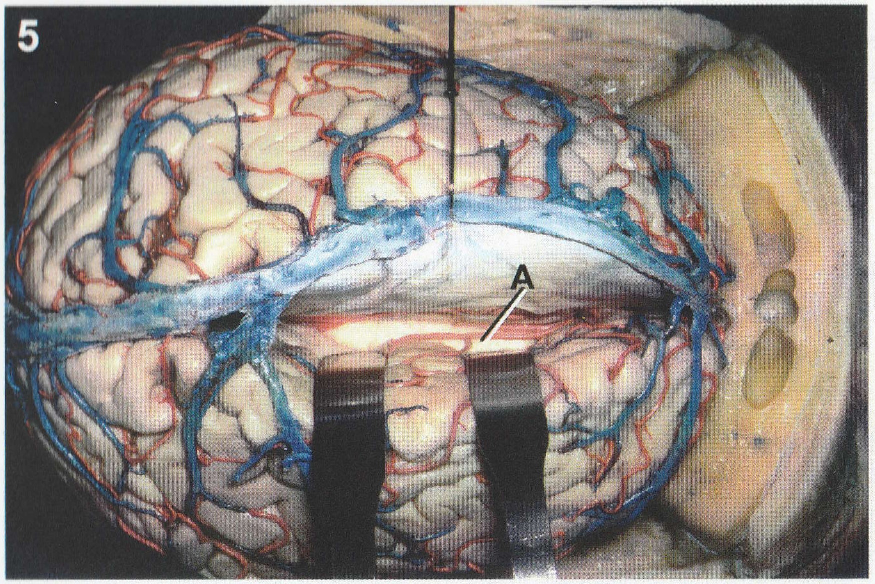
B. ______________________

7. Magnified view of Figure 6.

Identify the lettered structures:

A. ______________________	**D.** ______________________
B. ______________________	**E.** ______________________
C. ______________________	**F.** ______________________

8. Cuts through the right cerebral hemisphere at A and B expose the lateral ventricle. The first cut (A) is located above the level of the upper margin of the corpus callosum after identifying the corpus callosum through interhemispheric fissure. The second cut (B) is located just below the inferior surface of the corpus callosum. Line B corresponds to a line that crosses 1 cm above the posterior edge of the sylvian fissure.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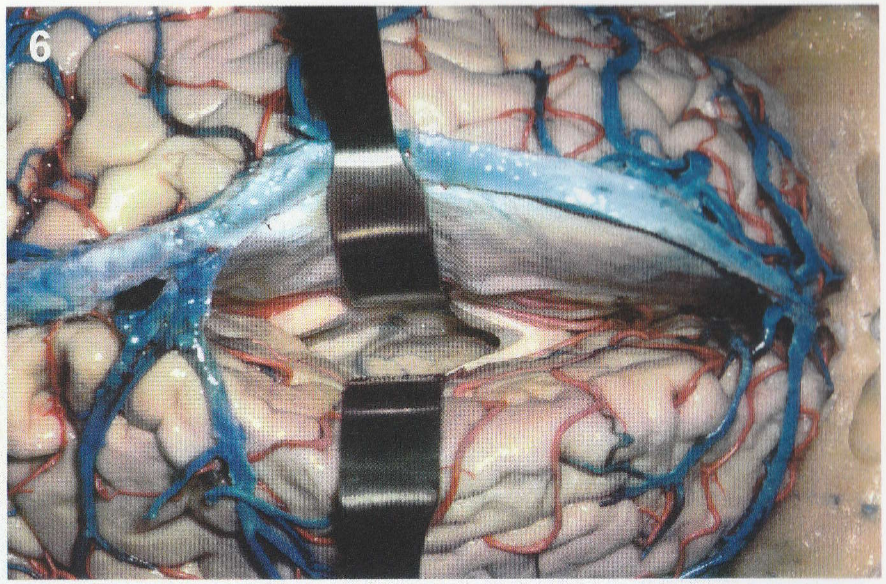
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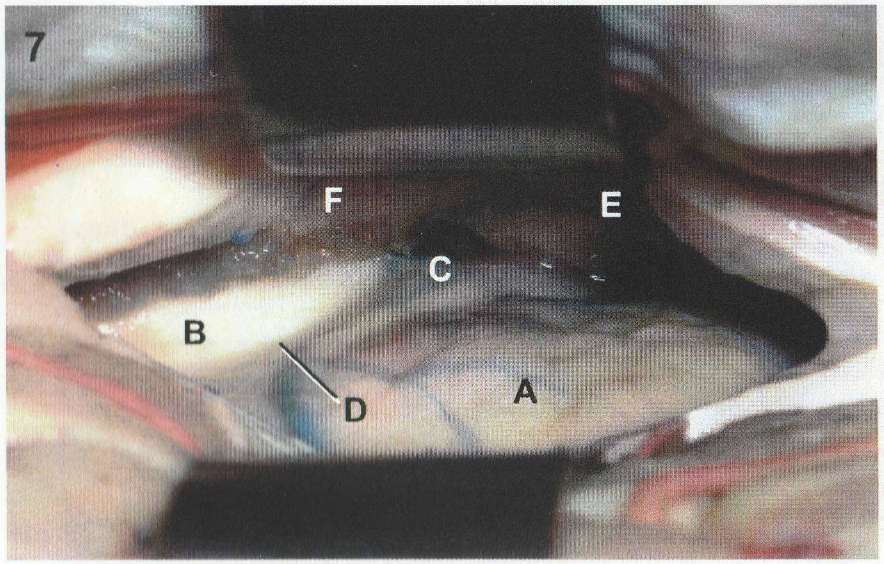
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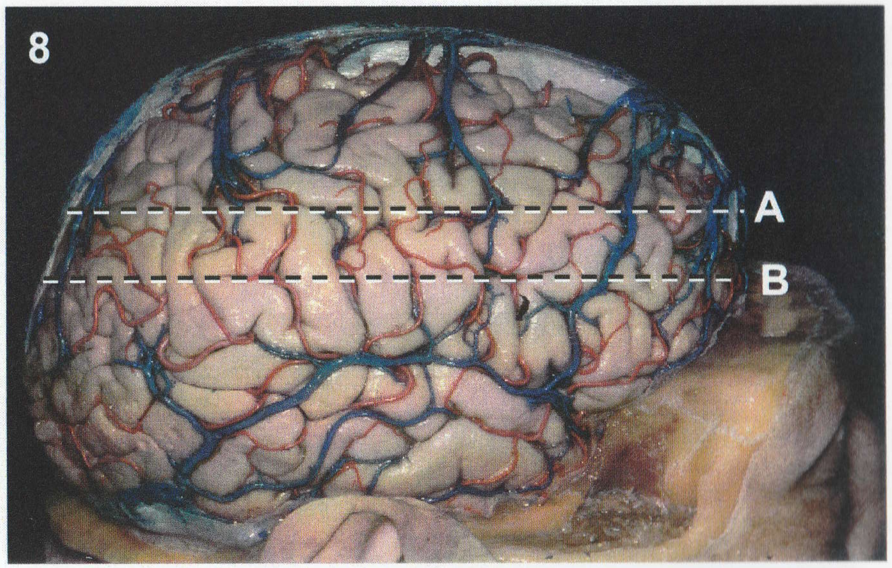
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9. After examining the relationship between the falx and the medial surface of the hemisphere, the falx is removed and the sulci and gyri on the medial surface are identified.

Identify the lettered structures:

A. ________________ **E.** ________________
B. ________________ **F.** ________________
C. ________________ **G.** ________________
D. ________________

10. Cut B has been completed to expose the right lateral ventricle.

Identify the exposed parts of the right lateral ventricle:

A. ________________ **C.** ________________
B. ________________

11. Superior view of the lateral ventricles in another specimen.

Identify the structures forming the five walls of the frontal horn:

A. Anterior wall ________________ **D. Lateral wall** ________________
B. Medial wall ________________ **E. Roof** ________________
C. Floor ________________

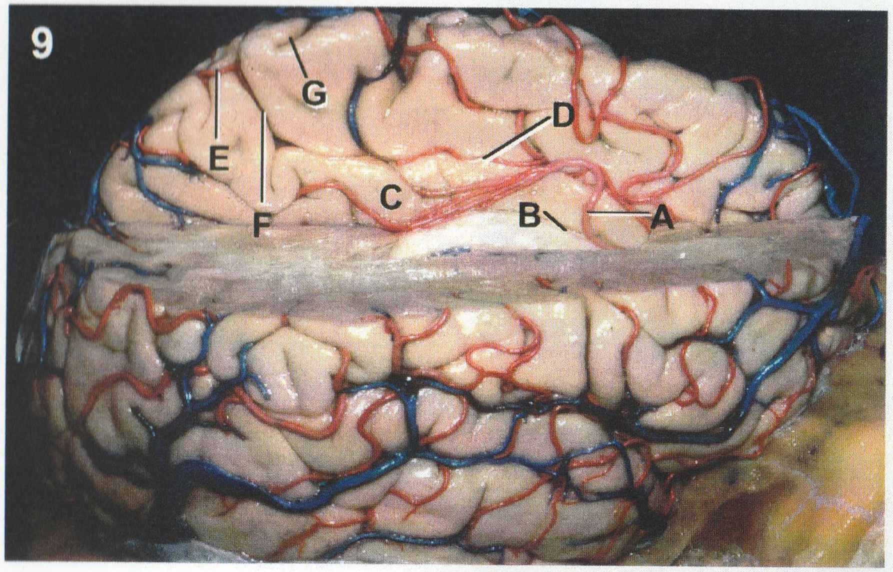
Identify the structures that form the walls of the body of lateral ventricle:

F. Lateral wall ________________ **H. Medial wall** ________________
G. Roof ________________ **I. Floor** ________________

12. Remove the frontal and parietal opercular to expose the insula, the superior surface of the temporal lobe, and the related arterial and venous structures.

Name the lettered structures:

A. ________________ **D.** ________________
B. ________________ **E.** ________________
C. ________________ **F.** ________________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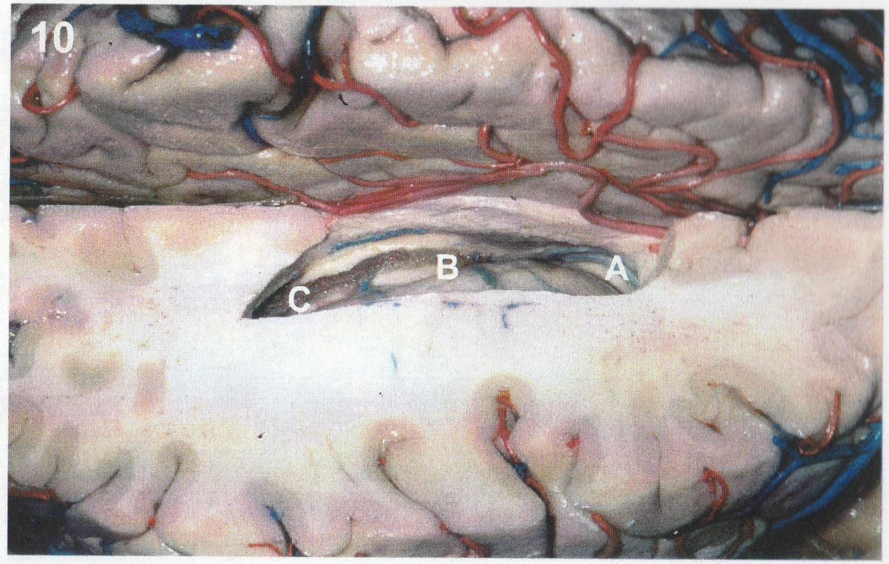
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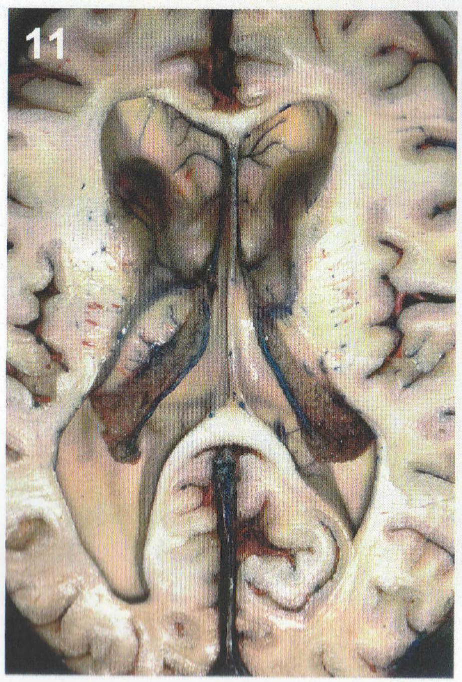
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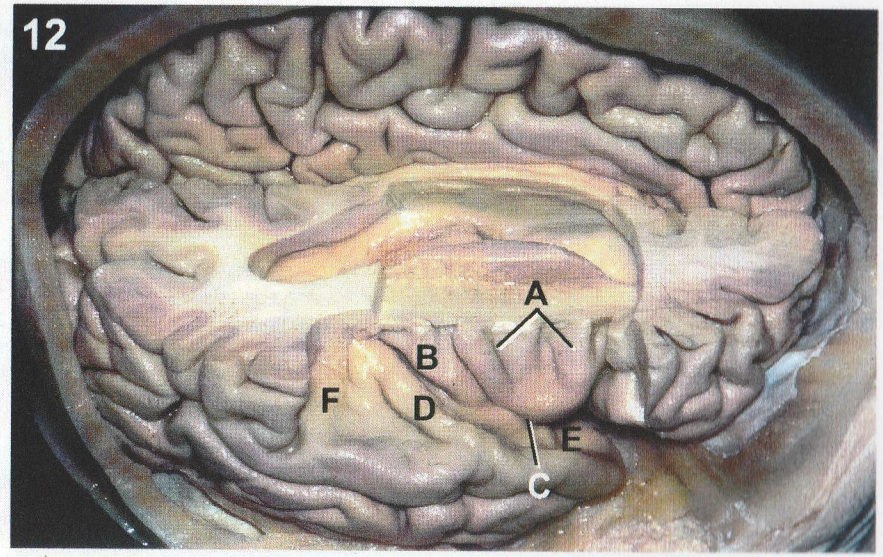
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13. Superior view of the right lateral ventricle and temporal operculum. Determine how close the anterior margin of the insula and the circular sulcus come to the lateral edge of the frontal horn. Also note how close the posterior margin of the insula and circular sulcus comes to the lateral edge of the atrium.

Identify the lettered structures:

A. ______________________ **C.** ______________________

B. ______________________

14. **Identify the lettered segments of the middle cerebral artery:**

A. ______________________ **C.** ______________________

B. ______________________

15. The atrium has been exposed using three cuts. The first is directed along the posterior wall of the atrium. The second is at the level of the anterior wall of the atrium, and the third is at the level of the floor of the atrium as shown in the figure.

What is the name of the prominent tuft of choroid plexus located in the atrium?

A. ______________________

16. The choroid plexus has been displaced forward to expose the structures forming the medial wall of the atrium.

Name the lettered veins crossing in the medial wall of the atrium:

A. ______________________

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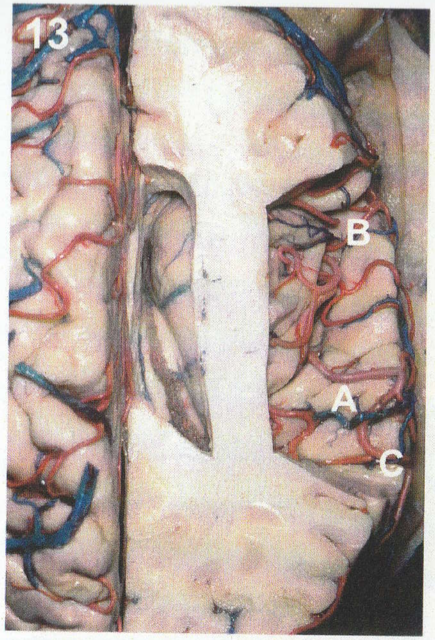

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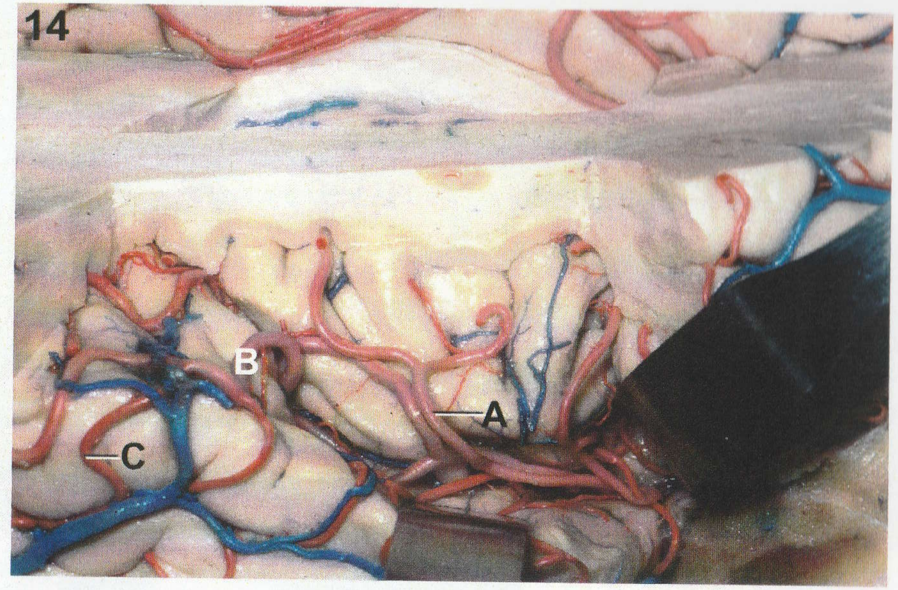

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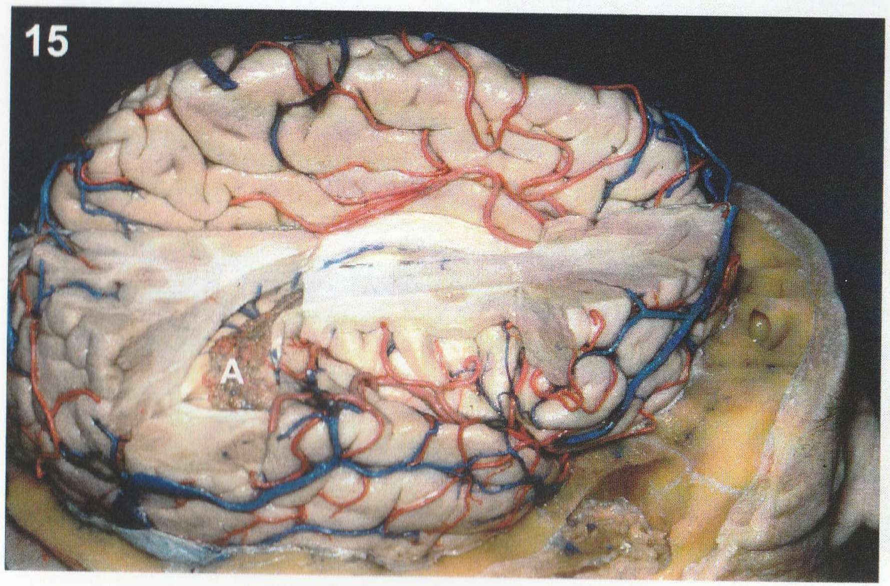

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17. Lateral view of the medial wall and floor of the atrium.

Identify the lettered structures in the medial wall of the atrium:

A. ______________________ **B.** ______________________

Identify the lettered structure in the floor of the atrium:

C. ______________________

18. Posterior view of the atrium after removing the occipital lobe.

Identify the lettered structures which form the anterior wall of the atrium:

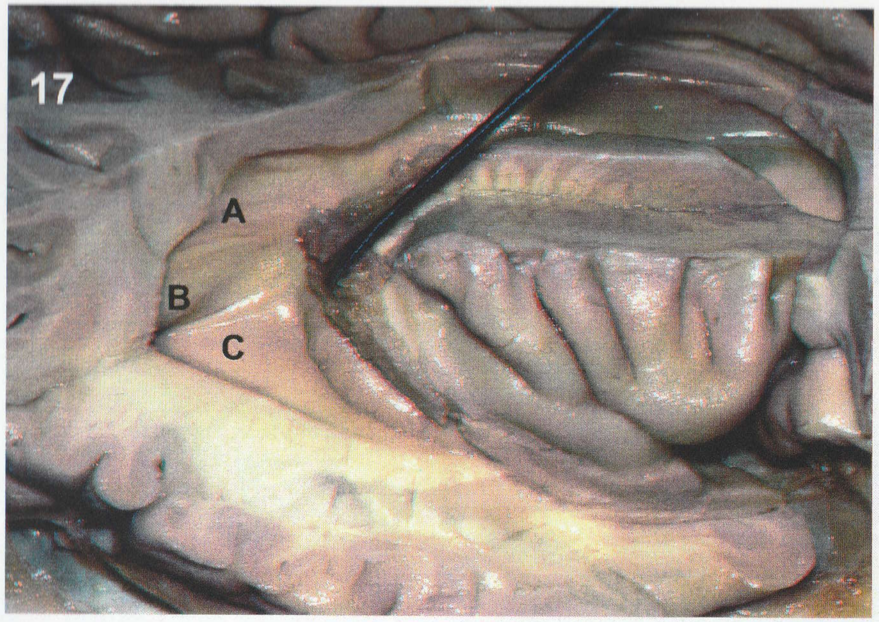
A. ______________________ **C.** ______________________
B. ______________________

Identify the lettered structures which form the lateral wall of the atrium:

D. ______________________ **F.** ______________________
E. ______________________

19. An axial cut at the level of the inferior part of the circular sulcus of the insula extends anteriorly to the level of the temporal horn. The cut ends 2 cm behind the limen insulae.

20. Note that the anterior tip of the temporal horn is directed medially below the insulae, basal ganglia and the circular sulcus of the insula.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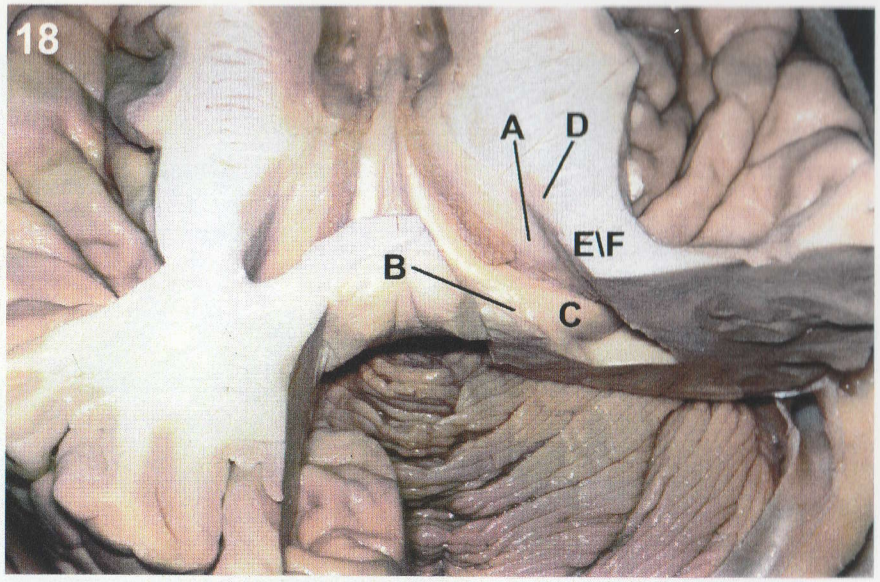
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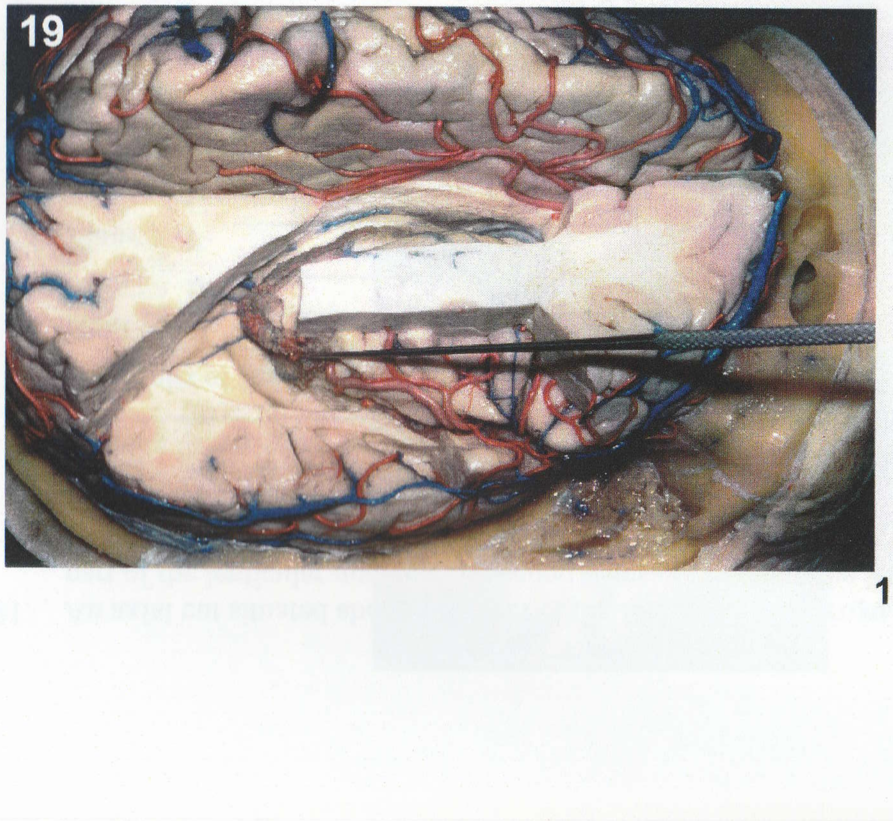
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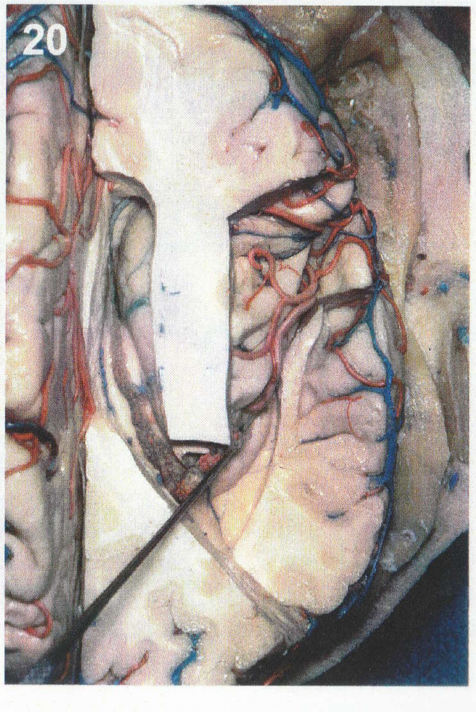
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21. An axial cut situated above the level of the foramen of Monro and above the medial part of the thalamus exposes the superior part of the lenticular nucleus. A second parasagittal cut at the level of the external third of the lenticular nucleus exposes the remainder of the temporal horn.

Identify the lettered structures:

A. ______________________ **B.** ______________________

The walls of the temporal horn are formed by:

Roof **C.** ______________________ **E.** ______________________
D. ______________________

Floor **F.** ______________________ **H.** ______________________
G. ______________________

Lateral wall I. ______________________ **J.** ______________________
Medial wall K. ______________________
Anterior wall L. ______________________

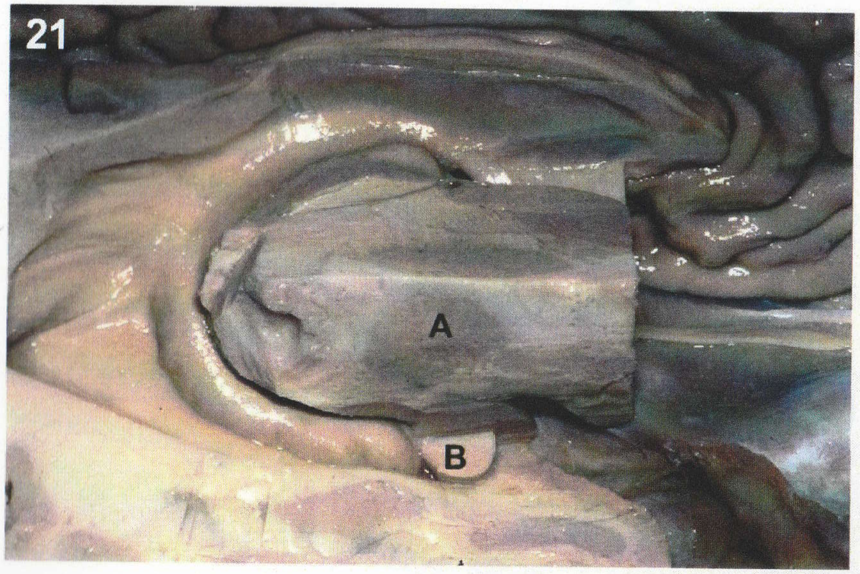
22. Lateral view of the right lateral ventricle. Note that the anterior tip of the temporal horn is located below the level of the limen insulae. The relationship between the limen insulae and inferior part of the circular sulcus with the temporal horn should be considered when planning a selective amygdalocampectomy.

23. Superior view of the right lateral ventricle.

24. Note the relationship of the amygdaloid nucleus to the anterior tip of the temporal horn, the temporal pole and uncus.

Identify the lettered structures:

A. ______________________ **C.** ______________________
B. ______________________ **D.** ______________________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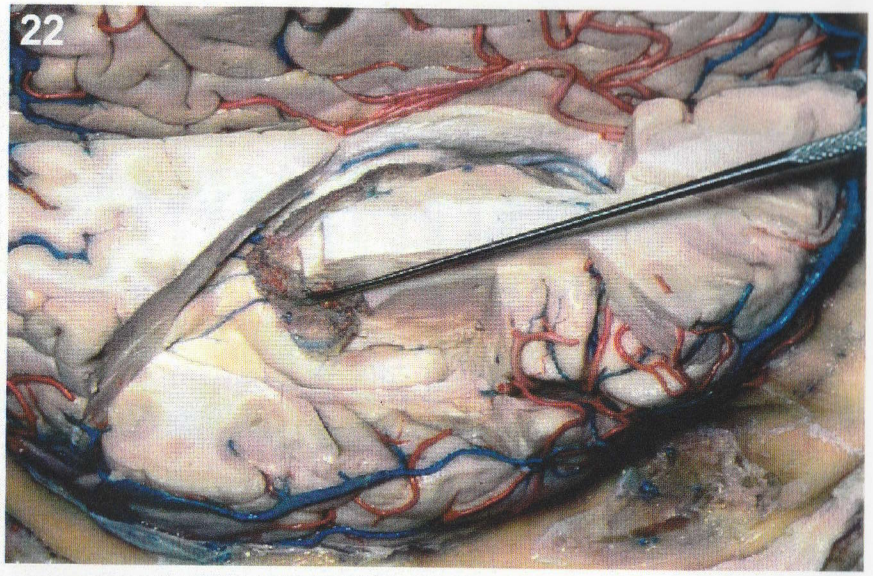
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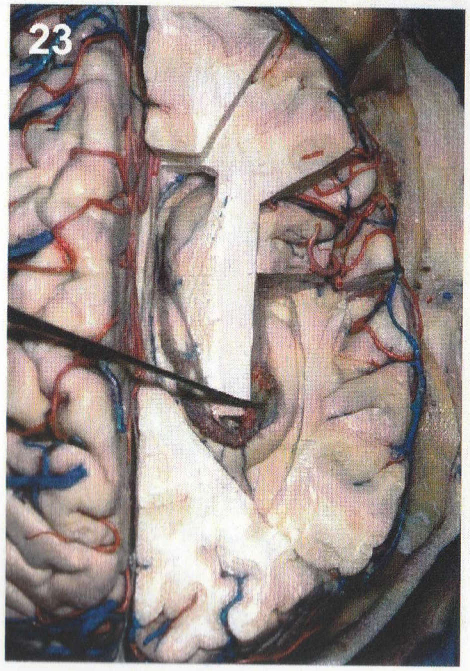
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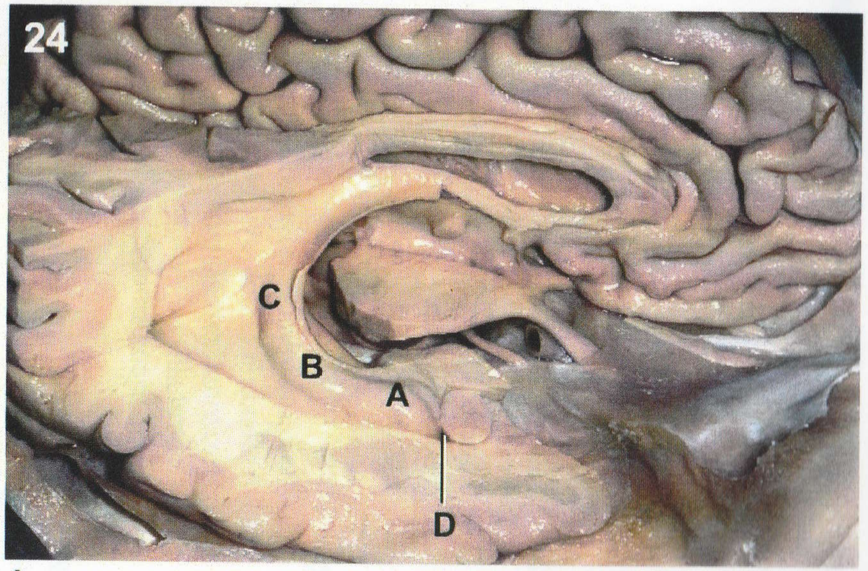
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Answers (Cerebral Hemispheres and Lateral Ventricles)

Figure 2
A. Superficial sylvian vein
B. Vein of Labbé
C. Rolandic vein
D. Vein of the precentral sulcus

Figure 3
A. Frontal bone
B. Parietal bone
C. Temporal bone
D. Sphenoid bone

Figure 4
A. Posterior ramus, sylvian fissure
B. Ascending ramus, sylvian fissure
C. Horizontal ramus, sylvian fissure
D. Central sulcus
E. Intraparietal sulcus

Figure 5
A. Pericallosal artery

Figure 6
A. Right
B. Left

Figure 7
A. Head of caudate
B. Thalamus
C. Thalamostriate vein
D. Stria terminalis
E. Septum pellucidum
F. Fornix

Figure 9
A. Pericallosal artery
B. Callosal sulcus
C. Cingulate gyrus
D. Cingulate sulcus
E. Callosomarginal artery
F. Callosomarginal ramus
G. Central sulcus

Figure 10
A. Frontal horn
B. Body
C. Atrium

Figure 11
A. Genu of corpus callosum
B. Septum pellucidum
C. Rostrum of corpus callosum
D. Head of caudate nucleus
E. Body of corpus callosum
F. Body of the caudate nucleus
G. Body of corpus callosum
H. Septum Pellucidum
I. Thalamus and body of fornix

Figure 12
A. Short gyri of the insula
B. Long gyri of insula
C. Limen insula
D. Heschl's Gyrus
E. Planum polare
F. Planum temporale

Figure 13
A. Heschl's gyrus
B. Planum polare
C. Planum temporale

Figure 14
A. M-2 (Insular)
B. M-3 (Opercular)
C. M-4 (Cortical)

Figure 15
A. Glomus

Figure 16
A. Medial atrial veins

Answers (Cerebral Hemispheres and Lateral Ventricles) Continued

Figure 17

A. Bulb of corpus callosum
B. Calcar avis overlying calcarine sulcus
C. Collateral trigone overlying collateral sulcus

Figure 18

A. Pulvinar
B. Crus of fornix
C. Tail of hippocampus
D. Caudate nucleus
E. Tapetum
F. Optic radiations

Figure 21

A. Amygdaloid nucleus
B. Lenticular nucleus
C. Tail of caudate nucleus
D. Stria terminalis
E. Thalamus
F. Collateral eminence
G. Hippocampus
H. Fimbria of fornix
I. Tapetum of corpus callosum
J. Optic radiations
K. Choroid fissure
L. Amygdaloid nucleus

Figure 24

A. Hippocampal head
B. Lenticular nucleus
C. Tail of hippocampus
D. Uncal recess

Transcheroidal and Interforniceal Approaches. Third Ventricle

Transcharoidal and Interforniceal Approaches.
Third Ventricle

1. Superior view of the lateral ventricles. The columns of the fornix have been divided at the foramen of Monro and the body and crus of the fornix have been reflected backwards to expose the structures in the roof of the third ventricle.

   Name the lettered part of the fornix:

   A. ______________________ **C.** ______________________
   B. ______________________

   The next deeper layer of the roof of the third ventricle after the fornix is formed by:

   D. ______________________

2. The upper layer of tela choroidea has been opened.

   Opening the upper layer exposes the space called the:

   A. ______________________

   The velum interpositum may be closed without communication with the basal cisterns or it may open posteriorly into the quadrigeminal cistern. The next deeper layer after the upper layer of tela choroidea is the vascular layer formed by the internal cerebral veins and medial posterior choroidal arteries.

   Identify the lettered structures:

   B. ______________________ **F.** ______________________
   C. ______________________ **G.** ______________________
   D. ______________________ **H.** ______________________
   E. ______________________ **I.** ______________________

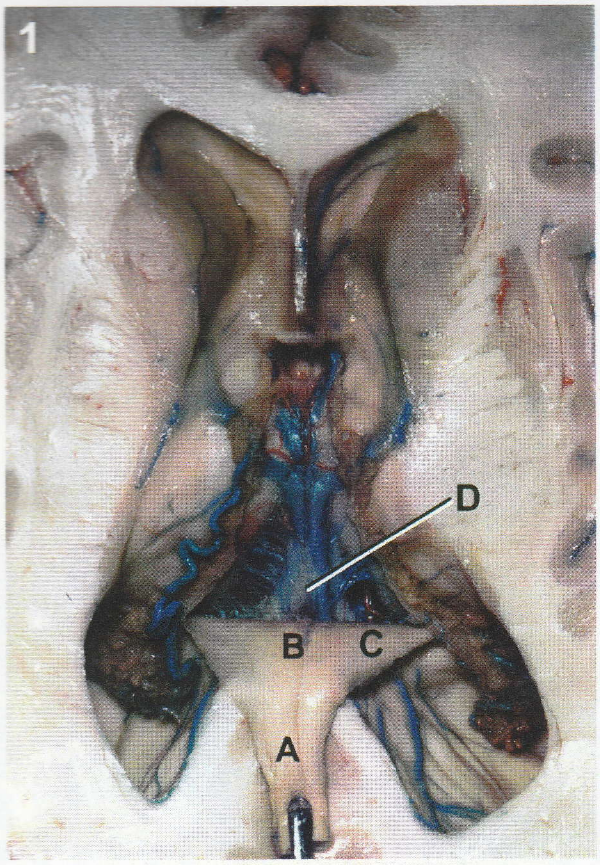
3. **The paired internal cerebral veins have been separated to expose the fourth and lower layer in the roof of the third ventricle which is formed by:**

   A. ______________________

4. The lower layer of tela choroidea has been opened and the massa intermedia has been divided in the midline to expose the floor of the third ventricle.

   Name the lettered structures that form the anterior part of the floor of the third ventricle

   A. ______________________ **D.** ______________________
   B. ______________________ **E.** ______________________
   C. ______________________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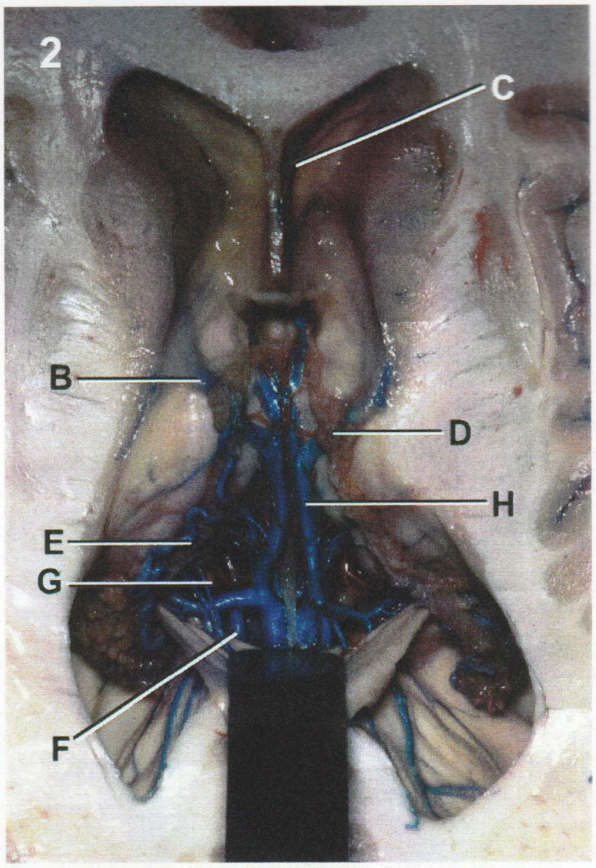
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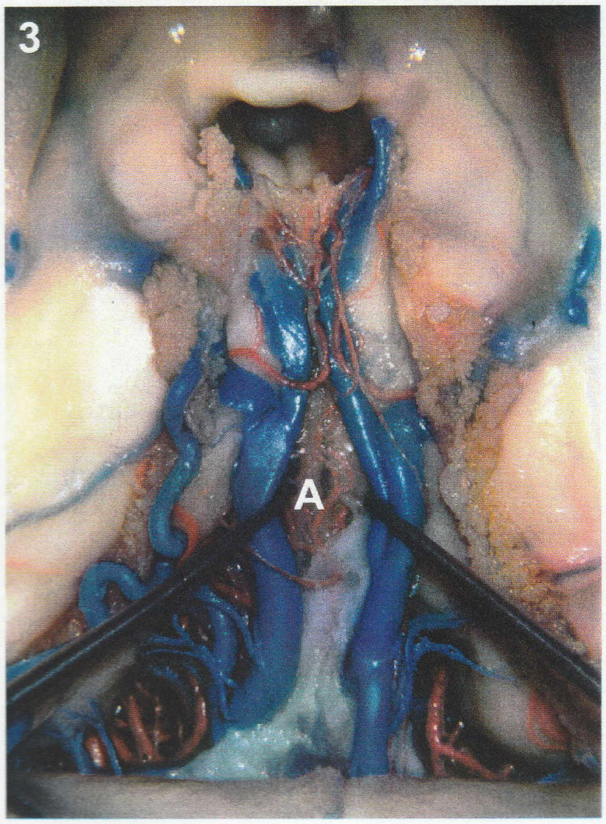
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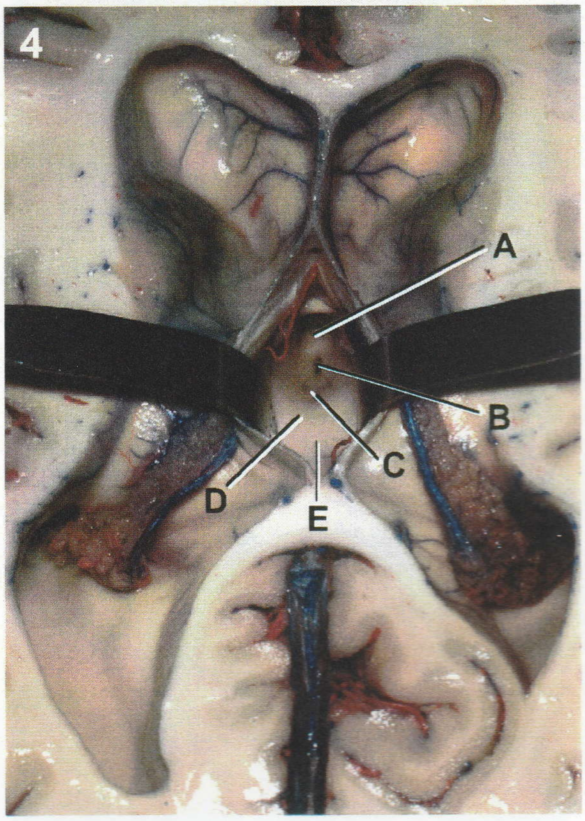
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5. The frontal horn, body, atrium and temporal horn of the right lateral ventricle have been exposed. The choroid plexus is attached along the choroidal fissure located between the fornix and thalamus. In the body, the fissure is located between the body of the fornix and the upper surface of the thalamus. In the atrium it is located between the pulvinar and the crus of the fornix and in the temporal horn is located between the fimbria of the fornix and the lower surface of the thalamus. The choroid plexus is attached on the thalamic side of the fissure to the tenia thalami and on the forniceal side to the tenia choroidea.

Opening the choroidal fissure in the body of the ventricle will expose the: **A.** ____________________
Opening the choroidal fissure in the atrium will expose the: **B.** ____________________
Opening the choroidal fissure in the temporal horn will expose the: **C.** ____________________

6. Magnified view of the tenia thalami and tenia fornix, which attaches the choroid plexus to the edge of the thalamus and fornix. The tenia are fine arachnoid-like membranes which are easily opened.

7. The choroidal fissure has been opened by dividing the tenia on the edge of the body of the fornix to expose the vascular structures in the velum interpositum and roof of the third ventricle. The choroid plexus remains attached by the tenia thalami to the superior surface of the thalamus.

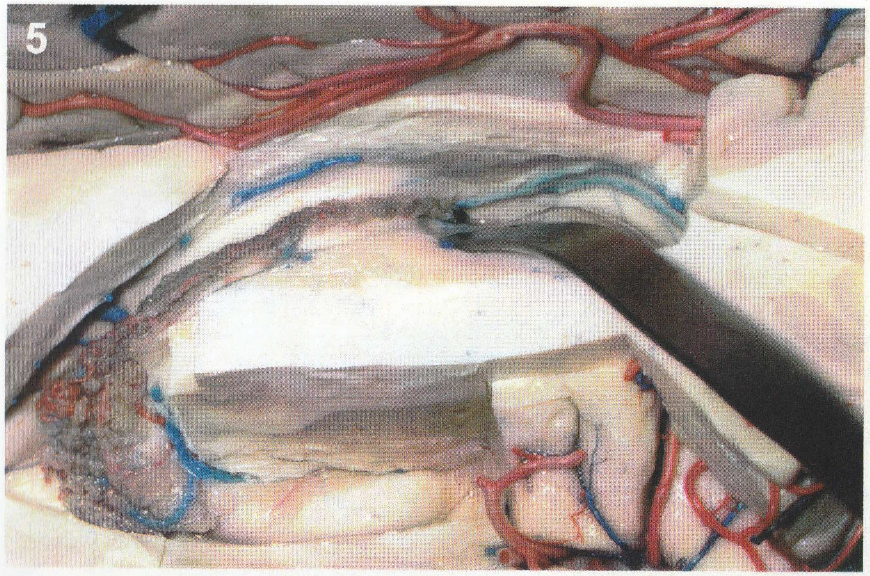
The venous drainage of the floor and lateral wall of the body of the lateral ventricle is directed through the tenia:
A. ____________________
The venous drainage of the roof and medial wall of the body of the lateral ventricle is directed through the tenia:
B. ____________________

The opening through the choroidal fissure has been directed through the tenia fornix in order to avoid damage to the large veins which drain the floor and lateral wall of the body of the ventricle.

Identify the lettered structures:
C. ____________________ **F.** ____________________
D. ____________________ **G.** ____________________
E. ____________________

The venous angle, which on the lateral view of the cerebral angiogram is often located at the posterior margin of the foramen of Monro, is located at the junction of the following two veins:
H. ____________________ **I.** ____________________
Note that the venous angle may also be located behind the foramen of Monro.

8. Enlarged view of Figure 7. After entering the velum interpositum the dissection is directed between the paired internal cerebral veins. Directing the exposure more laterally between one internal cerebral vein and the adjacent surface of the thalamus risks damaging the large veins which drain the internal capsule and the basal ganglia in the central part of the cerebral hemisphere. The medial posterior choroidal arteries which course in the roof of the third ventricle, arise in front of the brainstem from the P-1 segments of the posterior cerebral arteries. They pass around the midbrain in the crural, ambient, and quadrigeminal cisterns to reach the area beside the pineal body where they turn forward in the velum interpositum.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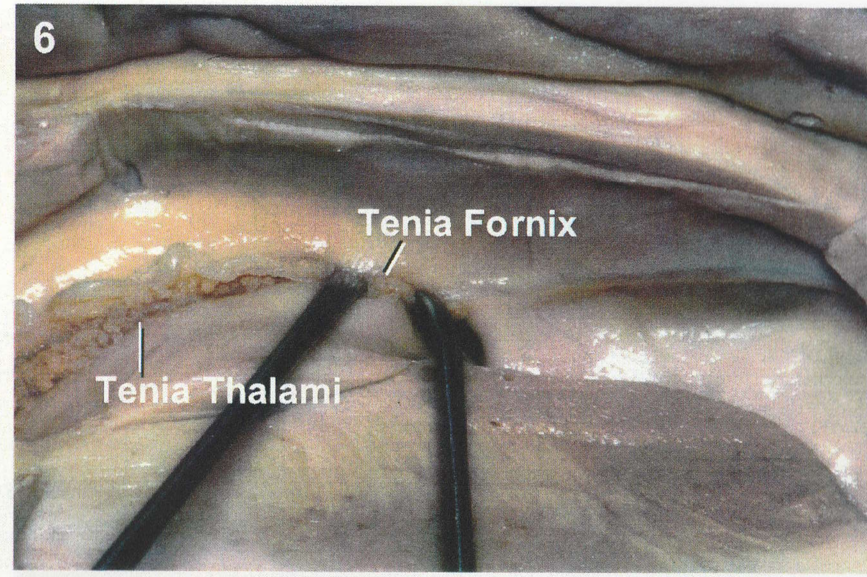
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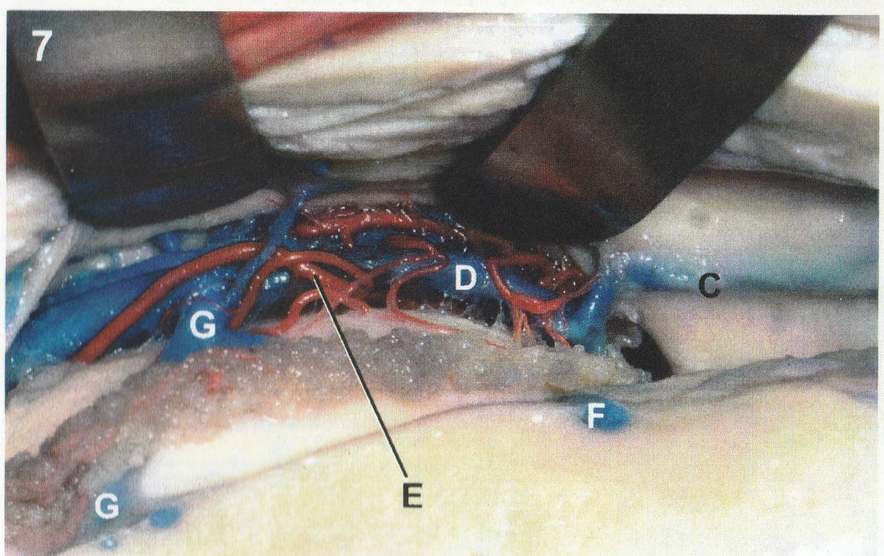
Tenia Fornix
Tenia Thalami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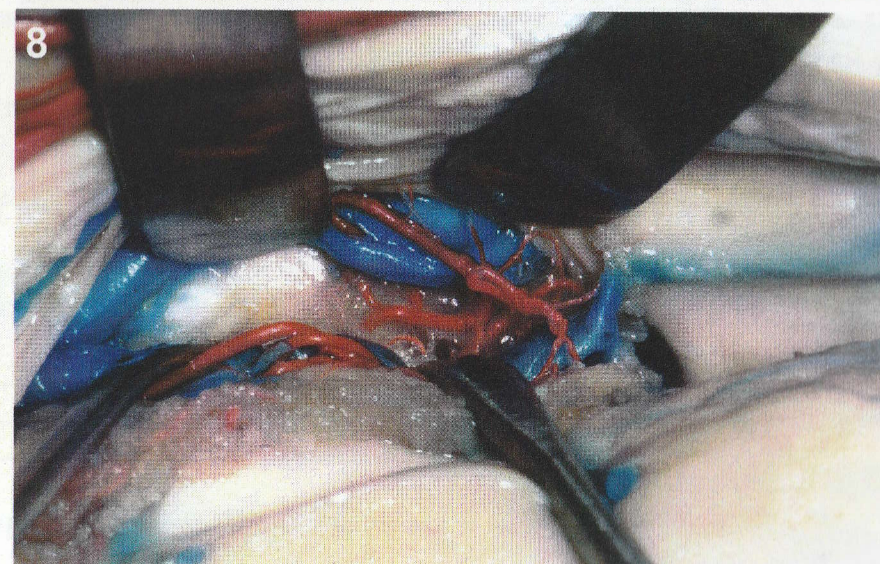
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9. The layer of tela choroidea, which attaches to the striate medullaris thalami, has been opened to expose the posterior part of the third ventricle.

Identify the structures that form the posterior part of the floor and posterior wall of the third ventricle:

A. ____________________ **D.** ____________________
B. ____________________ **E.** ____________________
C. ____________________ **F.** ____________________

10. The angle of view through the microscope has been changed to look into the mid and anterior parts of the floor of the third ventricle. The mammillary bodies are located in the mid portion of the floor.

11. The choroidal fissure in the atrium has been opened by dividing the tenia fornix to expose the quadrigeminal cistern. Note that the pineal gland (arrow) is located directly medial to the atrial part of the choroidal fissure.

The medial atrial veins which drain the medial wall of the atrium pass through the tenia A. ____________________ to reach the quadrigeminal cistern.

The lateral atrial veins which drain the lateral wall of the atrium pass through the tenia B. ____________________ to reach the quadrigeminal cistern.

12. Lateral view of the pineal region and quadrigeminal cistern in another specimen.

Identify the lettered veins in the pineal region:

A. ____________________ **C.** ____________________
B. ____________________ **D.** ____________________

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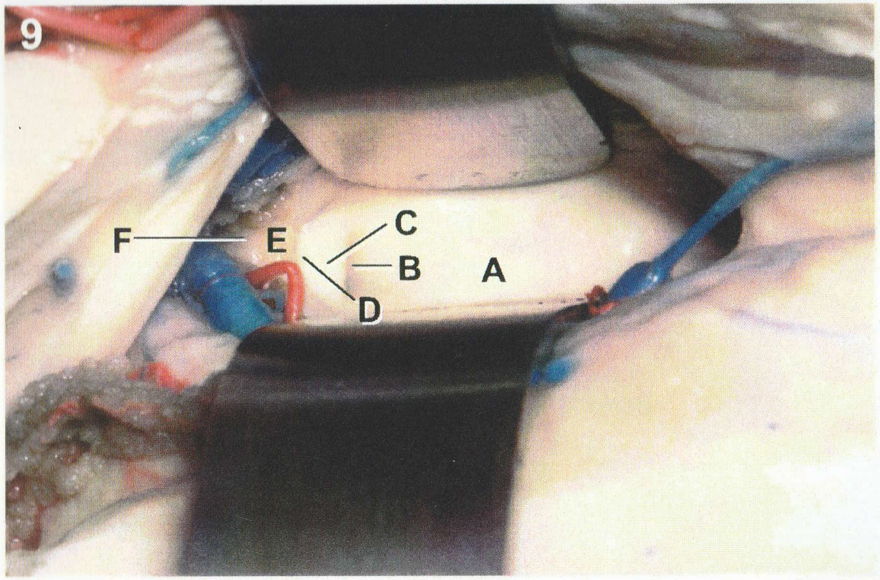

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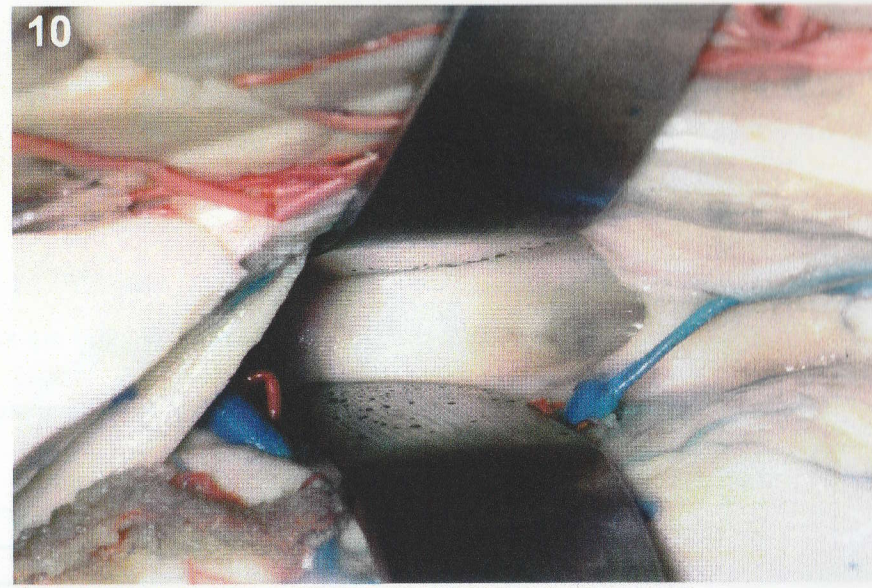

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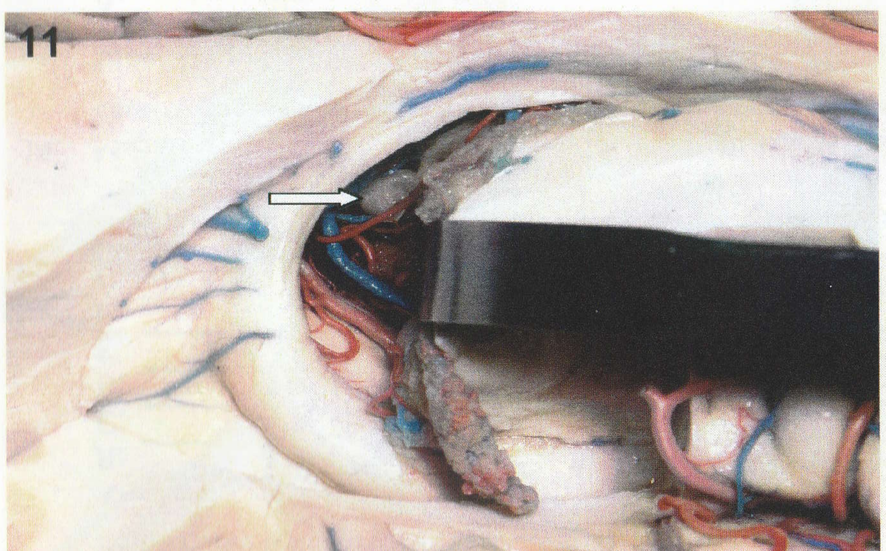

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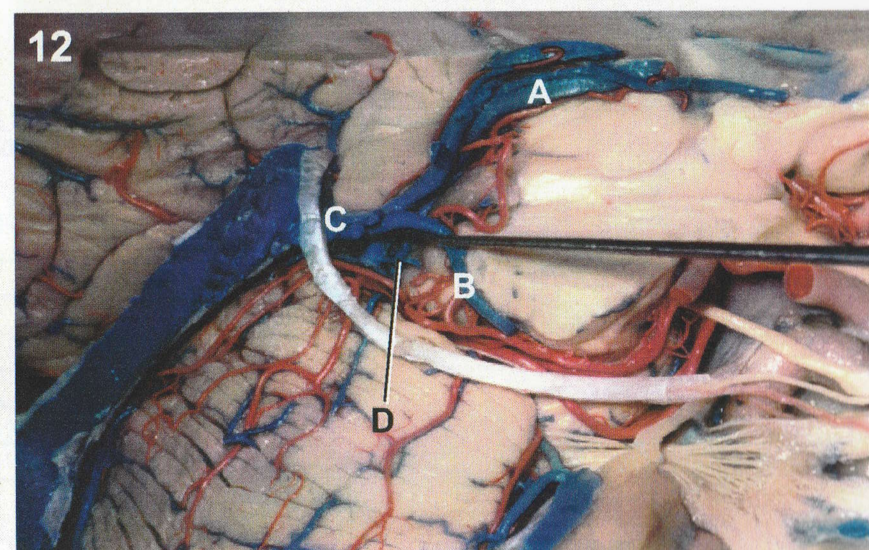


13. Sagittal section through the third ventricle, in another specimen, to show the relationships of the third ventricle.

Identify the lettered structures:

A. ____________________	**H.** ____________________
B. ____________________	**I.** ____________________
C. ____________________	**J.** ____________________
D. ____________________	**K.** ____________________
E. ____________________	**L.** ____________________
F. ____________________	**M.** ____________________
G. ____________________	**N.** ____________________

Note that the velum interpositum is located between the fornix and striae medullaris thalami.

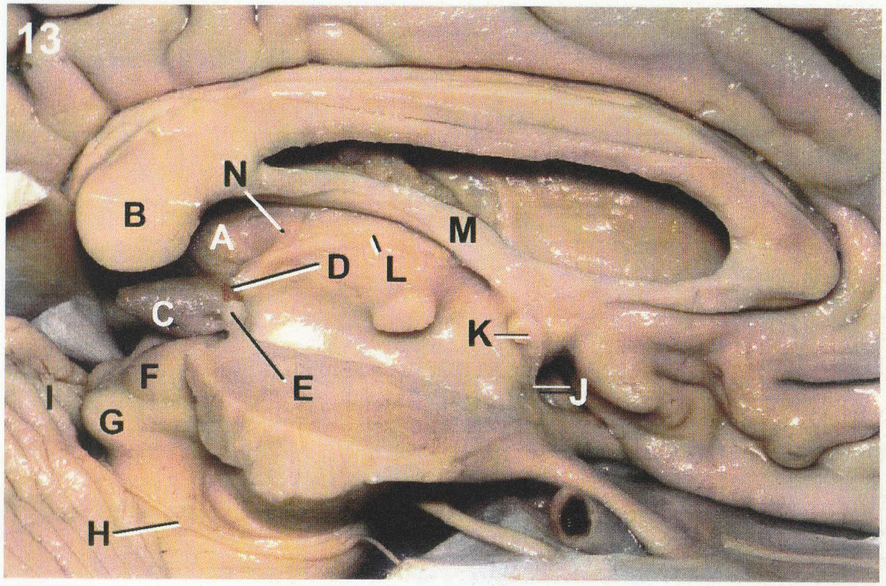
14. Magnified view through the atrial portion of the choroidal fissure into the quadrigeminal cistern and pineal region. Note that the choroid plexus has been detached from the fornix and remains attached to the thalamus.

Identify the lettered structures:

A. ____________________	**E.** ____________________
B. ____________________	**F.** ____________________
C. ____________________	**G.** ____________________
D. ____________________	

15. The ipsilateral and contralateral basal and internal cerebral veins have been exposed.

16. Retracting the tail of the hippocampus and the pulvinar exposes the precentral vein (arrow) emerging from the cerebello-mesencephalic fissure.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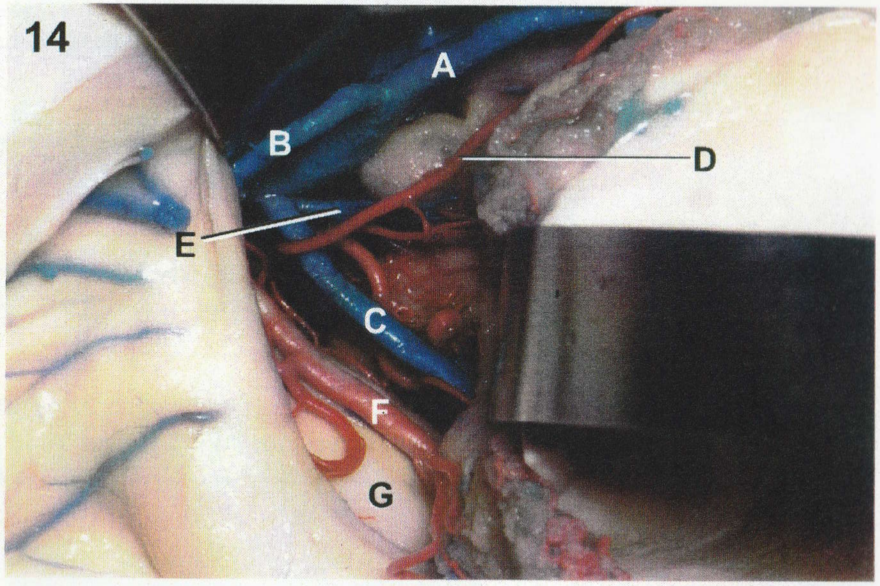
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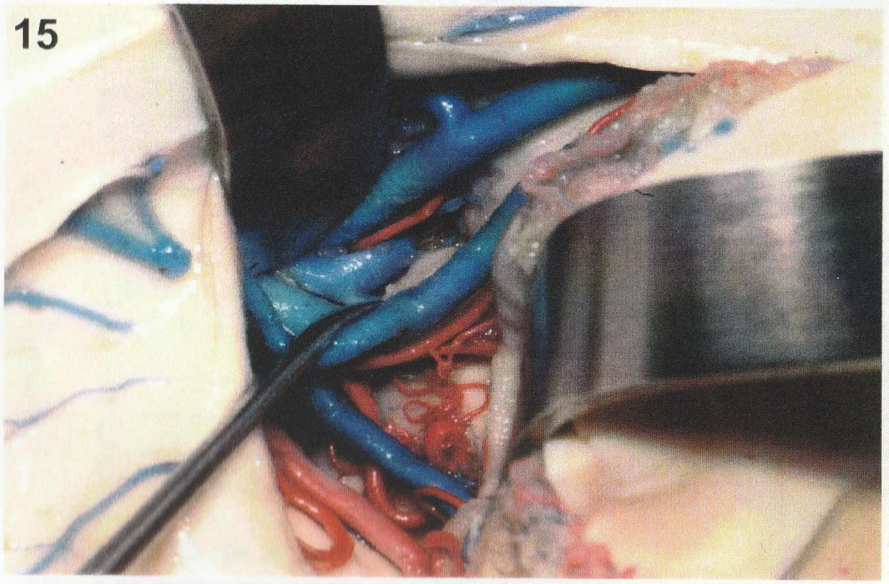
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16

17. The choroidal fissure in the temporal horn has been opened to expose the ambient cistern.
Identify the lettered structures:

A. ______________________ **E.** ______________________
B. ______________________ **F.** ______________________
C. ______________________ **G.** ______________________
D. ______________________

18. Superior view of the ambient and crural cisterns. The crural cistern is located between the cerebral peduncle and the uncus. The ambient cistern is located medial to the temporal horn between the parahippocampal gyrus and the lateral surface of the midbrain. The point where the fimbria of the fornix meets the uncus marks the lower end of the choroidal fissure called the inferior choroidal point.
Identify the lettered structures:

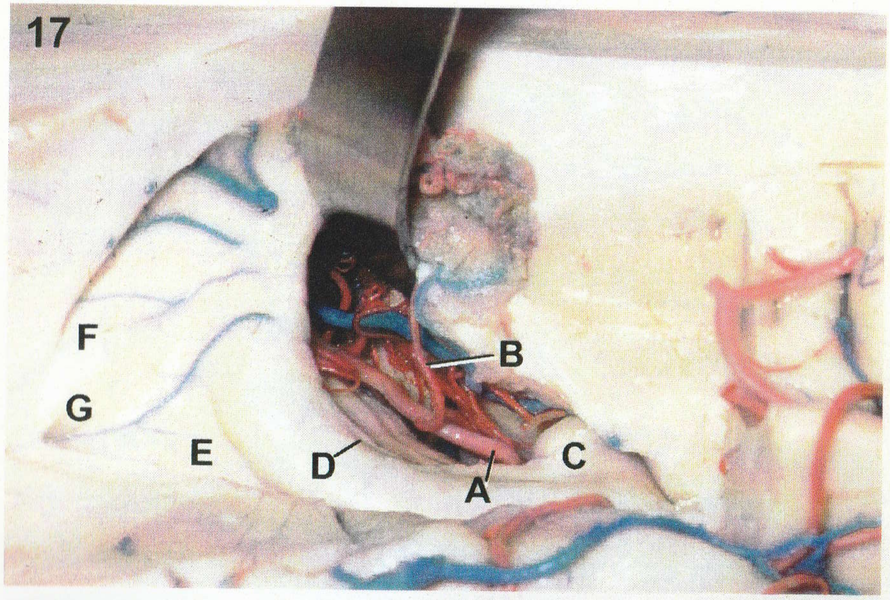
A. ______________________ **E.** ______________________
B. ______________________ **F.** ______________________
C. ______________________ **G.** ______________________
D. ______________________ **H.** ______________________

19. Superior view showing the vascular relationship in the cisterns around the midbrain. Note that the anterior choroidal artery courses in the upper part of the crural cistern, the posterior cerebral artery courses in the mid-level of the crural and ambient cisterns and the superior cerebellar artery courses in the lower part of the ambient cistern. The transverse hippocampal veins cross the floor of the temporal horn and the inferior ventricular vein, which drains the roof of the temporal horn (not shown), pass through the choroidal fissure to join the basal vein in the ambient cistern.
Identify the lettered structures:

A. ______________________ **E.** ______________________
B. ______________________ **F.** ______________________
C. ______________________ **G.** ______________________
D. ______________________

20. The hippocampus has been depressed and the thalamus elevated to provide a better view of the ambient cistern.
Identify the lettered structures:

A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________



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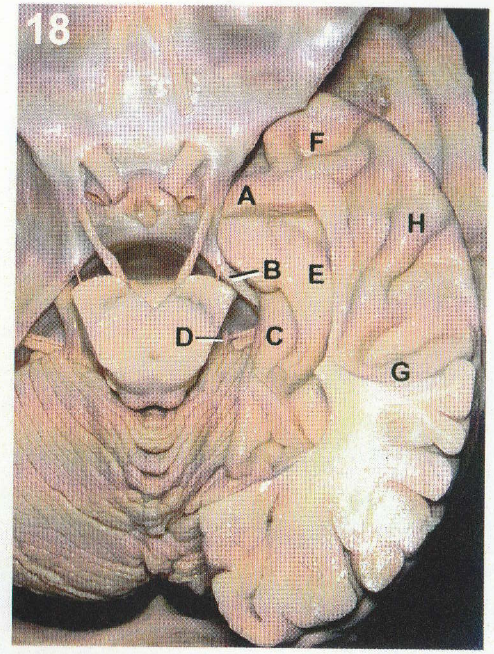

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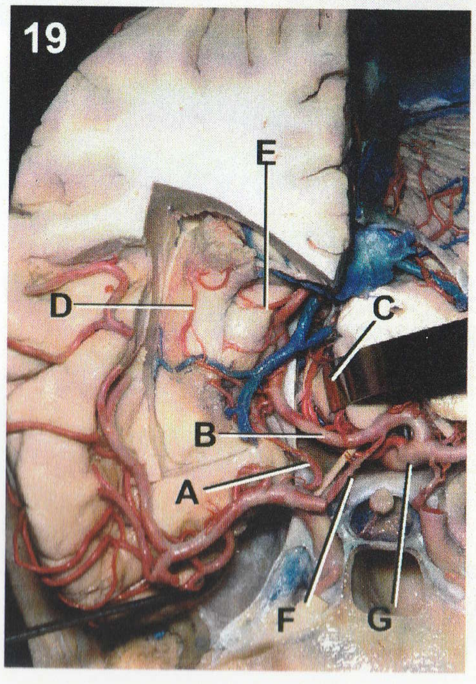

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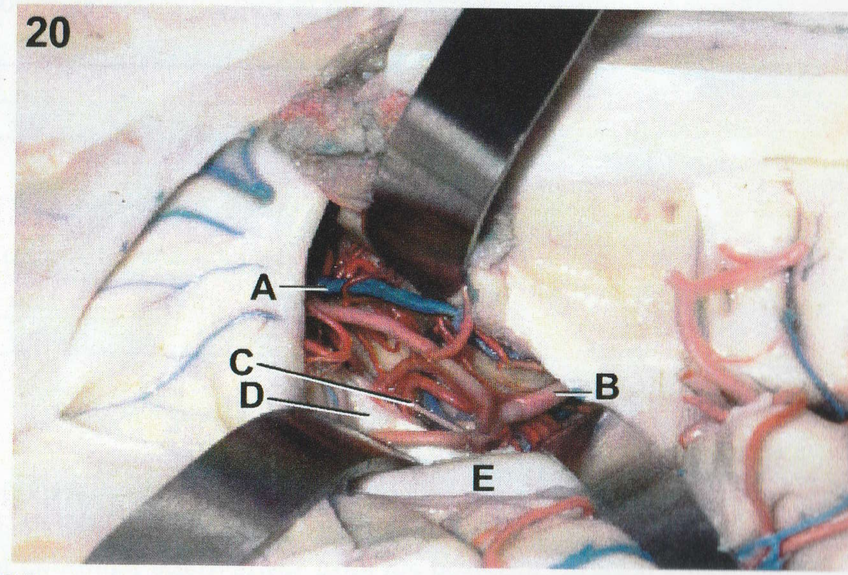

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21. Magnified view of the ambient cistern. A large lateral posterior choroidal artery arises from the posterior cerebral artery and ascends to supply the choroid plexus in the temporal horn. The thalamogeniculate arteries also arise from the posterior cerebral artery in this cistern and passes upward through the geniculate bodies to reach the thalamus. Ischemia in the distribution of the latter arteries gives rise to the thalamic syndrome.

Identify the lettered structures:

A. ______________________	**C.** ______________________
B. ______________________	**D.** ______________________

22. The hippocampus has been depressed to expose the lower part of the ambient cistern.

Identify the lettered structures:

A. ______________________	**D.** ______________________
B. ______________________	**E.** ______________________
C. ______________________	**F.** ______________________

23. The lower end of the choroidal fissure has been retracted to expose the posterior part of the crural cistern and the oculomotor nerve (arrow).

24. Transtemporal-transchoroidal approach to the basilar apex. The opening through the choroidal fissure into the ambient cistern has been extended by making a 10 mm cut beginning at the choroidal fissure and extending forward at the level of the fimbria of the fornix into the uncus. The microscope has been angled forward to allow inspection of the basilar tip.

Identify the lettered structures:

A. ______________________	**D.** ______________________
B. ______________________	**E.** ______________________
C. ______________________	

25. An axial cut has been completed in the left hemisphere at the level of the superior cut in the right hemisphere. The choroidal fissure can then be opened from the left side by opening the tenia fornix to expose the third ventricle.

26. An interforniceal approach to the velum interpositum and third ventricle has been completed by making a longitudinal incision in the midline through the body of the fornix. The approach should be directed between the internal cerebral veins.

27. Both internal cerebral veins have been retracted to expose the anterior part of the floor and anterior wall of the third ventricle.

    Identify the lettered structures:

    A. ____________________
    B. ____________________
    C. ____________________
    D. ____________________
    E. ____________________
    F. ____________________
    G. ____________________
    H. ____________________
    I. ____________________

28. View into the posterior part of the third ventricle.

    Identify the lettered structures:

    A. ____________________
    B. ____________________
    C. ____________________
    D. ____________________
    E. ____________________


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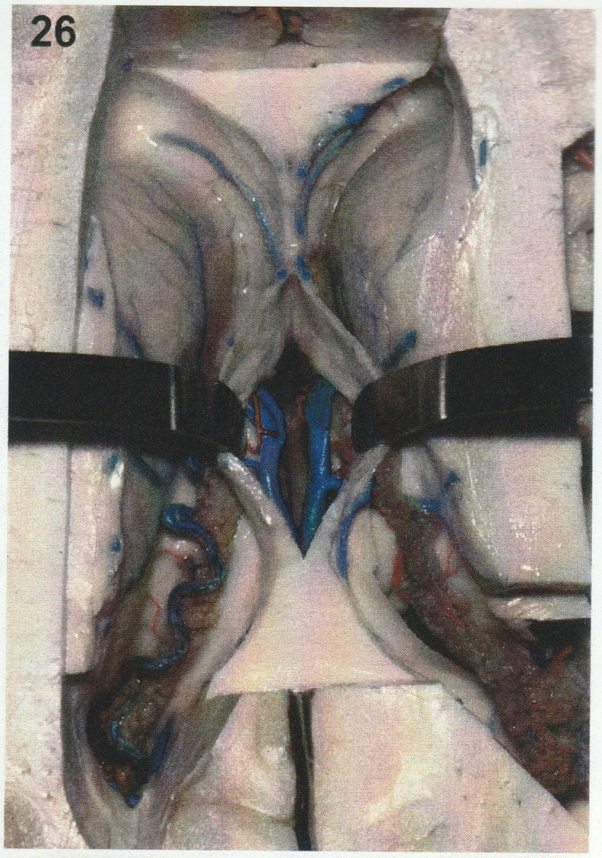
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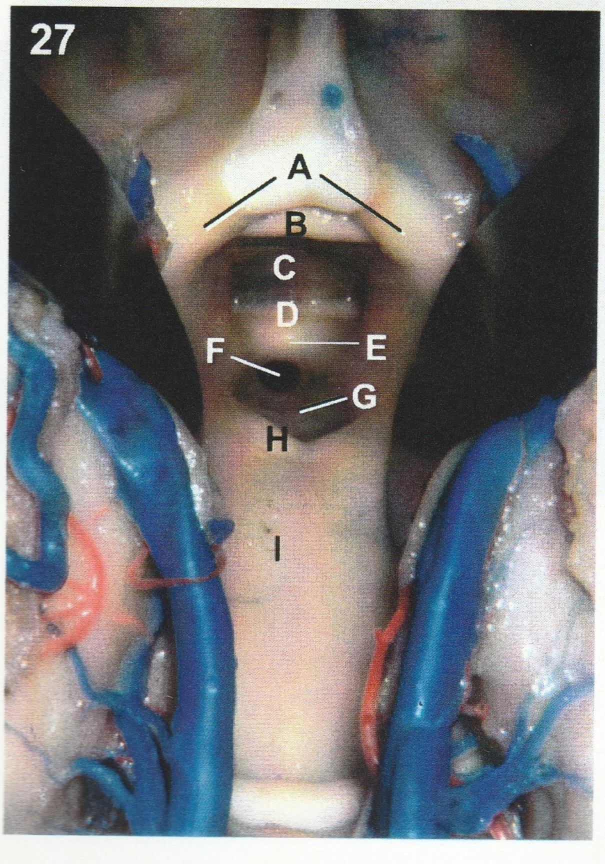
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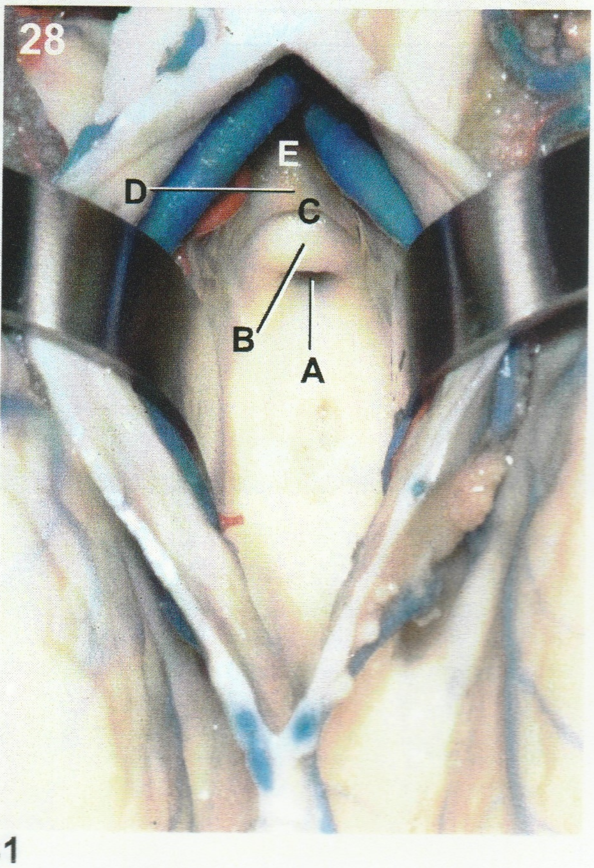
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29. The columns of the fornix have been divided at the foramen of Monro and lifted backwards along with the hippocampal commissure to expose the vascular structures in the roof of the third ventricle, the pineal gland (arrow), and the quadrigeminal cistern.

30. Enlarged view of the quadrigeminal cistern, pineal region, and roof of the third ventricle.

Identify the lettered structures:

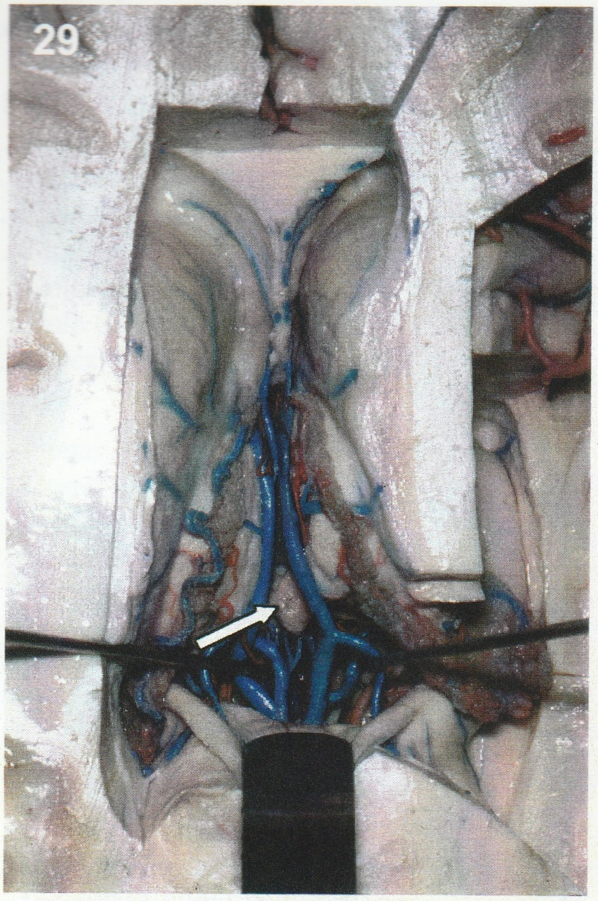
A. ______________________ E. ______________________
B. ______________________ F. ______________________
C. ______________________ G. ______________________
D. ______________________

31. Perform an axial cut through the basal ganglia at the level of the foramen of Monro while preserving the medial part of the thalamus as shown.

32. Note the close relationship of the genu of the internal capsule to the foramen of Monro and lateral ventricle. In the area directly lateral to the foramen of Monro, the genu of the capsule comes directly to the ventricular surface. Heavy retraction in this area during the course of exposing a third ventricular tumor could damage the internal capsule and cause hemiplegia.

Identify the lettered structures:

A. ______________________ E. ______________________
B. ______________________ F. ______________________
C. ______________________ G. ______________________
D. ______________________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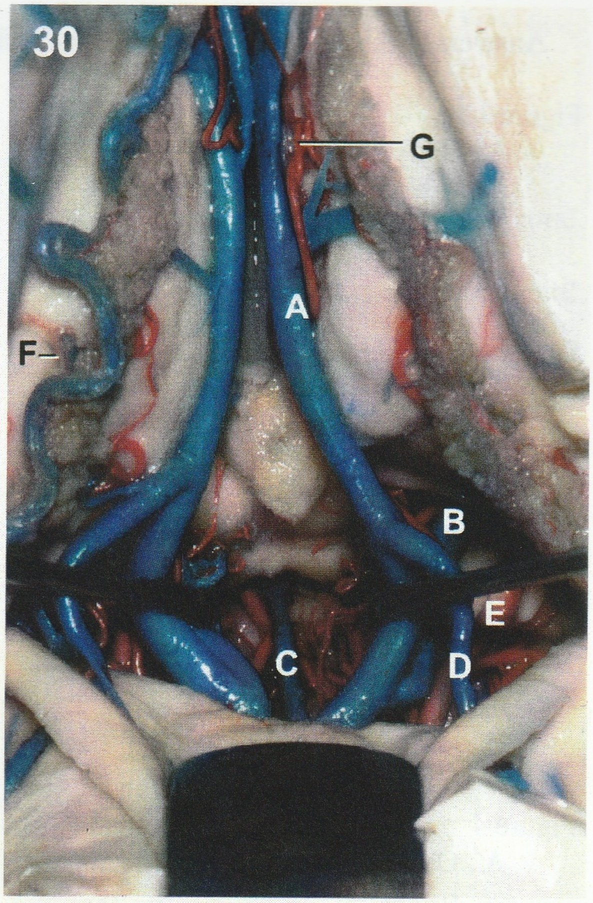
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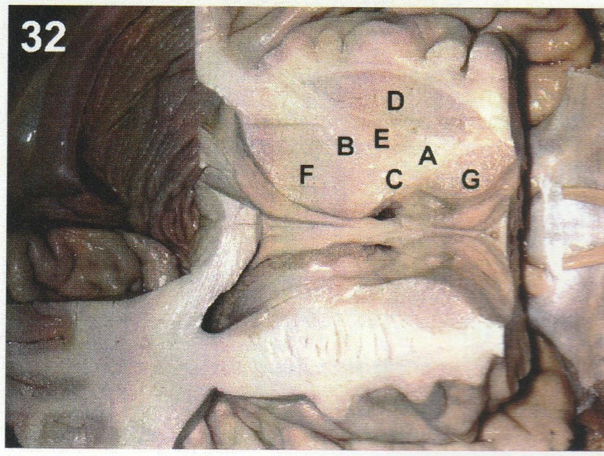
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Answers (Transchoroidal and Interforniceal Approaches. Third Ventricle)

Figure 1
A. Body of fornix
B. Hippocampal commissure
C. Crus of fornix
D. Tela choroidea located between the fornix and internal cerebral veins.

Figure 2
A. Velum interpositum
B. Thalamostriate vein
C. Anterior septal vein
D. Thalamocaudate vein
E. Superior choroidal vein
F. Common atrial vein
G. Medial posterior choroidal artery
H. Internal cerebral vein

Figure 3
A. Tela choroidea attached to the striae medullaris thalami

Figure 4
A. Optic chiasm and suprachiasmatic recess
B. Infundibular recess
C. Tuber cinereum
D. Mamillary bodies
E. Midbrain

Figure 5
A. Velum interpositum and third ventricle
B. Quadrigeminal cistern
C. Ambient cistern

Figure 7
A. Tenia thalami
B. Tenia fornix
C. Anterior septal vein
D. Internal cerebral vein
E. Medial posterior choroidal artery
F. Thalamostriate vein
G. Thalamocaudate vein
H. Internal cerebral vein
I. Thalamostriate vein

Figure 9
A. Midbrain
B. Aqueduct
C. Posterior commissure
D. Pineal recess
E. Habenular commissure
F. Suprapineal recess

Figure 11
A. Tenia fornix
B. Tenia thalami

Figure 12
A. Internal cerebral vein
B. Basal vein
C. Vein of Galen
D. Precentral cerebellar vein (vein of cerebellomesencephalic fissure)

Figure 13
A. Pulvinar
B. Splenium
C. Pineal gland
D. Habenular commissure
E. Posterior commissure
F. Superior colliculus
G. Inferior colliculus
H. Trochlear nerve
I. Central lobule of the vermis
J. Lamina terminalis
K. Anterior commissure
L. Striae medullaris thalami
M. Body fornix
N. Velum interpositum

Figure 14
A. Internal cerebral vein
B. Common atrial vein
C. Basal vein
D. Medial posterior choroidal artery
E. Pineal vein
F. Posterior cerebral artery
G. Parahippocampal gyrus

Figure 17
A. Posterior cerebral artery
B. Lateral posterior choroidal artery
C. Uncus
D. Fimbria of fornix
E. Collateral trigone
F. Bulb of corpus callosum
G. Calcar avis

Figure 18
A. Uncus
B. Crural cistern
C. Parahippocampal gyrus
D. Ambient cistern
E. Hippocampus
F. Planum polare
G. Planum temporale
H. Heschl's gyrus

Figure 19
A. Anterior choroidal artery
B. Posterior cerebral artery
C. Superior cerebellar artery
D. Lateral posterior choroidal artery
E. Hippocampal artery
F. Posterior communicating artery
G. Basilar artery

Figure 20
A. Basal vein
B. Posterior cerebral artery
C. Trochlear nerve
D. Tentorial edge
E. Hippocampus

Figure 21
A. Lateral mesencephalic vein
B. Thalamogeniculate arteries
C. Basal vein
D. Lateral posterior choroidal artery

Figure 22
A. Trochlear nerve
B. Medial posterior choroidal artery
C. Superior cerebellar artery
D. Basal vein
E. Tentorial edge
F. Hippocampus

Figure 24
A. Basilar artery
B. Superior cerebellar artery
C. P-1 segment of posterior cerebral artery
D. P-2 segment of posterior cerebral artery
E. Oculomotor nerve

Figure 27
A. Columns of the fornix
B. Anterior commissure
C. Lamina terminalis
D. Suprachiasmatic recess
E. Optic chiasm
F. Infundibular recess
G. Tuber cinereum
H. Mamillary bodies
I. Midbrain

Figure 28
A. Aqueduct
B. Posterior commissure
C. Pineal recess
D. Habenular commissure
E. Suprapineal recess

Figure 30
A. Internal cerebral vein
B. Basal vein
C. Precentral vein
D. Common atrial vein
E. Posterior cerebral artery
F. Lateral posterior choroidal artery
G. Medial posterior choroidal artery

Figure 32
A. Anterior limb of the internal capsule
B. Posterior limb of the internal capsule
C. Genu of the internal capsule
D. Putamen
E. Globus pallidus
F. Thalamus
G. Caudate nucleus

Pterional, Subtemporal, Pretemporal, and Interhemispheric Approaches to the Basal Cisterns

Pterional, Subtemporal, Pretemporal, and Interhemispheric Approaches to the Basal Cisterns

1. Superolateral view of the major arteries and segments which can be exposed by the pterional approach combined with wide opening of the sylvian fissure.
   Identify the lettered main trunks and arterial segments:

   A. ______________ **F.** ______________
   B. ______________ **G.** ______________
   C. ______________ **H.** ______________
   D. ______________ **I.** ______________

2. Note the relationship of the anterior choroidal artery to the uncus and the posterior communicating artery to the oculomotor nerve (arrow). The anterior choroidal artery passes around the medial aspect of the uncus to reach the temporal horn. The posterior communicating artery is directed backwards and medially from the internal carotid artery and usually courses superomedial to the oculomotor nerve to join the P-1 segment of the posterior cerebral artery. The only time the posterior communicating courses directly backwards above the third nerve is when there is a fetal origin of the posterior cerebral artery from the internal carotid artery.

3. The posterior communicating artery, the P-1 segment of the posterior cerebral artery and the basilar apex formed the posterior part of the circle of Willis.
   Identify the lettered structures:

   A. ______________ **C.** ______________
   B. ______________

   What arteries form the anterior part of the circle of Willis?

   D. ______________ **F.** ______________
   E. ______________

4. Inferior view of the arteries coursing in the basal cisterns.
   Identify structures A and B:

   A. ______________ **B.** ______________

   Identify the landmarks (C, D, and E) used to divide the posterior cerebral artery into the P1, P2A, P2P and P3 segments:

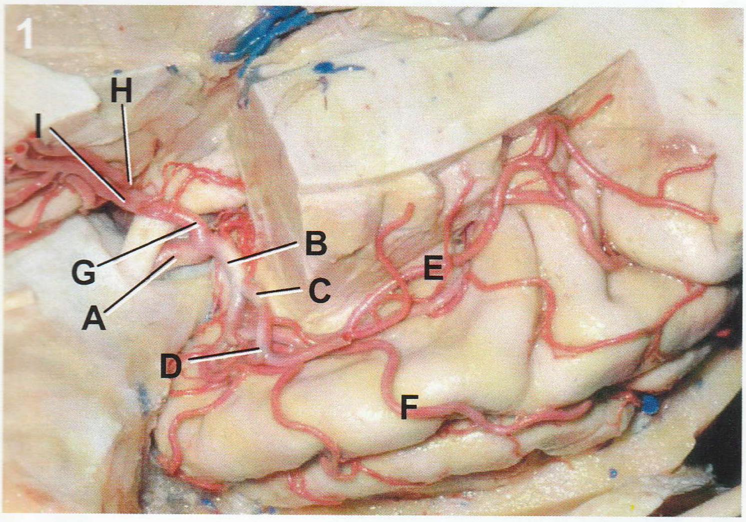
   C. ______________ **E.** ______________
   D. ______________

   List the segments into which the intradural portion of the internal carotid artery is divided:

   The first segment, F. ______________ **extends from the origin of the G.** ______________ **artery to the origin of the H.** ______________ **artery**

   The second segment, I. ______________ **extends from the J.** ______________ **artery to the K.** ______________ **artery.**

   The third segment, L. ______________ **extends from the M.** ______________ **artery to the N.** ______________.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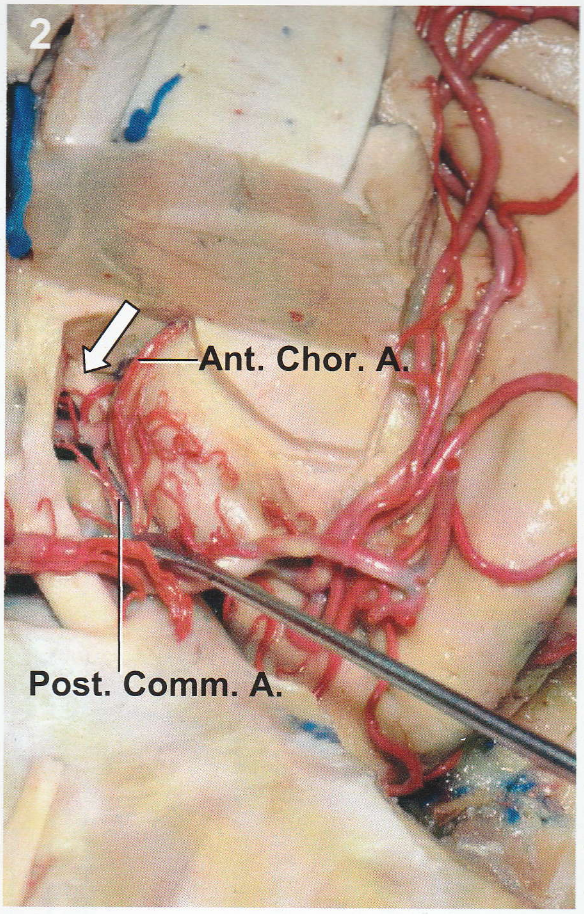
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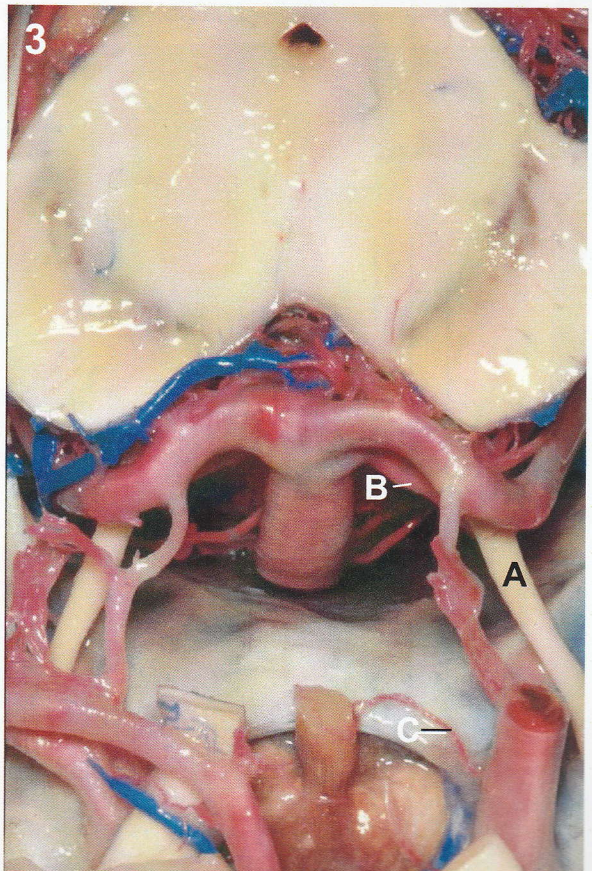
Ant. Chor. A.
Post. Comm. A.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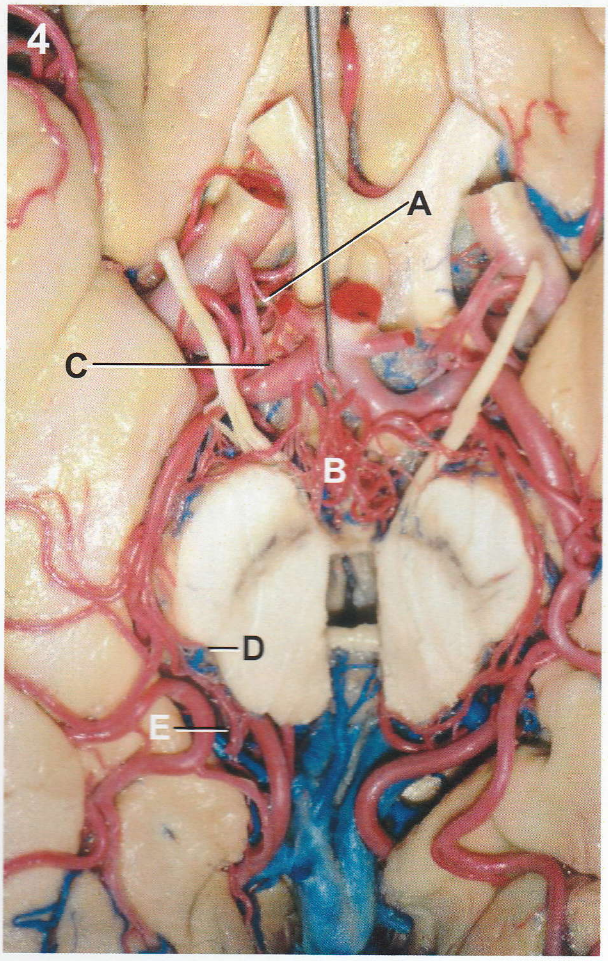
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5. The anatomic specimen used for these dissections is positioned to simulate a left pterional approach. The head is turned 20 to 30 degrees to the contralateral side. The left pterion and sphenoid ridge have been drilled to expose the lateral part of the superior orbital fissure (arrow) while leaving a thin lamina of bone over the orbital roof.

6. The sylvian fissure has been opened at the level of the pars triangularis of the inferior frontal gyrus to expose the M2 (insular) and M3 (opercular) segments of the middle cerebral artery.

7. The exposure has been extended medially along the horizontal portion of the sylvian fissure and the carotid, chiasmatic and lamina terminalis cisterns have been opened. The bifurcation of the middle cerebral artery may be located on the M1 segment prior to the genu or distal to the genu on the M2 segment.

   Identify the lettered structures:

   A. ______________________ **D.** ______________________
   B. ______________________ **E.** ______________________
   C. ______________________ **F.** ______________________

8. The internal carotid and posterior communicating arteries have been elevated to expose the basilar apex and P-1 segments.

   Identify the lettered structures:

   A. ______________________ **D.** ______________________
   B. ______________________ **E.** ______________________
   C. ______________________ **F.** ______________________

9. The microscope has been tilted to provide a view parallel to the horizontal part of the sylvian fissure in order to expose the A1 segment of the anterior cerebral artery and the recurrent artery of Heubner (arrow).

10. It is often necessary to retract the gyrus rectus, as shown, to expose the anterior communicating artery which may be located in the anterior part of the interhemispheric fissure.

Identify the lettered structures:

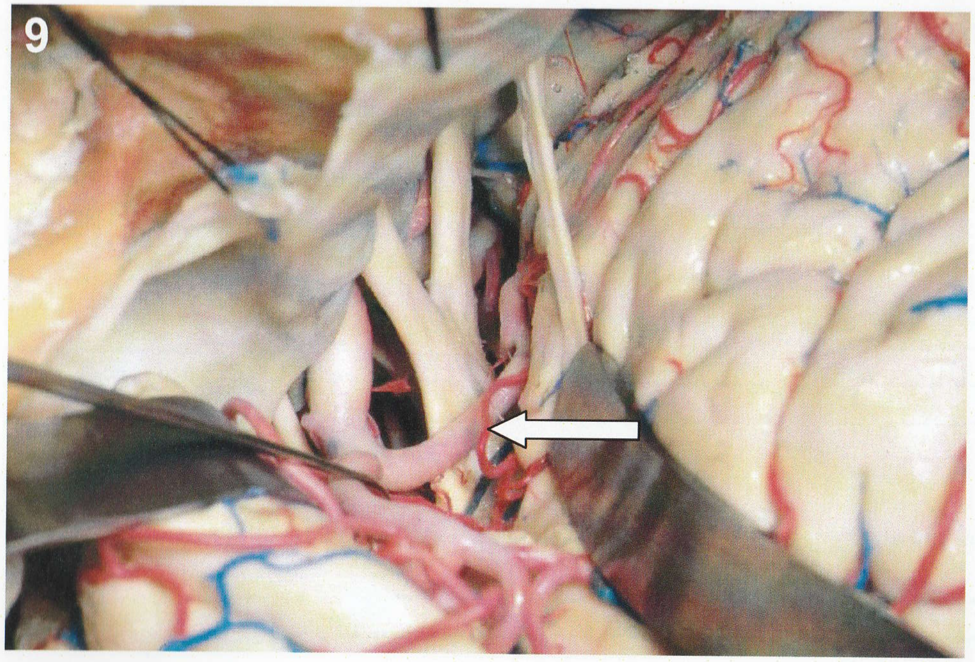
A. ______________________ **C.** ______________________
B. ______________________ **D.** ______________________

11. The posterior part of the gyrus rectus is often removed to expose an aneurysm of the anterior communicating artery located within the anterior part of the hemispheric fissure. Note that the recurrent artery (arrow) may loop forward across the gyrus rectus and could be damaged or occluded in removing the posterior part of the gyrus.

12. Enlarged view of the anterior communicating region following removal of the posterior part of the gyrus rectus.

Identify the lettered structures:

A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________ **F.** ______________________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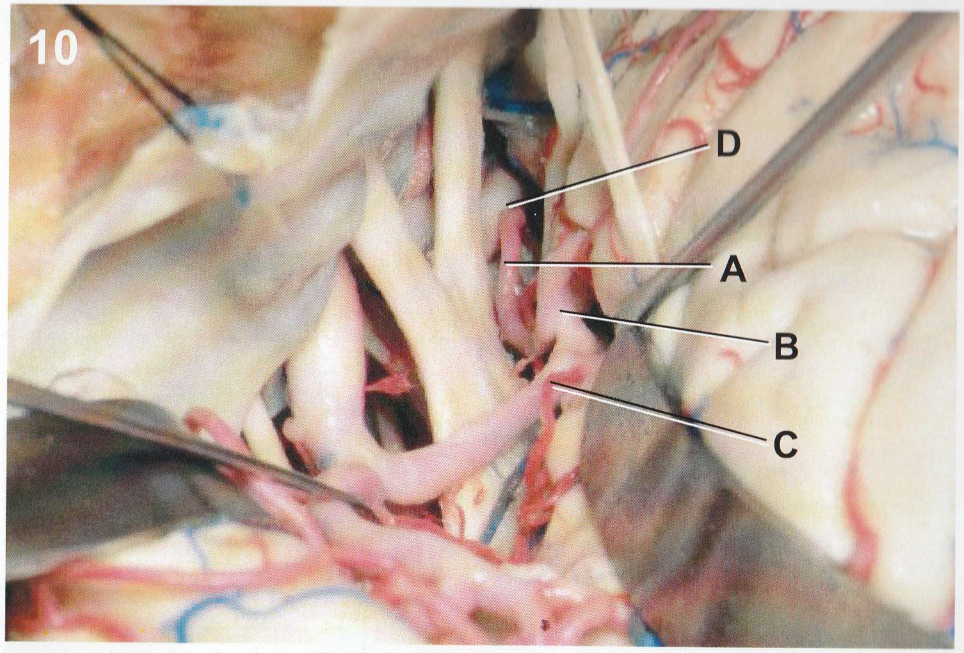
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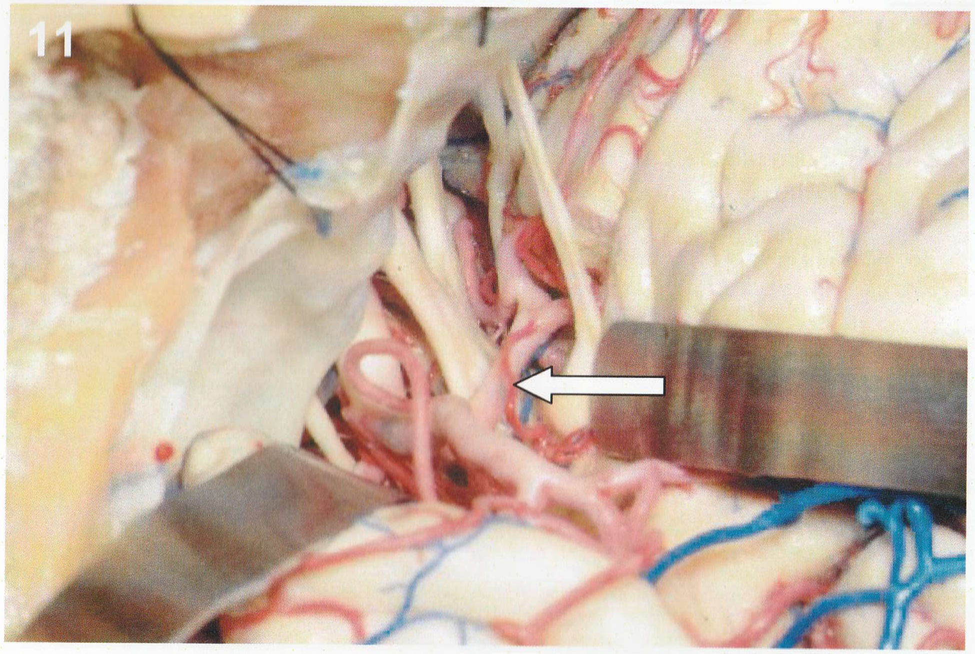
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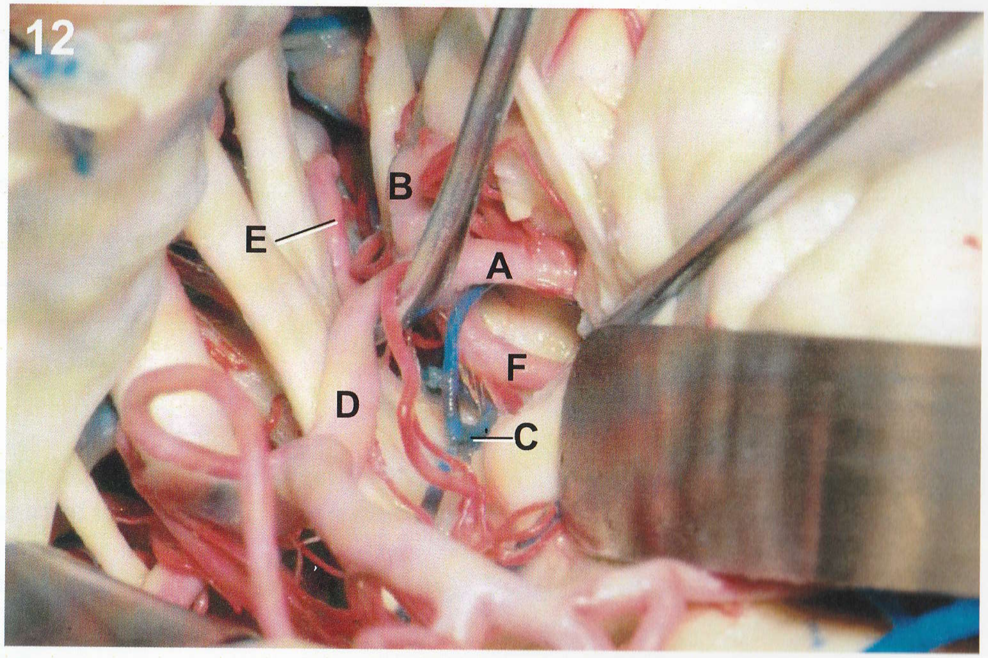
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13. The contralateral optic nerve has been gently elevated to expose the origin of the contralateral ophthalmic artery (arrow).

14. Liliequist membrane, the membrane extending from the dorsum sellae to the mamillary bodies, has been opened to expose the bifurcation of the basilar artery. The approach shown here is directed behind the internal carotid artery and above the oculomotor nerve and posterior communicating artery.

Identify the lettered structures:

A. ______	**D.** ______
B. ______	**E.** ______
C. ______	**F.** ______

15. The basilar apex has been exposed through the opticocarotid triangle which is located between the optic nerve, internal carotid artery, and the A1 segment of the anterior cerebral artery.

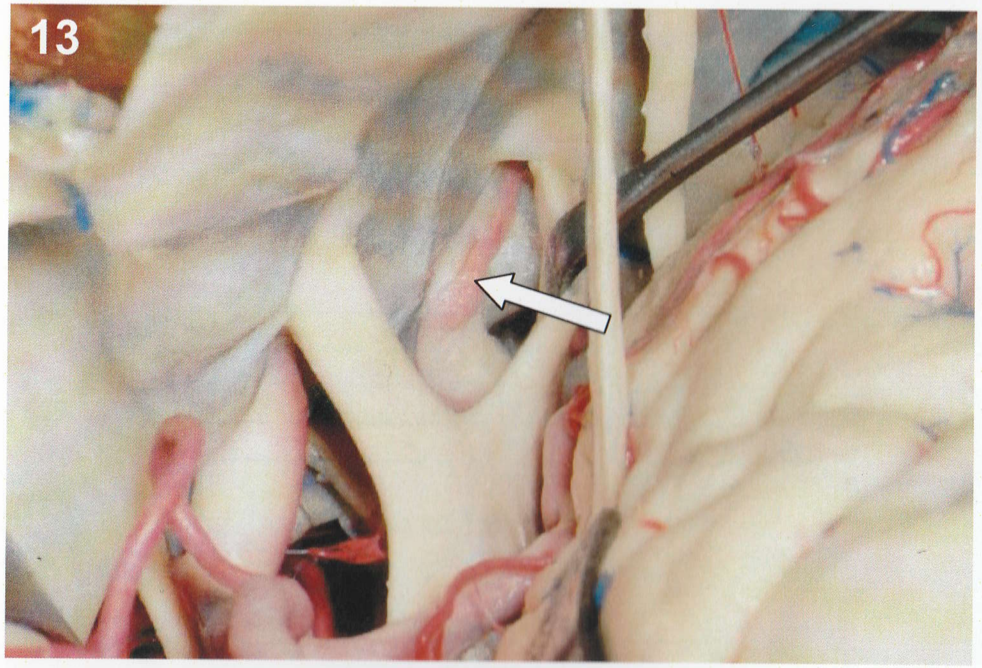
Identify the lettered structures:

A. ______	**E.** ______
B. ______	**F.** ______
C. ______	**G.** ______
D. ______	**H.** ______

16. The basilar apex has been exposed through an approach above the bifurcation of the internal carotid artery.

Identify the lettered structures:

A. ______	**D.** ______
B. ______	**E.** ______
C. ______	**F.** ______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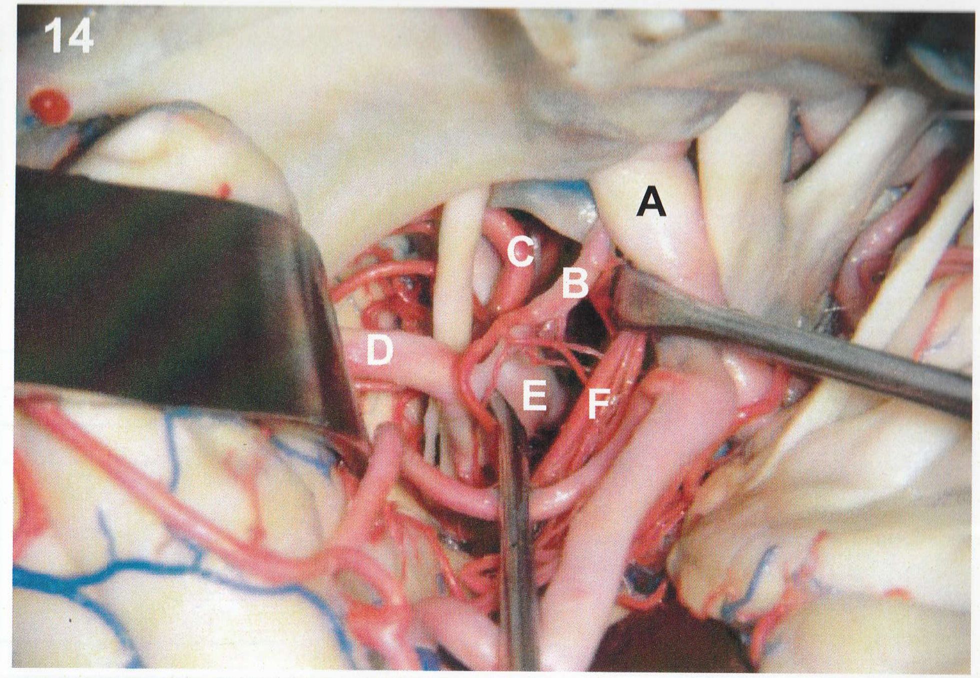
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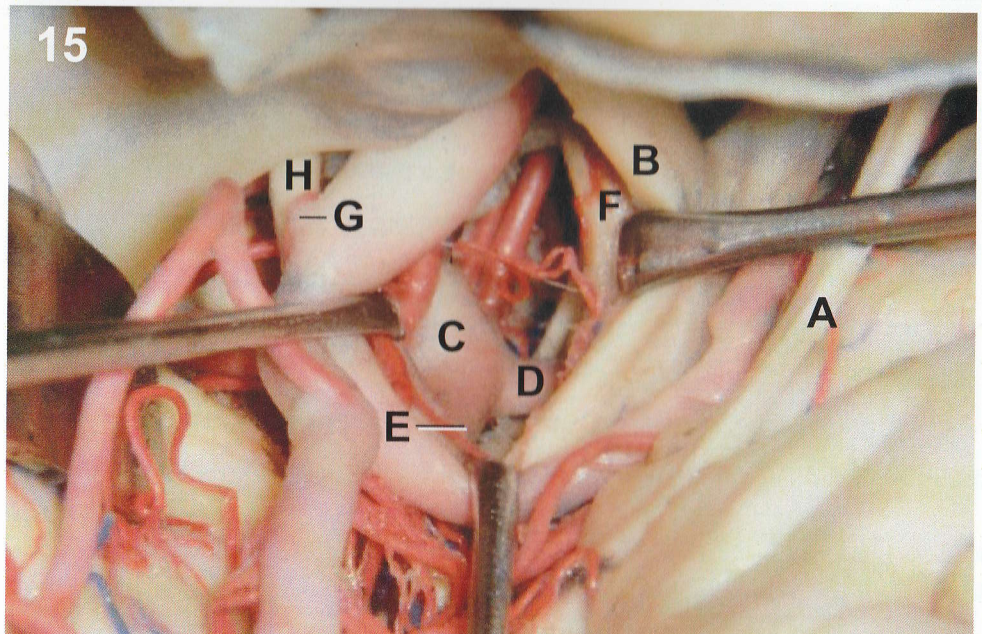
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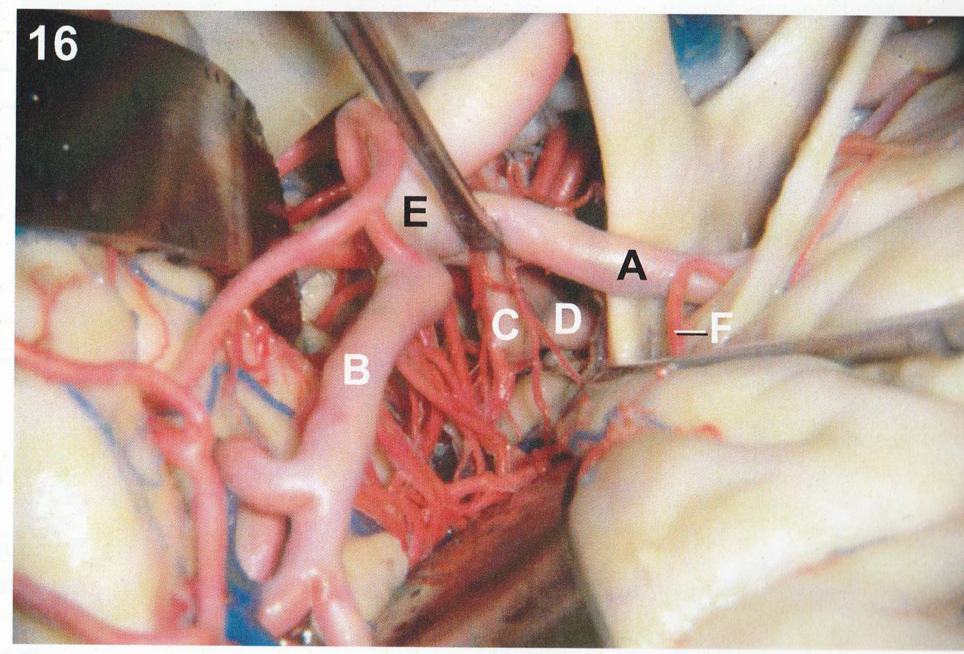
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17. The specimen has been positioned for a left anterior subtemporal approach. Bone is drilled along the floor of the middle fossa to provide a direct lateral approach and to minimize the need for temporal lobe elevation.

18. The temporal lobe has been elevated and the arachnoid membrane covering the basal cisterns has been opened.

Identify the lettered structures:

A. ______________	**D.** ______________
B. ______________	**E.** ______________
C. ______________	

19. Enlarged view of the basal cisterns.

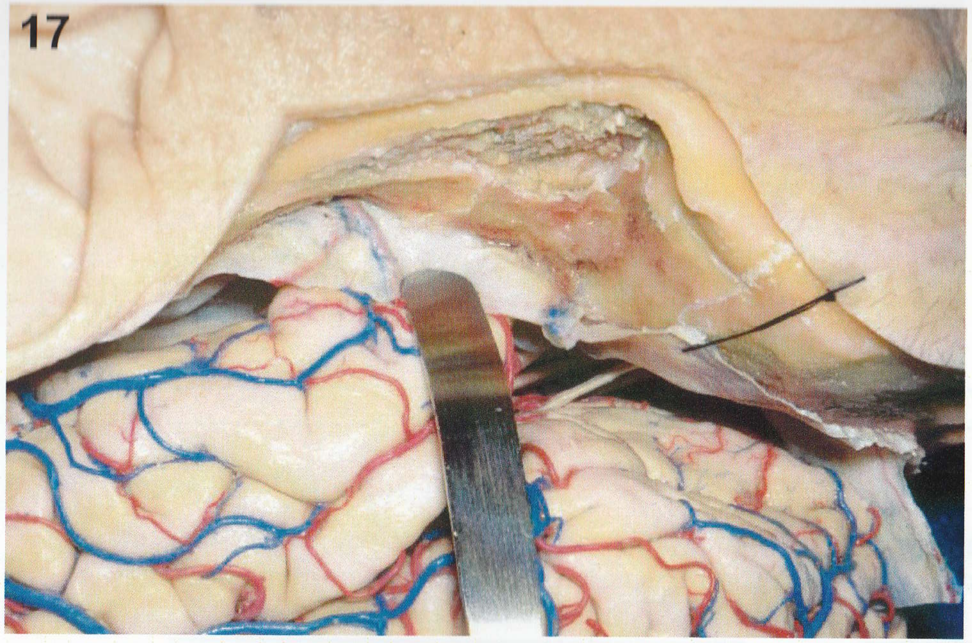
Identify the lettered structures:

A. ______________	**F.** ______________
B. ______________	**G.** ______________
C. ______________	**H.** ______________
D. ______________	**I.** ______________
E. ______________	**J.** ______________

20. Enlarged view of the anterior subtemporal exposure.

Identify the lettered structures:

A. ______________	**F.** ______________
B. ______________	**G.** ______________
C. ______________	**H.** ______________
D. ______________	**I.** ______________
E. ______________	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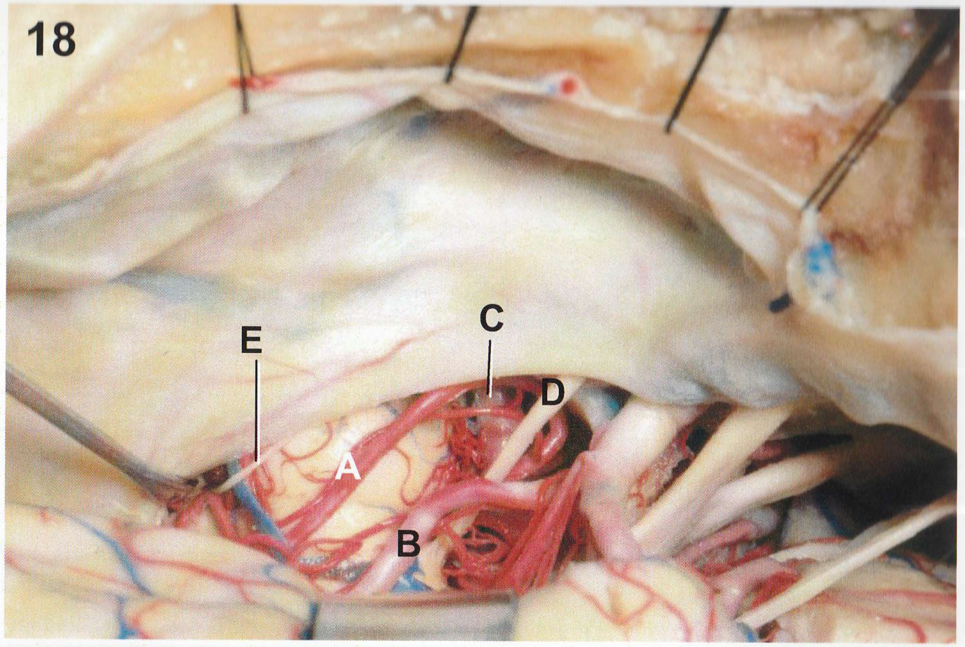
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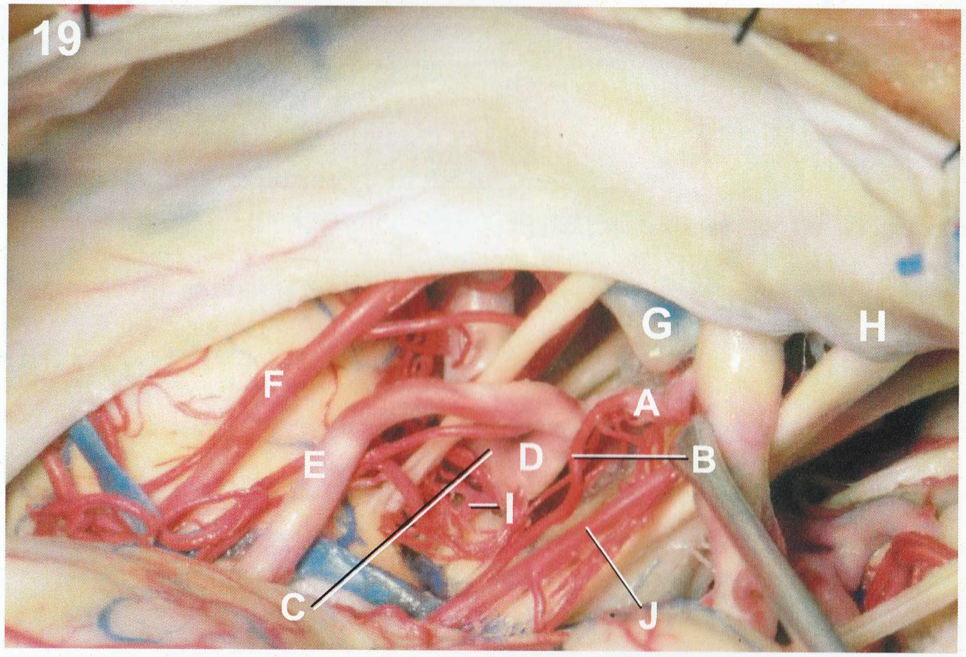
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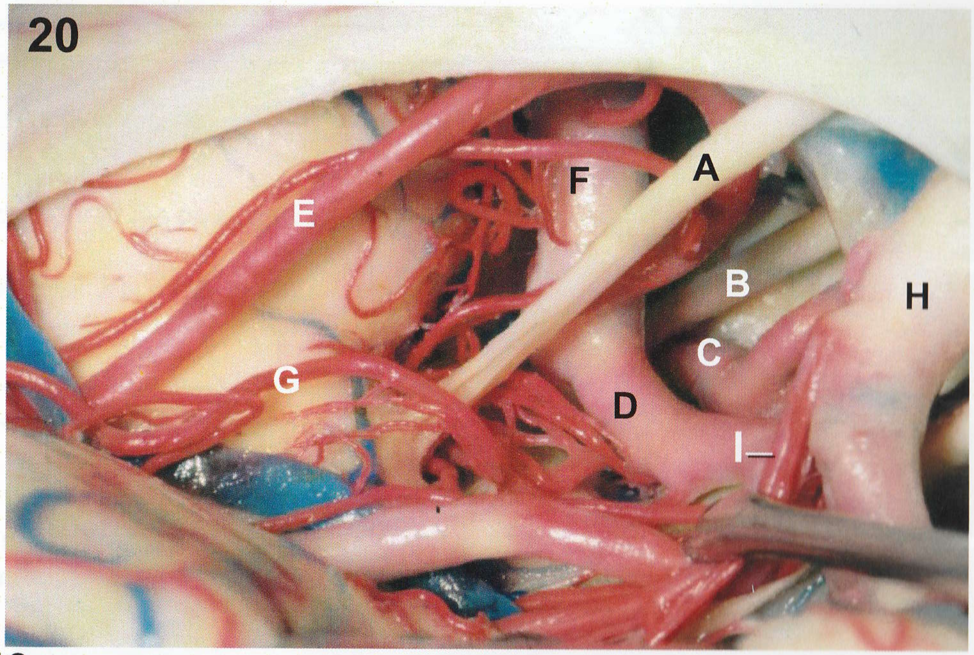
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21. An orbitozygomatic osteotomy, which includes the superior and lateral parts of the orbital rim and the zygomatic arch, has been completed in preparation for a pretemporal approach to the basilar apex.

Identify the lettered structures:

A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________

22. The temporal pole has been displaced posteriorly to complete the pretemporal exposure of the basal cisterns.

23. Compare the pretemporal and anterior subtemporal approaches. Positioning the bone flap correctly for a pretemporal approach also permits exposure from the pterional to the subtemporal routes.

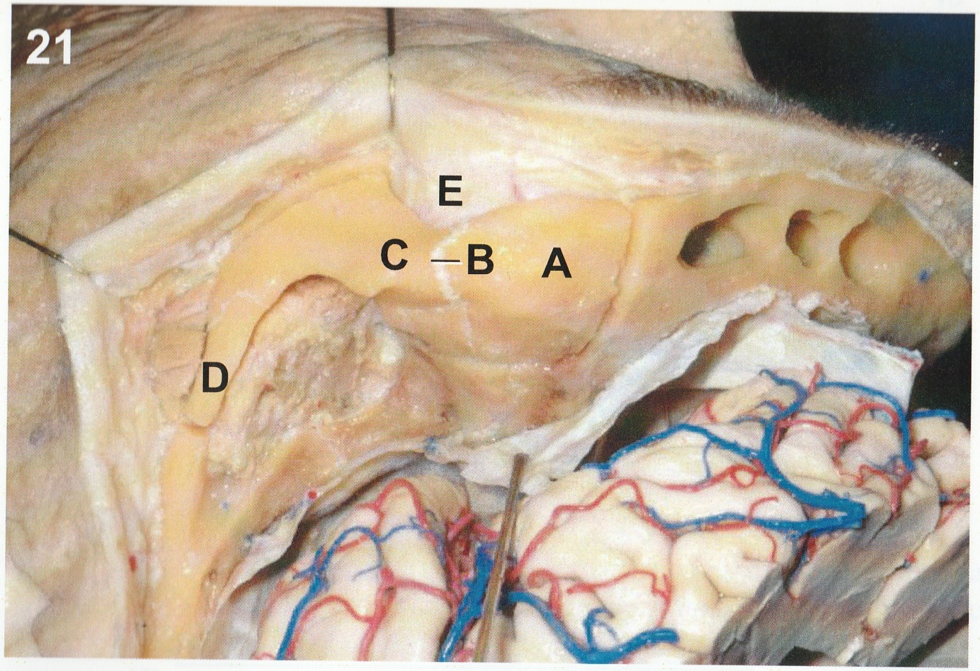
Identify the lettered structures:

A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________ **F.** ______________________

24. The internal carotid and anterior choroidal arteries, and the P2 segment of the posterior cerebral artery had been elevated to expose the basilar apex and both the ipsilateral and contralateral oculomotor nerves and P1 segments.

Identify the lettered structures:

A. ______________________ **C.** ______________________
B. ______________________ **D.** ______________________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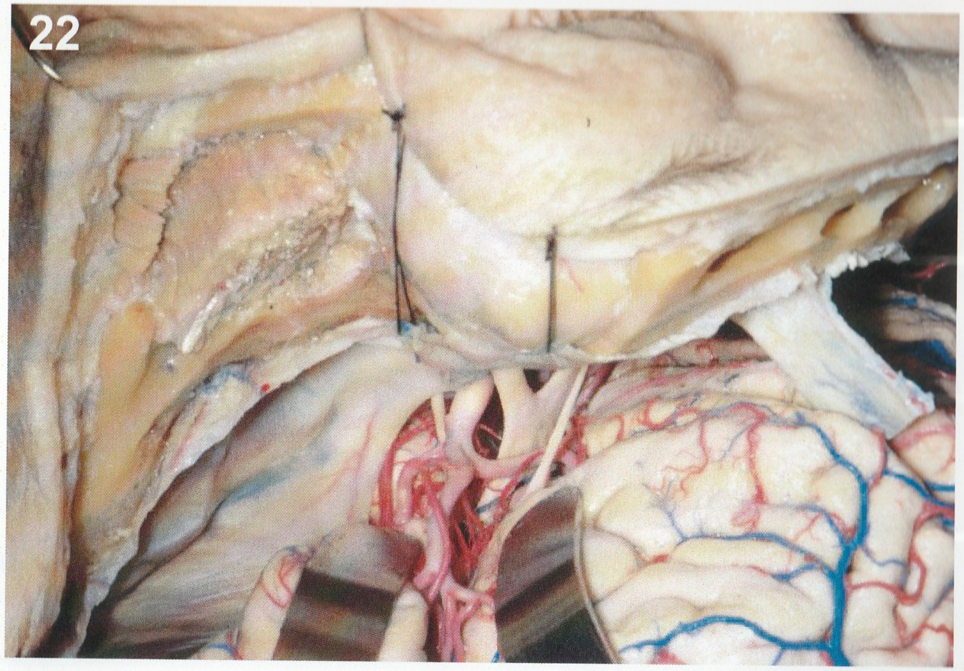
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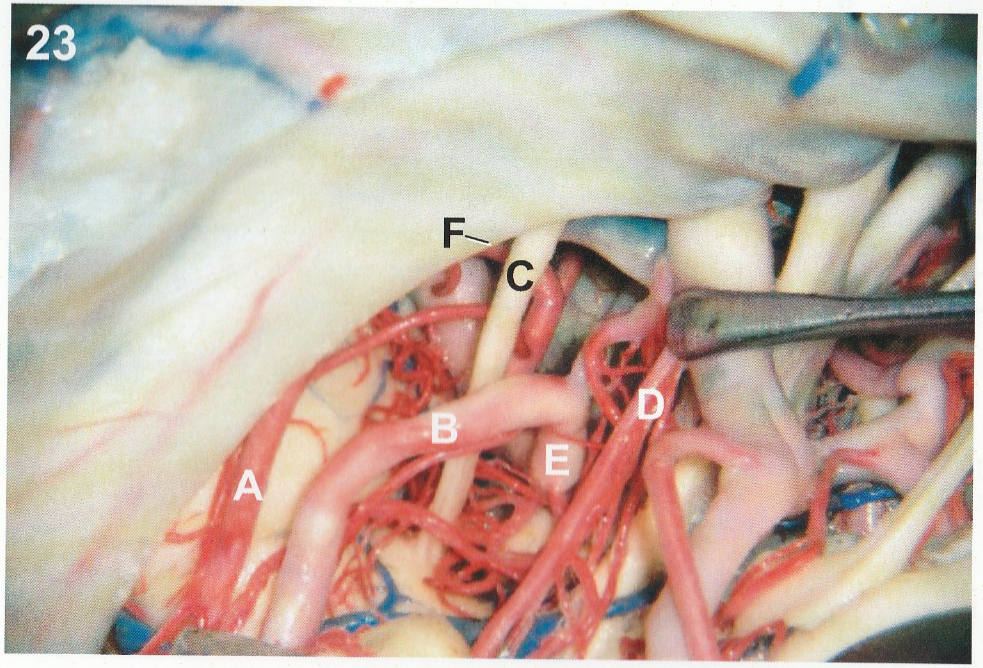
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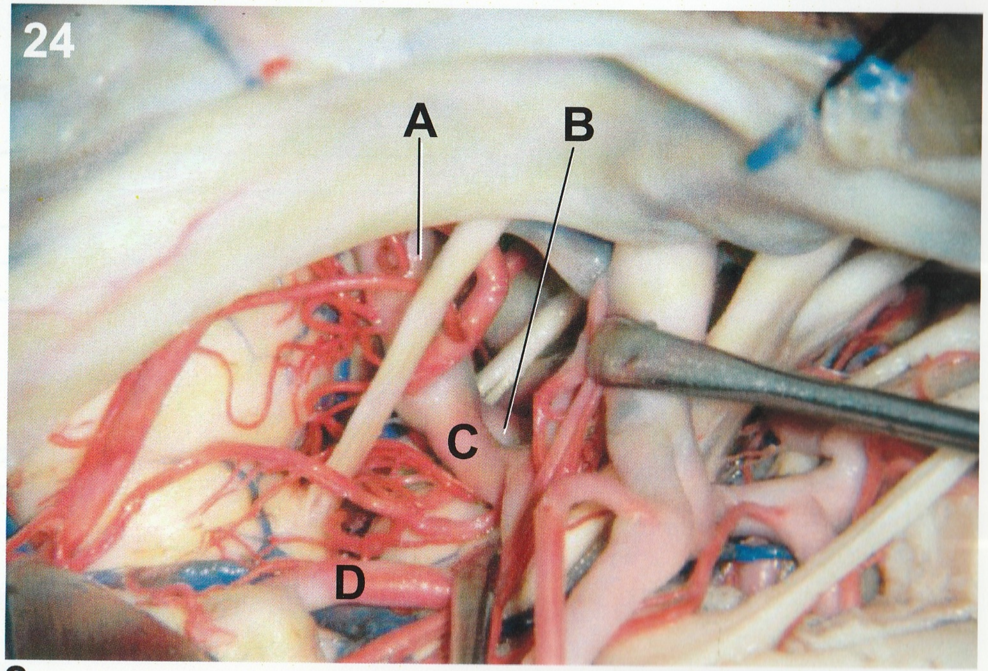
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25. The head has been positioned with the glabella upward in order to simulate an interhemispheric approach to the region of the anterior communicating artery.

26. The exposure has been extended through the anterior part of the interhemispheric fissure to the chiasmatic and lamina terminalis cisterns. In this exposure there is an arterial anomaly called the "Termatic Artery of Wilder" which is a third large branch arising between the paired A2 segments of the anterior cerebral artery.

Identify the lettered structures:

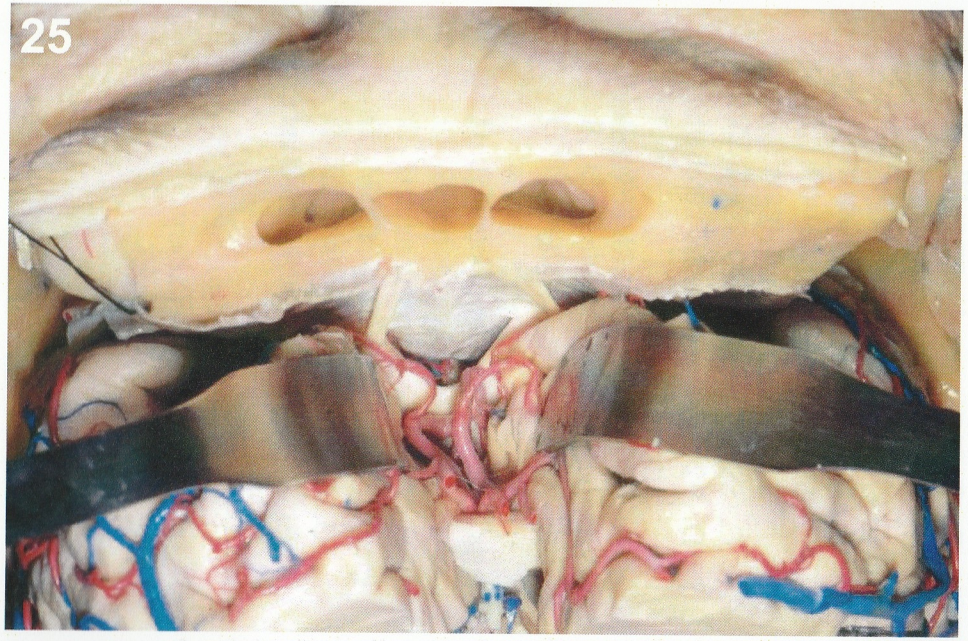
A. ______________________	**F.** ______________________
B. ______________________	**G.** ______________________
C. ______________________	**H.** ______________________
D. ______________________	**I.** ______________________
E. ______________________	**J.** ______________________

27. The lamina terminalis, which is situated above the optic chiasm, has been opened.

Identify the lettered structures:

A. ______________________	**B.** ______________________

28. The margins of the exposure into the third ventricle have been retracted, and the floor of the third ventricle has been incised in the midline at the level of the tuber cinereum, in order to expose the bifurcation of the basilar artery (arrow) through the floor of the third ventricle.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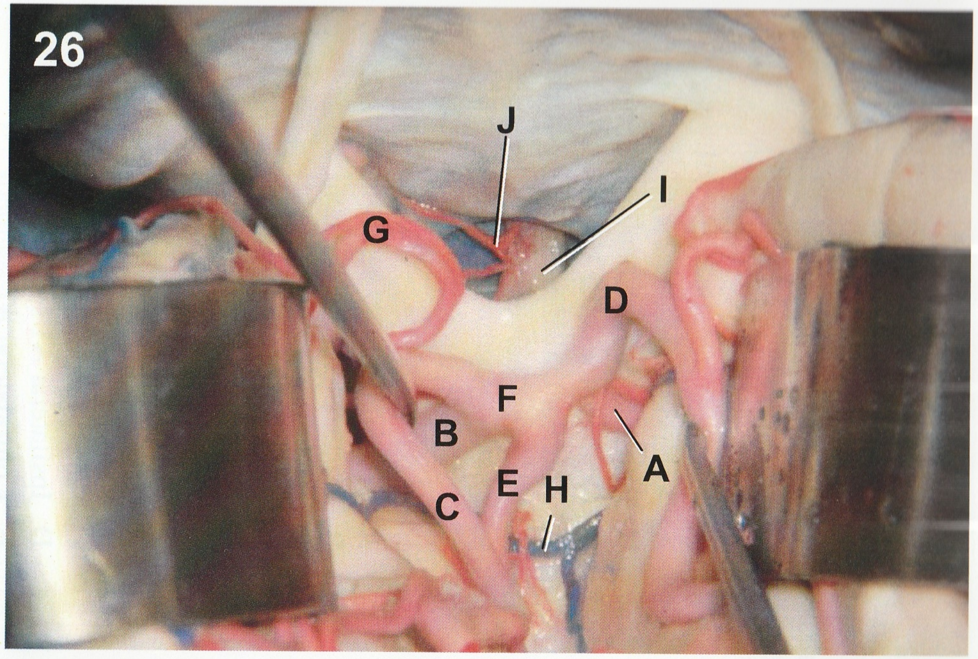
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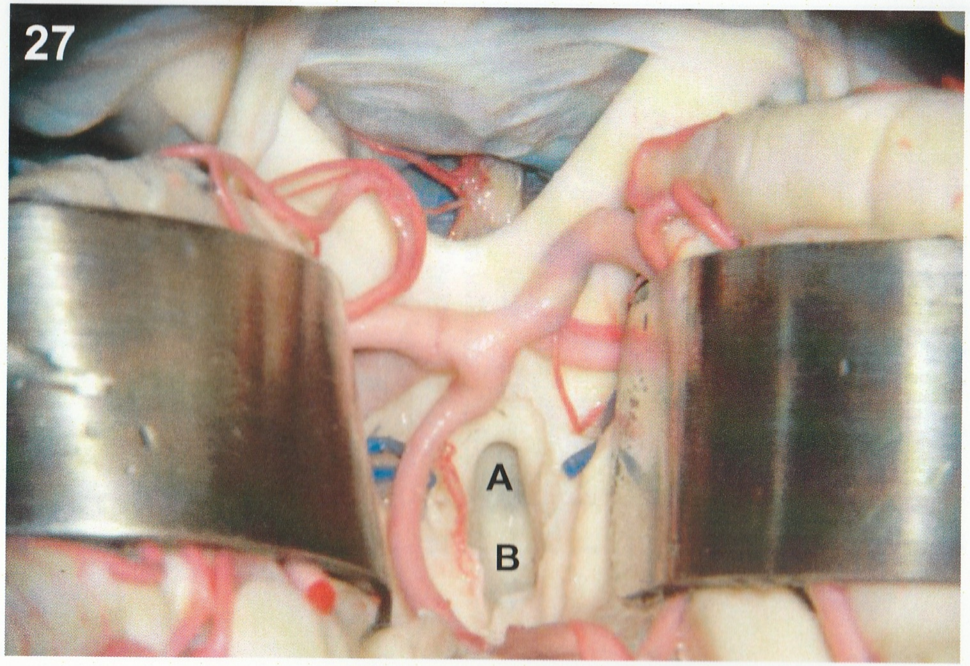
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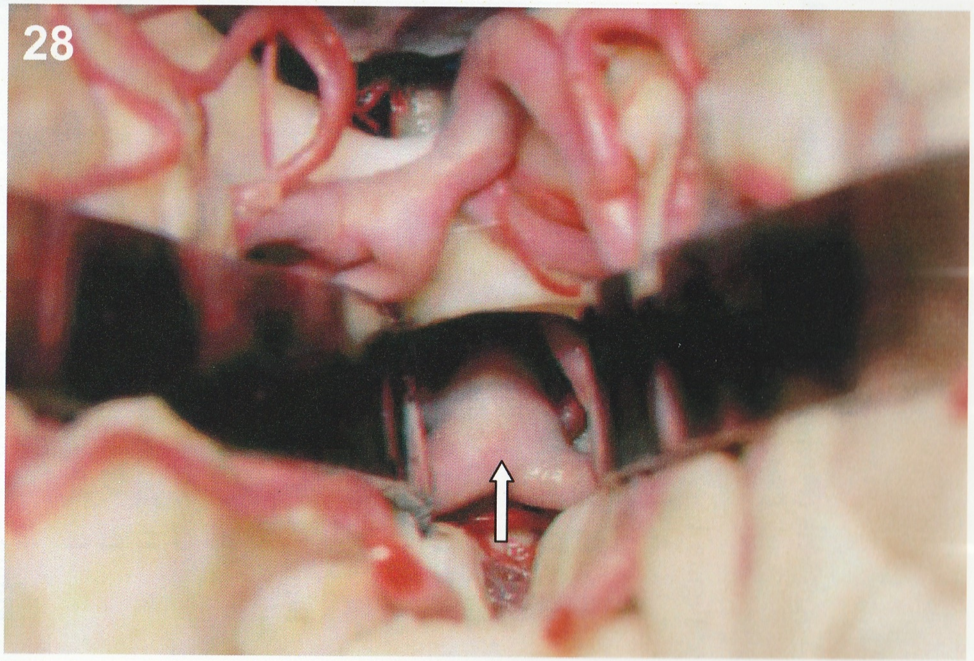
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Answers (Pterional, Subtemporal, Pretemporal, and Interhemispheric Approaches to the Basal Cisterns)

Figure 1
A. Internal carotid artery
B. M1 segment
C. Superior trunk of M1 segment
D. Inferior trunk of M1 segment
E. M2 segment
F. M3 segment
G. A1 segment
H. Anterior communicating artery
I. A2 segment

Figure 3
A. Oculomotor nerve
B. Superior cerebellar artery
C. Superior hypophyseal artery
D. Internal carotid artery
E. A1 segment
F. Anterior communicating artery

Figure 4
A. Anterior thalamoperforating artery
B. Posterior thalamoperforating artery
C. Posterior communicating artery
D. Lateral mesencephalic sulcus
E. Opening to the quadrigeminal cistern
F. Ophthalmic segment
G. Ophthalmic artery
H. Posterior communicating artery
I. Communicating segment
J. Posterior communicating artery
K. Anterior choroidal artery
L. Choroidal segment
M. Anterior choroidal artery
N. Carotid bifurcation

Figure 7
A. Early temporal branch
B. M1 segment
C. Lenticulostriate arteries
D. Carotid bifurcation
E. A1 segment
F. Internal carotid artery

Figure 8
A. Anterior choroidal artery
B. Posterior communicating artery
C. Oculomotor nerve
D. Anterior thalamoperforating arteries
E. Olfactory nerve
F. Optic nerve

Figure 10
A. Contralateral A1 segment
B. Contralateral A2 segment
C. Ipsilateral A2 segment
D. Contralateral carotid bifurcation

Figure 12
A. Ipsilateral A2 segment
B. Contralateral A2 segment
C. Anterior communicating vein
D. Ipsilateral A1 segment
E. Contralateral A1 segment
F. Termatic artery of Wilder

Figure 14
A. Internal carotid artery
B. Ipsilateral posterior communicating artery
C. Superior cerebellar artery
D. P2 segment posterior cerebellar artery
E. P1 segment posterior cerebellar artery
F. Anterior choroidal artery

Figure 15
A. Olfactory nerve
B. Optic nerve
C. Basilar apex
D. Contralateral P1
E. P1 segment posterior cerebral artery
F. Pituitary stalk
G. Origin of posterior of communicating artery
H. Oculomotor nerve

Answers (Pterional, Subtemporal, Pretemporal, and Interhemispheric Approaches to the Basal Cisterns) Continued

Figure 16
A. Ipsilateral A1
B. Ipsilateral M1
C. Basilar apex
D. Contralateral P1
E. Bifurcation internal carotid artery
F. Recurrent artery of Heubner

Figure 18
A. Superior cerebellar artery
B. Posterior cerebellar artery
C. Basilar artery
D. Oculomotor nerve
E. Trochlear nerve

Figure 19
A. Posterior communicating artery
B. Anterior thalamoperforating artery
C. Basilar tip
D. P1 segment
E. P2 segment
F. Superior cerebellar artery
G. Posterior clinoid process
H. Anterior clinoid process
I. Posterior thalamoperforating arteries
J. Anterior choroidal artery

Figure 20
A. Ipsilateral oculomotor nerve
B. Contralateral oculomotor nerve
C. Contralateral posterior cerebral artery
D. Ipsilateral posterior cerebral artery
E. Superior cerebellar artery
F. Basilar artery
G. Medial posterior choroidal artery
H. Internal carotid artery
I. Anterior choroidal artery

Figure 21
A. Frontal bone
B. Frontozygomatic suture
C. Zygomatic bone
D. Zygomatic arch
E. Periorbita

Figure 23
A. Superior cerebellar artery
B. Ipsilateral P2
C. Oculomotor nerve
D. Anterior choroidal artery
E. Ipsilateral P1
F. Tentorial edge

Figure 24
A. Basilar artery
B. Contralateral P1 segment
C. Ipsilateral P1 segment
D. Ipsilateral P2 segment

Figure 26
A. Right A1 segment
B. Left A1 segment
C. Left A2 segment
D. Right A2 segment
E. Termatic artery of Wilder
F. Anterior communicating artery
G. Recurrent artery of Heubner
H. Anterior communicating vein
I. Pituitary stalk
J. Superior hypophyseal artery

Figure 27
A. Tuber cinereum
B. Mamillary bodies

Extradural Approach to the Cavernous Sinus

Extradural Approach to the Cavernous Sinus

1. The head is positioned to simulate a right pterional approach. The dura is elevated from the floor of the anterior and middle fossa and the pterion and sphenoid ridge drilled leaving a thin shell of bone intact over the orbital roof to expose the lateral part of the superior orbital fissure (arrow).

2. A knife has been used to separate the outer from the inner layer of dura at the lateral edge of the superior orbital fissure. Separating these two fibrous layers allows the outer layer of dura in the lateral wall of the cavernous sinus to be easily separated from the inner layer. The nerves in the lateral wall of the cavernous sinus can be seen through the inner layer of dura following elevation of the lateral layer.

   Identify the lettered structures:

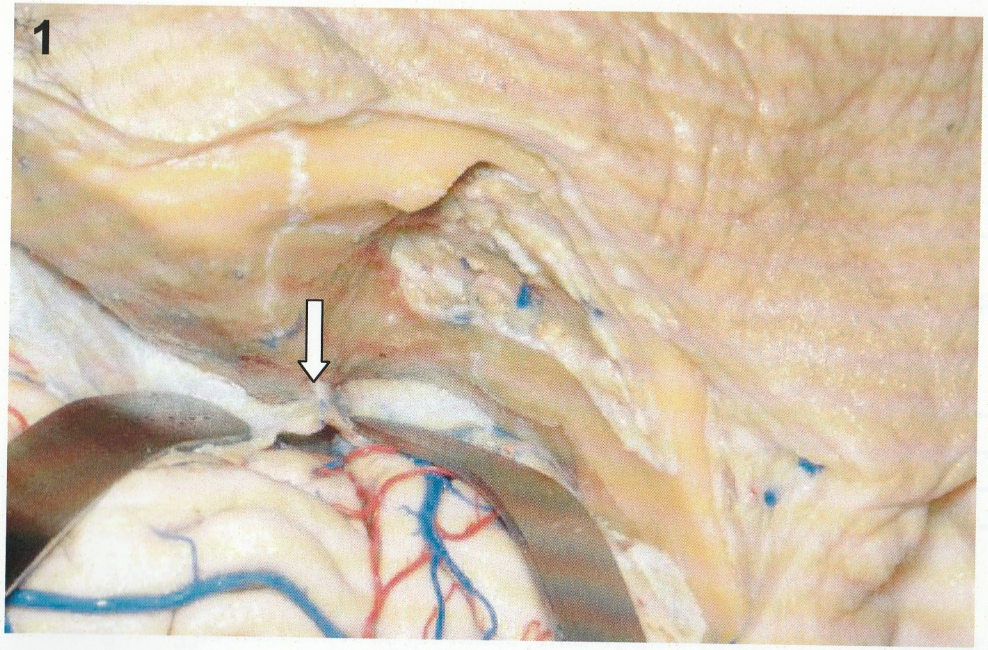
   A. ____________________ **E.** ____________________
   B. ____________________ **F.** ____________________
   C. ____________________ **G.** ____________________
   D. ____________________

3. The interior of the anterior clinoid has been drilled and the remaining thin cortical bone on the clinoidal surface has been removed to expose the clinoid segment of the internal carotid artery and the optic strut, the bridge of bone, which separates the optic nerve and the optic canal from the nerves passing through the superior orbital fissure.

   Identify the lettered structures:

   A. ____________________ **E.** ____________________
   B. ____________________ **F.** ____________________
   C. ____________________ **G.** ____________________
   D. ____________________

4. The dissection has been continued backward along the floor of the middle fossa, the middle meningeal artery divided at the foramen spinosum, and the greater (arrow) petrosal nerve exposed.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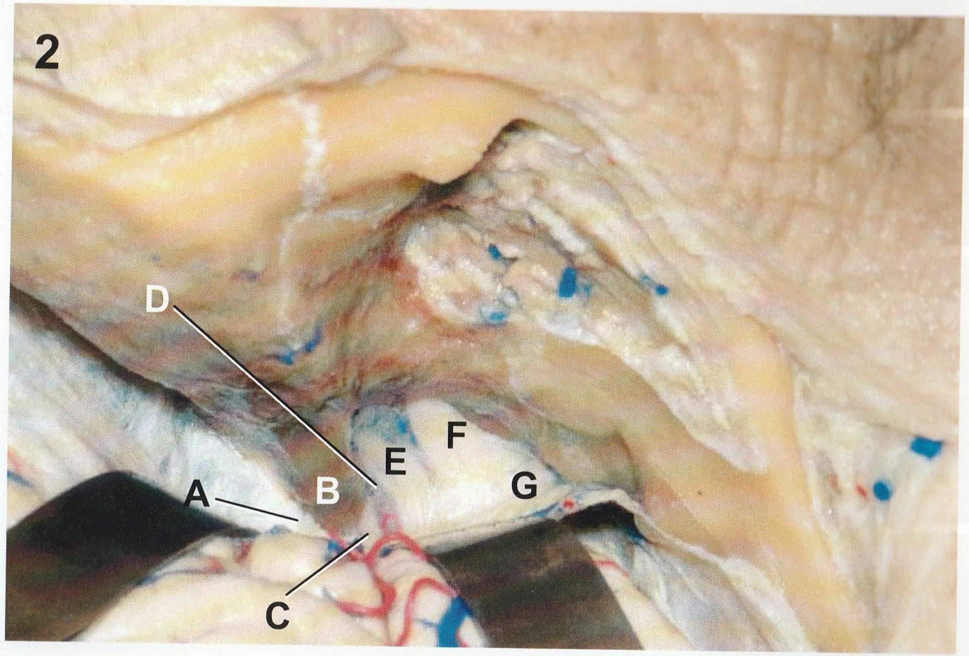
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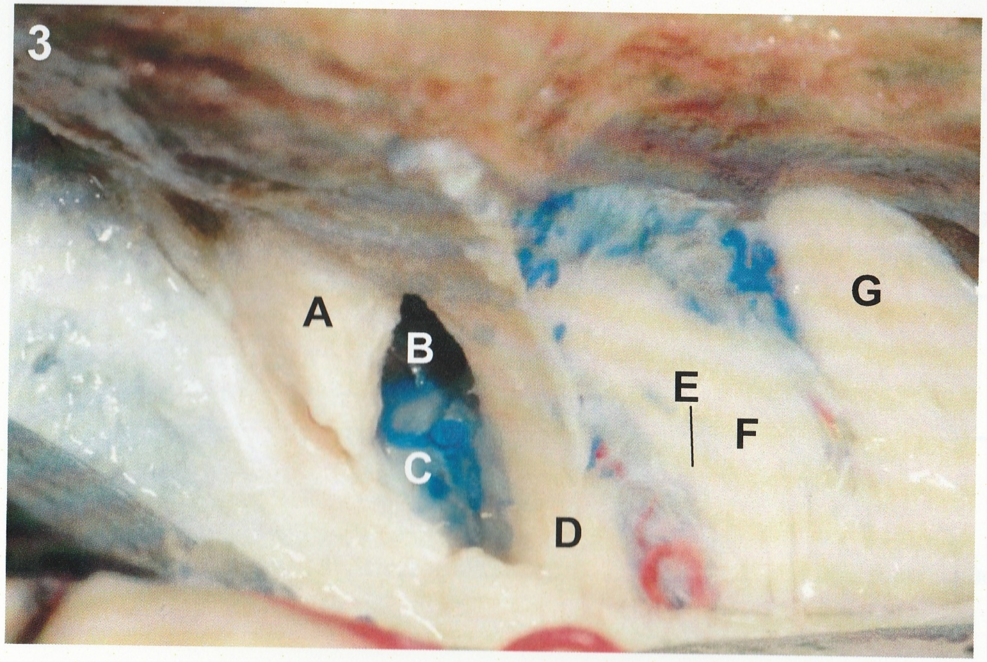
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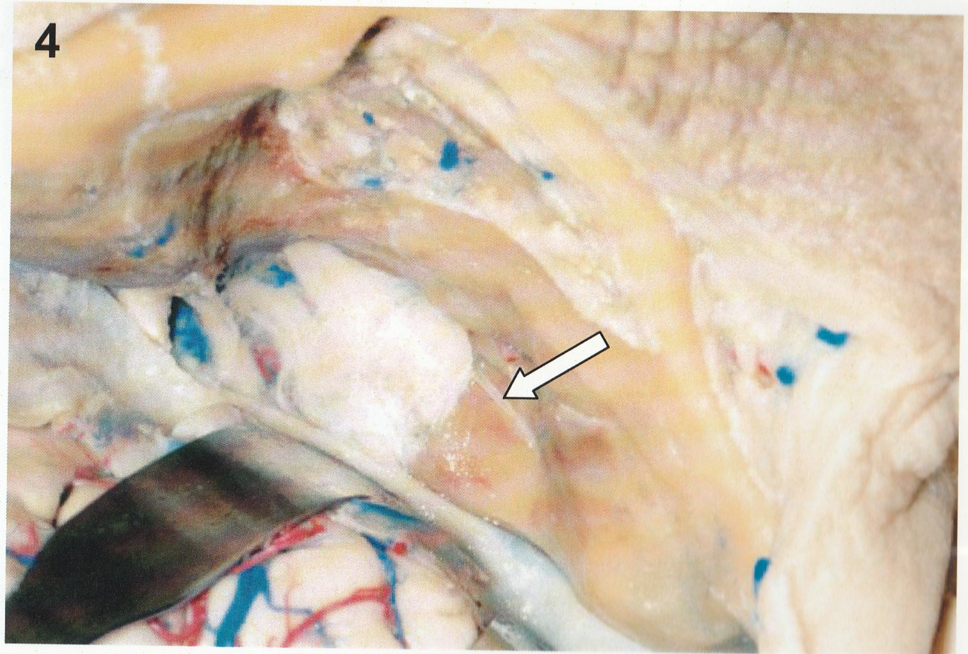
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5. Exposure of the right cavernous sinus in another specimen. The venous spaces in the sinus have been exposed by removing the inner layer of dura in the lateral wall.

Identify the triangles in the cavernous sinus:

A. ______________________	**C.** ______________________
B. ______________________	

Identify the triangles of the middle fossa:

D. ______________________	**F.** ______________________
E. ______________________	**G.** ______________________

Name the triangle that forms the main part of the roof of the cavernous sinus:

H. ______________________

6. The inner layer of dura that covers the clinoid segment of the internal carotid artery (arrow) has been removed to provide a site where flow into the intracranial segment of the internal carotid artery can be controlled.

7. The remainder of the inner layer of dura and the venous plexus of the cavernous sinus has been removed.

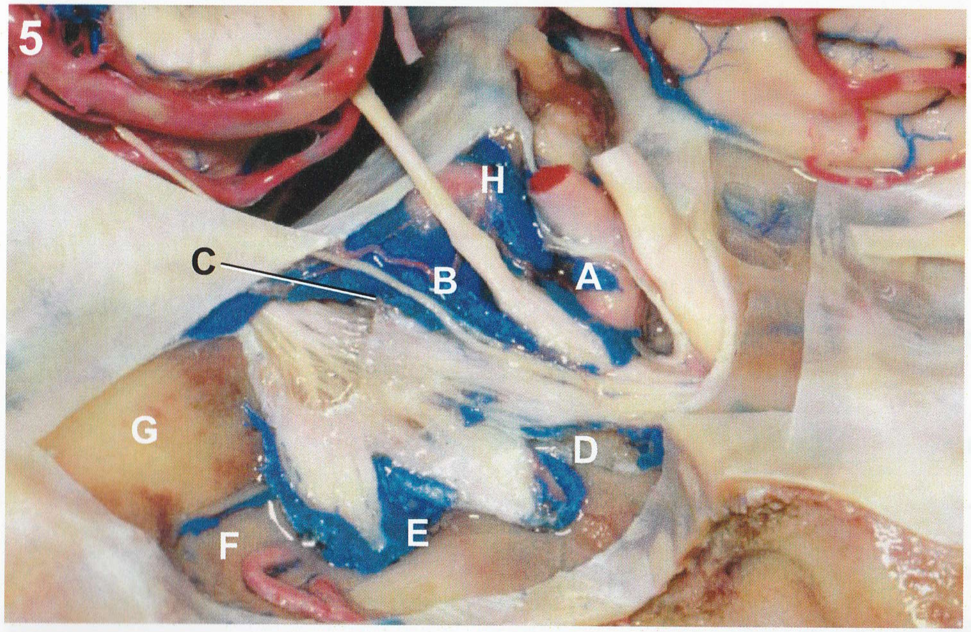
Identify the lettered structures:

A. ______________________	**E.** ______________________
B. ______________________	**F.** ______________________
C. ______________________	**G.** ______________________
D. ______________________	**H.** ______________________

8. The oculomotor nerve has been displaced downward.

Identify the two lettered structures which can be exposed through the clinoidal triangle:

A. ______________________	**B.** ______________________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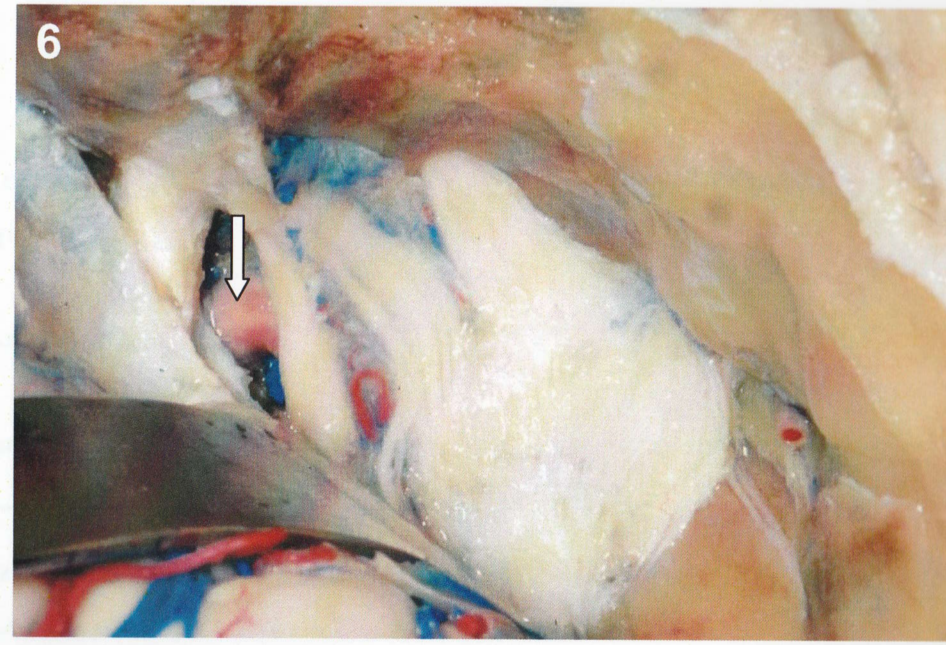
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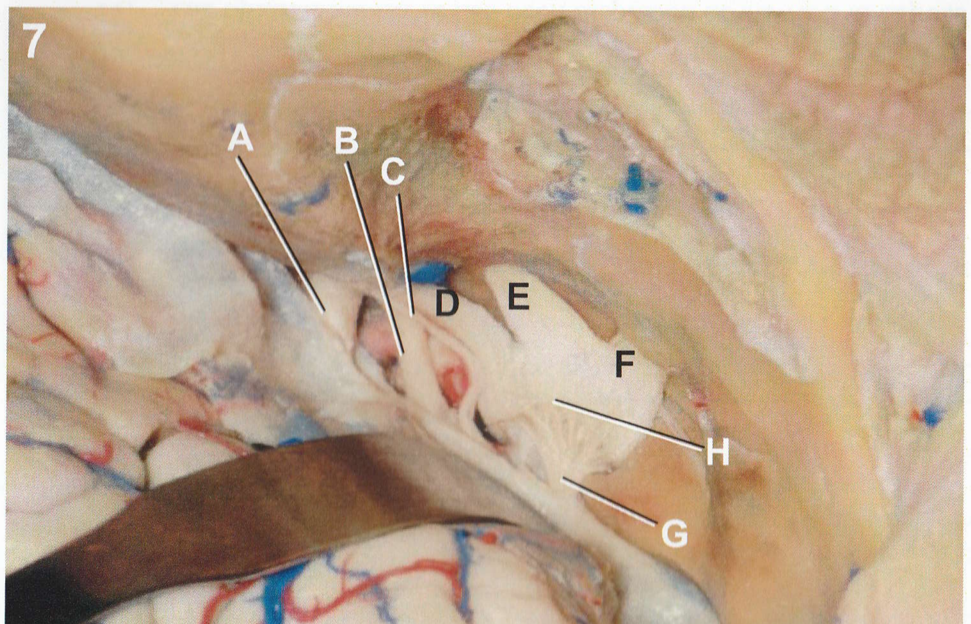
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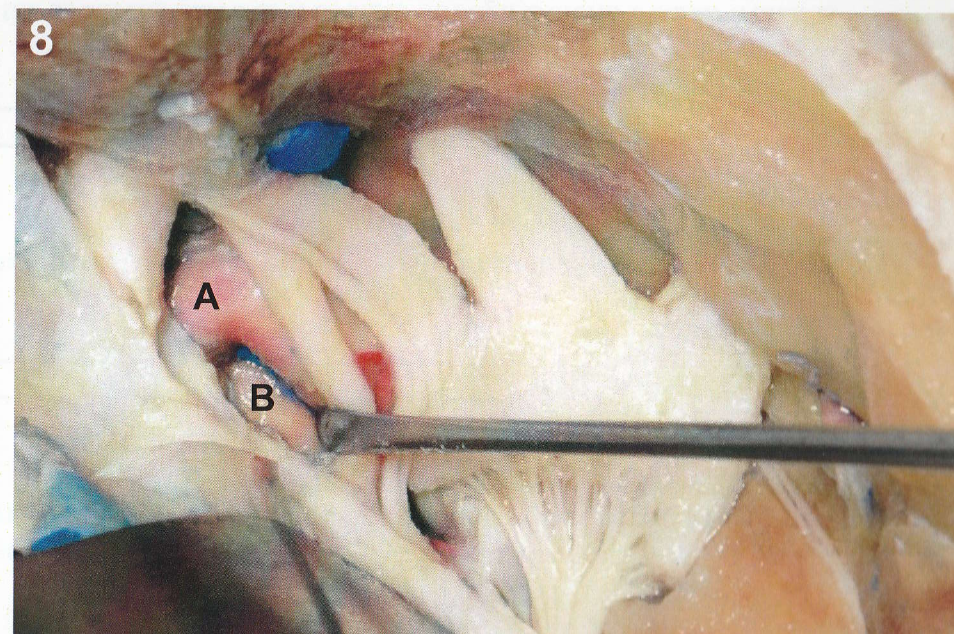
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Answers (Extradural Approach to the Cavernous Sinus)

Figure 2
A. Dura covering optic nerve
B. Anterior clinoid process
C. Oculomotor nerve
D. Trochlear nerve
E. Ophthalmic nerve
F. Maxillary nerve
G. Mandibular nerve

Figure 3
A. Optic nerve
B. Optic strut
C. Clinoid segment of the internal carotid artery
D. Oculomotor nerve
E. Trochlear nerve
F. Ophthalmic nerve
G. Maxillary nerve

Figure 5
A. Clinoidal triangle
B. Supratrochlear triangle
C. Infratrochlear (Parkinson's) triangle
D. Anteromedial triangle
E. Anterolateral triangle
F. Posterolateral (Glasscock's) triangle
G. Posteromedial (Kawase's) triangle
H. Oculomotor triangle

Figure 7
A. Optic nerve
B. Oculomotor nerve
C. Trochlear nerve
D. Ophthalmic nerve
E. Maxillary nerve
F. Mandibular nerve
G. Posterior trigeminal root
H. Trigeminal ganglion

Figure 8
A. Clinoid segment of the internal carotid artery
B. Pituitary gland

Figure 9
A. Inferolateral trunk
B. Meningohypophyseal artery
C. Inferior hypophyseal artery
D. Tentorial artery
E. Dorsal meningeal artery

Figure 10
A. Inferolateral trunk
B. Meningohypophyseal trunk
C. Inferior hypophyseal artery
D. Tentorial artery
E. Dorsal meningeal artery

Figure 11
A. Dorsal meningeal artery
B. Inferior petrosal sinus

Figure 12
A. Motor root of trigeminal nerve
B. Sphenoid sinus
C. Sphenoid sinus
D. Infratemporal fossa
E. Side of the Clivus
F. Internal auditory canal

Middle Fossa Approach to the Internal Auditory Canal

Middle Fossa Approach to the Internal Auditory Canal

1. The head is rotated 60 degrees to the side opposite the approach. The dura has been elevated from the floor of the right middle fossa. The arcuate eminence, which overlies the superior semicircular canal, is identified. The internal auditory canal is located along a line drawn at an angle 60 degrees clockwise to the long axis of the arcuate eminence. Drilling along this line will expose the internal auditory canal. Another way to find the internal canal is to follow the greater petrosal nerve to the geniculate ganglion, following which an imaginary line is drawn from the ganglion to a point on the petrous ridge 1 cm lateral to the porus trigeminus. The internal auditory canal is located just lateral to this line. The bone above the internal auditory canal has been removed and the dura opened to expose the facial and vestibulocochlear nerves.

2. Enlarged view of Figure 1.

   Identify the lettered structures:

A. ____________________	**D.** ____________________
B. ____________________	**E.** ____________________
C. ____________________	**F.** ____________________

3. Enlarged view of the nerves in the internal auditory canal.

   Identify the lettered nerves in the canal:

A. ____________________	**D.** ____________________
B. ____________________	**E.** ____________________
C. ____________________	

4. The facial nerve and the nervus intermedius has been displaced forward and the superior vestibular nerve backwards to expose the cochlear and inferior vestibular nerves. Note that the facial nerve is situated anterior-superior, the cochlear nerve anterior-inferior, the superior vestibular nerve posterior-superior, and the inferior vestibular nerve posterior-inferior, within the meatus. The nervus intermedius at the brain stem, courses along the anterior margin of the vestibulocochlear nerve and joins the facial nerve within the meatus.


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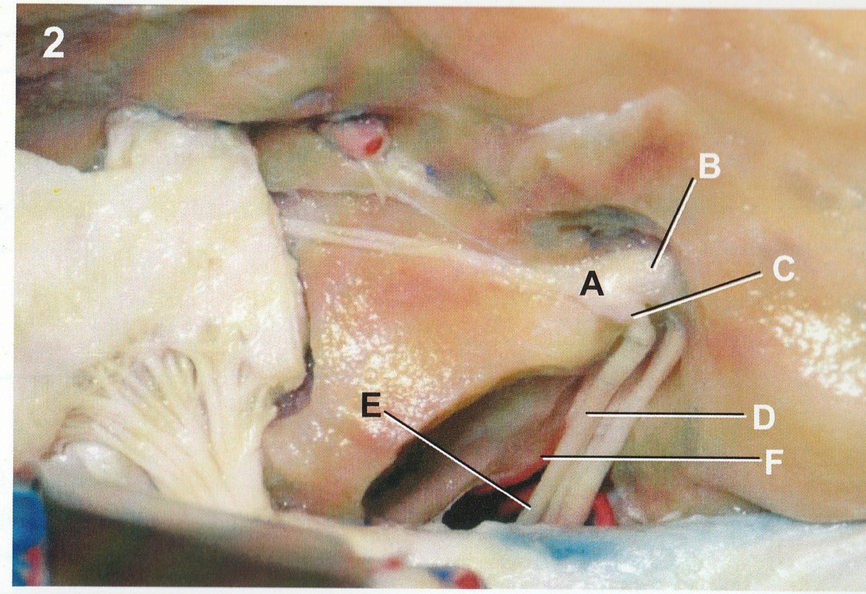
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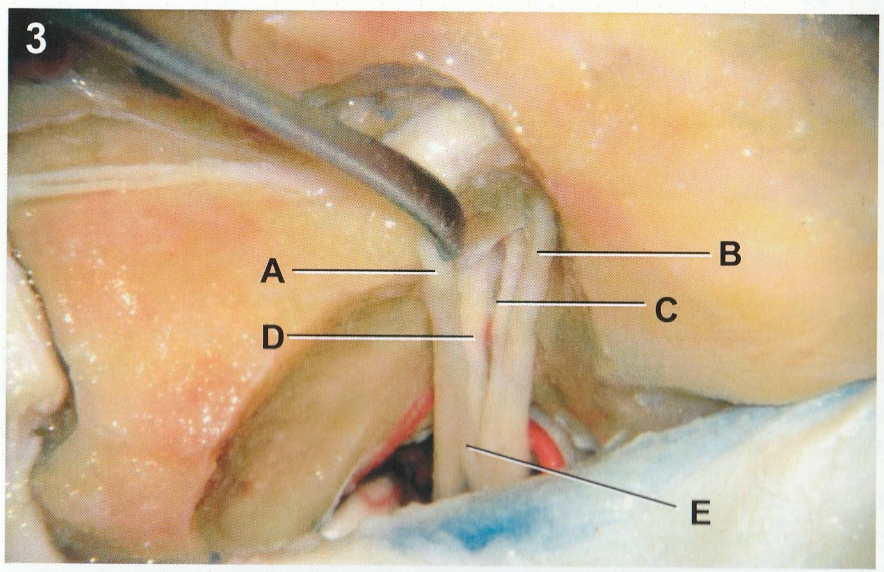
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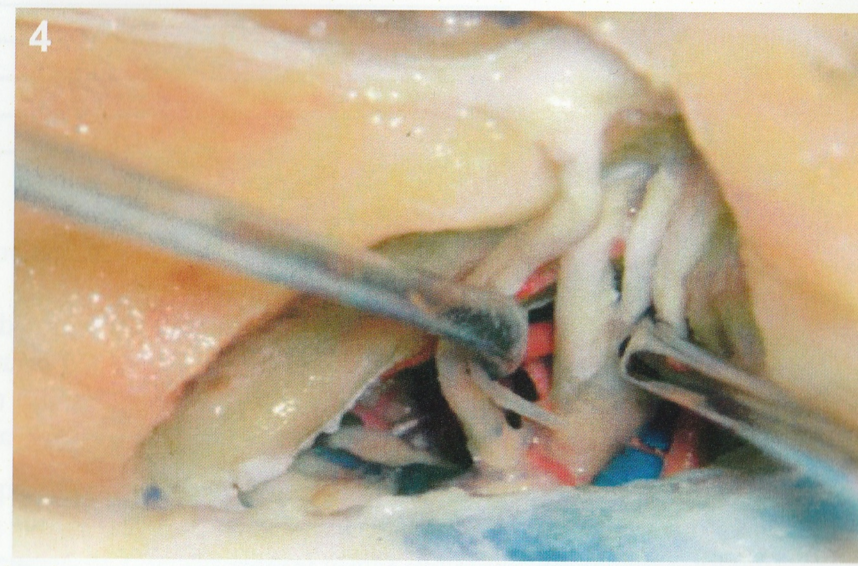
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5. The internal carotid artery (arrow) is exposed below the greater petrosal nerve at the junction of Glasscock's and Kawase's triangles. Bone has been removed anterior to the petrous segment of the internal carotid artery to expose the tensor tympani muscle and eustachian tube both of which course parallel to the anterior surface of the artery. The middle ear has been exposed by opening the tegmen. Bone has been removed to expose the bony capsule around the semicircular canals.

6. Enlarged view. Note the relationship of the cochlea to the angle between the meatal segment of the facial nerve and the greater petrosal nerve. Both ends of the lateral semicircular canal open into the vestibule which is located lateral and behind the cochlea. The medial end of the posterior canal and the posterior end of the superior canal join to from a common crus which opens into the vestibule, and the opposite ends of both canals open into the vestibule. The superior and inferior vestibular nerves end in the vestibule and the ampulla of the semicircular canals. The cochlear nerve, which courses below the facial nerve, pierces tiny openings in the lateral end of the meatus to reach the cochlea.

Identify the lettered structures:

A. ____________________	**H.** ____________________
B. ____________________	**I.** ____________________
C. ____________________	**J.** ____________________
D. ____________________	**K.** ____________________
E. ____________________	**L.** ____________________
F. ____________________	**M.** ____________________
G. ____________________	**N.** ____________________

7. The semicircular canals have been opened by removing bone along their long axis. Note the relationship of the stapedial muscle (arrow) to the stapes, and how the posterior and superior canals join at the common crus.

The superior vestibular nerve gives branches to:

A. ____________________	**C.** ____________________
B. ____________________	

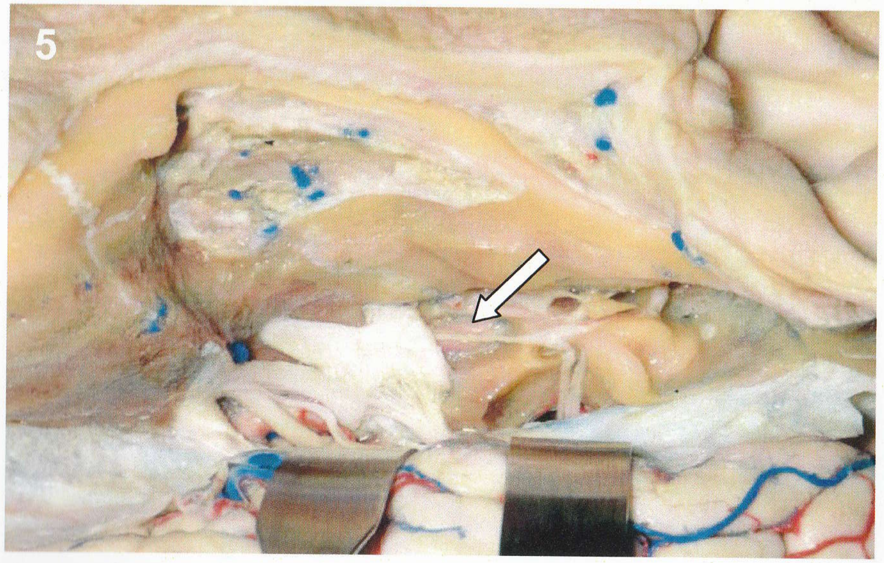
The inferior vestibular nerve gives branches to:

D. ____________________	**E.** ____________________

8. The semicircular canals have been removed to expose the vestibule which is located in the angle between the meatal and tympanic segments of the facial nerve.

Identify the lettered structures:

A. ____________________	**C.** ____________________
B. ____________________	**D.** ____________________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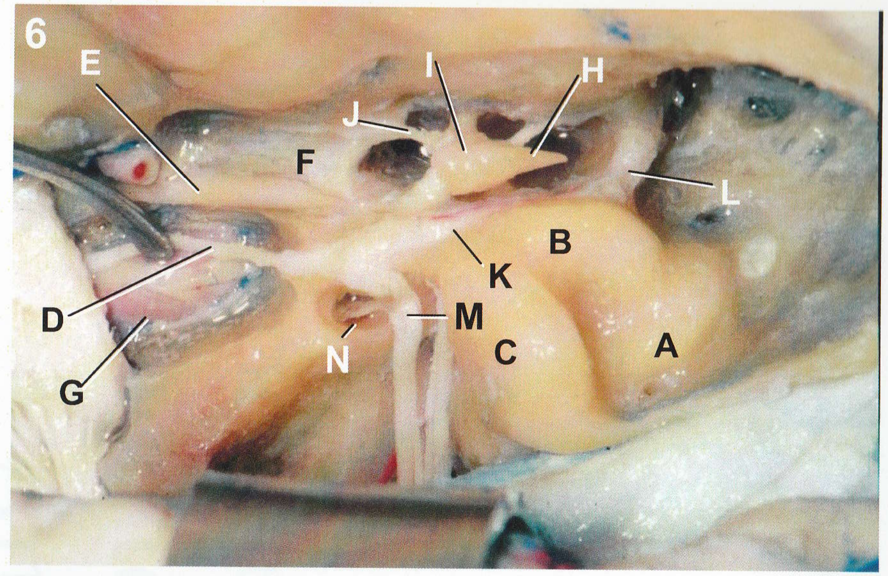
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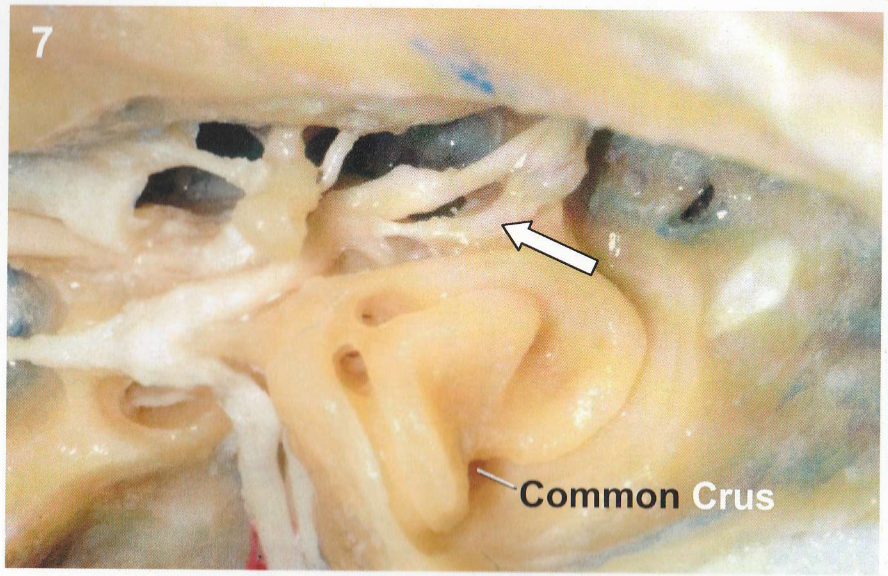
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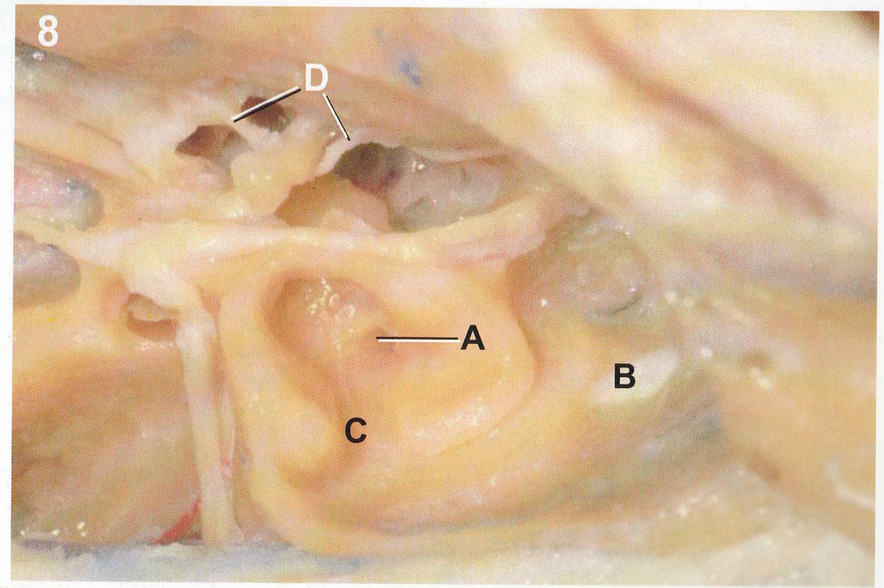
Common Crus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Answers (Middle Fossa Approach to the Internal Auditory Canal)

Figure 2

A. Geniculate ganglion
B. Tympanic segment of facial nerve
C. Labyrinthine segment of facial nerve
D. Meatal segment of facial nerve
E. Cisternal segment of facial nerve
F. Labyrinthine artery

Figure 3

A. Facial nerve
B. Superior vestibular nerve
C. Inferior vestibular nerve
D. Cochlear nerve
E. Nervus intermedius

Figure 6

A. Posterior semicircular canal
B. Lateral semicircular canal
C. Superior semicircular canal
D. Greater petrosal nerve
E. Tensor tympani muscle
F. Eustachian tube
G. Intrapetrous carotid artery
H. Incus
I. Malleus
J. Chorda tympani
K. Tympanic segment of facial nerve
L. Mastoid segment of facial nerve
M. Labyrinthine segment facial nerve
N. Cochlea

Figure 7

A. Superior semicircular canal
B. Lateral semicircular canal
C. Utriculus
D. Sacculus
E. Posterior semicircular canal

Figure 8

A. Ampulla of the posterior semicircular canal
B. Endolymphatic canal
C. Common crus
D. Chorda tympani

Anterior Petrosectomy Approach to the Basilar Artery

Anterior Petrosectomy Approach to the Basilar Artery

1. Prior to drilling the petrous apex the basilar apex is examined through a subtemporal approach in order that the anterior petrosectomy and subtemporal approach can be compared. In this case the basilar apex is located high above the level of the tentorial incisura. The anterior petrosectomy approach is most useful in dealing with aneurysms situated on a basilar apex located below the tentorial incisura.

   Identify the lettered structures:

A. ______________	**E.** ______________
B. ______________	**F.** ______________
C. ______________	**G.** ______________
D. ______________	

2. The dura has been elevated from the floor of the middle fossa in preparation for the extradural approach through the petrous apex.

   Identify the lettered structures:

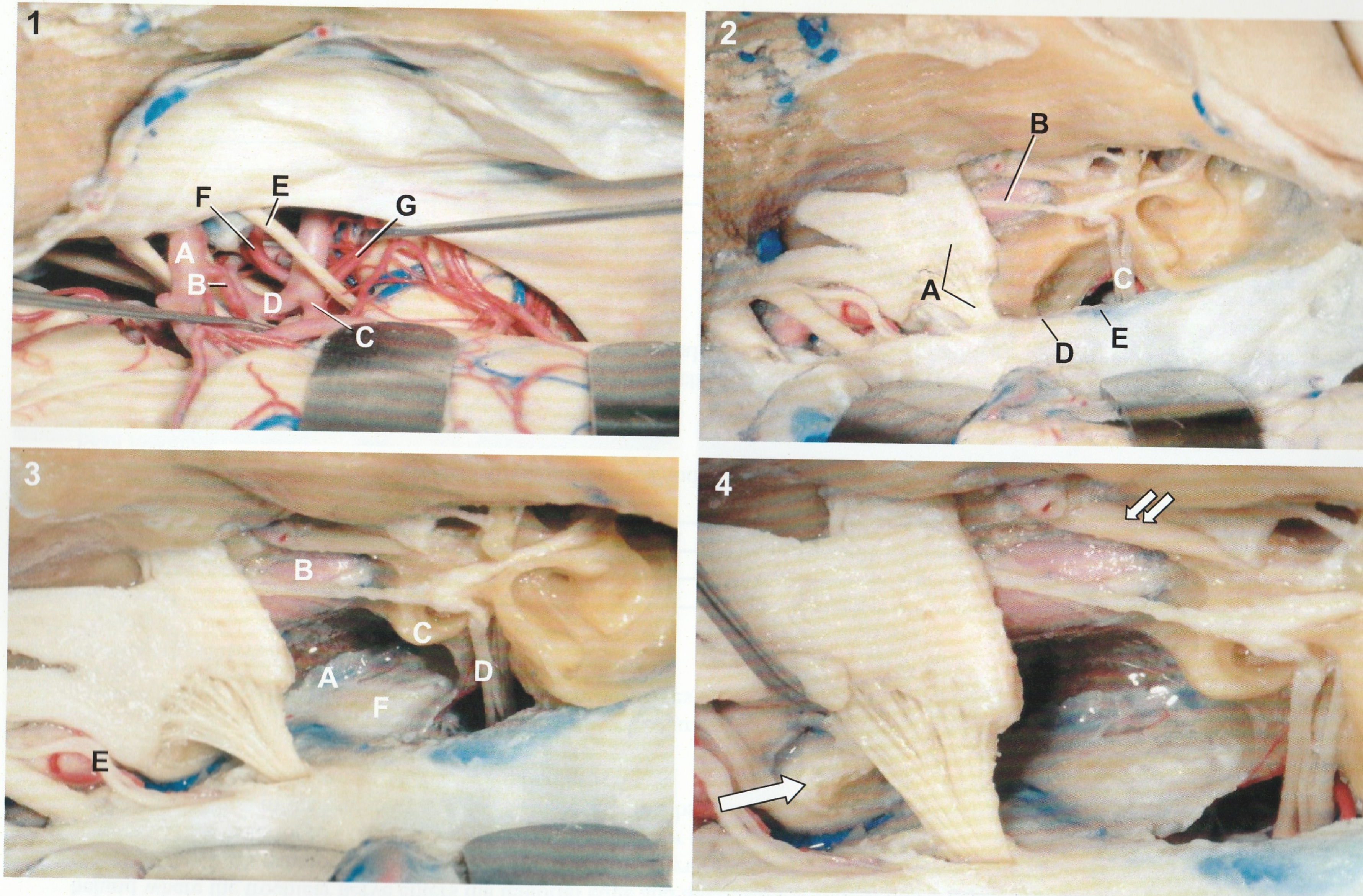
A. ______________	**D.** ______________
B. ______________	**E.** ______________
C. ______________	**F.** ______________

3. The petrous apex has been removed. The bony removal extends behind the internal carotid artery and medially under the trigeminal nerve. The limits of the drilling are identified by the lettered structures.

   Identify the lettered structures:

A. ______________	**D.** ______________
B. ______________	**E.** ______________
C. ______________	**F.** ______________

4. Magnified view after completing the drilling. The exposure extends medially to the inferior petrosal sinus which courses along the lateral margin of the clivus. The cochlea (arrow) is located behind the geniculate ganglion. The tensor tympani muscle (double arrow) is situated anterior to the petrous segment of the internal carotid artery.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5. The approach has been directed intradurally along the subtemporal route. The tentorium has been divided beginning 2 cm behind where the trochlear nerve enters the tentorial edge and the posterior margin of the cavernous sinus. The incision in the tentorium has been extended laterally above the trigeminal nerve and then forward to the petrous ridge creating a tentorial flap which is pulled anterior to expose the entrance of the posterior trigeminal root into Meckel's cave. The dural flap has been sutured to the dura of the middle fossa with a single stitch. Observe the added length of basilar trunk which can be exposed by this route as compared to the previous subtemporal approach.

6. Magnified view of the previous Figure 5. Note that the basilar trunk can be exposed between the trochlear and trigeminal nerves, as well as between the oculomotor and trochlear nerves.

Identify the lettered structures:

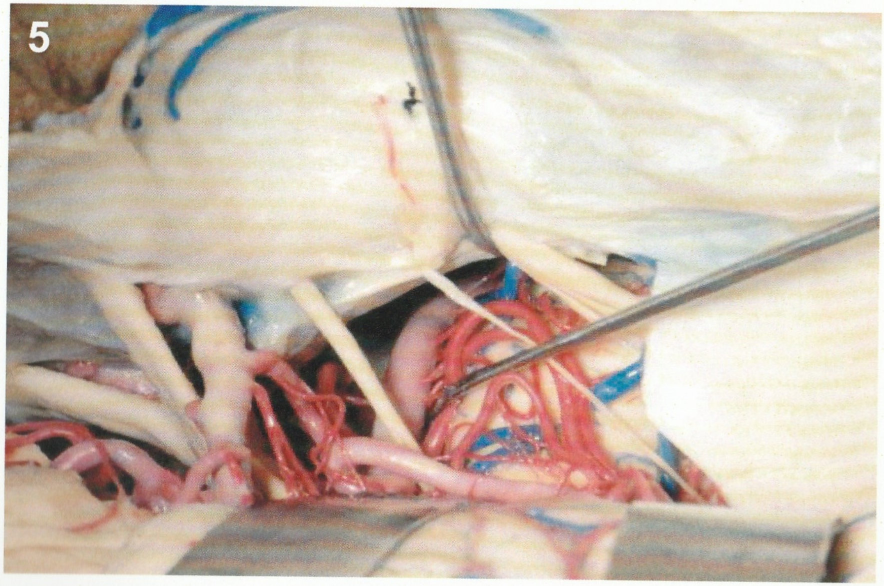
A. ____________________ **E.** ____________________
B. ____________________ **F.** ____________________
C. ____________________ **G.** ____________________
D. ____________________ **H.** ____________________

7. The approach has been redirected to the extradural location and the dura of the posterior fossa which lines the petrous apex has been removed.

8. The approach not only creates a new window between the trochlear and trigeminal nerves for exposing the basilar trunk but also creates a window between the trigeminal nerve and the internal auditory canal which provides access to the lower part of the basilar trunk.

Identify the lettered structures:

A. ____________________ **E.** ____________________
B. ____________________ **F.** ____________________
C. ____________________ **G.** ____________________
D. ____________________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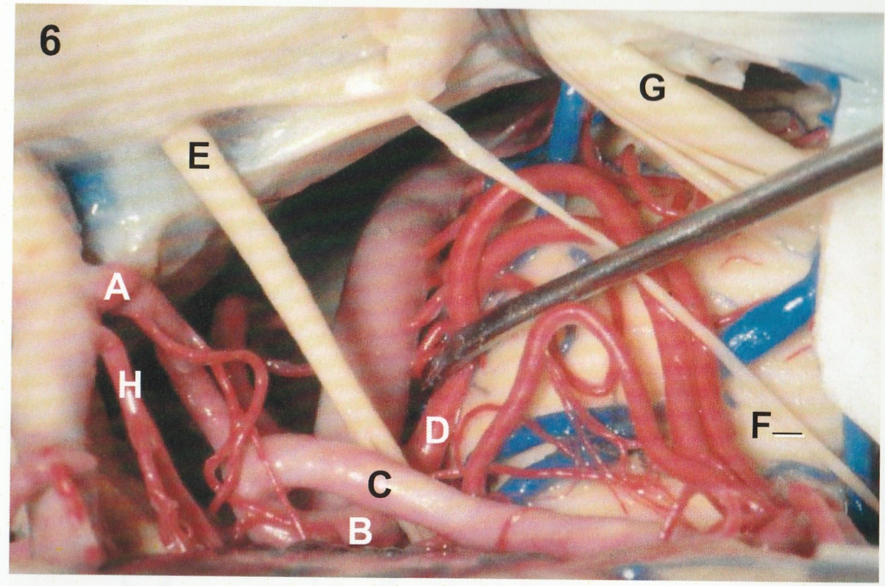
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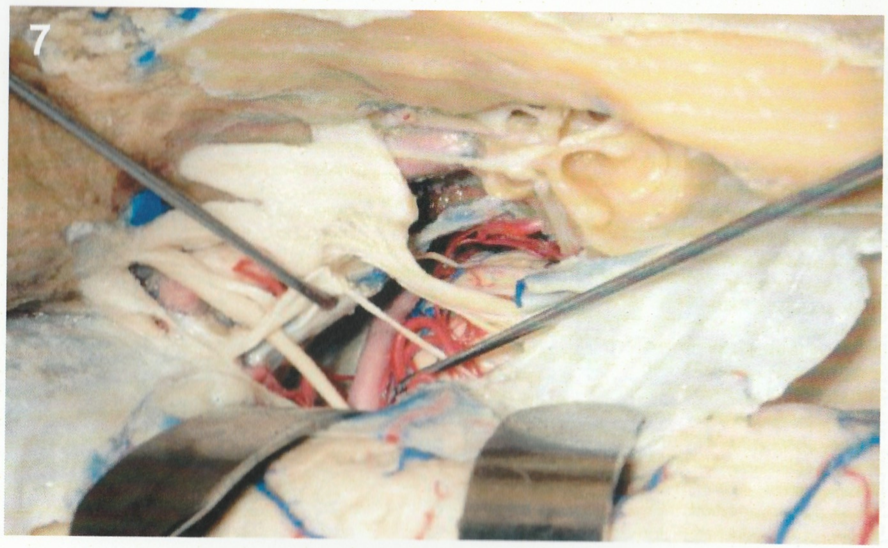
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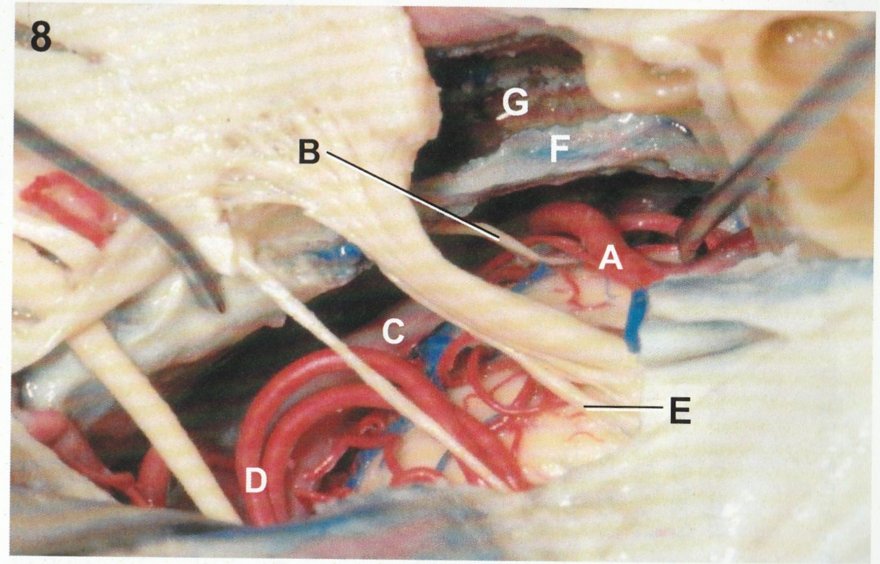
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Answers (Anterior Petrosectomy Approach to the Basilar Artery)

Figure 1

A. Internal carotid artery
B. Posterior communicating artery
C. Ipsilateral P1
D. Contralateral P1
E. Oculomotor nerve
F. Contralateral superior cerebellar artery
G. Ipsilateral superior cerebellar artery

Figure 2

A. Posterior trigeminal root and semilunar ganglion
B. Greater petrosal nerve
C. Internal auditory canal
D. Petrous ridge
E. Superior petrosal sinus
F. Middle ear

Figure 3

A. Inferior petrosal sinus
B. Intrapetrous carotid artery
C. Cochlea
D. Internal auditory canal and facial nerve
E. Trochlear nerve
F. Posterior fossa dura

Figure 6

A. Posterior communicating artery
B. Ipsilateral P1
C. Ipsilateral P2
D. Superior cerebellar artery
E. Oculomotor nerve
F. Trochlear nerve
G. Trigeminal nerve
H. Anterior choroidal artery

Figure 8

A. AICA
B. Abducens nerve
C. Basilar artery
D. Superior cerebellar artery
E. Motor root trigeminal nerve
F. Inferior petrosal sinus
G. Clivus

Preauricular Infratemporal Approach

Figures 1 to 3 are inserted here to show the anatomy of the infratemporal fossa prior to showing how the subtemporal and petrousectomy approaches are extended to expose the infratemporal fossa.

1. Lateral view of the infratemporal fossa. This exposure has been achieved by reflecting a preauricular flap forward, removing the temporalis muscle and removing all but the posterior edge of the mandible (arrow).

   Identify the lettered structures:

   A. ______________________________ **E.** ______________________________
   B. ______________________________ **F.** ______________________________
   C. ______________________________ **G.** ______________________________
   D. ______________________________

   The maxillary artery and the mandibular nerve and their branches are the main neurovascular structures in the infratemporal fossa.

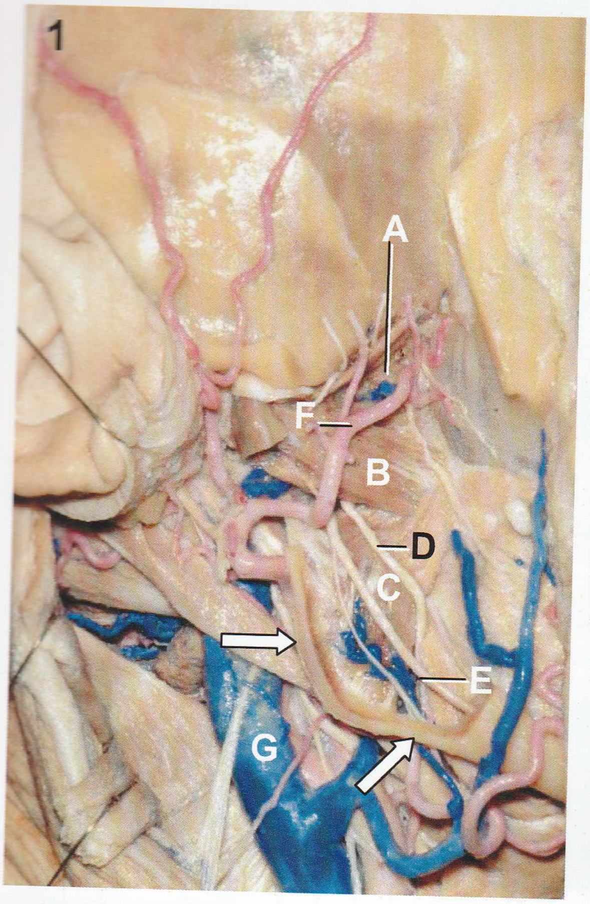
2. The four structures in the infratemporal fossa are the mandibular nerve and its branches, the maxillary artery and its branches, the pterygoid muscles and the pterygoid venous plexus. The venous plexus has been removed in this case. The pterygoid muscles and the styloid process and attached muscles have been removed to expose the anterior margin of the jugular foramen. Note that the internal carotid artery enters the carotid canal which is located immediately in front of the jugular foramen.

   Identify the lettered structures:

   A. ______________________________ **G.** ______________________________
   B. ______________________________ **H.** ______________________________
   C. ______________________________ **I.** ______________________________
   D. ______________________________ **J.** ______________________________
   E. ______________________________ **K.** ______________________________
   F. ______________________________

3. After entering the carotid canal the petrous segment of the internal carotid artery turns medially behind the tensor tympani muscle (A) and the eustachian tube (B). Both the muscle and eustachian tube have to be removed if the petrous segment of the internal carotid artery is to be reflected forward out of the carotid canal.

4. The next step in exposing the subtemporal-infratemporal fossa approach includes an osteotomy of the anterior part of the zygomatic arch. Posteriorly the bone cut encircles the area above the glenoid fossa.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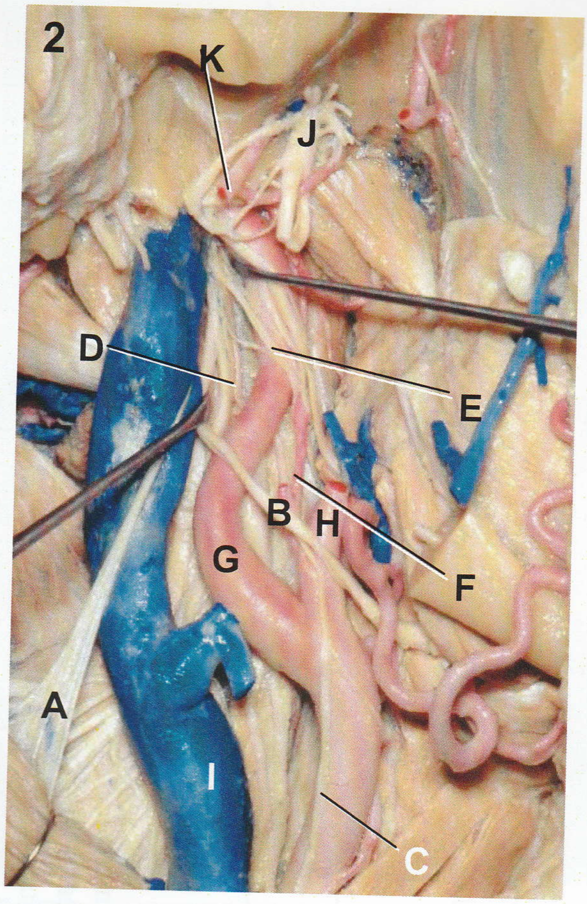
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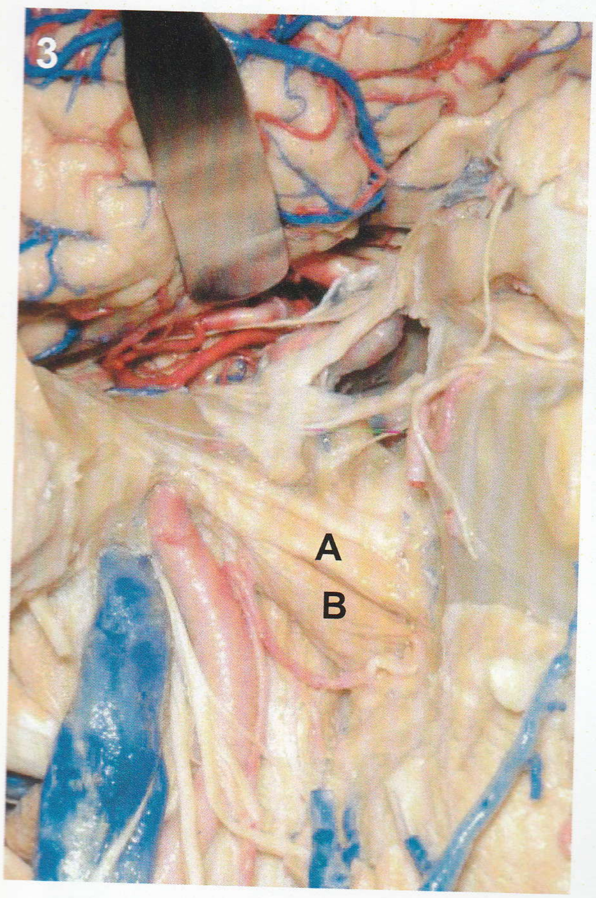
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5. The bone in the floor of the middle fossa, which separates the middle fossa from the infratemporal fossa, has been removed extending medially to the level of the foraminal ovale. The temporalis muscle has been detached from the cornoid process of the mandible.
Identify the lettered structures:

A. ____________ **C.** ____________
B. ____________ **D.** ____________

6. The mandibular condyle and the heads of the lateral pterygoid muscles have been removed to expose the neural and vascular structures in the infratemporal fossa.
Identify the segments of the maxillary artery:

A. ____________ **B.** ____________ **C.** ____________

Identify the lettered branches of the mandibular nerve:

D. ____________ **E.** ____________ **F.** ____________

Identify the nerve marked G:

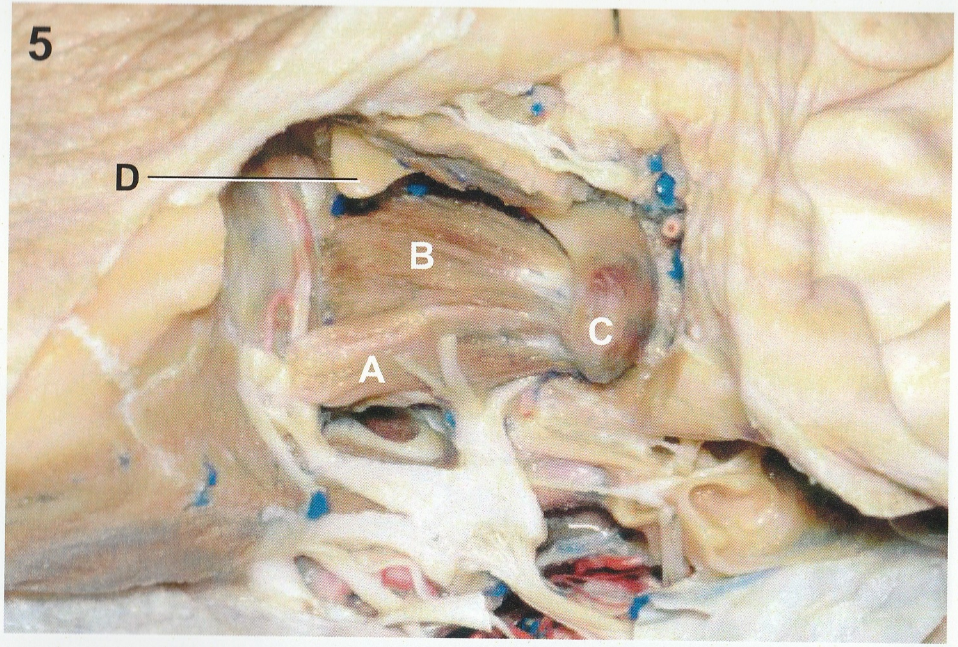
G. ____________

7. The bone in the floor of the anterolateral triangle, which is situated between the maxillary and mandibular nerves, has been drilled to expose the vidian nerve (arrow) in the pterygoid canal. A small artery and vein also course in the pterygoid canal. Removing the bone in this area exposes the pterygopalatine fossa which is located medial to the infratemporal fossa between the posterior wall of the maxillary sinus and the pterygoid process of the sphenoid bone. Note how the greater petrosal nerve extends forward to form one component of the vidian nerve with the other component coming from the carotid sympathetic plexus. Both the greater petrosal and sympatric nerves course on the internal carotid artery prior to joining to the form the vidian nerve. The vidian nerve joins the sphenopalatine ganglion in the pterygopalatine fossa.
Identify the lettered structures:

A. ____________ **E.** ____________ **I.** ____________
B. ____________ **F.** ____________ **J.** ____________
C. ____________ **G.** ____________ **K.** ____________
D. ____________ **H.** ____________ **L.** ____________

8. The auriculotemporal nerve has been divided and the deep fascia that covers the upper part of the cervical portion of the internal carotid artery (arrow), in the area below the carotid canal, has been opened.
Identify the lettered structures:

A. ____________ **C.** ____________
B. ____________ **D.** ____________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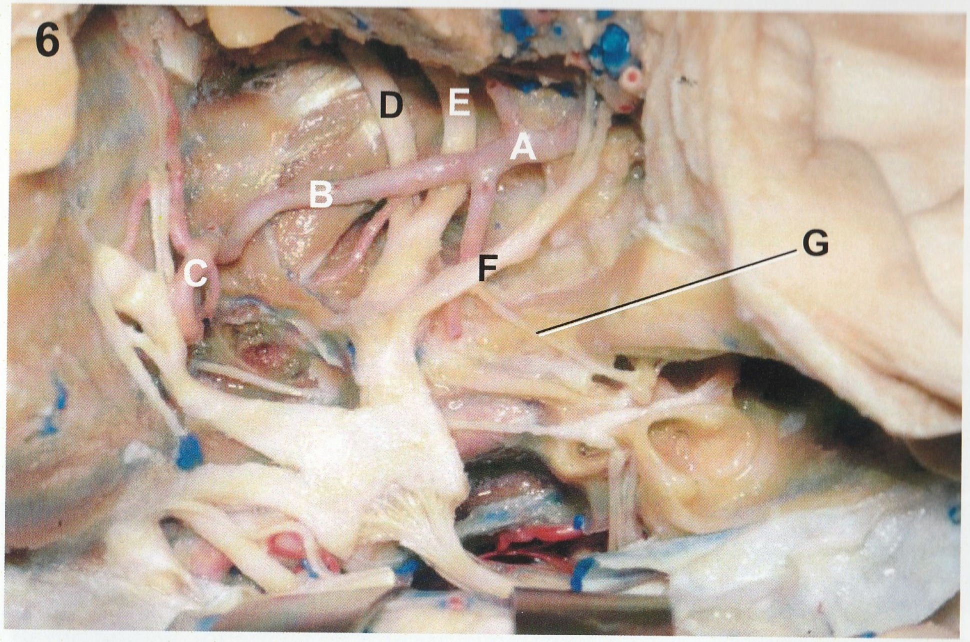
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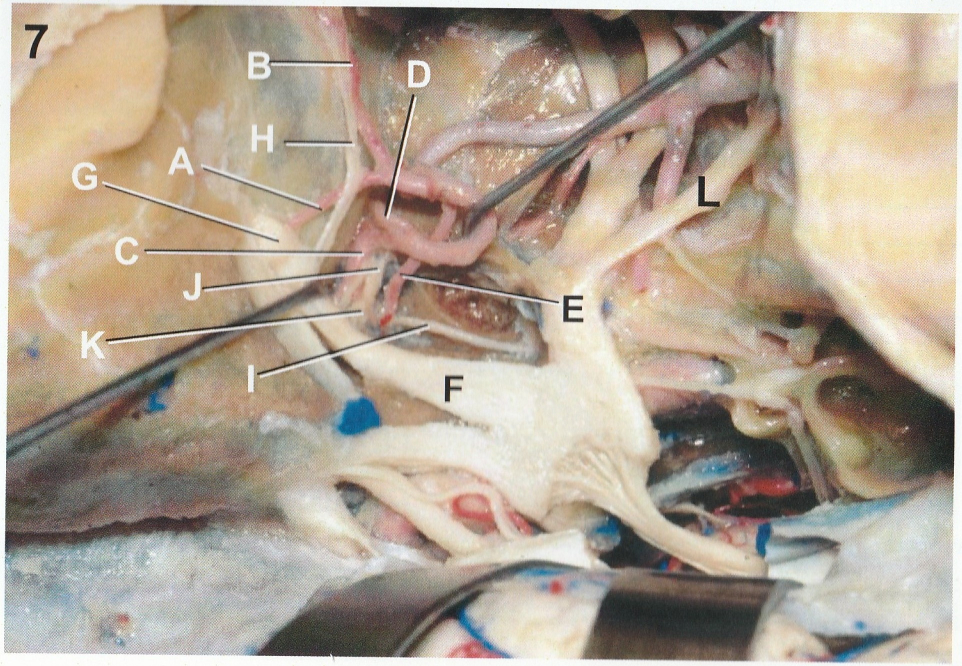
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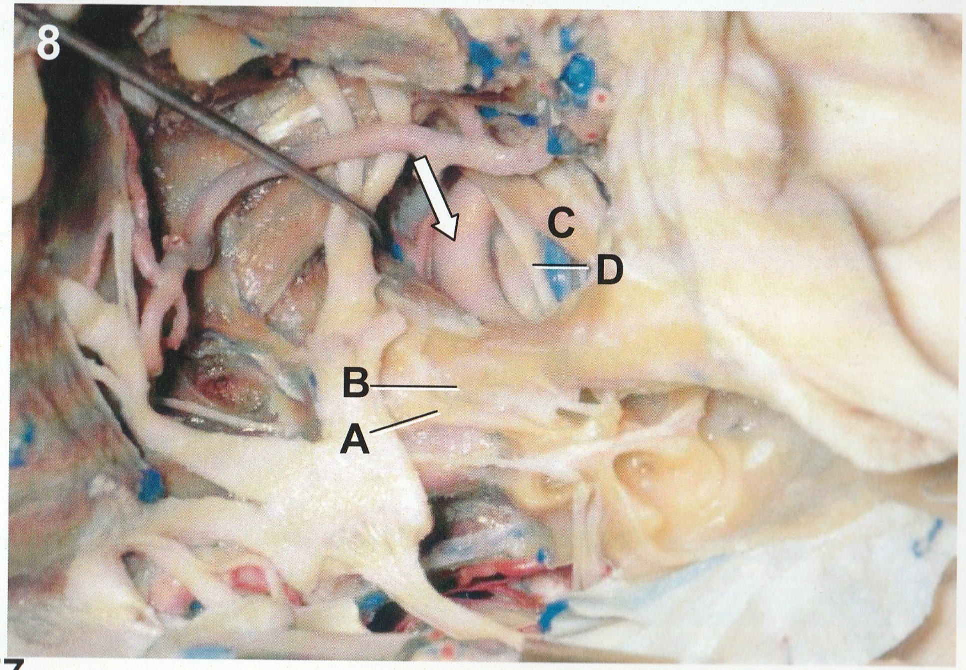
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9. The styloid process has been removed and the vaginal process has been drilled in order to expose the anterior margin of the jugular foramen.

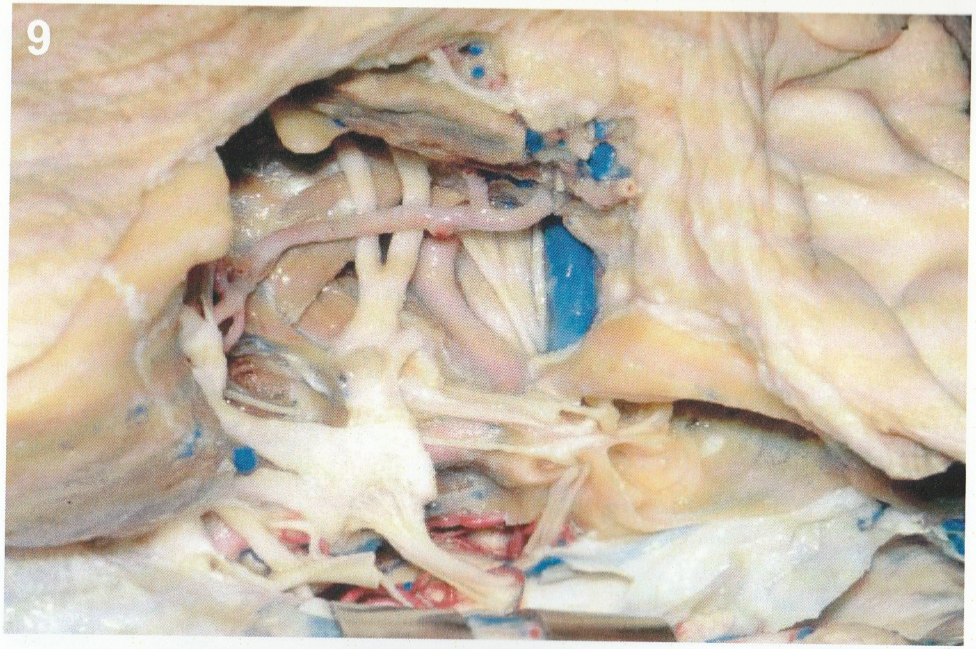
10. Enlarged view of Figure 9.

    Identify the lettered structures:

A. ____________________	**E.** ____________________
B. ____________________	**F.** ____________________
C. ____________________	**G.** ____________________
D. ____________________	**H.** ____________________

11. The glossopharyngeal nerve (IX) has been retracted forward to expose the vagus nerve (X) as it emerges from the jugular foramen. The accessory nerve (XI) is behind the vagus nerve.

12. The glossopharyngeal nerve has been retracted forward and the accessory nerve backward to expose the hypoglossal nerve (XII) which passes through the hypoglossal canal on the medial side of the jugular foramen and joins the nerves exiting the jugular foramen immediately below the skull base.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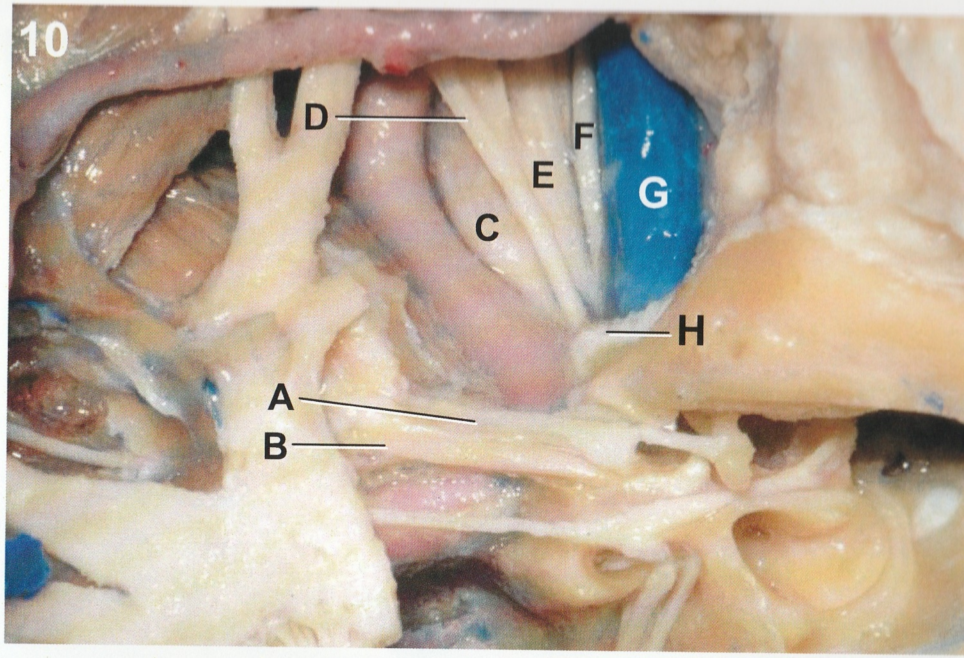
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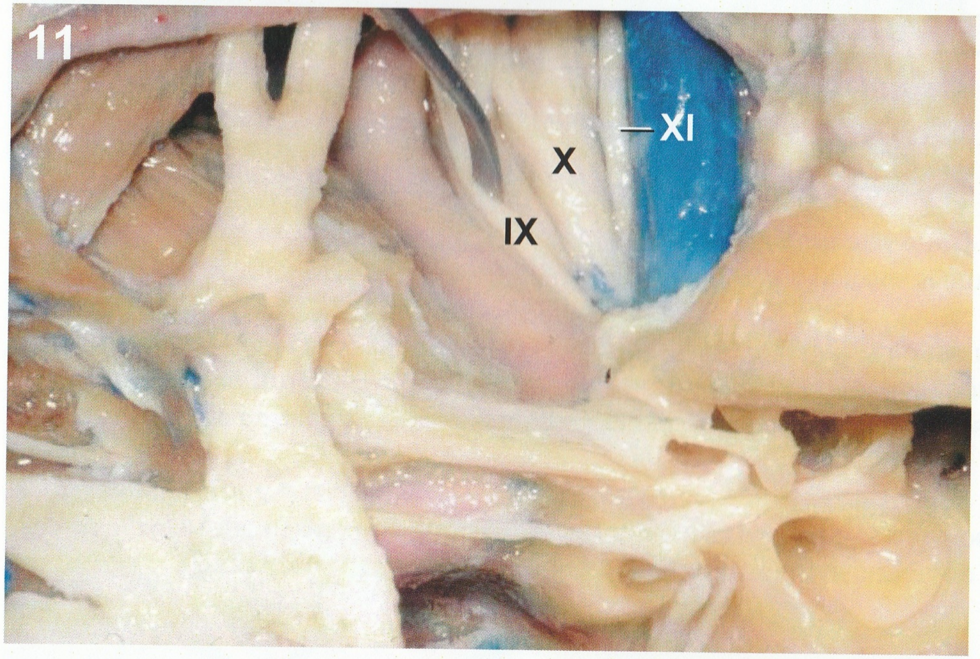
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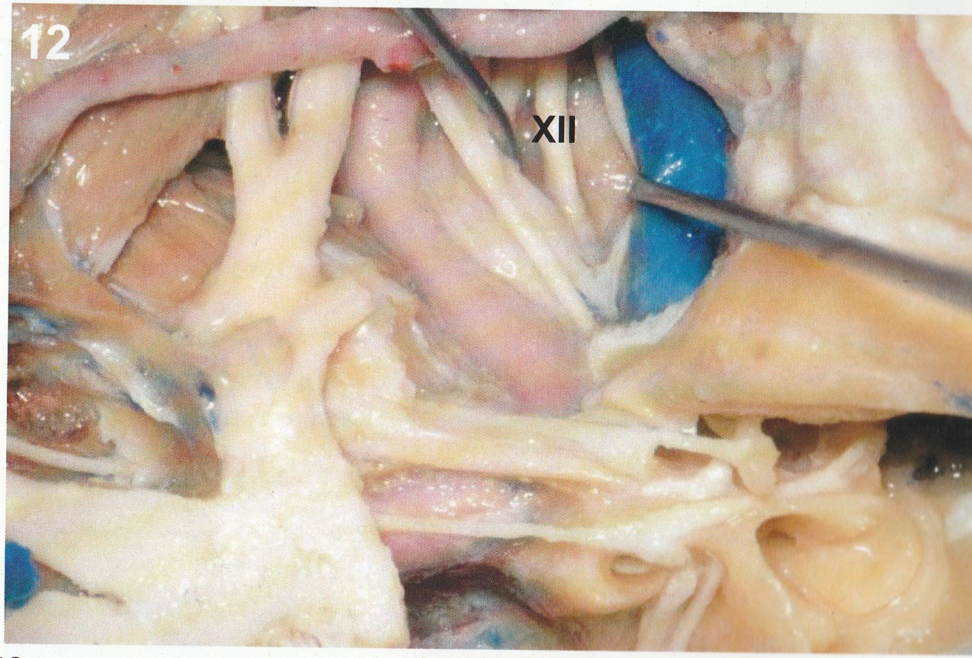
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13. Overview of the exposure. Again, note the relationship of the tensor tympani muscle and Eustachian tube to the petrous segment of the internal carotid artery. Both the latter structures must be resected in order to elevate the petrous segment of the internal carotid artery out of the carotid canal.

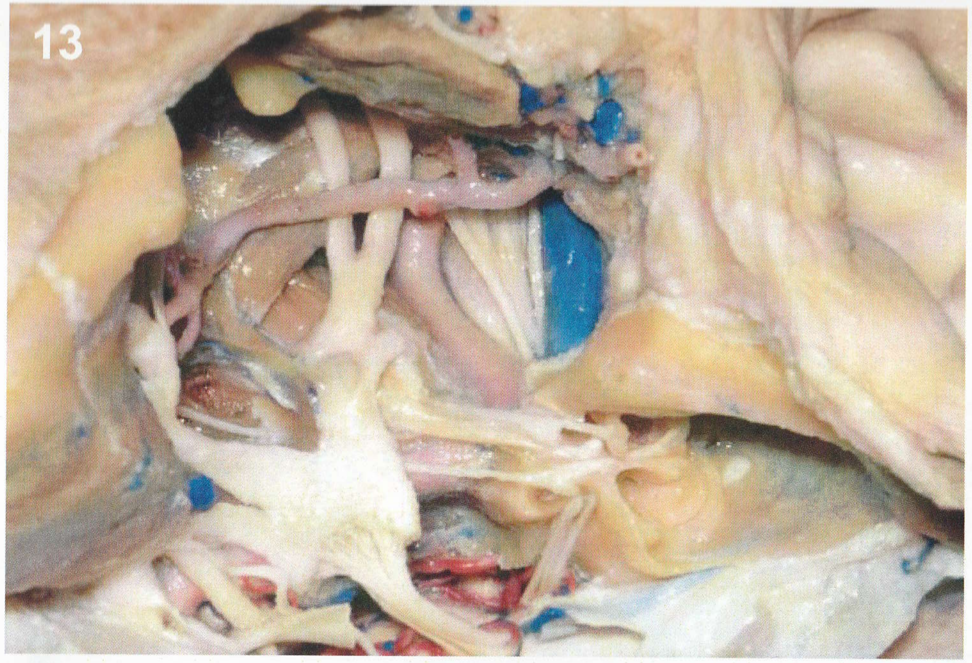
14. The eustachian tube and tensor tympani muscles have been resected and the petrous segment of the internal carotid artery has been reflected forward out of the carotid canal. Additional bone will be removed from the petrous apex in the area behind the internal carotid artery to expose the side of the clivus and the inferior petrosal sinus.

15. The dura exposed by drilling the area behind the petrous segment of the internal carotid artery has been opened to expose the cisterns in front of the brainstem and the right vertebral artery (arrow).

16. Magnified view of Figure 15.

Identify the lettered structures:

A. ____________________ **D.** ____________________
B. ____________________ **E.** ____________________
C. ____________________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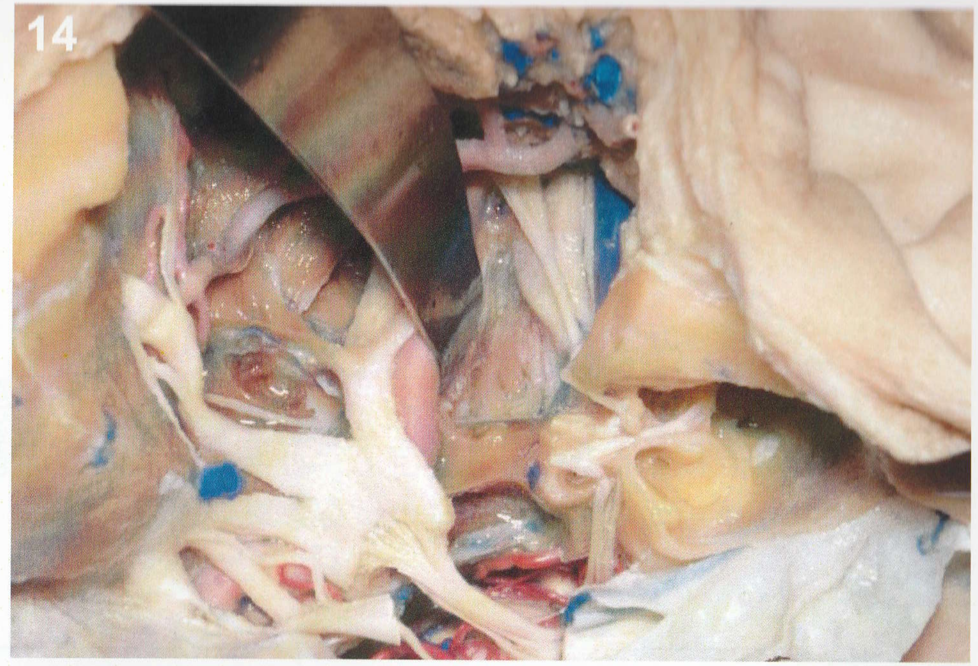
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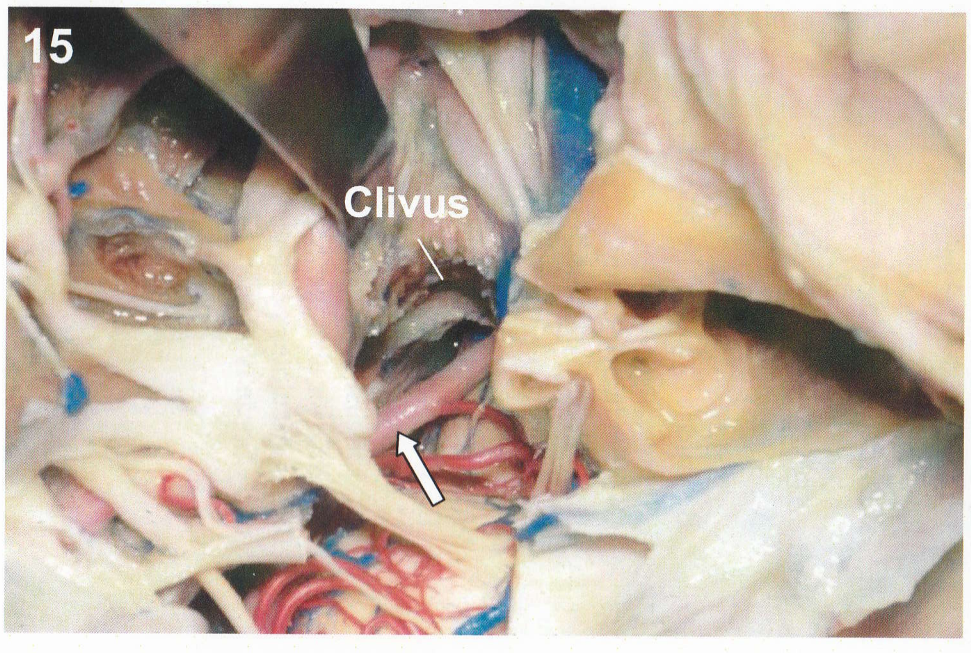
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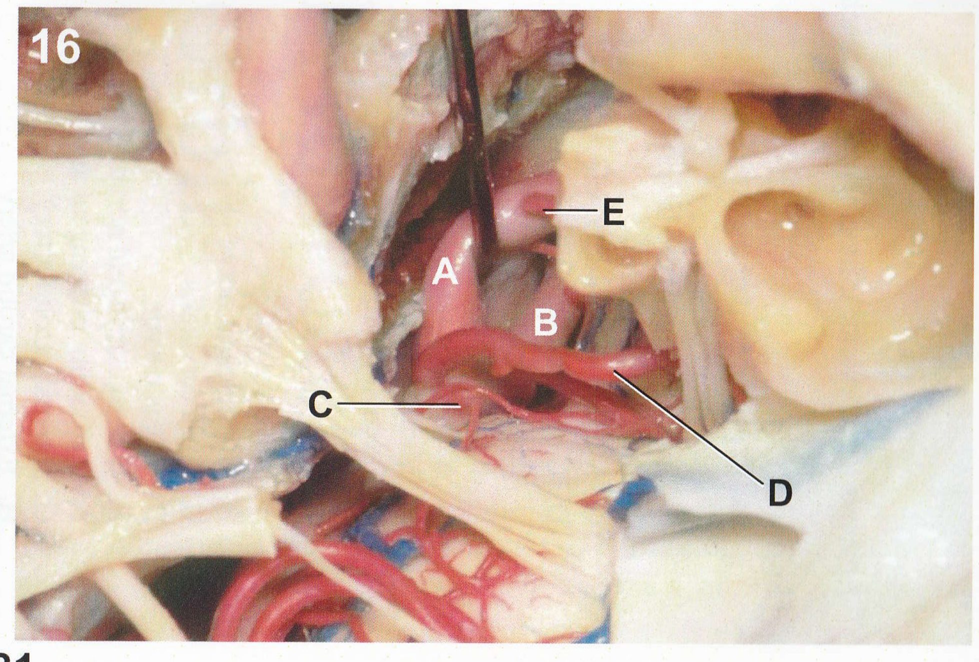
Clivus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Answers (Preauricular Infratemporal Approach)

Figure 1
A. Superior head of the lateral pterygoid muscle
B. Inferior head of the lateral pterygoid muscle
C. Medial pterygoid muscle
D. Lingual branch of the mandibular nerve
E. Inferior alveolar branch of the mandibular nerve
F. Maxillary artery
G. Internal jugular vein

Figure 2
A. Accessory nerve
B. Hypoglossal nerve
C. Ansa cervicalis
D. Vagus nerve
E. Glossopharyngeal nerve
F. Ascending pharyngeal artery
G. Internal carotid artery
H. External carotid artery
I. Internal jugular vein
J. Mandibular nerve
K. Middle meningeal artery

Figure 5
A. Superior head of the lateral pterygoid muscle
B. Inferior head of the lateral pterygoid muscle
C. Mandibular condyle
D. Coronoid process of mandible

Figure 6
A. Mandibular segment
B. Pterygoid segment
C. Pterygopalatine segment
D. Lingual nerve
E. Inferior alveolar nerve
F. Auriculotemporal nerve
G. Chorda tympani

Figure 7
A. Infraorbital branch of maxillary artery
B. Posterior superior alveolar artery
C. Sphenopalatine branch of maxillary artery
D. Greater palatine artery
E. Pharyngeal branch of maxillary artery
F. Maxillary nerve
G. Infraorbital nerve
H. Posterior superior alveolar nerve
I. Vidian nerve
J. Greater palatine nerve
K. Sphenopalatine ganglion
L. Auriculotemporal nerve

Figure 8
A. Tensor tympani muscle
B. Eustachian tube
C. Styloid process and attached muscles
D. Glossopharyngeal nerve

Figure 10
A. Eustachian tube
B. Tensor tympani muscle
C. Cervical sympathetic trunk
D. Glossopharyngeal nerve
E. Vagus nerve
F. Accessory nerve
G. Internal jugular vein
H. Upper attachment of carotid sheath

Figure 16
A. Ipsilateral vertebral artery
B. Contralateral vertebral artery
C. Vertebrobasilar junction
D. AICA
E. PICA

Transcranial Approach to the Orbit

Transcranial Approach to the Orbit

1. The head has been turned 30 degrees to the opposite side. The dura has been elevated from the orbital roof, and the roof and lateral walls have been thinned by the prior drilling. The nerves passing through the inferior orbital fissure were exposed immediately behind the fissure in completing the extradural approach to the cavernous sinus.

2. The orbital roof has been removed while preserving the periorbita. The orbital rim has been preserved.
Identify the two nerves which can be seen through the periorbita (A and B) and the other lettered structures:

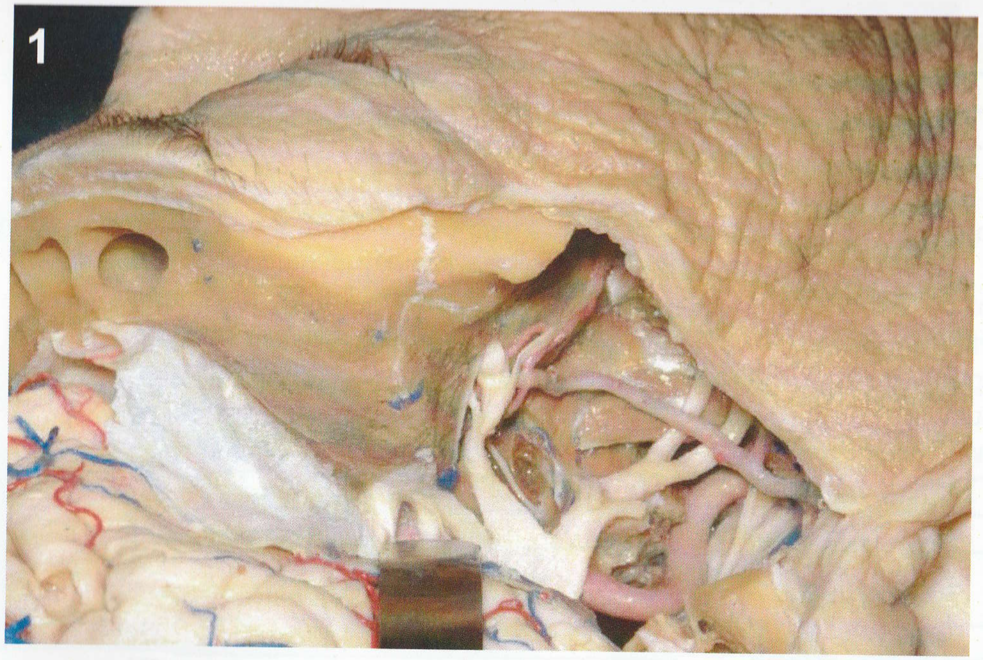
A. ______	**D.** ______	**G.** ______
B. ______	**E.** ______	**H.** ______
C. ______	**F.** ______	**I.** ______

3. The periorbita has been opened and the orbital fat removed to expose the extraocular muscles, and the neural and vascular structures within the orbit. The optic nerve and ophthalmic artery pass through the optic foramen. The oculomotor, trochlear, ophthalmic and abducens nerves pass through the superior orbital fissure. The four rectus muscles arise from an annular tendon which blends into the periorbita at the orbital apex and surrounds the optic foramen and central part of the superior orbital fissure. Both structures, which pass through the optic foramen, also pass through the annular tendon. Some structures which pass through the superior orbital fissure, pass outside the annular tendon. The trochlear nerve, the frontal and lacrimal branches of the ophthalmic nerve, and the superior and inferior ophthalmic veins exit the orbital apex outside the annular tendon. The structures which pass through both the superior orbital fissure and the annular tendon, are the oculomotor and abducens nerves and the nasociliary branch of the ophthalmic nerve.
Identify the lettered structures:

A. ______	**E.** ______	**H.** ______
B. ______	**F.** ______	**I.** ______
C. ______	**G.** ______	**J.** ______
D. ______		

4. Enlarged view of the orbital apex. The ophthalmic artery enters the orbital apex on the lateral side of the optic nerve and gives rise to the central retinal artery almost immediately upon entering the orbit. The central retinal artery enters the lower surface of the optic nerve and is smaller than the ciliary arteries and yet, occlusion of the central retinal artery can lead to complete blindness, while occlusion of the larger ciliary artery may result in only minimal or no loss of vision. Great care should be taken to avoid coagulation of vascular structures at the orbital apex on the lateral side of the optic nerve because vascular damage to the central retinal artery in that area may lead to blindness.
Identify the lettered structures:

A. ______	**C.** ______	**E.** ______
B. ______	**D.** ______	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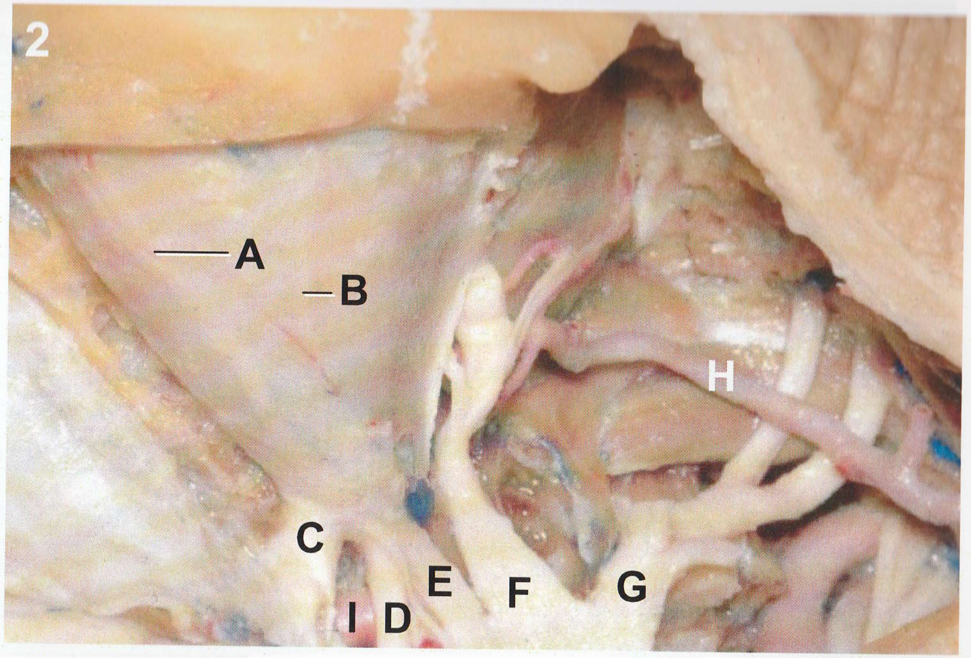
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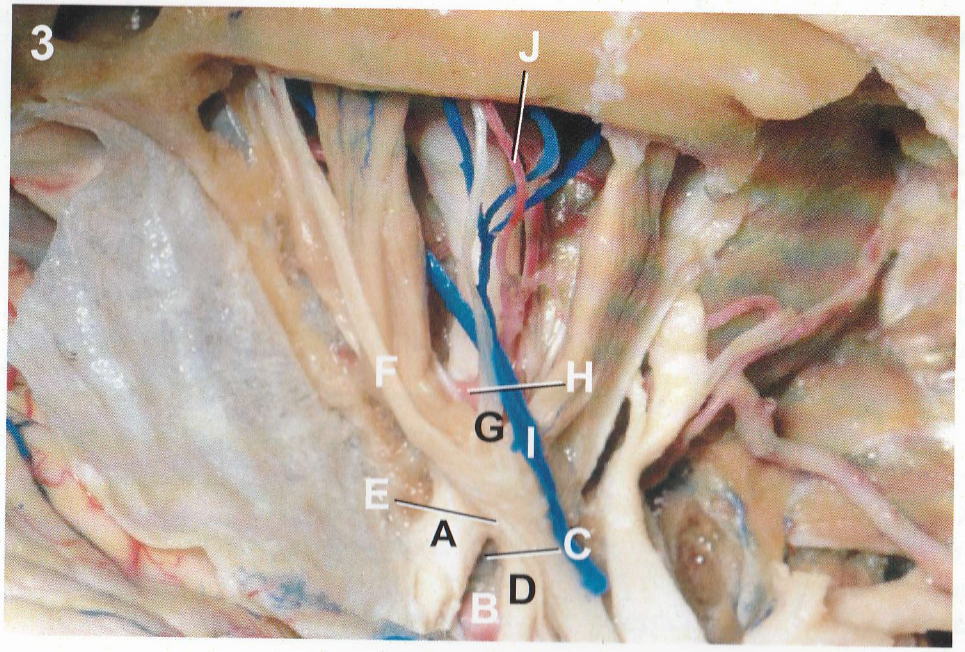
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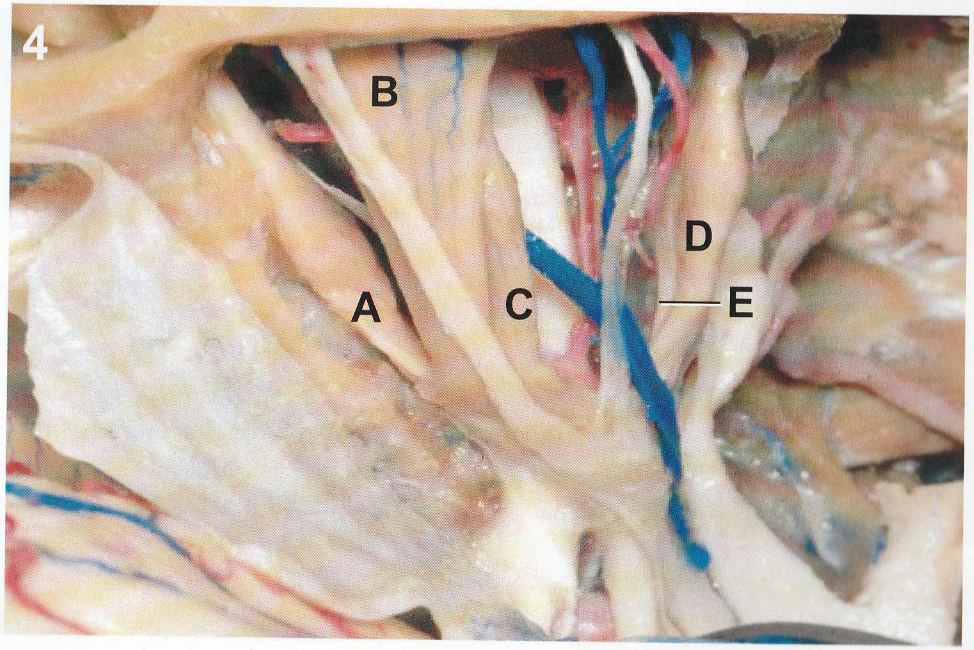
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5. The frontal nerve and levator and superior rectus muscles have been retracted laterally to expose the optic nerve. Four structures, which pass through the superior orbital fissure, cross above the optic nerve to reach the medial side of the orbit in front of the orbital apex. These structures are the trochlear nerve and superior ophthalmic vein which pass outside the annular tendon, and the ophthalmic artery and nasociliary branch of the ophthalmic nerve which pass through the annular tendon. The approach to the optic nerve, directed between the superior oblique and levator muscle, called the medial approach, is commonly selected for tumors extending through the optic foramen.

Identify the lettered structures:

A. ________ **C.** ________ **E.** ________
B. ________ **D.** ________ **F.** ________

6. The central approach to the orbit is completed by retracting the superior oblique muscle laterally and the levator muscle medially. This is the shortest route to the optic nerve at the orbital apex.

Identify the lettered structures:

A. ________ **C.** ________
B. ________ **D.** ________

7. The lateral approach to the optic nerve and orbital apex is directed between the levator and lateral rectus muscle. This approach is selected for tumors extending through the superior orbital fissure.

List the structures which cross above the optic nerve inside the orbit:

A. ________ **C.** ________
B. ________ **D.** ________

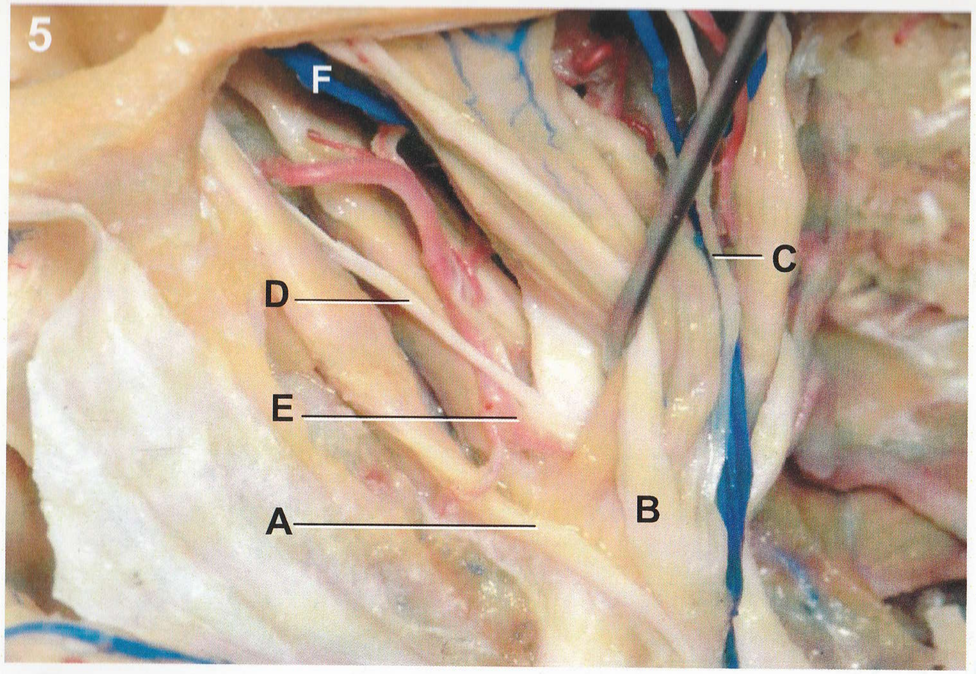
Identify the other lettered structures:

E. ________ **H.** ________ **K.** ________
F. ________ **I.** ________
G. ________ **J.** ________

8. Lateral view of the orbit after dividing the lateral rectus muscle just behind its insertion into the globe and reflecting the muscle backward. This exposes the structures which pass through the annular tendon. The oculomotor nerve divides into superior and inferior divisions at the level of the superior orbital fissure. The superior division supplies the levator and superior rectus muscles. The inferior division supplies the inferior and medial rectus and inferior oblique muscles and gives rise to the motor parasympathetic root of the ciliary ganglion. The abducens nerve passes through the annular tendon and enters the medial side of the lateral rectus muscle. The superior ophthalmic vein, ophthalmic artery and nasociliary nerve pass above the optic nerve. The nasociliary nerve gives rise to the sensory root to the ciliary ganglion which conveys corneal sensation to the ophthalmic division of the trigeminal nerve.

Identify the lettered structures:

A. ________ **D.** ________ **G.** ________
B. ________ **E.** ________ **H.** ________
C. ________ **F.** ________ **I.** ________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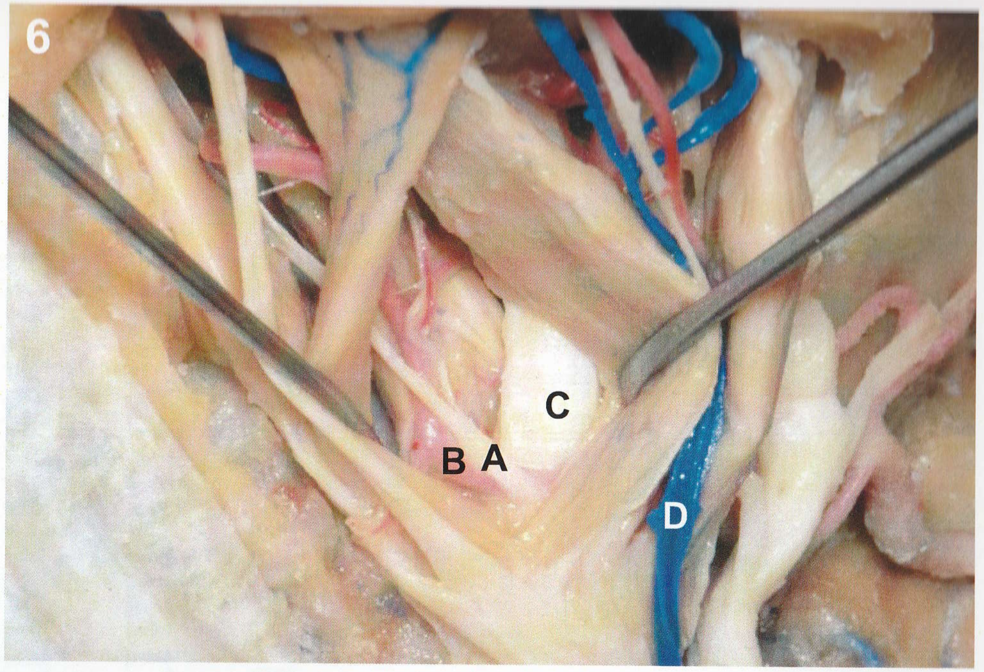
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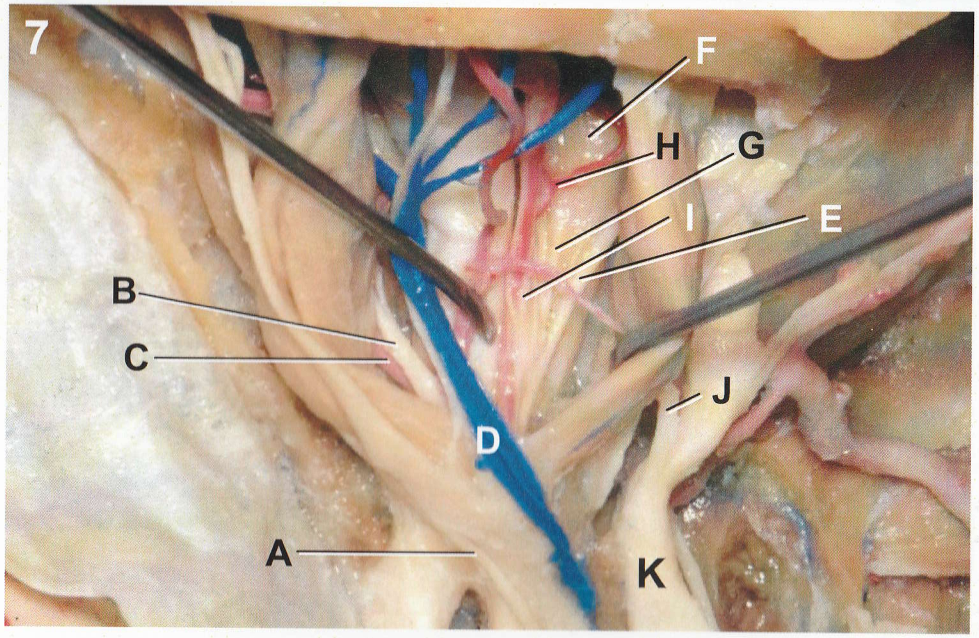
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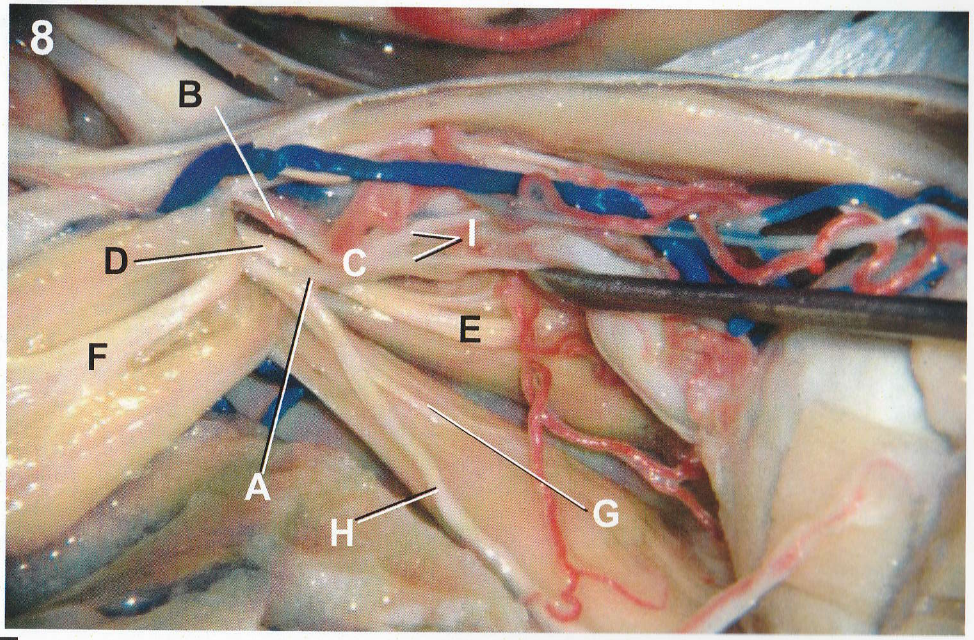
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Answers (Transcranial Approach to the Orbit)

Figure 2
A. Frontal nerve
B. Lacrimal nerve
C. Optic nerve
D. Oculomotor nerve
E. Ophthalmic nerve
F. Maxillary nerve
G. Mandibular nerve
H. Maxillary artery
I. Internal carotid artery

Figure 3
A. Optic nerve
B. Clinoid segment internal carotid artery
C. Optic strut
D. Oculomotor nerve
E. Trochlear nerve
F. Frontal nerve
G. Lacrimal nerve
H. Ophthalmic artery
I. Superior ophthalmic vein
J. Ciliary artery

Figure 4
A. Superior oblique muscle
B. Levator muscle
C. Superior rectus muscle
D. Lateral rectus muscle
E. Abducens muscle

Figure 5
A. Trochlear nerve
B. Frontal nerve
C. Lacrimal nerve
D. Nasociliary branch of ophthalmic nerve
E. Ophthalmic artery
F. Superior ophthalmic vein

Figure 6
A. Nasociliary branch of ophthalmic nerve
B. Ophthalmic artery
C. Optic nerve
D. Superior ophthalmic vein

Figure 7
A. Trochlear nerve
B. Nasociliary nerve
C. Ophthalmic artery
D. Superior ophthalmic vein
E. Oculomotor branch to inferior oblique muscle
F. Inferior rectus muscle
G. Oculomotor branch to inferior rectus muscle
H. Ciliary artery
I. Short ciliary nerves
J. Zygomatic branch maxillary nerve
K. Maxillary nerve

Figure 8
A. Motor root of the ciliary ganglion
B. Sensory root of the ciliary ganglion
C. Ciliary ganglion
D. Inferior trunk of oculomotor nerve
E. Nerve to medial rectus muscle
F. Abducens nerve
G. Nerve to inferior rectus muscle
H. Nerve to inferior oblique muscle
I. Short ciliary nerves

Transcavernous Approach to the Basilar Artery and Intradural Approach to the Cavernous Sinus

Transcavernous Approach to the Basilar Artery and Intradural Approach to the Cavernous Sinus

1. The head has been turned toward the right side in order to simulate a left pterional approach. The Sylvian fissure has been opened and the olfactory, optic, and oculomotor nerves and the internal carotid artery exposed.

2. The dura (vertical arrow) lining the upper surface of the anterior clinoid process has been reflected forward and the anterior clinoid process removed to expose the clinoid segment of the internal carotid artery (horizontal arrow).

3. The dura has been opened along the roof of the cavernous sinus following the dural entrance of the oculomotor nerve. The exposure along the medial side of the oculomotor nerve is carried forward to the superior orbital fissure. The upper dural ring around the clinoid segment has been divided along its lateral, anterior, and posterior margins so that the artery can be retracted medially as shown. The upper part of the venous plexus within the cavernous sinus has been obliterated and removed.

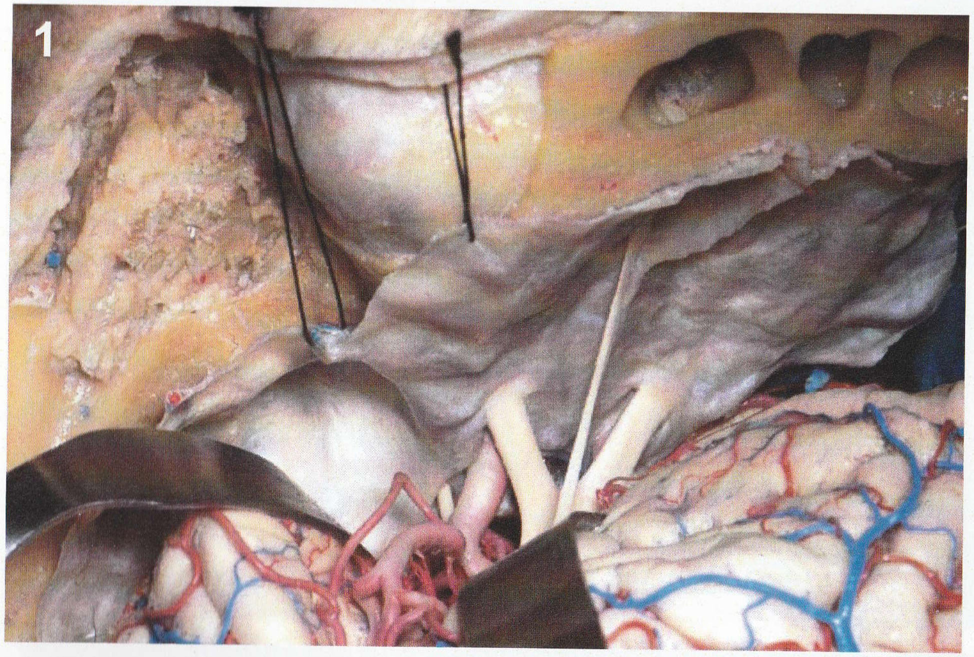
   Identify the lettered structures:

   A. ____________________ **E.** ____________________
   B. ____________________ **F.** ____________________
   C. ____________________ **G.** ____________________
   D. ____________________

4. The posterior clinoid process and adjacent part of the dorsum sellae has been removed and the dura covering these bony structures has been opened.

   Identify the lettered structures:

   A. ____________________ **C.** ____________________
   B. ____________________ **D.** ____________________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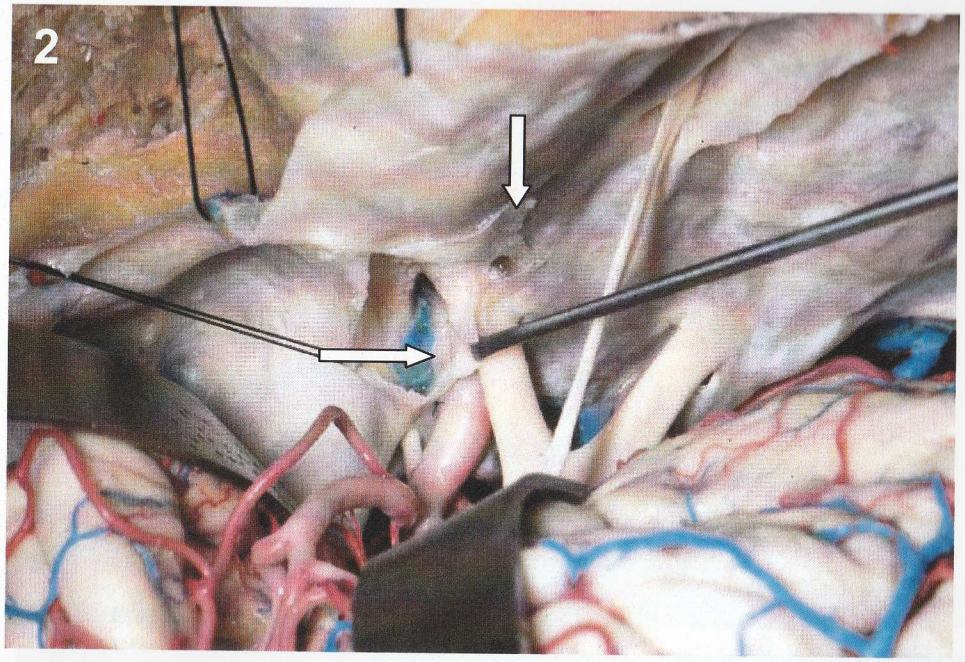
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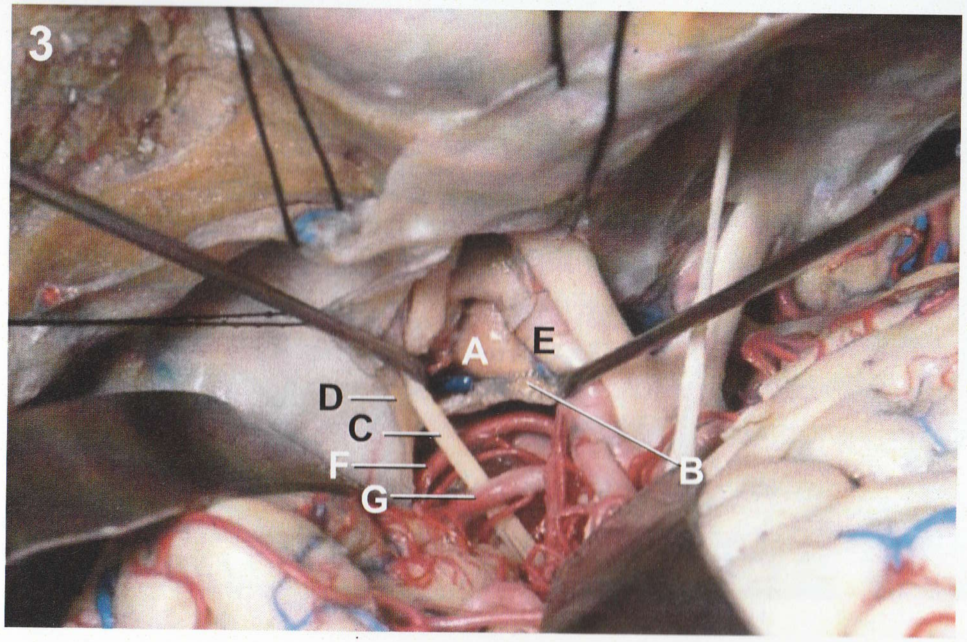
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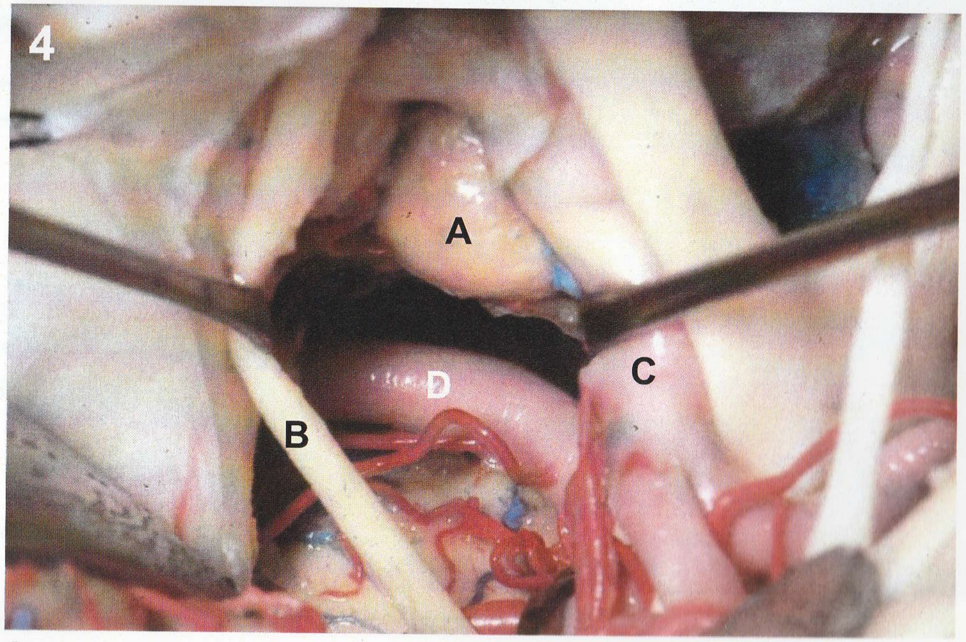
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5. Overview of the exposure at this stage in preparation for an intradural approach to the cavernous sinus on the same side as the transcavernous approach.

6. The outer layer of dura on the lateral wall of the cavernous sinus has been incised 2 or 3 mm below the entrance of the oculomotor nerve and parallel to the anterior petroclinoid dural fold. The incision is extended 1 cm forward and 1 cm backward from the level at which the oculomotor nerve pierces the roof of the cavernous sinus, and the dural margins of the incision have been retracted. After opening the inner layer of dura the venous plexus of the cavernous sinus was removed.

7. Enlarged view of the cavernous sinus.

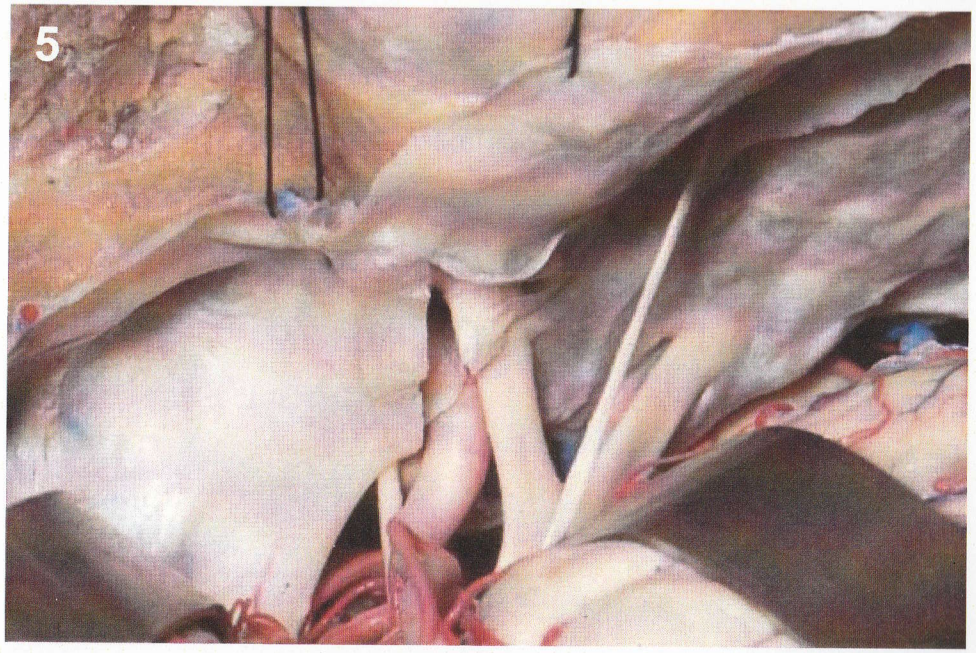
   Identify the lettered structures:

   A. ____________________ **C.** ____________________
   B. ____________________ **D.** ____________________

8. The margins of the infratrochlear (Parkinson's) triangle have been retracted to expose the central part of the cavernous sinus.

   Identify the lettered structures:

   A. ____________________ **D.** ____________________
   B. ____________________ **E.** ____________________
   C. ____________________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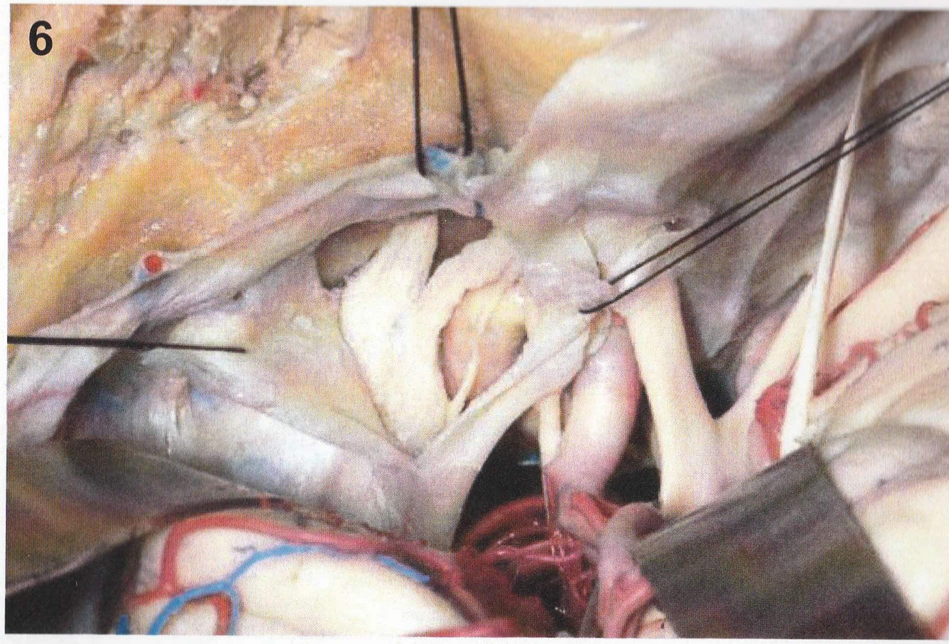
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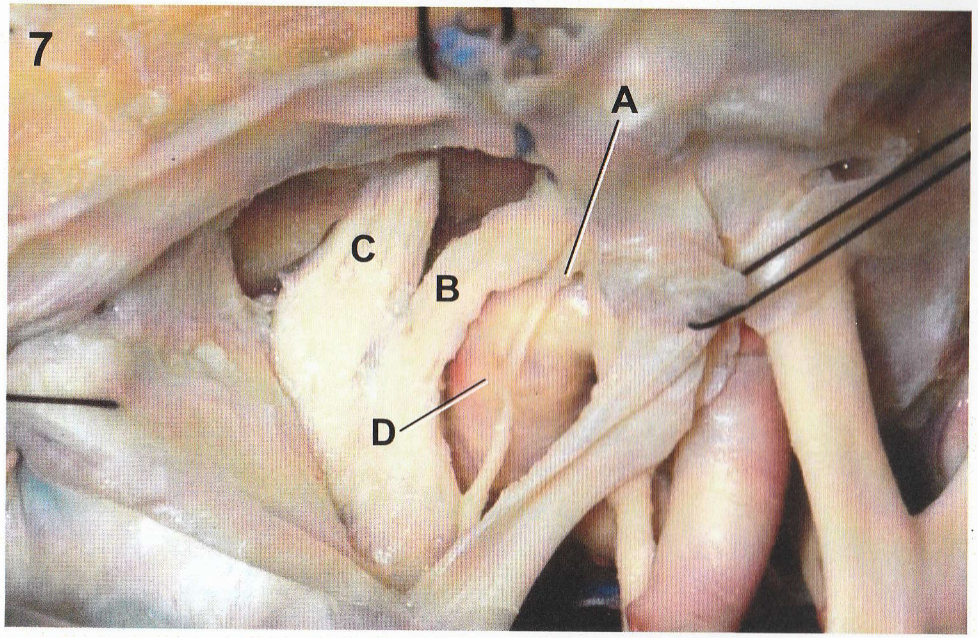
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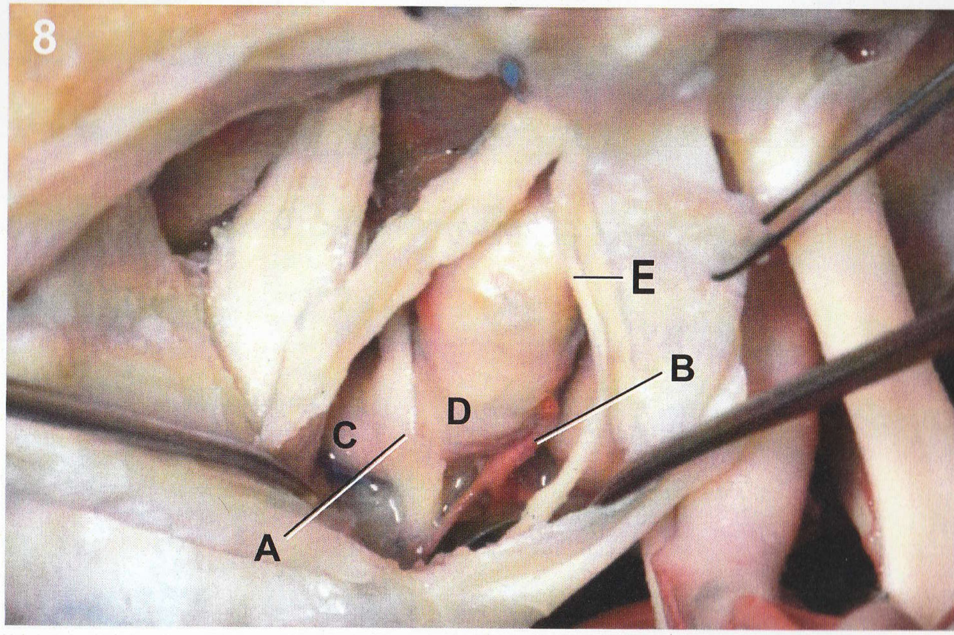
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Answers (Transcavernous Approach to the Basilar Artery and Intradural Approach to the Cavernous Sinus)

Figure 3

A. Pituitary gland
B. Posterior clinoid process
C. Oculomotor nerve
D. Ophthalmic nerve
E. Internal carotid artery
F. Superior cerebellar artery
G. Posterior cerebral artery

Figure 4

A. Pituitary gland
B. Oculomotor nerve
C. Supraclinoid segment internal carotid artery
D. Superior cerebellar artery

Figure 7

A. Trochlear nerve
B. Ophthalmic nerve
C. Maxillary nerve
D. Horizontal segment internal carotid artery

Figure 8

A. Abducens nerve
B. Meningohypophyseal trunk
C. Vertical segment intracavernous carotid
D. Posterior bend intracavernous carotid
E. Trochlear nerve

Subfrontal Extradural Transcranial Approach to the Clivus

Subfrontal Extradural Transcranial Approach to the Clivus

1. The head is positioned with the glabella upwards. The dura is elevated from the planum sphenoidale back to the dural sheath of both optic nerves after dividing the olfactory nerves at the site where they pass through the lamina cribrosa of the ethmoid bone. The periorbita is separated from the superior orbital rim on both sides and the scalp flap is reflected to expose both nasal bones.

2. If the supraorbital nerve passes through a canal in the superior orbital rim a small osteotomy is completed around the canal in order to reflect the nerve within the canal with the scalp flap. The posterior part of the roof of the frontal sinus has been removed.

   Identify the lettered structures:

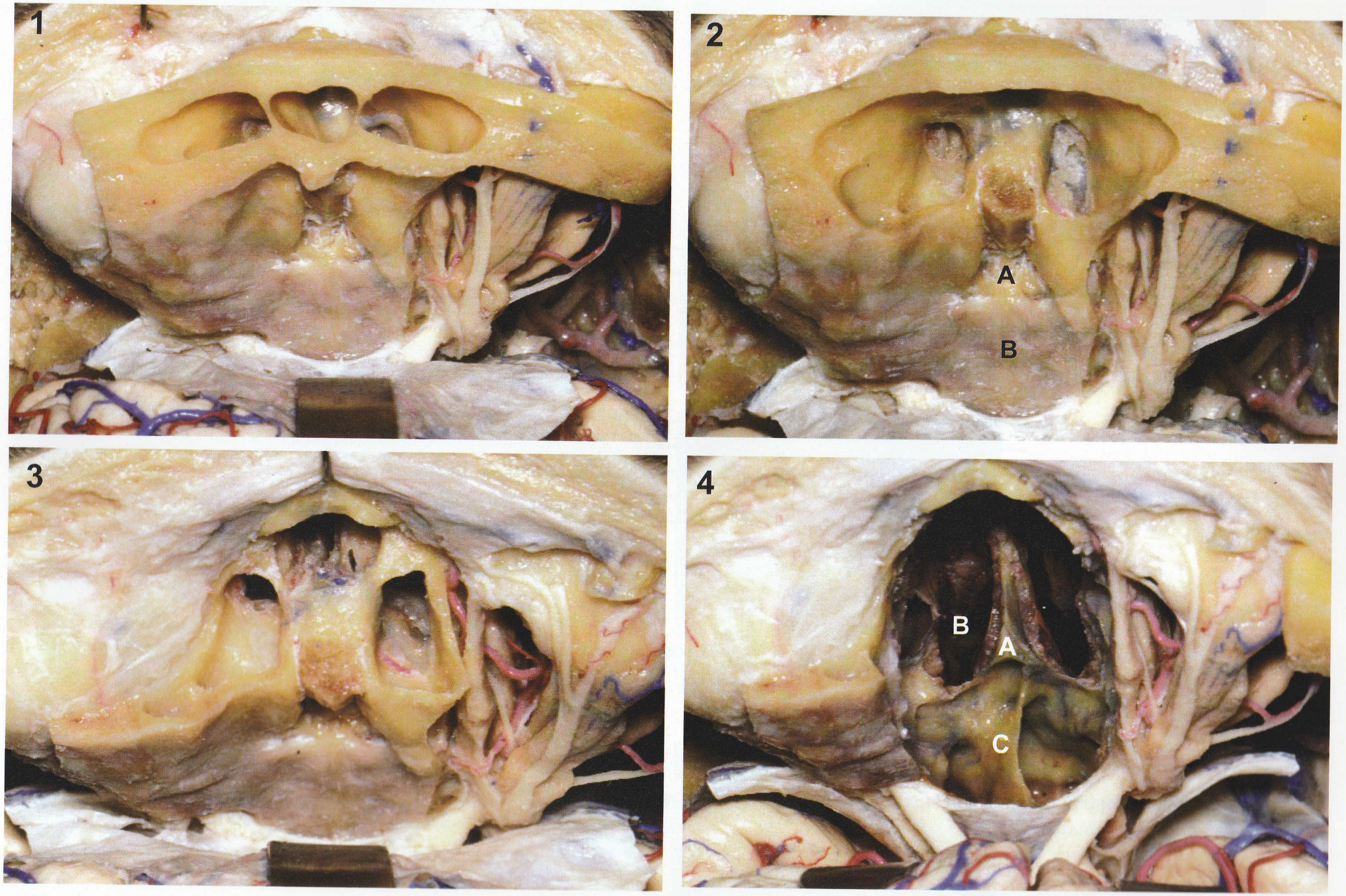
   A. ______________________ **B.** ______________________

3. A bilateral orbitofrontal osteotomy, which extends to the top of the nasal bone and allows removal of both superior orbital rims in one piece, has been completed.

4. Drill the lamina cribrosa, the roof of the ethmoid and frontal sinuses, and the planum sphenoidale to expose the superior part of the nasal cavity and the sphenoid sinus.

   Identify the lettered structures:

   A. ______________________ **C.** ______________________
   B. ______________________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5. The posterior wall of the sphenoid sinus has been removed to expose the dura lining the upper part of the clivus. The bone medial to the optic canal and the clinoid segment of the internal carotid artery and that forming the anterior and lower wall of the sellae has been removed.

Identify the lettered structure:

A. ______________________________

6. The dura lining the upper part of the clivus has been removed to expose the basilar artery and the prepontine cistern.

7. Enlarged view.

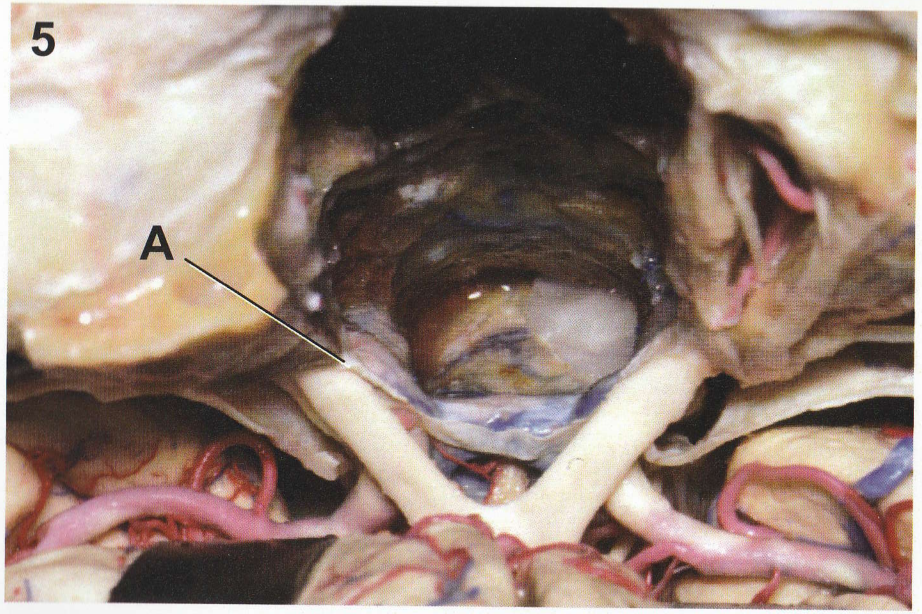
Identify the lettered structures:

A. ______________________________ **F.** ______________________________
B. ______________________________ **G.** ______________________________
C. ______________________________ **H.** ______________________________
D. ______________________________ **I.** ______________________________
E. ______________________________ **J.** ______________________________

8. Overview of the intra and extradural exposure.

Identify the lettered structures:

A. ______________________________ **D.** ______________________________
B. ______________________________ **E.** ______________________________
C. ______________________________ **F.** ______________________________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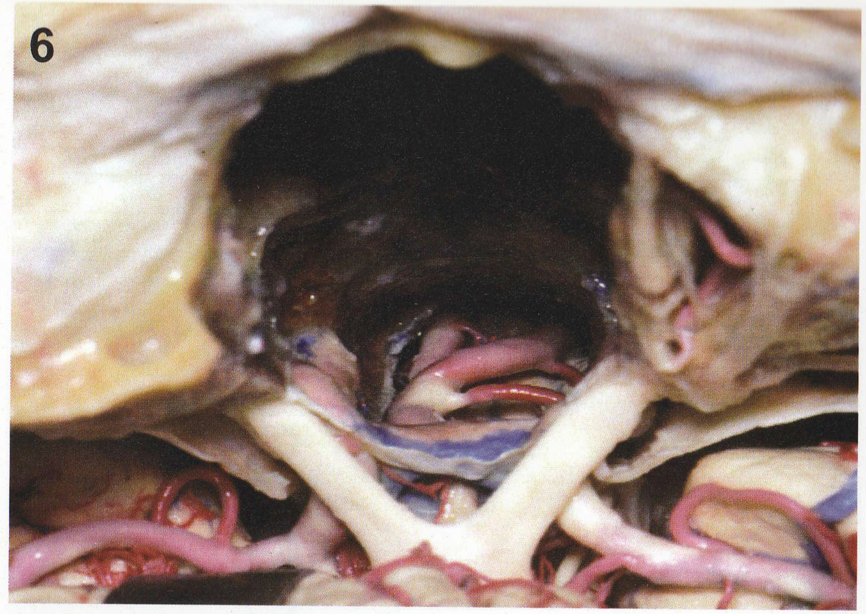
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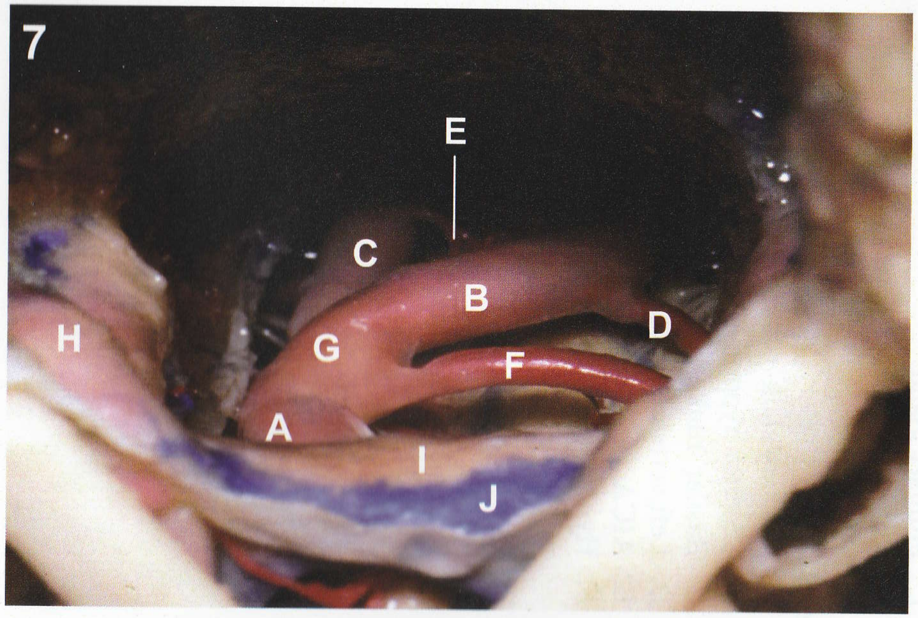
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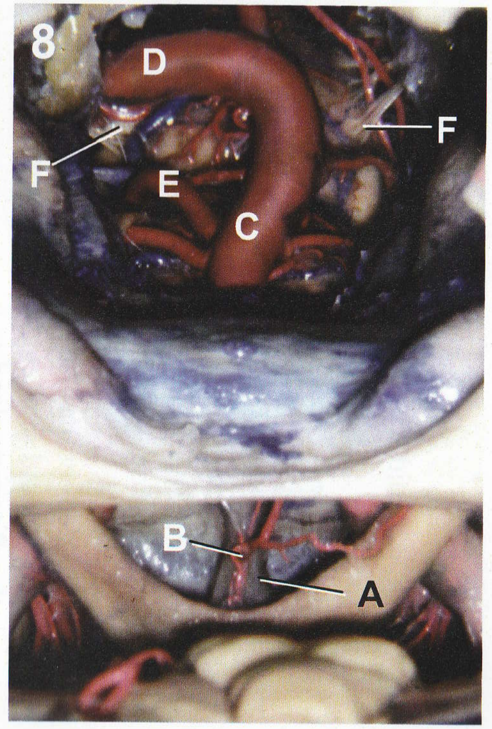
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Answers (Subfrontal Extradural Transcranial Approach to the Clivus)

Figure 2

A. Lamina cribrosa of the ethmoid bone
B. Planum sphenoidale

Figure 4

A. Vomer
B. Middle nasal turbinate
C. Sphenoid sinus

Figure 5

A. Clinoid segment of the internal carotid artery

Figure 7

A. Basilar trunk
B. Right vertebral artery
C. Left vertebral artery
D. PICA
E. Anterior spinal artery
F. AICA
G. Vertebrobasilar junction
H. Clinoid segment internal carotid artery
I. Pituitary gland
J. Anterior intercavernous sinus

Figure 8

A. Pituitary stalk
B. Superior hypophyseal artery
C. Basilar trunk
D. Left vertebral artery
E. AICA
F. Hypoglossal nerve

Cerebellopontine Angle

Cerebellopontine Angle

1. The head has been positioned for craniotomy in the three-quarter prone position with the left side up. The scalp has been reflected downward to provide this exposure of the suboccipital muscles and region.

   Examine and identify the lettered muscles and neurovascular structures:

A. ________________	**E.** ________________
B. ________________	**F.** ________________
C. ________________	**G.** ________________
D. ________________	**H.** ________________

2. The sternocleidomastoid muscle has been reflected downward and the trapezius muscle medially. This provides a more complete view of the splenius capitus muscle which is located in the next layer and has an attachment to the occipital and temporal bones deep to the sternocleidomastoid muscle.

3. The splenius capitis muscle has been reflected downward to expose the next muscular layer. Reflection of the splenius capitis also exposes the occipital artery as it courses backward on the medial side of the mastoid tip.

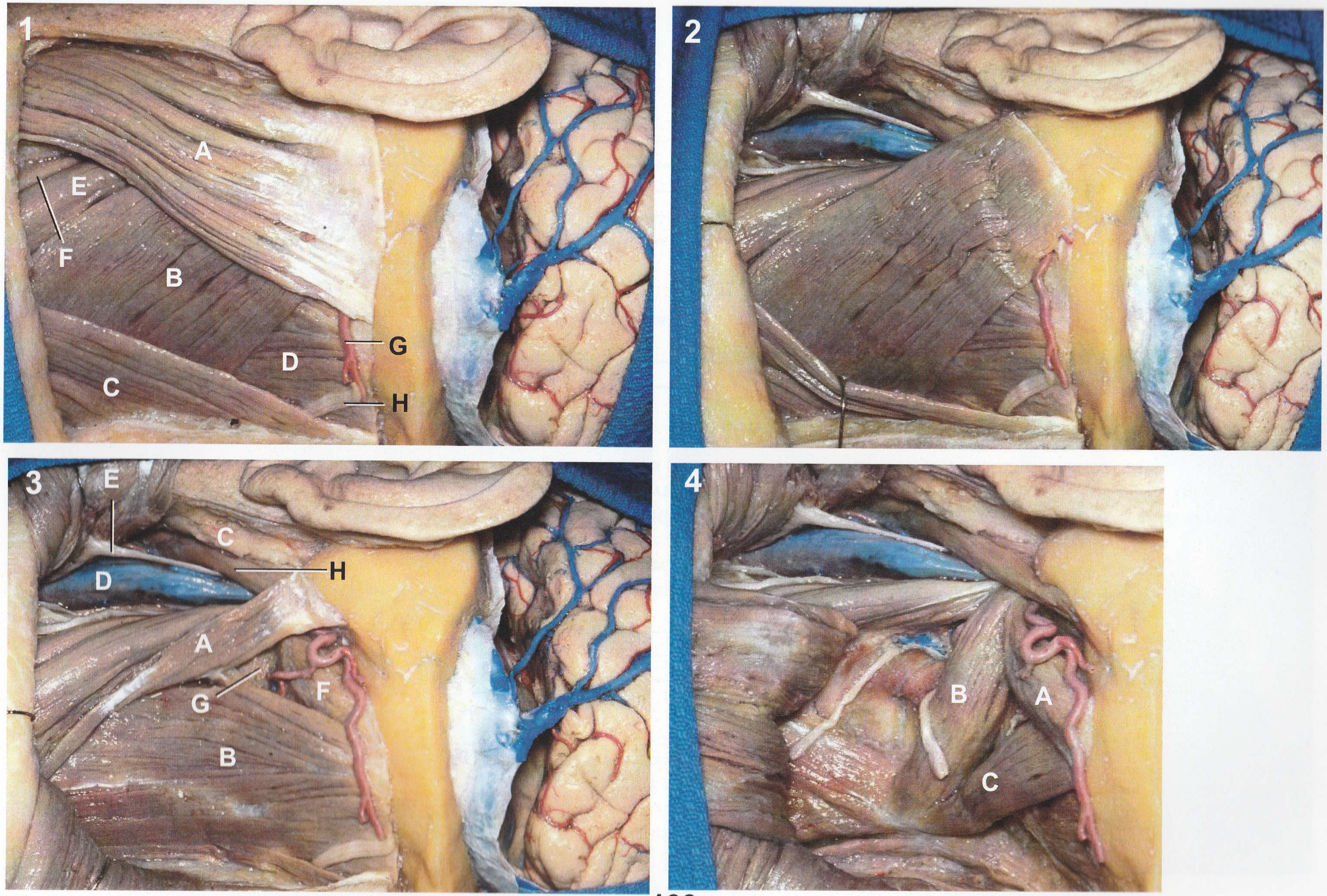
   Identify the lettered structures:

A. ________________	**E.** ________________
B. ________________	**F.** ________________
C. ________________	**G.** ________________
D. ________________	**H.** ________________

4. The longissimus capitus and semispinalis capitis muscles have been reflected downward to expose the three muscles which form the borders of the suboccipital triangle in which the vertebral artery courses after turning medially above the transverse process of the atlas.

   Identify the muscles which form the borders of the suboccipital triangle:

A. ________________	**C.** ________________
B. ________________	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5. The rectus capitis posterior major and superior oblique muscles have been reflected while preserving the inferior oblique muscle which extends from the spinous process of the axis to the transverse process of the atlas. The vertebral venous plexus encases the vertebral artery as it courses along the upper margin of the posterior arch of the atlas. The vertebral artery, as it ascends from the C2 to the C1 transverse process, is directed somewhat laterally.

Identify the lettered structures in the exposure:

A. ____________________	**D.** ____________________
B. ____________________	**E.** ____________________
C. ____________________	**F.** ____________________

6. The rectus capitis posterior minor muscle has been reflected downward and the venous plexus around the vertebral artery has been removed. A retrosigmoid craniotomy has been completed and the dura opened.

7. The portion of the vertebral artery which courses behind the atlantoaxial joint has been elevated to expose the suboccipital nerve which courses along its lower border. Several meningeal arteries arise from the exposed segment of the vertebral artery. In addition, one small artery (A) arises just before and penetrates the dura with the vertebral artery.

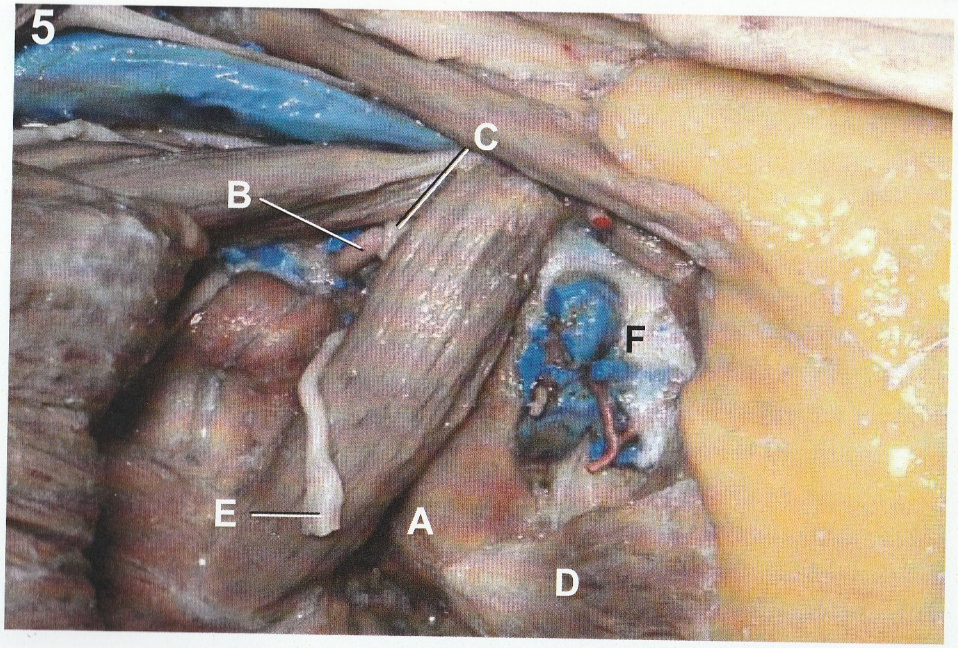
Identify the lettered structures:

A. ____________________	**C.** ____________________
B. ____________________	**D.** ____________________

8. The cerebellum has been gently depressed to expose the cranial nerves and vascular structures in the cerebellopontine angle.

Identify the lettered structures:

A. ____________________	**G.** ____________________
B. ____________________	**H.** ____________________
C. ____________________	**I.** ____________________
D. ____________________	**J.** ____________________
E. ____________________	**K.** ____________________
F. ____________________	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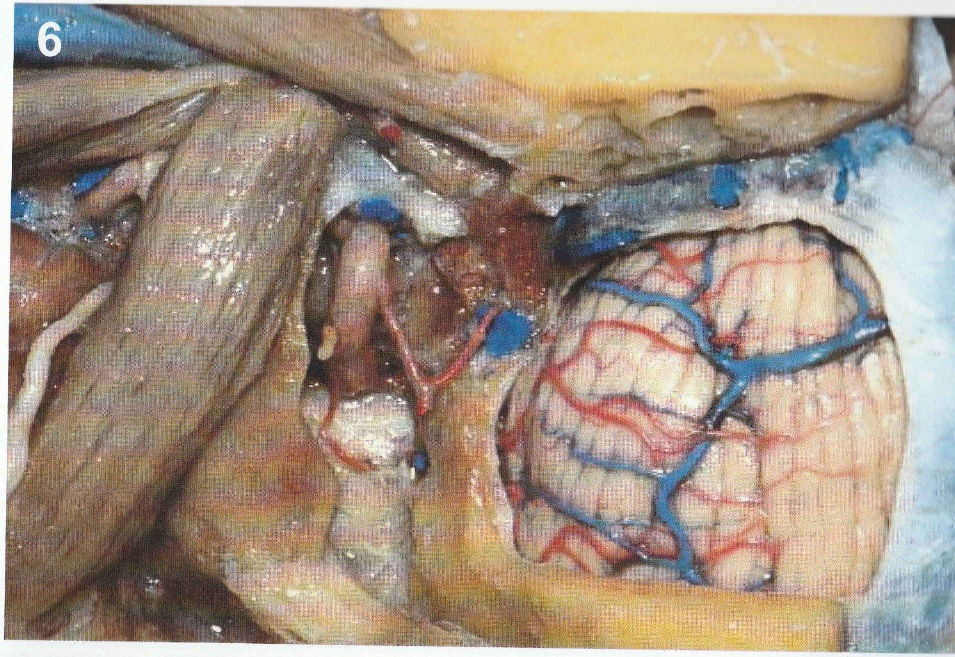
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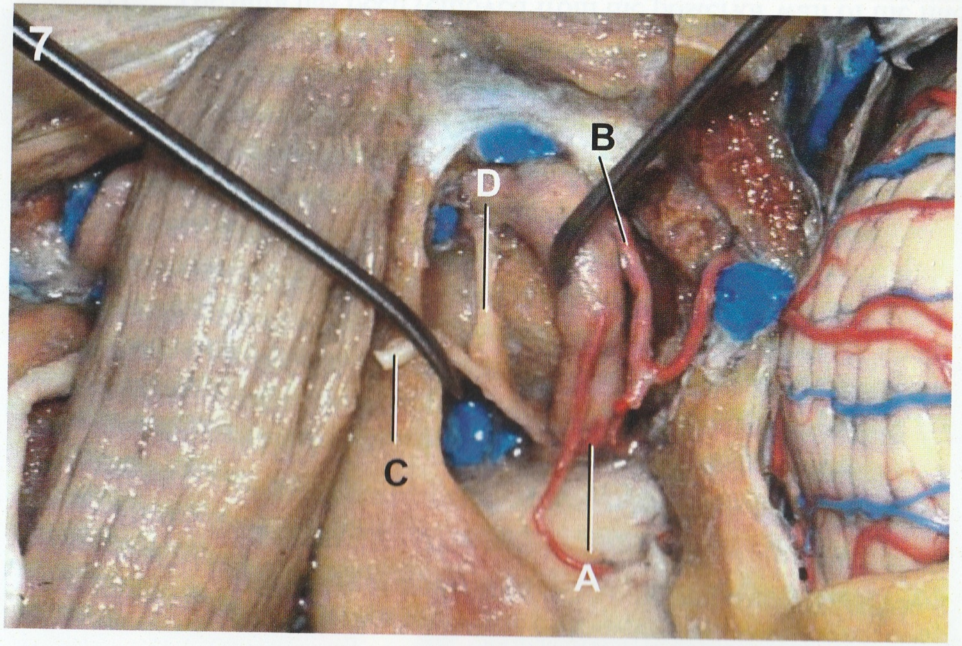
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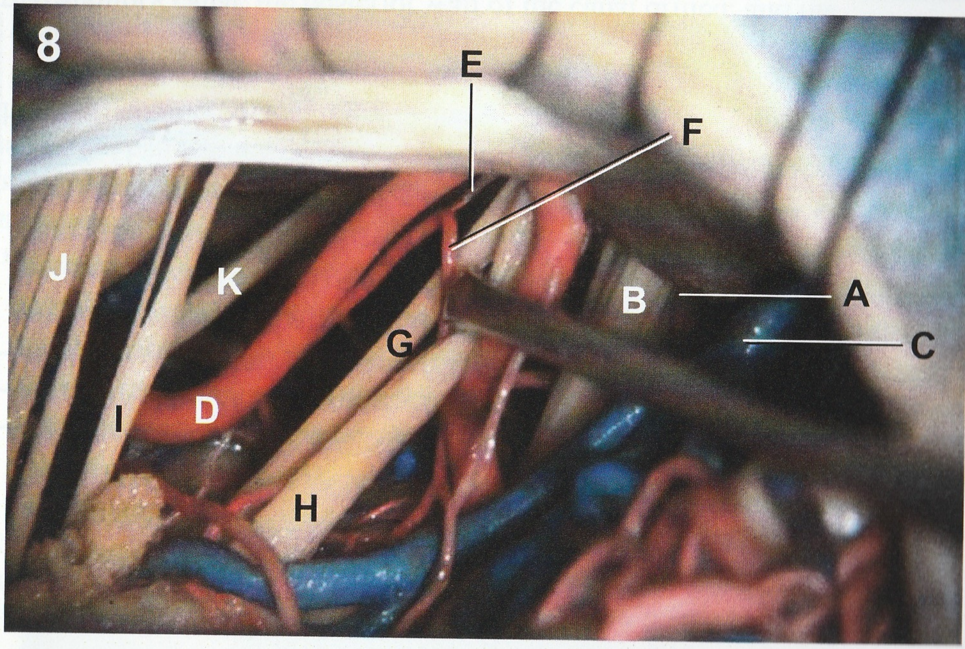
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9. It is sometimes possible to expose the basilar artery through a retrosigmoid approach without completing any of the complex skull base procedures. The vestibulocochlear nerve has been gently elevated.

Identify the lettered structures:

A. ____________________	**E.** ____________________
B. ____________________	**F.** ____________________
C. ____________________	**G.** ____________________
D. ____________________	

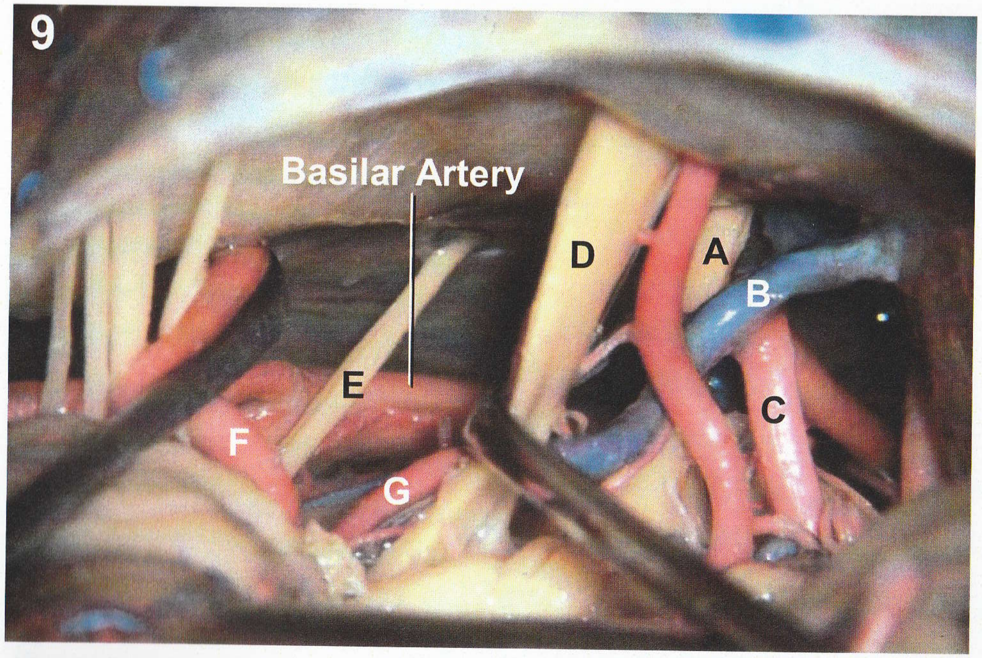
10. The microscope has been tilted to provide a better view of the nerves entering the internal acoustic meatus. The AICA loops into the porus for a short distance before looping back to the brainstem. A vein passes from the side of the medulla to the jugular bulb between the glossopharyngeal and vagus nerves. Superior petrosal veins pass behind the trigeminal nerve and enter the superior petrosal sinus. The (A) ____________________ is located beneath the dura, below and slightly lateral to the internal acoustic meatus. The name of the vein passing from the medulla to the jugular bulb is the (B) ______________ ______________ vein.

11. The dura has been removed from the posterior wall of the internal auditory canal, the posterior wall of the canal drilled, and the dura lining the meatus opened. This exposes the transverse crest which divides the upper and lower compartments of the lateral end of the internal acoustic meatus. The superior vestibular and facial nerves pass above the transverse crest and the inferior vestibular and cochlear nerves pass below. A labyrinthine artery (arrow) arises from the AICA and curves around the nerves within the meatus.

12. A cleavage plane has been developed between the different nerves in the internal acoustic meatus.

Identify the lettered nerves:

A. ____________________	**C.** ____________________
B. ____________________	**D.** ____________________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Basilar Artery
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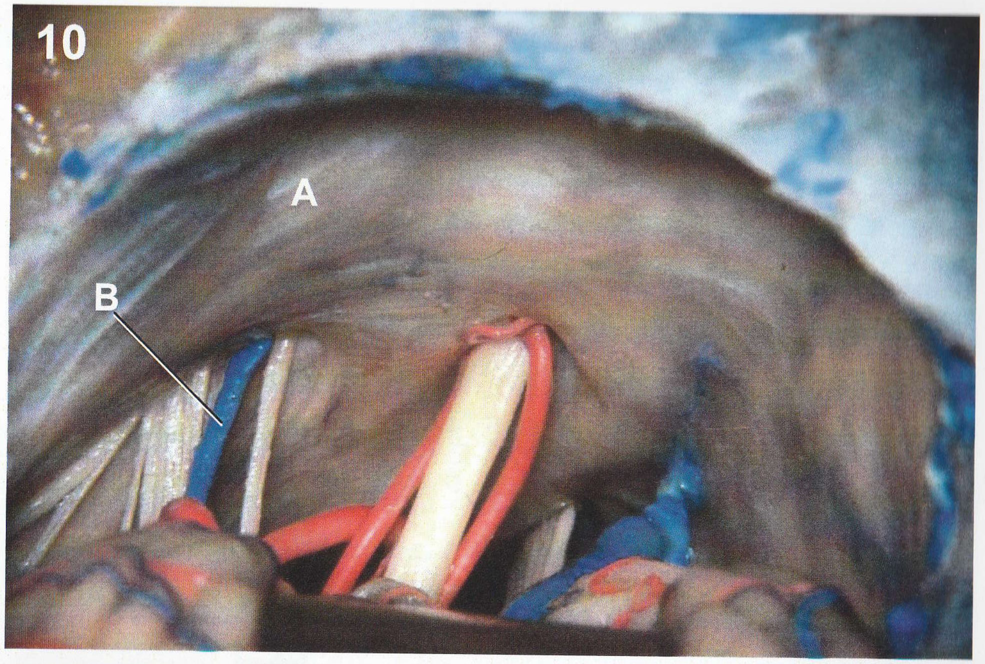
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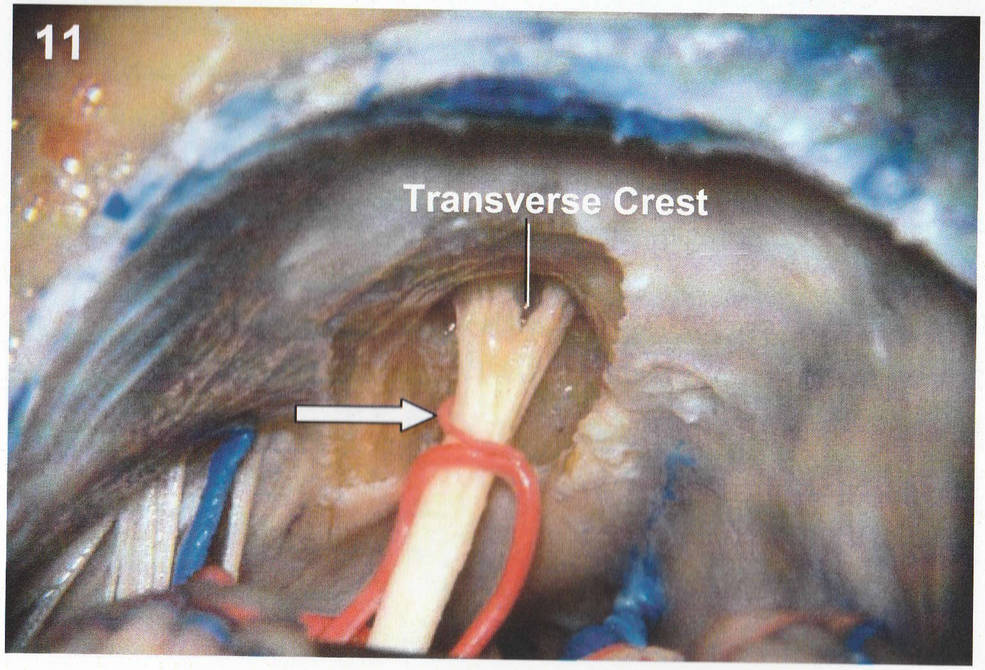
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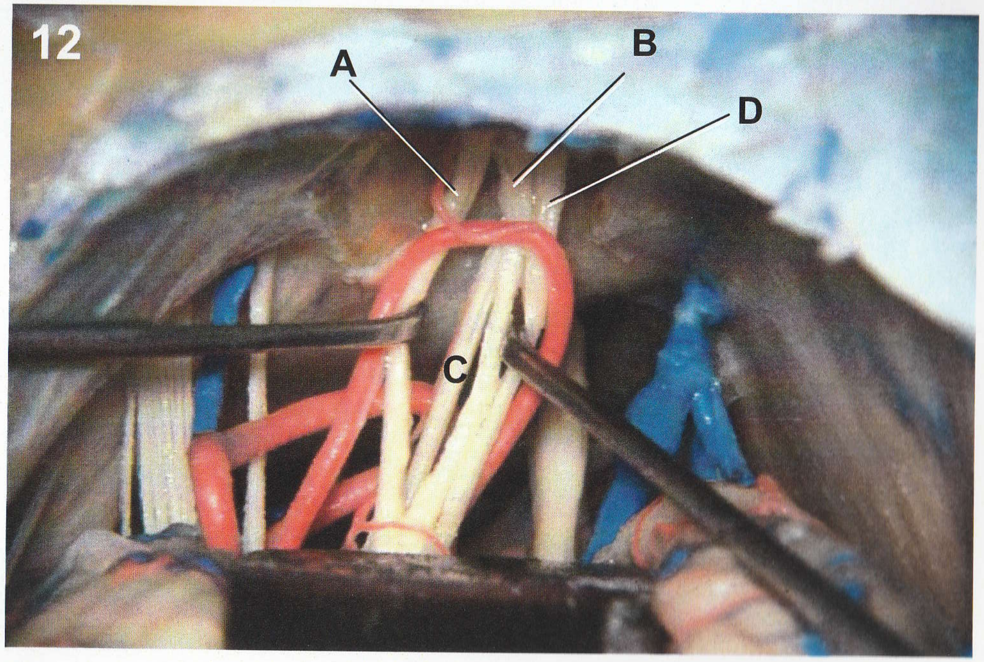
Transverse Crest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Answers (Cerebellopontine Angle)

Figure 1
A. Sternomastoid muscle
B. Splenius capitus muscle
C. Trapezius muscle
D. Semispinalis capitis muscle
E. Levator scapulae muscle
F. Posterior scalene muscle
G. Occipital artery
H. Greater occipital nerve

Figure 3
A. Longissimus capitis muscle
B. Semispinalis capitis muscle
C. Parotid gland
D. Internal jugular vein
E. Glossopharyngeal nerve
F. Superior oblique muscle
G. Inferior oblique muscle
H. Posterior belly digastric muscle

Figure 4
A. Superior oblique muscle
B. Inferior oblique muscle
C. Rectus capitis posterior major muscle

Figure 5
A. Posterior arch of the atlas
B. Vertebral artery
C. Ventral root of C2
D. Rectus capitis posterior minor muscle
E. Dorsal ramus of C2
F. Atlanto-occipital membrane

Figure 7
A. Posterior spinal artery
B. Posterior meningeal artery
C. Dorsal ramus of C1
D. Ventral ramus of C1

Figure 8
A. Superior cerebellar artery
B. Trigeminal nerve
C. Superior petrosal vein
D. AICA
E. Labyrinthine artery
F. Recurrent artery
G. Facial nerve
H. Vestibulocochlear nerve
I. Glossopharyngeal nerve
J. Vagus nerve
K. Abducens nerve

Figure 9
A. Trigeminal nerve
B. Petrosal vein
C. Superior cerebellar artery
D. Vestibulocochlear nerve
E. Abducens nerve
F. PICA
G. AICA

Figure 10
A. Endolymphatic sac
B. Inferior petrosal vein

Figure 12
A. Inferior vestibular nerve
B. Superior vestibular nerve
C. Cochlear nerve
D. Facial nerve

Presigmoid Approach

Presigmoid Approach

1. There are several variations of the presigmoid approach. These include the minimal mastoidectomy, retrolabyrinthine, partial labyrinthectomy, translabyrinthine, and transcochlear modifications. The part of the temporal bone covering the sigmoid sinus has been removed in the minimal mastoidectomy approach shown in Figures 1, 2 and 3. The bony removal extends anterior to the sigmoid sinus which has been gently retracted in this exposure. The facial nerve and semicircular canals have not been exposed.

   What structures form Citelli's angle?

   A. ____________________ **B.** ____________________

   The presigmoid dura which lines the posterior surface of the temporal bone is called: C. ____________________

2. The dural incision parallels the anterior border of the sigmoid sinus and extends through the superior petrosal sinus and the tentorium 1 cm behind the petrous ridge. Care has been taken to identify and protect the trochlear nerve as it courses medial and then within the tentorial edge. The point at which the vein of Labbé empties into the junction of the transverse and sigmoid sinuses has been preserved. Retractors have been placed to elevate the temporal lobe and to retract the sigmoid sinus and petrosal surface of the cerebellum. Note the extent of the exposure and the structures that can be visualized in preparation for comparing the minimal mastoidectomy approach, shown here, to the other variations of the presigmoid approach.

   Identify the lettered structures:

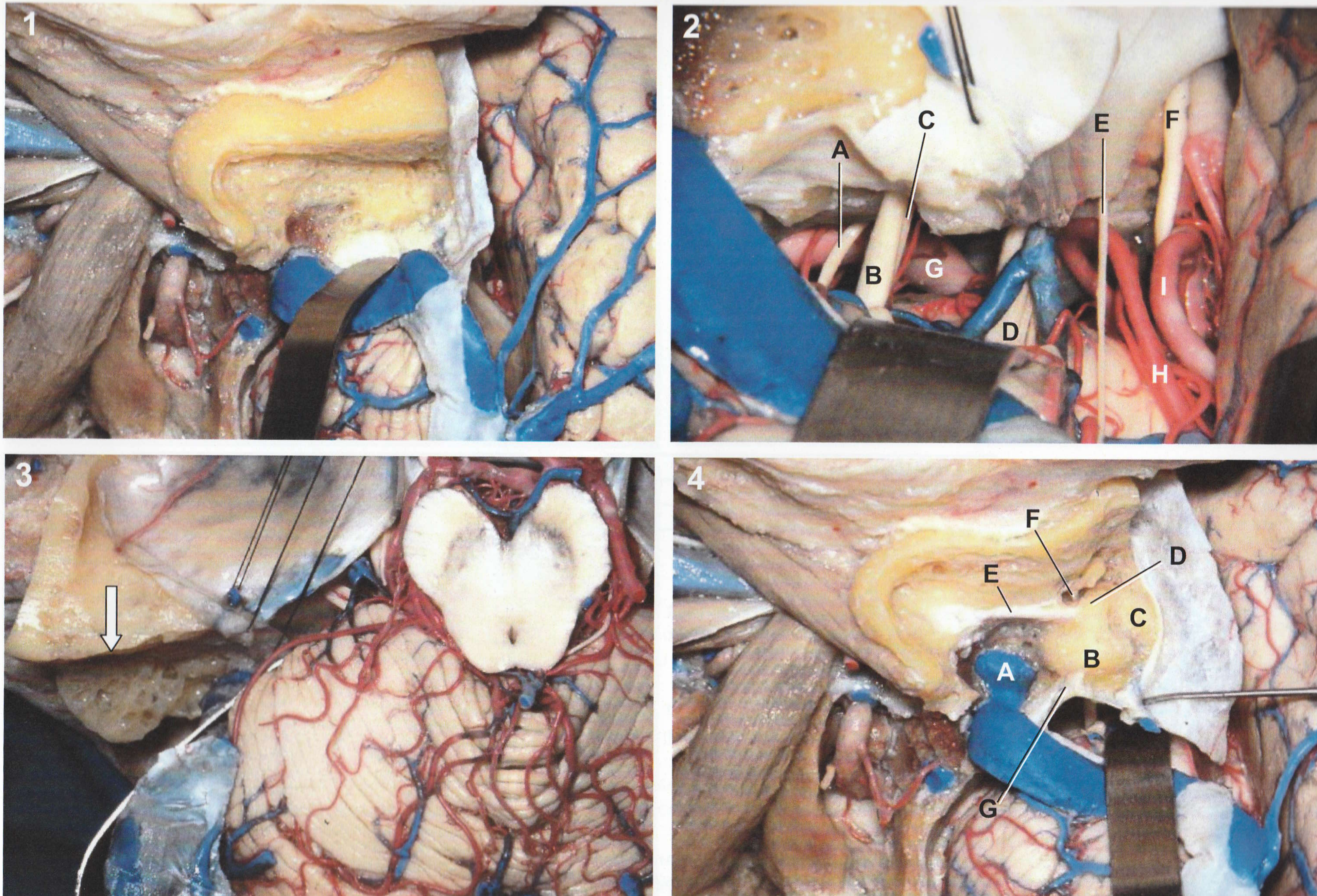
   A. ____________________ **F.** ____________________
   B. ____________________ **G.** ____________________
   C. ____________________ **H.** ____________________
   D. ____________________ **I.** ____________________
   E. ____________________

3. Superior view in another specimen showing the amount of bone resected with the minimal mastoidectomy approach (arrow) on the left side. The minimal mastoidectomy exposure does not expose the facial or the semicircular canals.

4. Additional bone has been removed to complete a retrolabyrinthine variation of the presigmoid approach. The bone removal exposes bony capsule of the semicircular canals and the facial nerve as it descends after passing below the lateal semicircular canal.

   Identify the lettered structures:

   A. ____________________ **E.** ____________________
   B. ____________________ **F.** ____________________
   C. ____________________ **G.** ____________________
   D. ____________________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5. The dural incision has been extended downward to the upper edge of the jugular bulb and the dural flap has been reflected forward. Compare this exposure with the minimal mastoidectomy exposure shown in Figure 7.

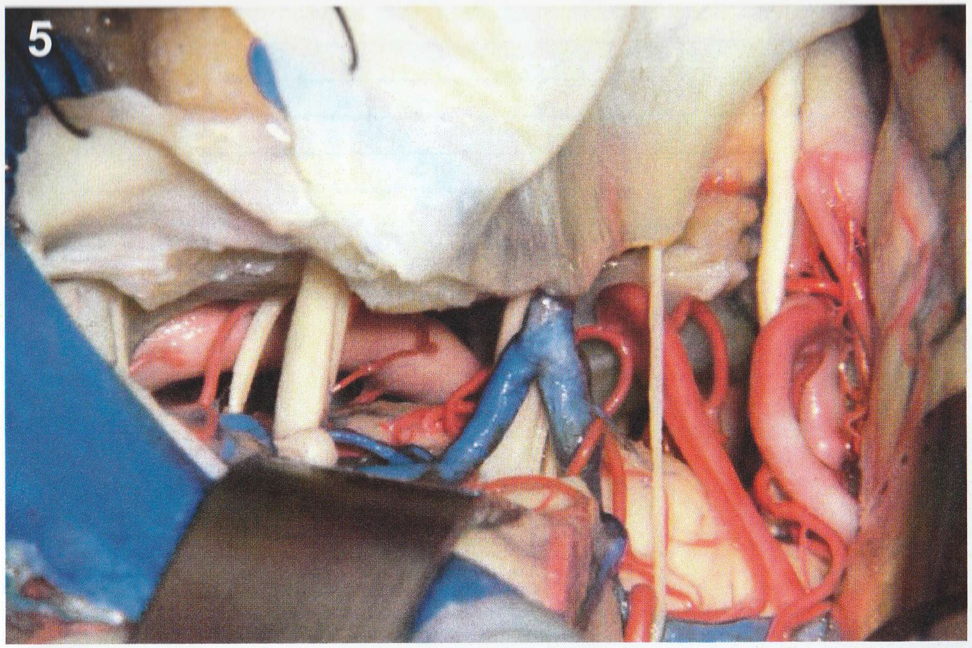
6. Superior view of the retrolabyrinthine exposure. Note that the bone of the otic capsule (arrow) and the petrous apex surrounding the internal auditory canal presents a bony barrier obstructing the view of the anterior brainstem.

7. Minimal mastoidectomy exposure in another specimen. The basilar artery (arrow) is exposed between the trigeminal and vestibulocochlear nerve. The abducens nerve ascends along the anterior margin of the exposure.

8. Exposure after completion of a retrolabyrinthine approach shown in Figure 7. Compare the approaches in Figures 2 and 5, and Figures 7 and 8, and note that there is little difference between exposure obtained with the minimal mastoidectomy and retrolabyrinthine exposures. The retrolabyrinthine exposure does aid in accessing the lower cranial nerve and petrosal surface of the cerebellum

Identify the lettered structures:

A. ______________	**E.** ______________
B. ______________	**F.** ______________
C. ______________	**G.** ______________
D. ______________	**H.** ______________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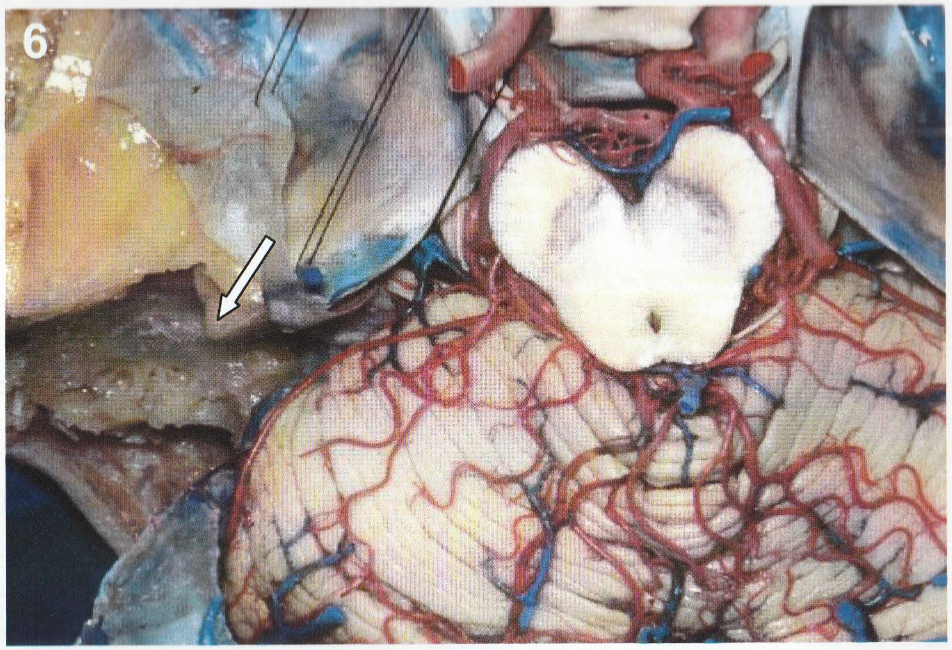
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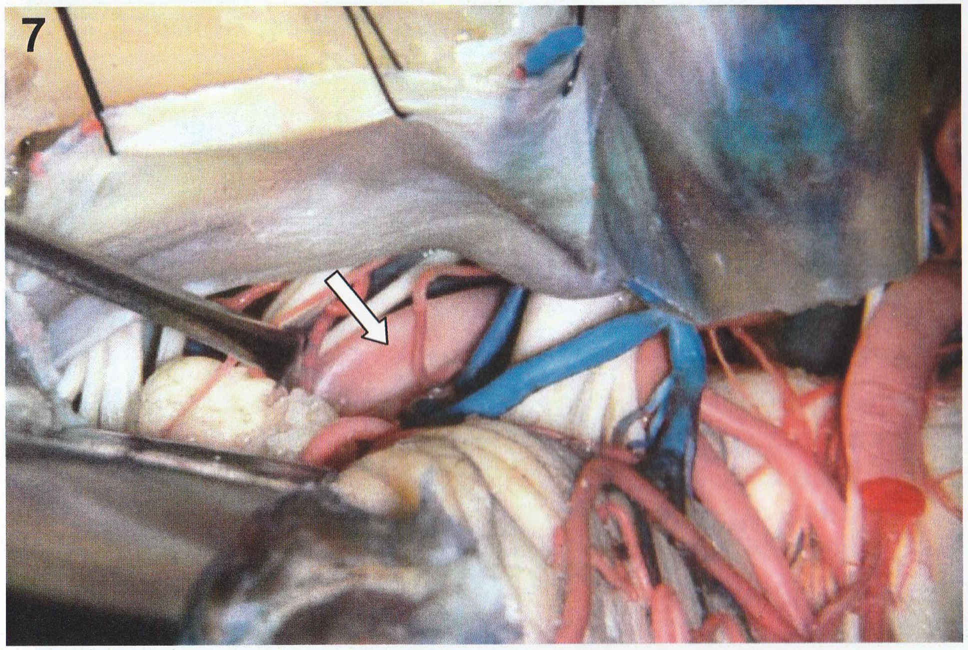
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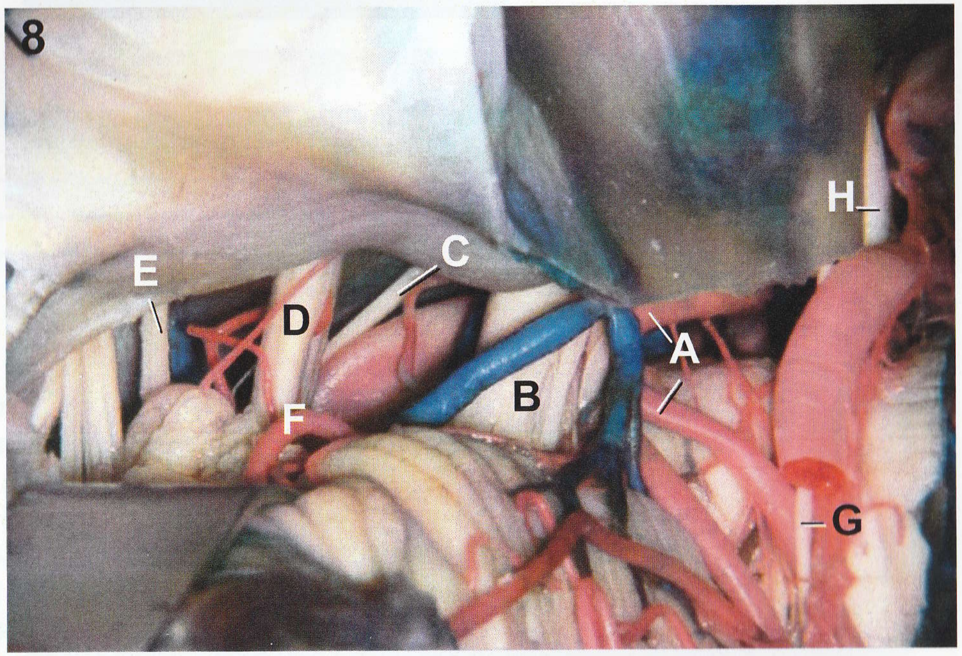
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9. Note that the presigmoid approach provides two different work channels: one, the presigmoid, for the inferior two thirds of the petroclival region and the other one, the subtemporal, for the upper third of the petroclival region. In step-wise fashion, the posterior semicircular canal was removed and it was noted that there is still an obstruction to view of the petroclival region. The superior semicircular canal was then removed to complete a partial labyrinthectomy. The removal of the superior canal opens the subtemporal exposure only if it is combined with an extensive resection of the petrous apex. In this exposure, the translabyrinthine approach has been completed by resecting all three semicircular canals and the vestibule to expose the full length of the internal acoustic meatus. Note that the removal of the labyrinth provides excellent exposure of the internal auditory canal at the cost of hearing loss. The exposure along the front of the brainstem is only minimally increased over that obtained with the minimal mastoidectomy or partial labyrinthectomy approaches.

Identify the lettered structures:

A. ____________________ **D.** ____________________
B. ____________________ **E.** ____________________
C. ____________________ **F.** ____________________

10. The individual nerves within the meatus have been separated. Note that the superior and inferior vestibular nerves are behind the facial and cochlear nerve.

Identify the lettered structures:

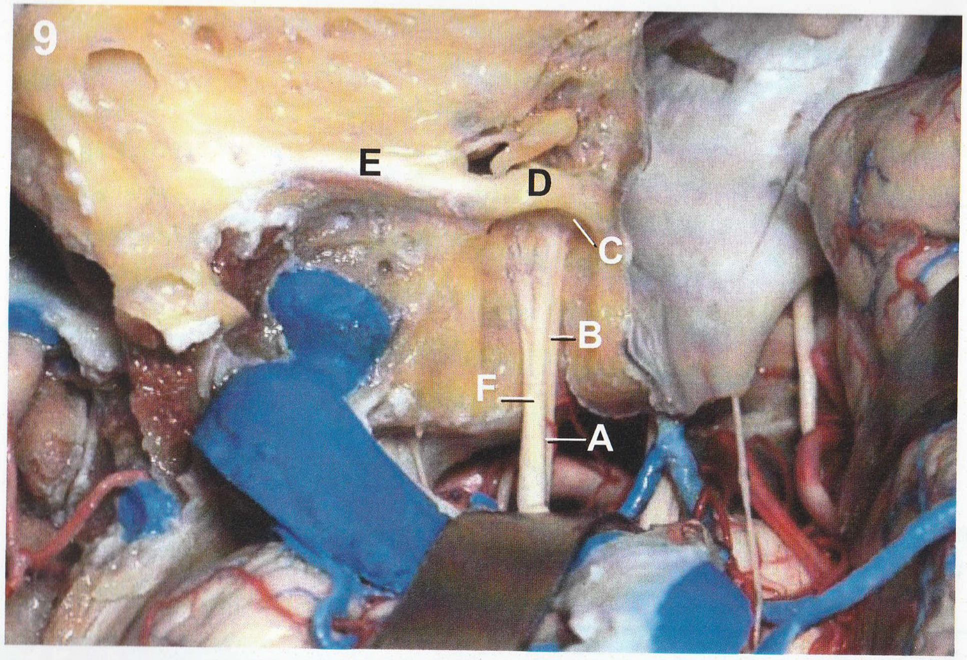
A. ____________________ **D.** ____________________
B. ____________________ **E.** ____________________
C. ____________________

11. Superior view of the exposure obtained after completing the translabyrinthine approach. Note that the petrous apex (arrow) still blocks access to the front of the brainstem.

12. The bone above the internal auditory canal in the region of the suprameatal tubercle and petrous apex have been removed to expose the trigeminal nerve in the posterior part of Meckel's cave. Note that the suprameatal drilling has increased the exposure of the upper petroclival region.

Identify the lettered structures:

A. ____________________ **E.** ____________________
B. ____________________ **F.** ____________________
C. ____________________ **G.** ____________________
D. ____________________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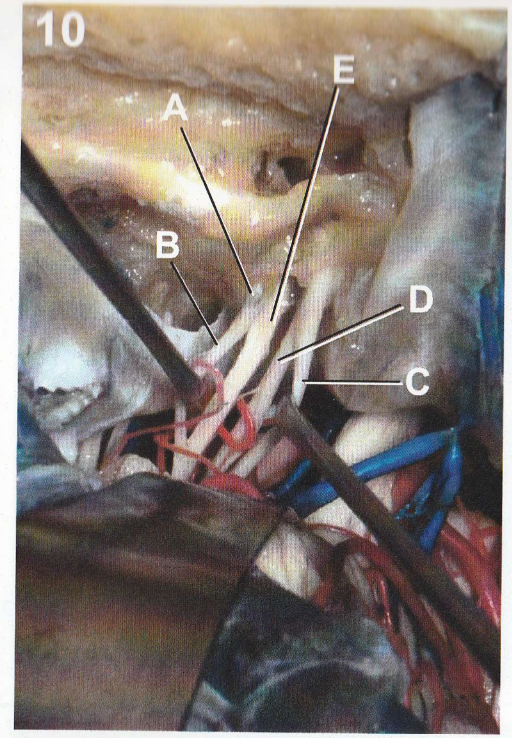
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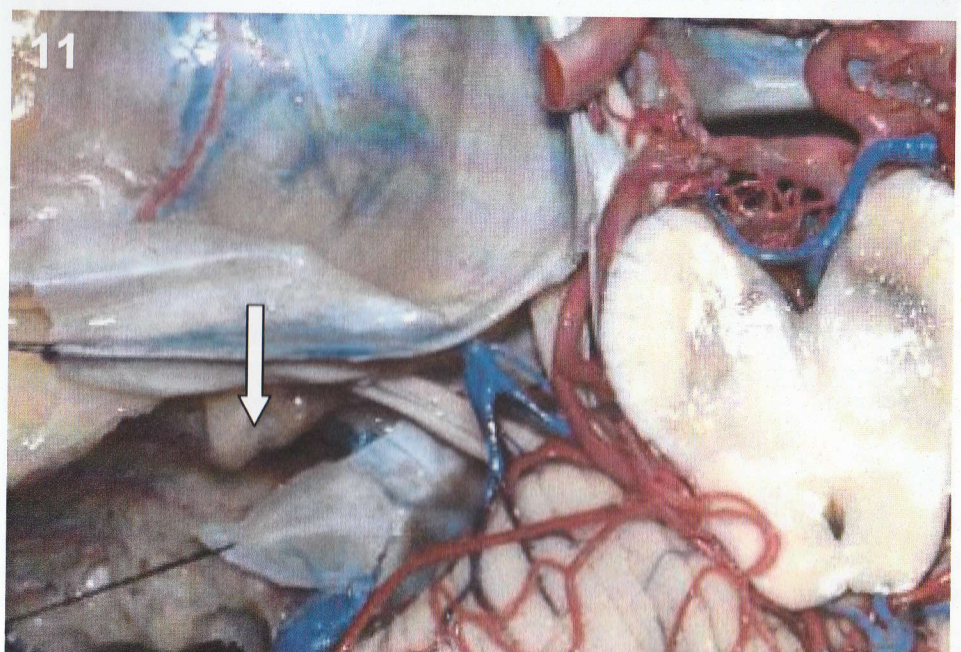
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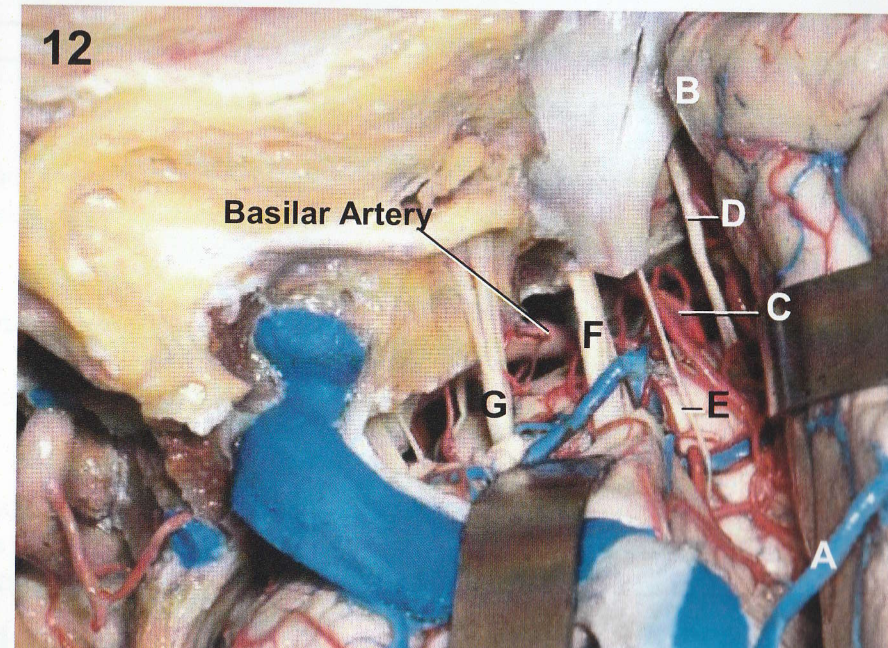
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Basilar Artery
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13. The transotic approach has been started. The facial nerve at this stage has not been transposed. The external auditory canal has been transected and the ear reflected forward. The tympanic membrane and ossicular chain have been removed and the bone in front of the facial nerve and behind the external auditory canal has been removed to expose the internal carotid artery (arrow) in front of the facial nerve.

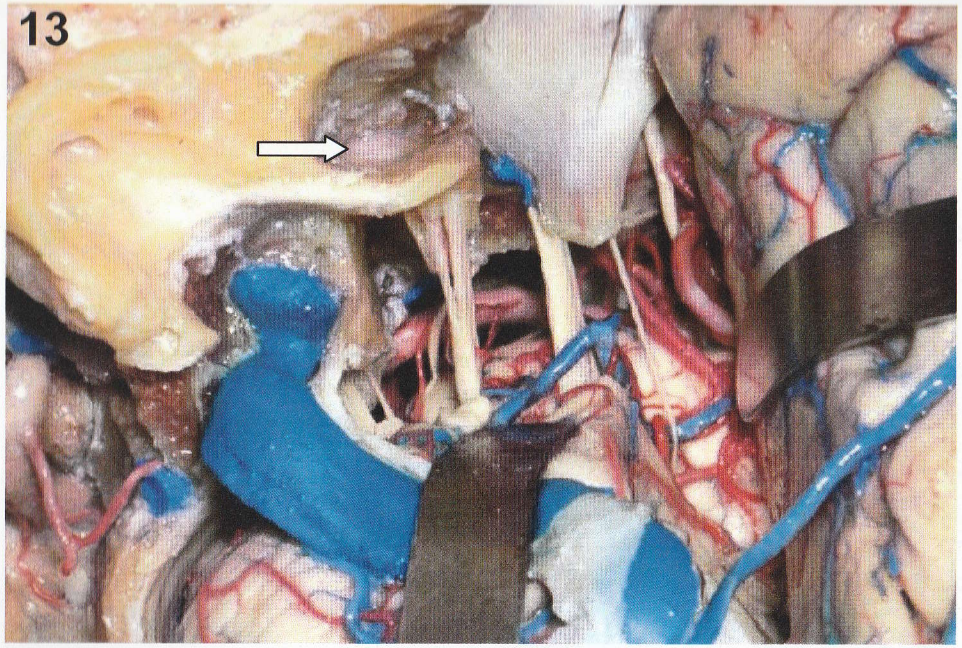
14. The vestibulocochlear nerve has been transected and the greater petrosal nerve has been divided adjacent to the geniculate ganglion so that the facial nerve (vertical arrow) can be transposed posteriorly. This allows the remainder of the petrous bone, including the cochlea, to be removed as far forward as the intrapetrous carotid artery, inferior petrosal sinus and the dural site of entry of the abducens nerve (horizontal arrow).

15. Enlarged view of the transcochlear presigmoid exposure, which provides a more direct access to the front of the brainstem and the basilar artery while minimizing the need for retraction of the temporal lobe and cerebellum.

Identify the lettered structures:

A. ____________________	**E.** ____________________
B. ____________________	**F.** ____________________
C. ____________________	**G.** ____________________
D. ____________________	**H.** ____________________

16. Superior view of the bone removal for the transcochlear approach. Note the more direct access to the front of the brainstem. It should be noted that this is at the cost of loss of hearing and at least transient and sometimes permanent loss of facial nerve function associated with facial nerve transposition.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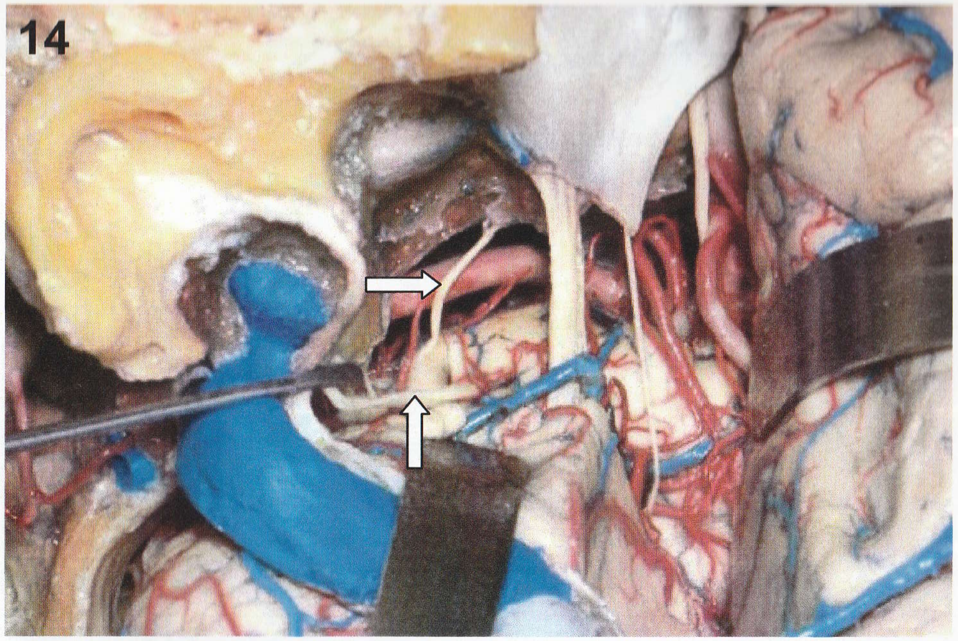
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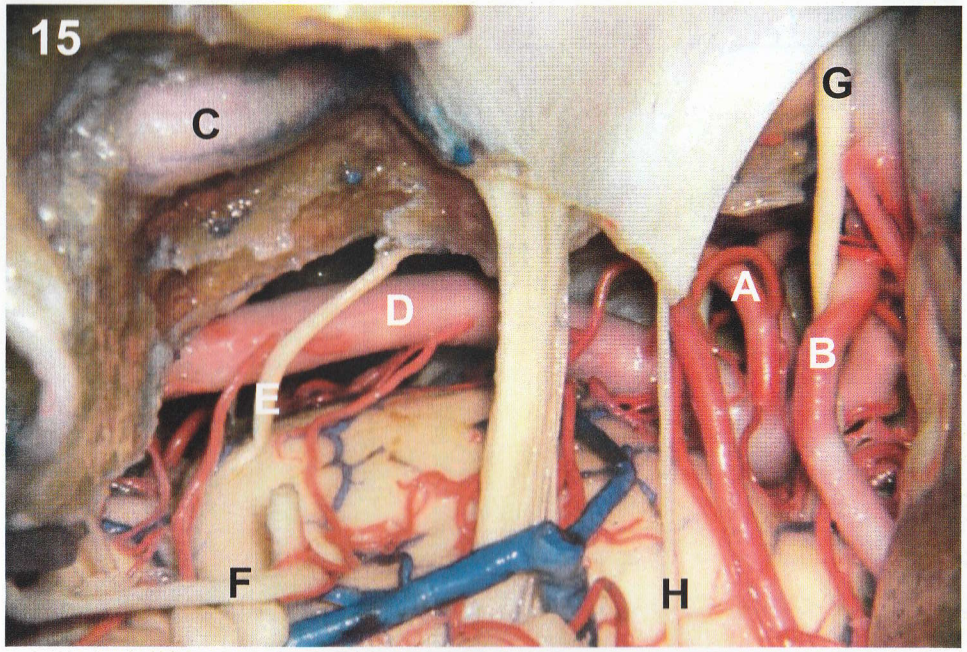
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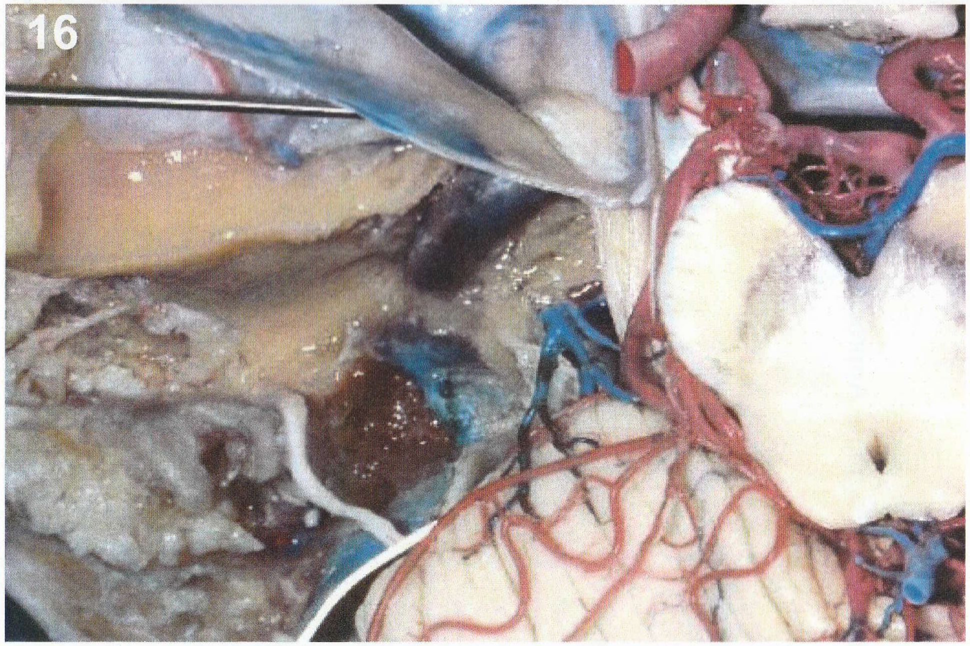
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Figure 1
A. Superior petrosal sinus
B. Sigmoid sinus
C. Trautmann's triangle

Figure 2
A. Abducens nerve
B. Vestibulocochlear nerve
C. Facial nerve
D. Trigeminal nerve
E. Trochlear nerve
F. Oculomotor nerve
G. Basilar artery
H. Superior cerebellar artery
I. Posterior cerebral artery

Figure 4
A. Jugular bulb
B. Posterior semicircular canal
C. Superior semicircular canal
D. Lateral semicircular canal
E. Facial nerve
F. Facial recess
G. Endolymphatic sac

Figure 8
A. Superior cerebellar artery
B. Trigeminal nerve
C. Abducens nerve
D. Vestibulocochlear nerve
E. Glossopharyngeal nerve
F. AICA
G. Trochlear nerve
H. Oculomotor nerve

Figure 9
A. Cisternal segment of facial nerve
B. Meatal segment of facial nerve
C. Labyrinthine segment of facial nerve
D. Tympanic segment of facial nerve
E. Mastoid segment of facial nerve
F. Vestibulocochlear nerve

Figure 10
A. Singular nerve
B. Inferior vestibular nerve
C. Superior vestibular nerve
D. Facial nerve
E. Cochlear nerve

Figure 12
A. Vein of Labbé
B. Uncus
C. Superior cerebellar artery
D. Oculomotor nerve
E. Trochlear nerve
F. Trigeminal nerve
G. Vestibulocochlear nerve

Figure 15
A. Superior cerebellar artery
B. Posterior cerebellar artery
C. Internal carotid artery
D. Basilar artery
E. Abducens nerve
F. Facial nerve (transposed)
G. Oculomotor nerve
H. Trochlear nerve

Retrocondylar, Transcondylar, and Paracondylar Modification of the Far Lateral Approach

Retrocondylar, Transcondylar, and Paracondylar Modification of the Far Lateral Approach

1. To perform the retrocondylar modification of the far lateral approach, the lateral suboccipital incision is extended downward below the level of the transverse process of C-1, and the suboccipital craniotomy is extended down to the level of the foramen magnum and laterally to the medial margin of the occipital condyle. In this dissection, the dura has been removed. The posterior arch of the atlas is exposed.

   Identify the lettered structures:

   A. ____________________ **D.** ____________________
   B. ____________________ **E.** ____________________
   C. ____________________ **F.** ____________________

2. Magnified view after elevating the cerebellum. Note that the exposure of the vertebral artery is limited by the narrow space between the medulla and the occipital condyle.

   Identify the lettered structures:

   A. ____________________ **F.** ____________________
   B. ____________________ **G.** ____________________
   C. ____________________ **H.** ____________________
   D. ____________________ **I.** ____________________
   E. ____________________

3. Magnified view of the initial intradural segment of the right vertebral artery. The dentate ligament (arrow) ascends behind the vertebral artery and has its upper attachment to the dura at the level of the foramen magnum.

   Identify the structures that course behind the dentate ligament:

   A. ____________________ **B.** ____________________

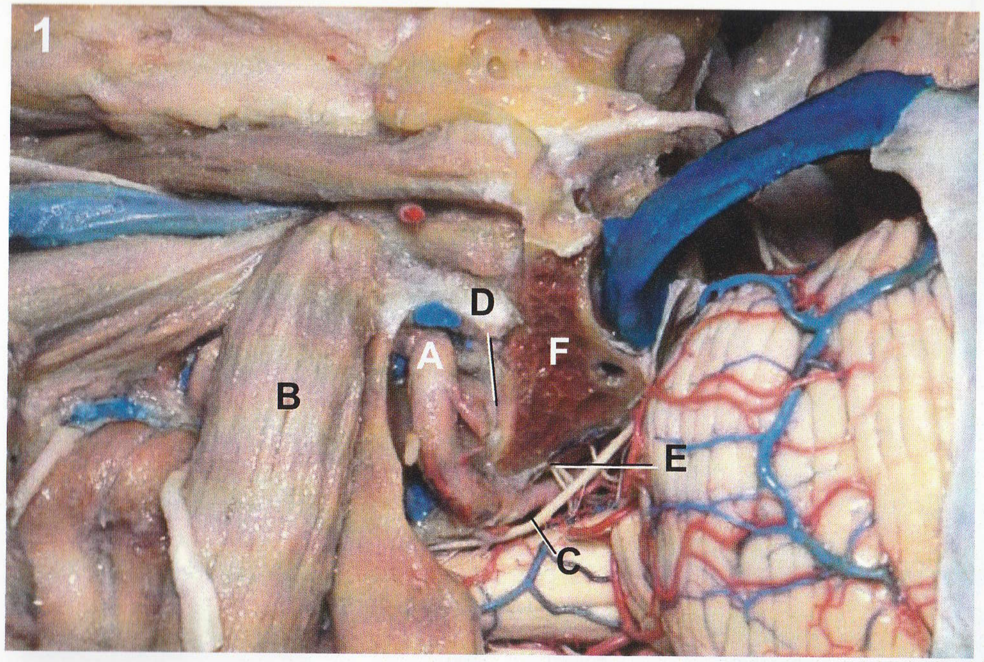
   Identify the structure that courses in front of the dentate ligament:

   C. ____________________

4. Drill away the posterior third of the occipital condyle in order to expose the hypoglossal canal and its contents. Note the increased exposure between the medulla and the condyle.

   Identify the lettered structures:

   A. ____________________ **D.** ____________________
   B. ____________________ **E.** ____________________
   C. ____________________ **F.** ____________________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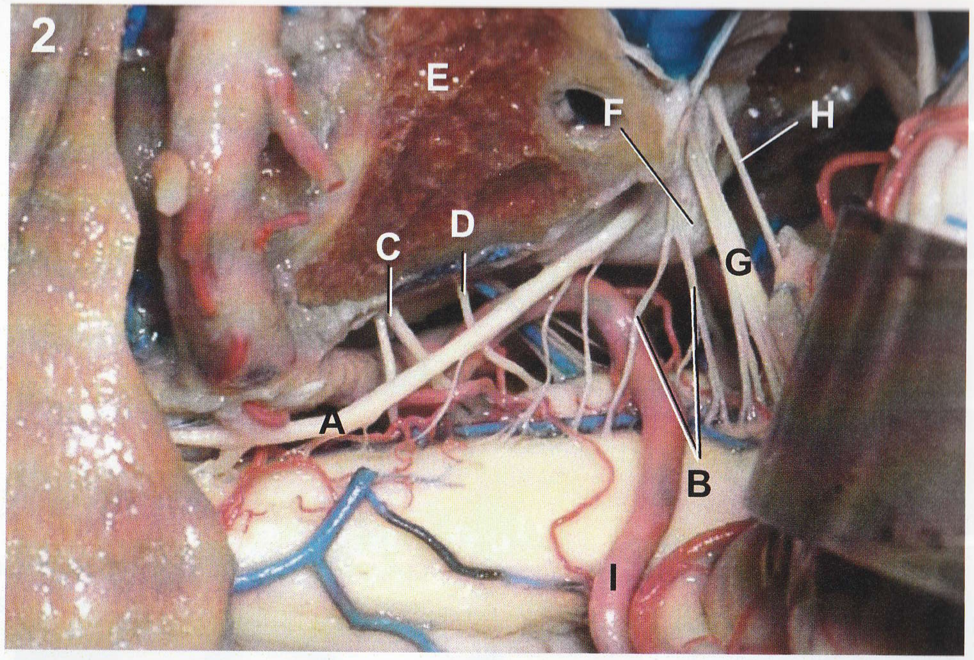
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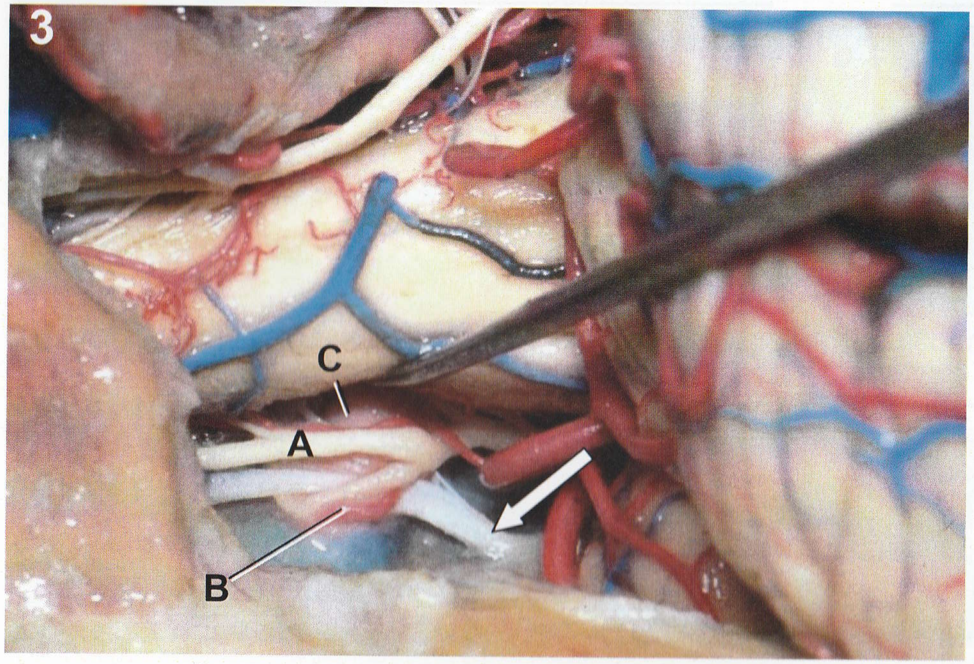
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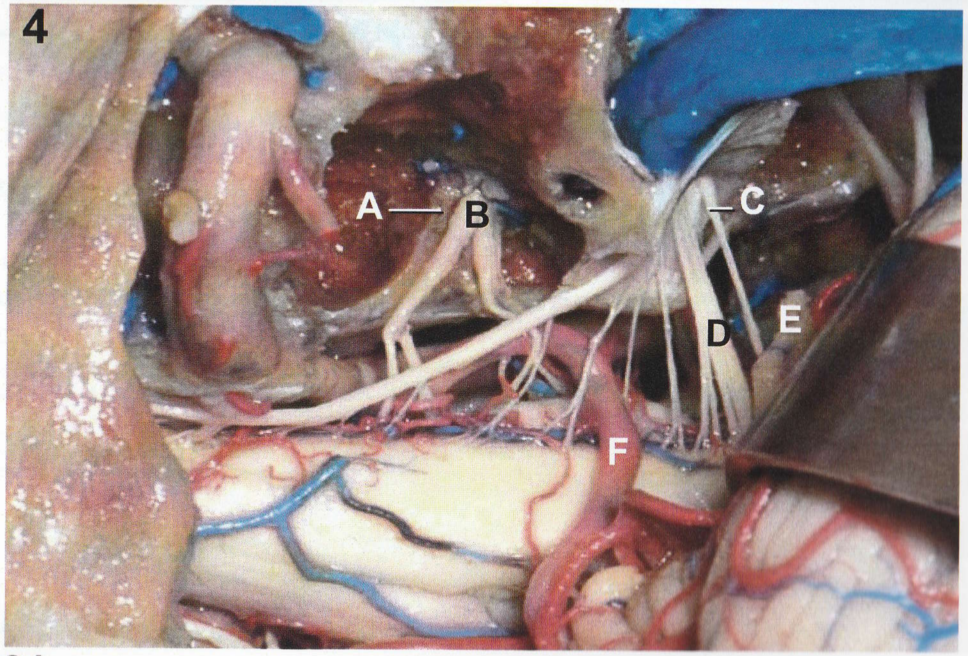
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5. The accessory nerve has been elevated to expose both vertebral arteries which have shifted to the left side of the brainstem as a result of tortuosity of the arteries.

Identify the lettered structures:

A. ______________________	**D.** ______________________
B. ______________________	**E.** ______________________
C. ______________________	**F.** ______________________

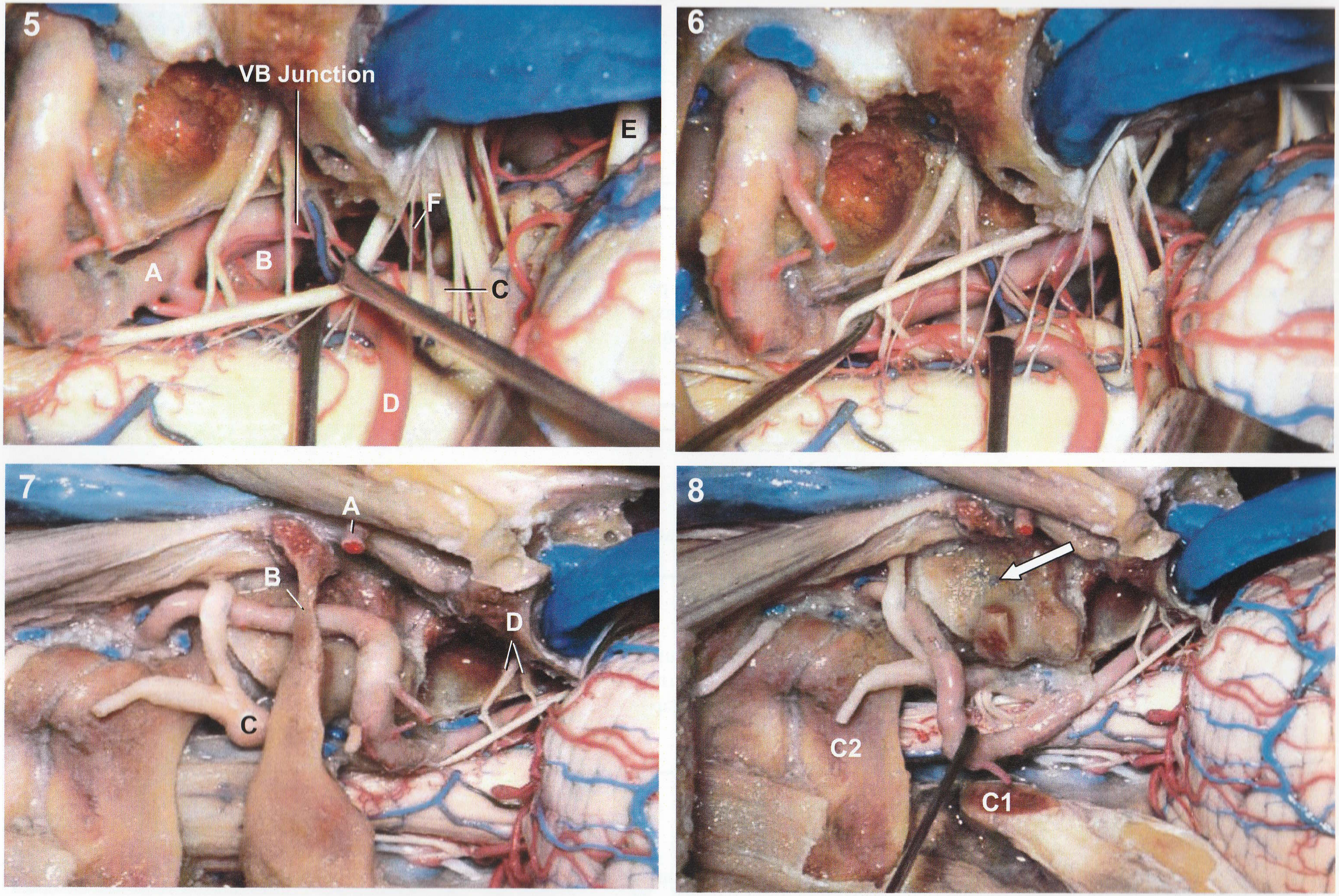
6. The approach can be extended to the lower third of the basilar trunk by completing a supracondylar approach in which the jugular tubercle is removed through an extradural exposure. The extradural removal of the jugular tubercle allows the dura to be displaced laterally, thus increasing the exposure between the brainstem and dura.

7. The cervicomedullary and the anterolateral surface of the upper cervical cord may be exposed after removing the posterior arch of the atlas and reflecting or removing the inferior oblique muscle.

Identify the lettered structures:

A. ______________________	**C.** ______________________
B. ______________________	**D.** ______________________

8. After removing the posterior root of the transverse process of the atlas, the vertebral artery can be displaced medially out of the transverse foramen (arrow) and away from the condyle in order to allow a more extensive resection of the condyle in the transcondylar approach.



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9. Drilling the medial aspect of the occipital and atlantal condyles and the atlanto-occipital joint increases access to the lateral and anterior surface of the brainstem.

Identify the lettered structures:

A. ____________________ **C.** ____________________
B. ____________________

10. The anterior spinal arteries arise from the vertebral arteries, and descend and unite to form a single trunk which courses in the midline on the anterior surface of the cord. The posterior spinal arteries arise from the vertebral arteries near the site at which the vertebral arteries enter the dura and course along the posterior lateral margin of the spinal cord.

Identify the lettered structures:

A. ____________________ **B.** ____________________

11. The digastric and levator scapular muscles have been reflected downward to increase the paraspinous exposure in the upper cervical region.

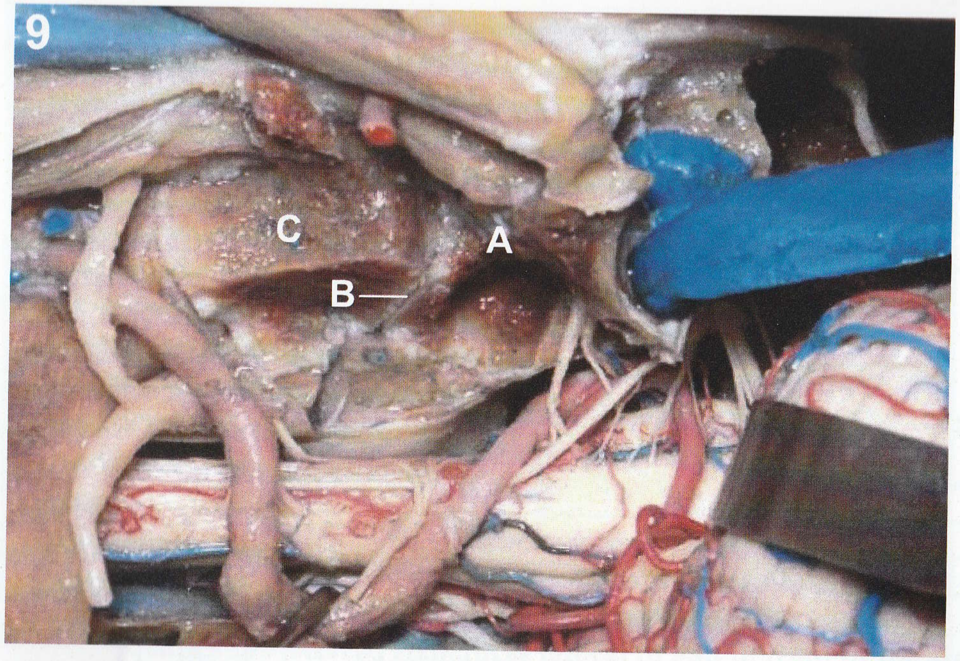
Identify the lettered structures:

A. ____________________ **D.** ____________________
B. ____________________ **E.** ____________________
C. ____________________

12. The glossopharyngeal, vagus and accessory nerves pass through the jugular foramen. The hypoglossal nerve passes through the hypoglossal canal. All four nerves join immediately below the skull base and pass laterally between the internal carotid artery and internal jugular vein. The internal jugular vein has been reflected backwards.

Identify the lettered structures:

A. ____________________ **C.** ____________________
B. ____________________ **D.** ____________________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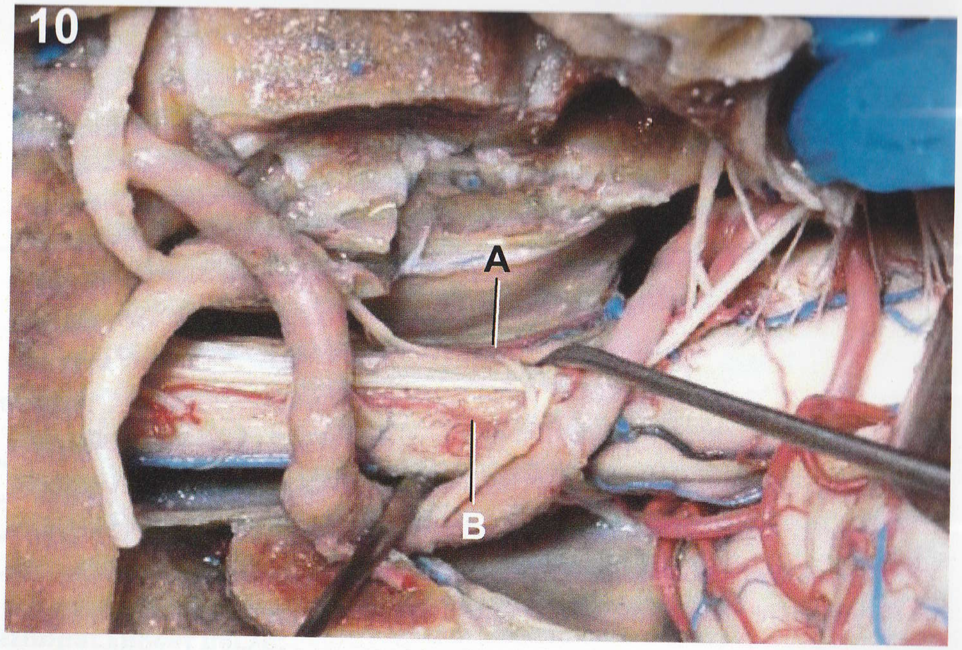
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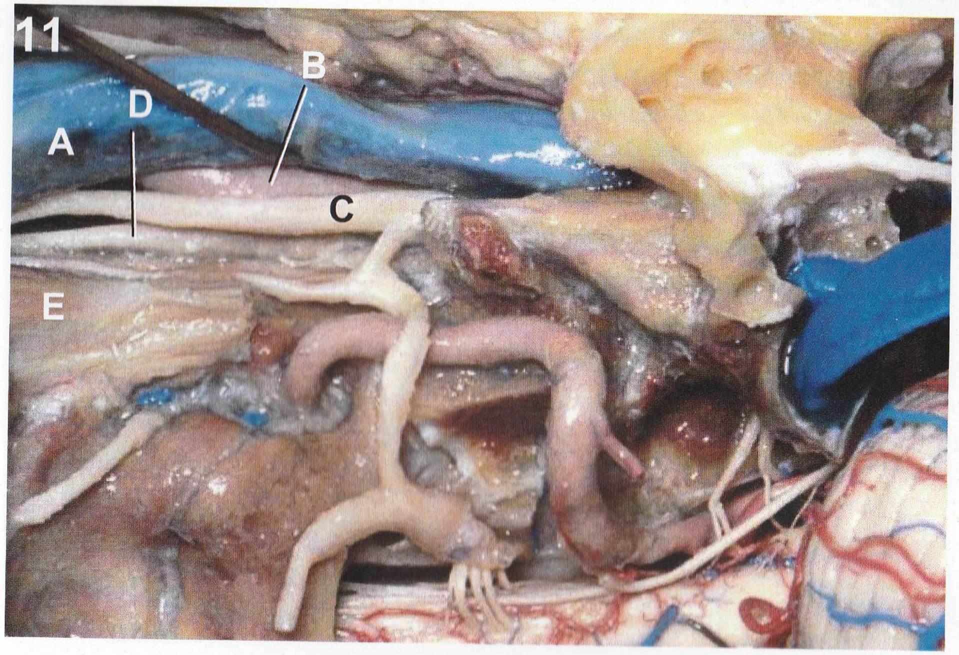
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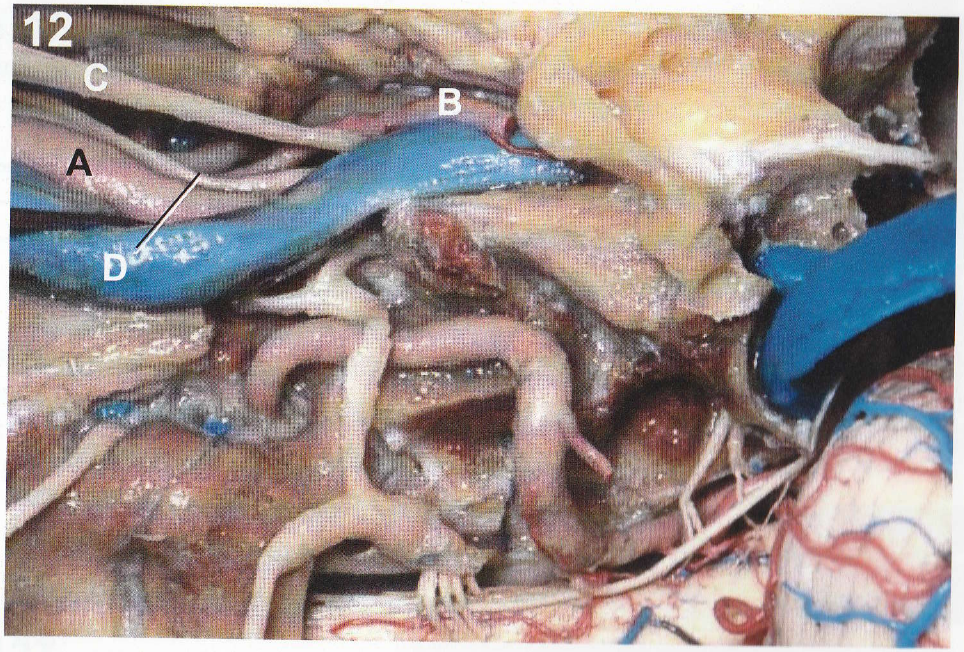
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13. The jugular process of the occipital bone, which extends laterally from the occipital condyle and forms the posterior margin of the jugular foramen, has been removed to expose the posterior surface of the jugular bulb at the junction of the sigmoid sinus and internal jugular vein.

14. The jugular bulb and adjacent part of the sigmoid sinus and internal jugular vein have been removed as may be done to expose pathology in the region of the jugular foramen, especially when the pathology occludes venous flow. The glossopharyngeal, vagus and accessory nerves pass through the jugular foramen and the hypoglossal nerve passes through the hypoglossal canal. Note the manner in which all four nerves join immediately below the jugular foramen to course inside the carotid sheath.

Identify the lettered structures:

A. ____________________ **E.** ____________________
B. ____________________ **F.** ____________________
C. ____________________ **G.** ____________________
D. ____________________

15. The glossopharyngeal nerve has been displaced medially. Note that the glossopharyngeal nerve exits the jugular foramen by passing along the medial surface of the intrajugular ridge (arrow) while the vagus and accessory nerves pass along the lateral margin.

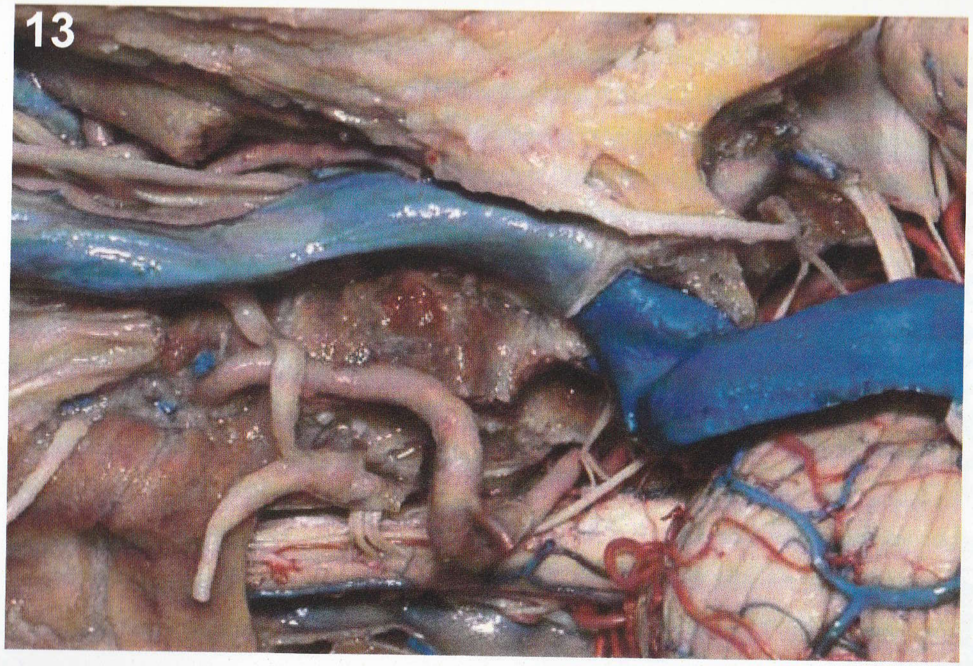
Identify the lettered structures lateral to and in front of the glossopharyngeal nerve:

A. ____________________ **E.** ____________________
B. ____________________ **F.** ____________________
C. ____________________ **G.** ____________________
D. ____________________ **H.** ____________________

16. The intrajugular ridge has been removed to expose the course of the glossopharyngeal nerve through the intrajugular part of the jugular foramen.

Identify the lettered structures:

A. ____________________ **C.** ____________________
B. ____________________ **D.** ____________________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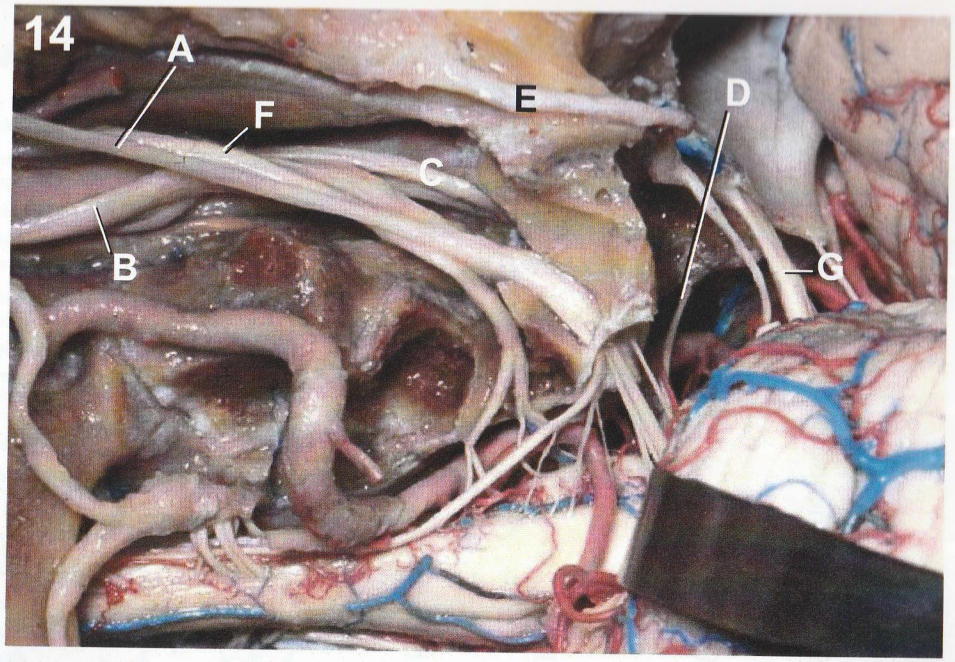
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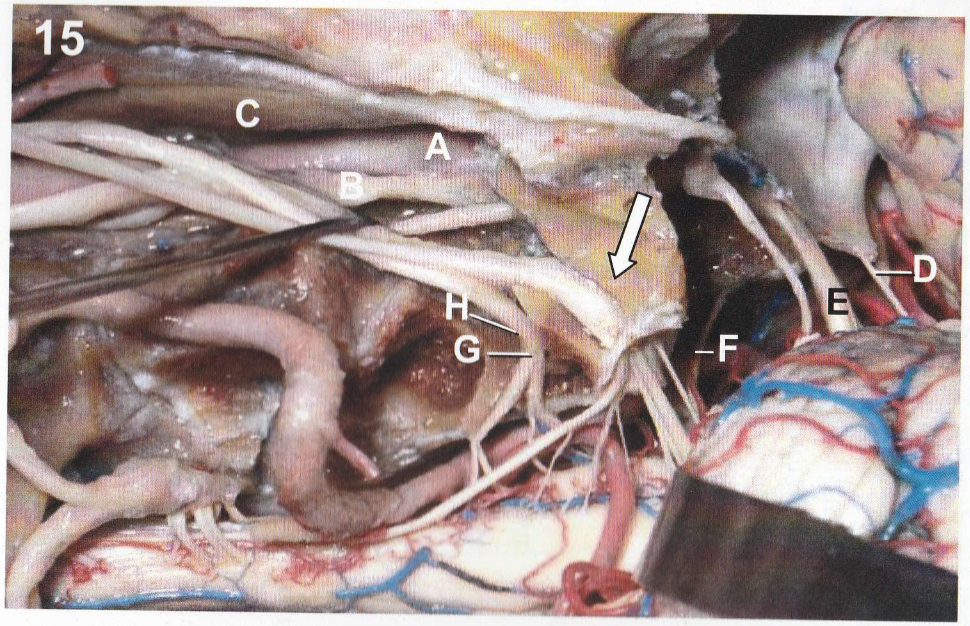
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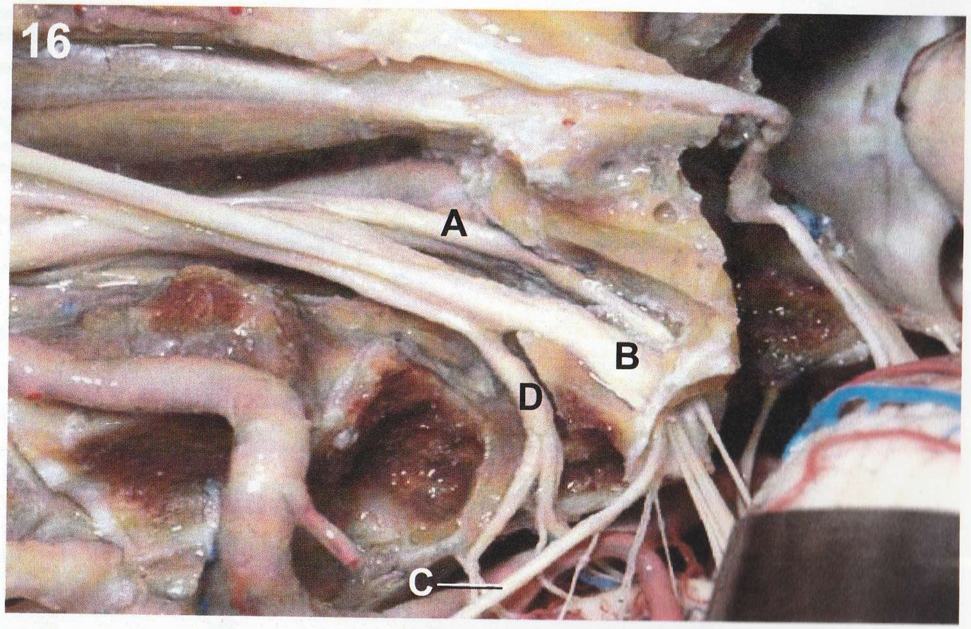
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Answers (Retrocondylar, Transcondylar, and Paracondylar Modification of the Far Lateral Approach)

Figure 1
A. Vertebral artery
B. Inferior oblique muscle
C. Accessory nerve
D. Atlanto-occipital joint
E. Hypoglossal nerve
F. Occipital condyle

Figure 2
A. Spinal root of accessory nerve
B. Medullary rootlets of accessory nerve
C. Inferior rootlet of hypoglossal nerve
D. Superior rootlet of hypoglossal nerve
E. Occipital condyle
F. Jugular tubercle
G. Vagus nerve
H. Glossopharyngeal nerve
I. PICA

Figure 3
A. Accessory nerve
B. Posterior spinal artery
C. Vertebral artery

Figure 4
A. Hypoglossal canal
B. Hypoglossal nerve
C. Glossopharyngeal nerve
D. Vagus nerve
E. Choroid plexus protruding from the foramen of Luschka
F. PICA

Figure 5
A. Ipsilateral vertebral artery
B. Contralateral vertebral artery
C. Inferior olive
D. PICA
E. Vestibulocochlear nerve
F. Jugular tubercle

Figure 7
A. Occipital artery
B. Posterior root of the transverse process of C-1
C. C-2 dorsal root ganglion
D. Hypoglossal nerve

Figure 9
A. Occipital condyle
B. Atlanto-occipital joint
C. Atlantal condyle

Figure 10
A. Anterior spinal artery
B. Posterior spinal artery

Figure 11
A. Internal jugular vein
B. Internal carotid artery
C. Vagus nerve
D. Cervical sympathetic trunk
E. Longissimus capitis muscle

Figure 12
A. Internal carotid artery
B. Occipital artery
C. Accessory nerve
D. Hypoglossal nerve

Figure 14
A. Vagus nerve
B. Cervical sympathetic nerve
C. Glossopharyngeal nerve
D. Abducens nerve
E. Transposed facial nerve
F. Hypoglossal nerve
G. Trigeminal nerve

Figure 15
A. Internal carotid artery
B. Cervical sympathetic nerve
C. Stylohyoid muscle
D. Trochlear nerve
E. Trigeminal nerve
F. Abducens nerve
G. Hypoglossal nerve
H. Hypoglossal canal

Figure 16
A. Glossopharyngeal nerve
B. Vagus nerve
C. Accessory nerve
D. Hypoglossal nerve

Infratentorial Supracerebellar, Occipital Transtentorial, and Combined Approaches to the Pineal Region

Infratentorial Supracerebellar, Occipital Transtentorial, and Combined Approaches to the Pineal Region

1. The area above and below the transverse sinuses and tentorium has been exposed. The cerebellar surface exposed here is the suboccipital surface which is the surface exposed in a wide suboccipital craniectomy. This surface is supplied by the PICA.

2. Superolateral lateral view of the pineal region in another specimen which has been dissected to show the structures in the quadrigeminal cistern which surrounds the pineal gland.

   Identify the lettered structures:

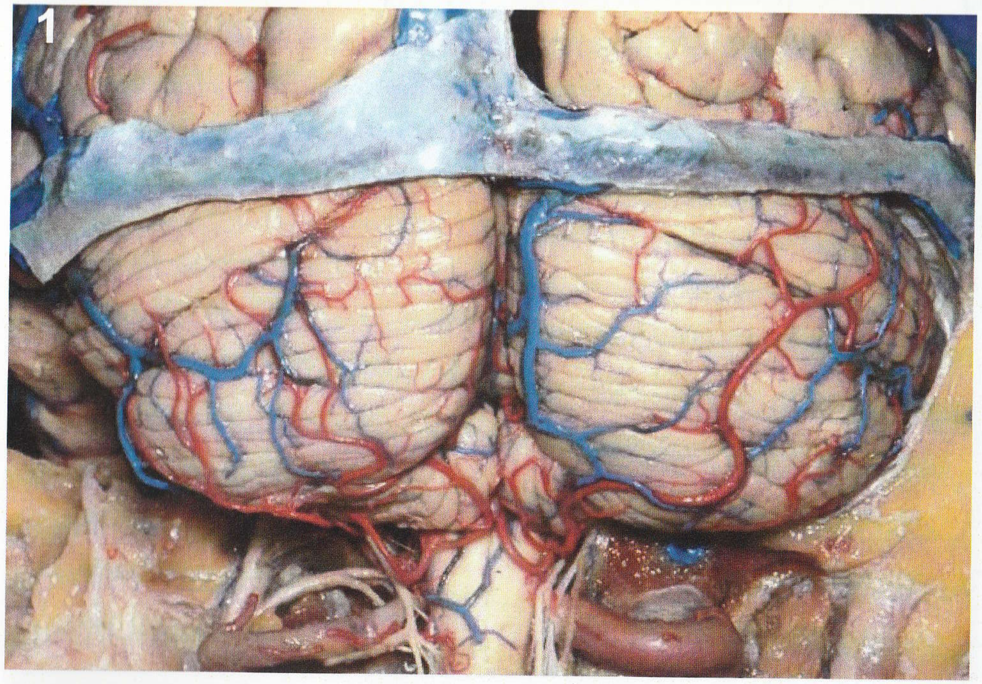
   A. ______________________ **D.** ______________________
   B. ______________________ **E.** ______________________
   C. ______________________ **F.** ______________________

3. Superior view of the quadrigeminal cistern shown in Figure 2.

   Identify the lettered structures:

   A. ______________________ **F.** ______________________
   B. ______________________ **G.** ______________________
   C. ______________________ **H.** ______________________
   D. ______________________ **I.** ______________________
   E. ______________________

4. The superior cerebellar surface has been depressed to expose the lower margin of the tentorium. This exposes the bridging veins on the superior surface of the cerebellum which empty into sinuses in the tentorium which, in turn, empty into the transverse and straight sinuses.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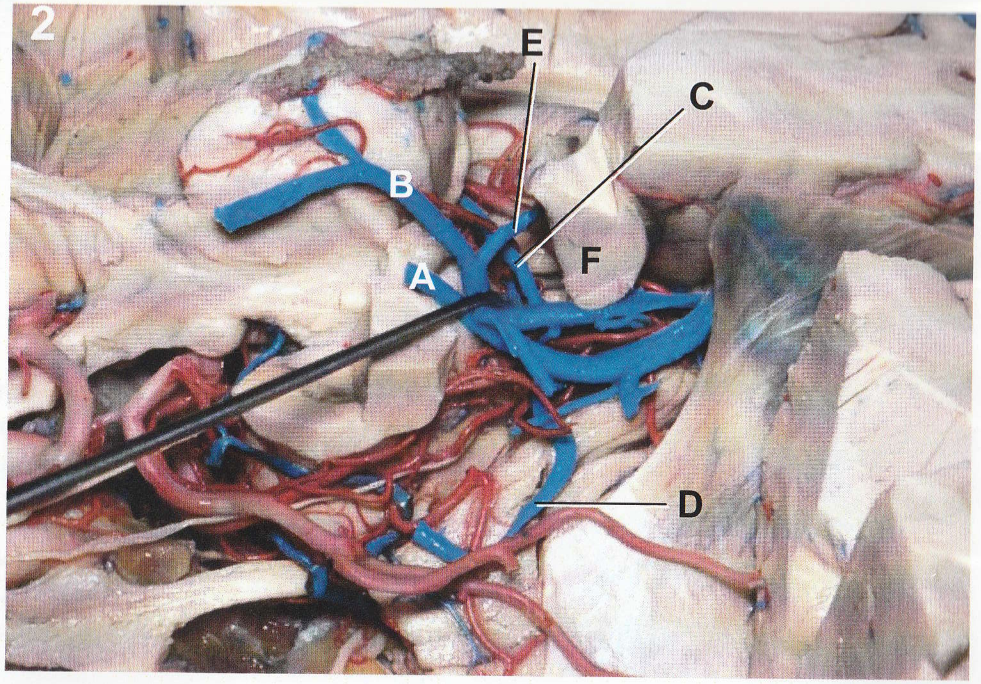
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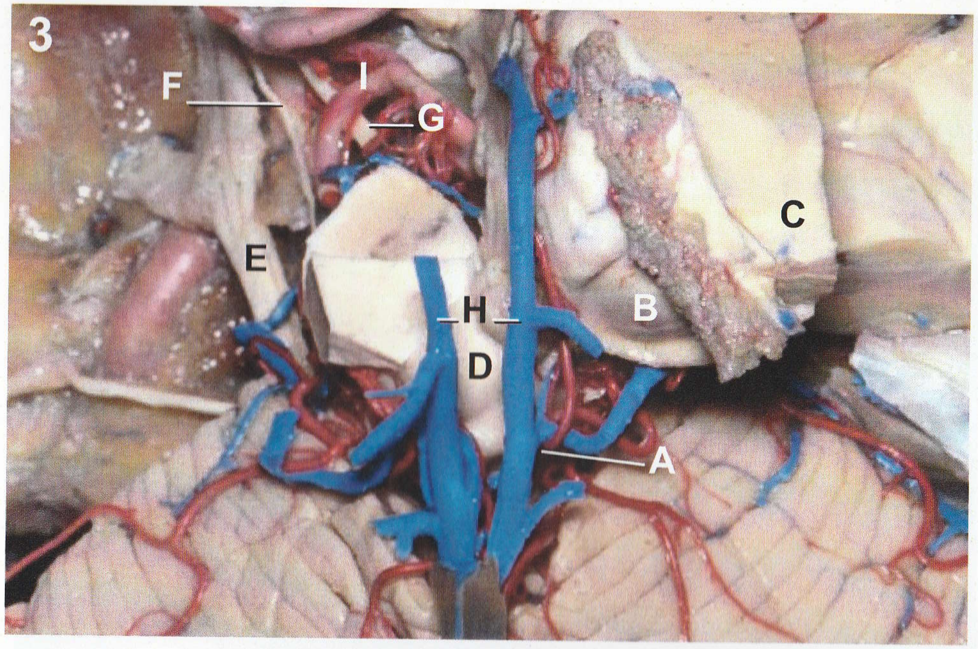
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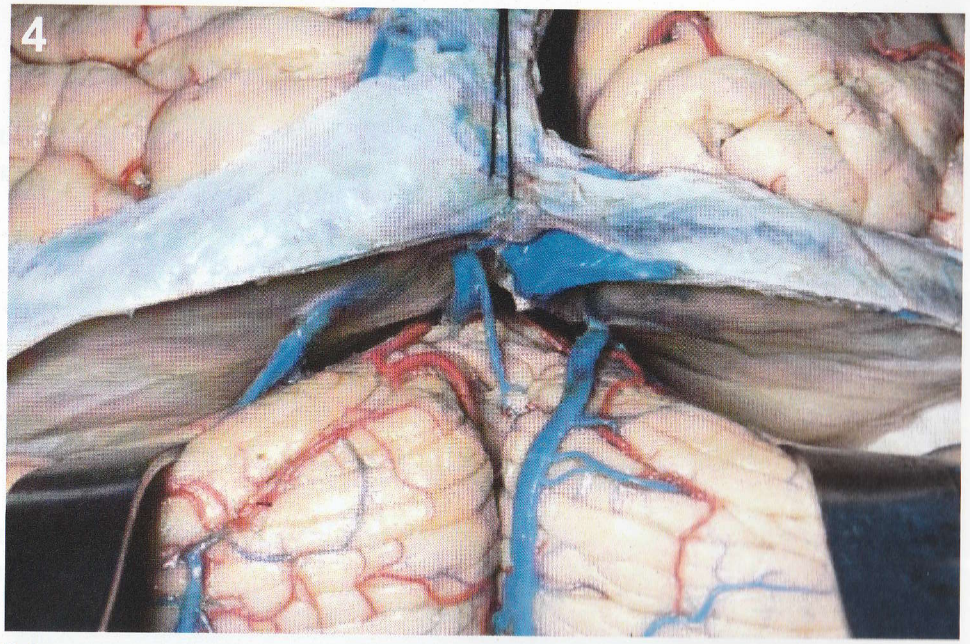
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5. The arachnoid covering the quadrigeminal cistern has been opened. Note that the medial part of the cistern contains predominately venous structures and the lateral part of the cistern contains arterial structures.

Identify the lettered structures:

A. ____________	**G.** ____________
B. ____________	**H.** ____________
C. ____________	**I.** ____________
D. ____________	**J.** ____________
E. ____________	**K.** ____________
F. ____________	**L.** ____________

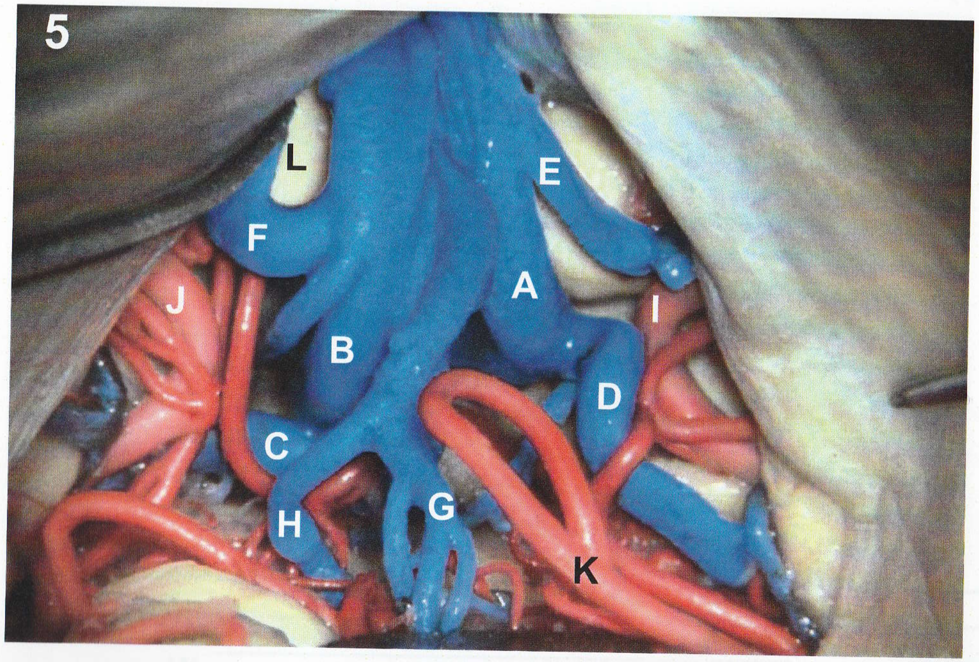
6. The superior vermian and precentral vein (vein of the cerebellomesencephalic fissure) have been divided and the superior vermis displaced inferiorly to increase the exposure of the pineal region.

7. Enlarged view.

Identify the lettered structures:

A. ____________	**E.** ____________
B. ____________	**F.** ____________
C. ____________	**G.** ____________
D. ____________	

8. The medial surface of the right occipital lobe has been elevated to complete an occipital transtentorial exposure. Note that there are no bridging veins from the occipital lobe to the posterior part of the superior sagittal sinus, thus providing an area where the pineal region can be accessed without having to occlude a number of bridging veins.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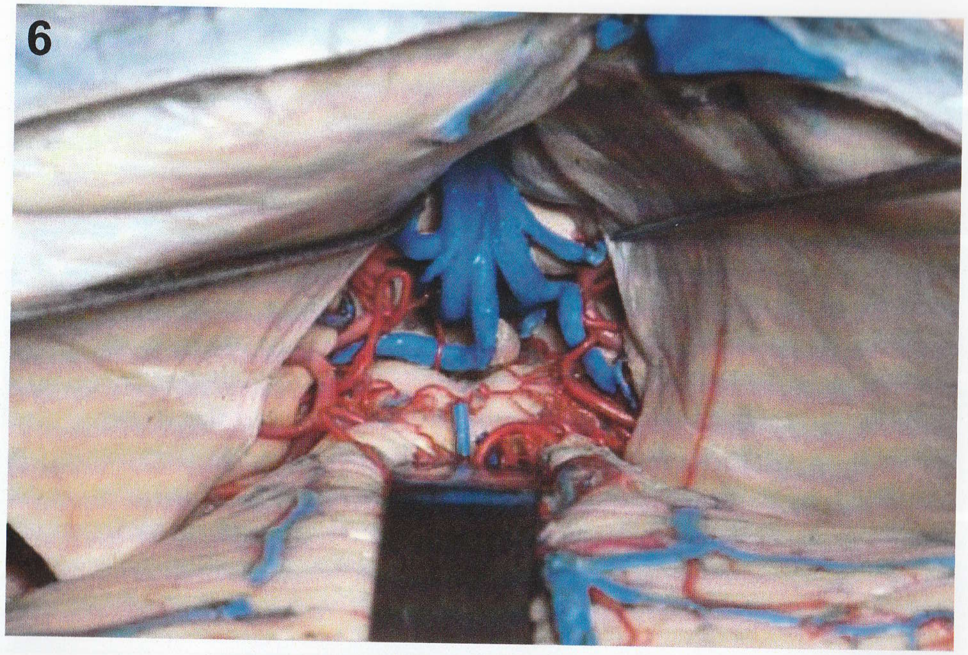
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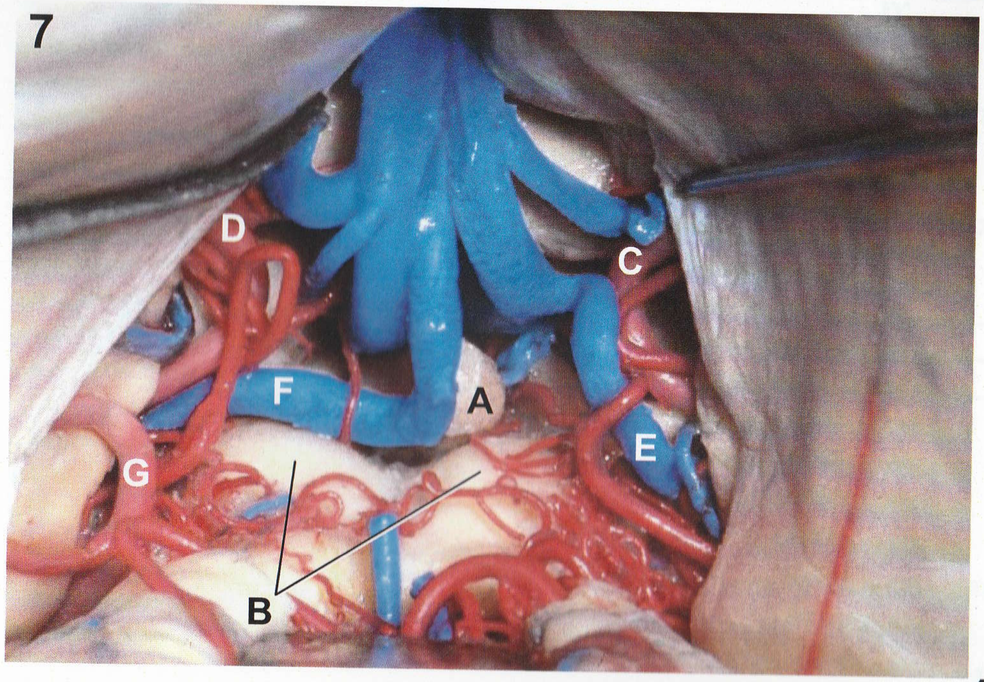
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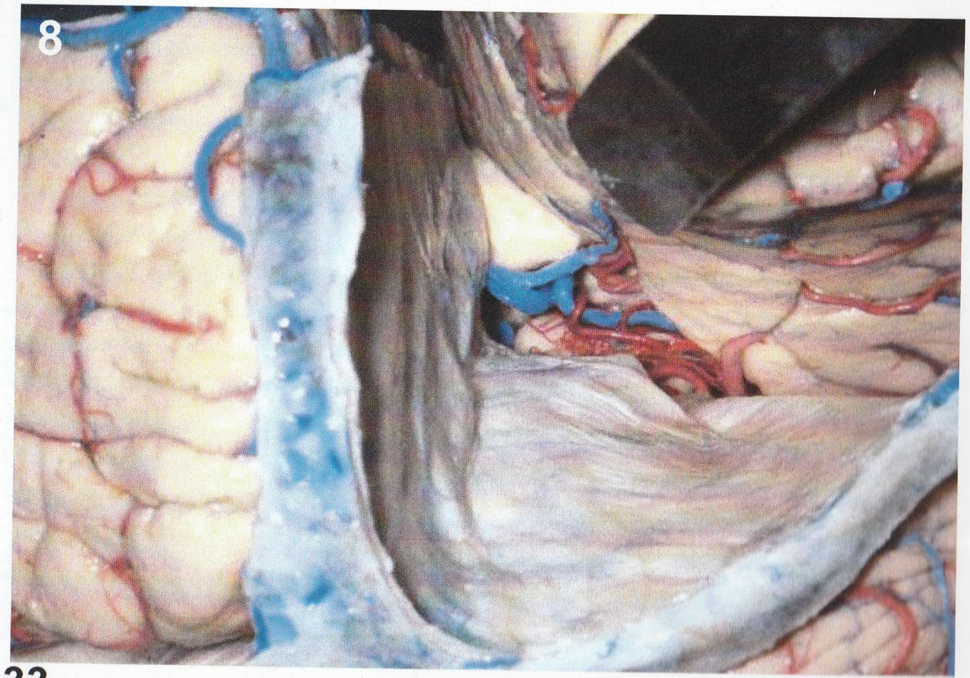
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9. The tentorium has been divided adjacent to the straight sinus and the tentorial leaf reflected laterally.

10. Enlarged view.

Identify the lettered structures:

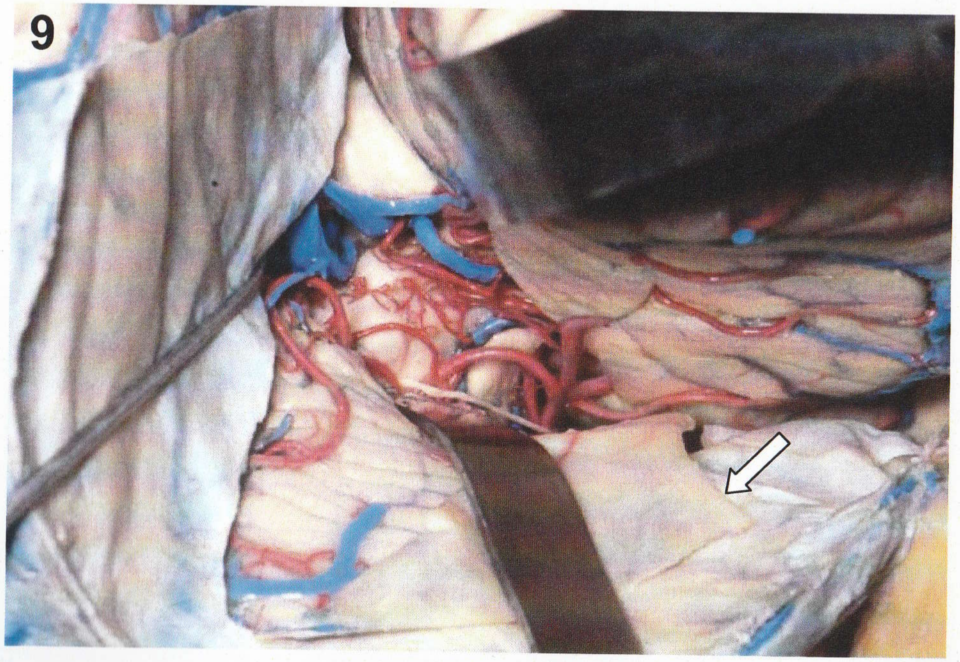
A. ______________	**E.** ______________
B. ______________	**F.** ______________
C. ______________	**G.** ______________
D. ______________	

11. The transverse sinus and the remaining portion of the tentorium has been divided to provide a combined exposure of the supra and infratentorial exposure of the pineal region.

12. Enlarged view of the combined supra and infratentorial exposure.

Identify the lettered structures:

A. ______________	**D.** ______________
B. ______________	**E.** ______________
C. ______________	**F.** ______________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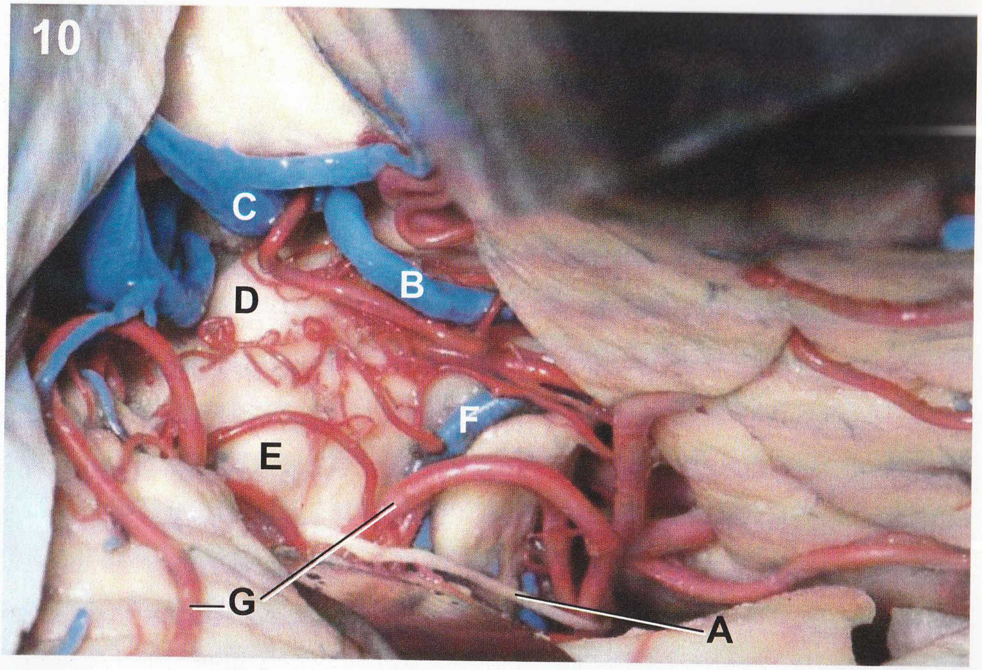
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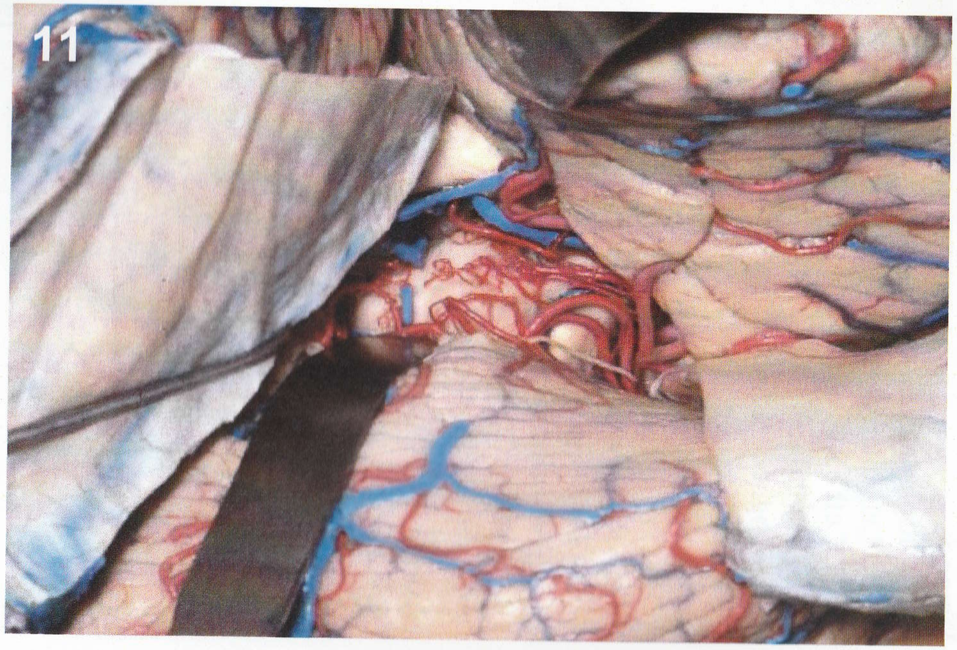
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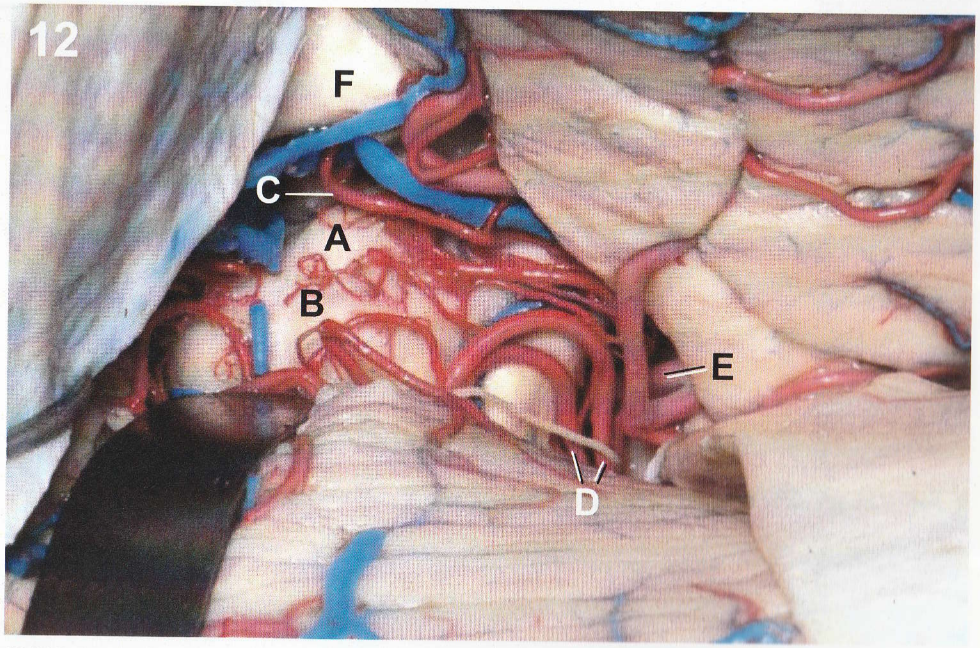
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Answers (Infratentorial Supracerebellar, Occipital Transtentorial, and Combined Approaches to the Pineal Region)

Figure 2

A. Left internal cerebral vein
B. Right internal cerebral vein
C. Right basal vein
D. Left basal vein
E. Right common atrial vein
F. Splenium of corpus callosum

Figure 3

A. Cerebellomesencephalic fissure
B. Pulvinar exposed in lateral wall of quadrigeminal cistern
C. Pulvinar exposed in atrium of lateral ventricle
D. Superior colliculus
E. Trigeminal nerve
F. Trochlear nerve
G. Oculomotor nerve
H. Internal cerebral veins
I. Posterior cerebral artery

Figure 5

A. Right internal cerebral vein
B. Left Internal cerebral vein
C. Left basal vein
D. Right basal vein
E. Right common atrial vein
F. Left common atrial vein
G. Superior vermian vein
H. Precentral vein
I. Right posterior cerebral artery
J. Left posterior cerebral artery
K. Vermian branch superior cerebellar artery
L. Splenium of corpus callosum

Figure 7

A. Pineal gland
B. Superior colliculi
C. Right posterior cerebral artery
D. Left posterior cerebral artery
E. Right basal vein
F. Left basal vein
G. Superior cerebellar artery

Figure 10

A. Trochlear nerve
B. Basal vein
C. Internal cerebral vein
D. Superior colliculus
E. Inferior colliculus
F. Lateral mesencephalic vein
G. Superior cerebellar artery

Figure 12

A. Superior colliculus
B. Inferior colliculus
C. Medial posterior choroidal artery
D. Trunks superior cerebellar artery
E. Posterior cerebral artery
F. Splenium of corpus callosum

Coronal Cuts

Coronal Cuts

1. A series of coronal cuts exposes the structures in the left hemisphere. The first section is located in front of the caudate nucleus and exposes the medial surface of the right frontal lobe. Note the relationship of the gyrus rectus to the optic and olfactory nerves. Note the relationship of the anterior portion of the lenticular nucleus to the anterior perforated substance.

2. The next section is located at the level of the optic chiasm. The temporal lobe is preserved in each of the coronal cuts by combining the coronal cuts with axial cuts along the temporal stem and brainstem.

   Identify the lettered structures:

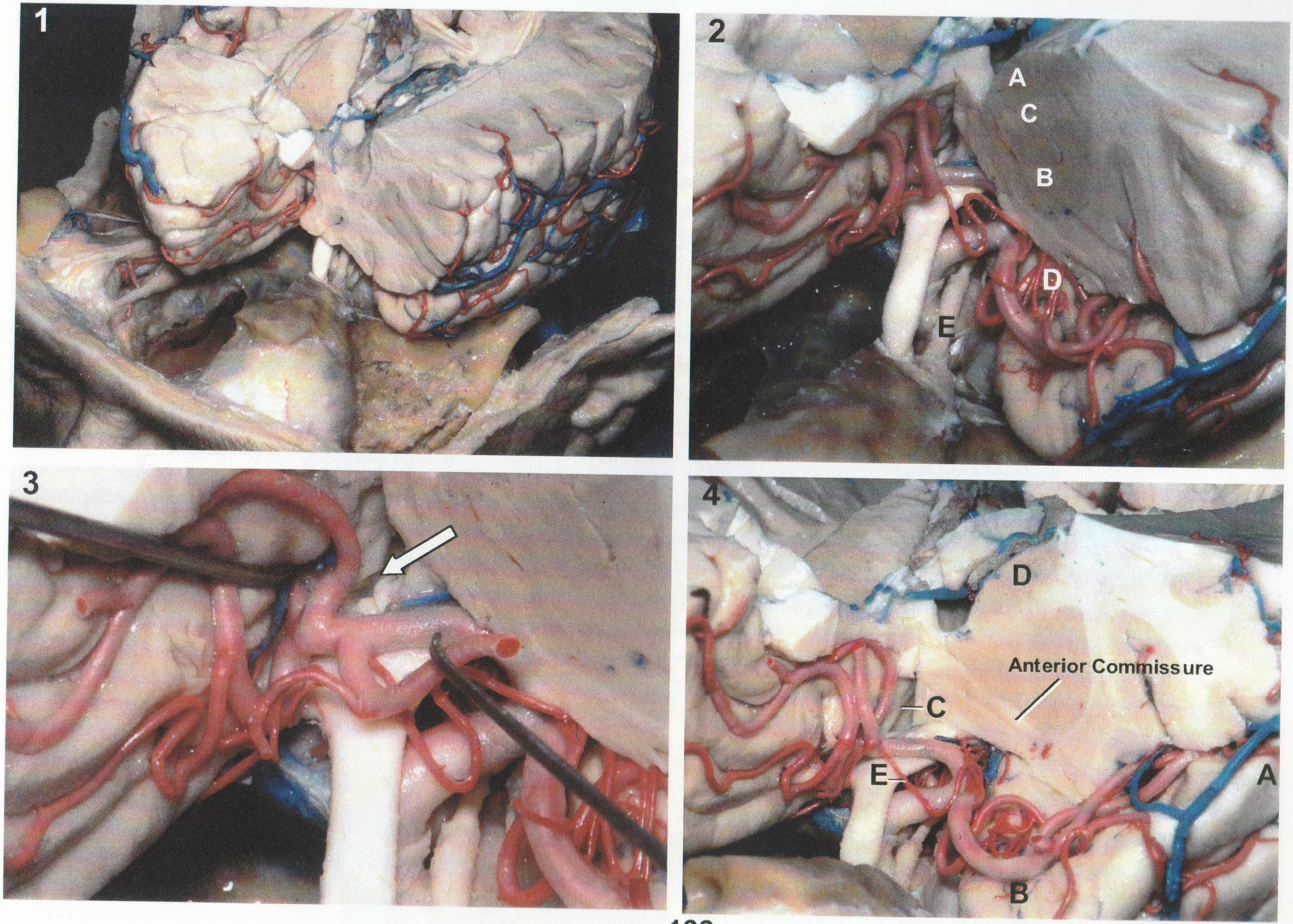
   A. ______________________ **D.** ______________________
   B. ______________________ **E.** ______________________
   C. ______________________

3. The anterior cerebral-anterior communicating artery complex is exposed. Note the relationship of the lamina terminalis (arrow) to the optic chiasm.

4. The next section is located at the level of the anterior commissure which descends slightly as it passes below the lenticular nucleus and toward the stem of the temporal lobe.

   Identify the lettered structures:

   A. ______________________ **D.** ______________________
   B. ______________________ **E.** ______________________
   C. ______________________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Anterior Commissure
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5. The next section is located at the level of the posterior edge of the foramen of Monro. Note the relationships between the optic track and the geniculate body, and the lenticular nucleus and the upper part of the cerebral peduncle. Identify Heschl's gyrus and the planum polare

6. This next section is situated just anterior to the posterior commissure.

Identify the lettered structures:

A. ______________	**E.** ______________
B. ______________	**F.** ______________
C. ______________	**G.** ______________
D. ______________	

7. The next section, which exposes the temporal horn from above, is an axial section which extends into the stem of the temporal lobe medial to the inferior portion of the circular sulcus of the insula.

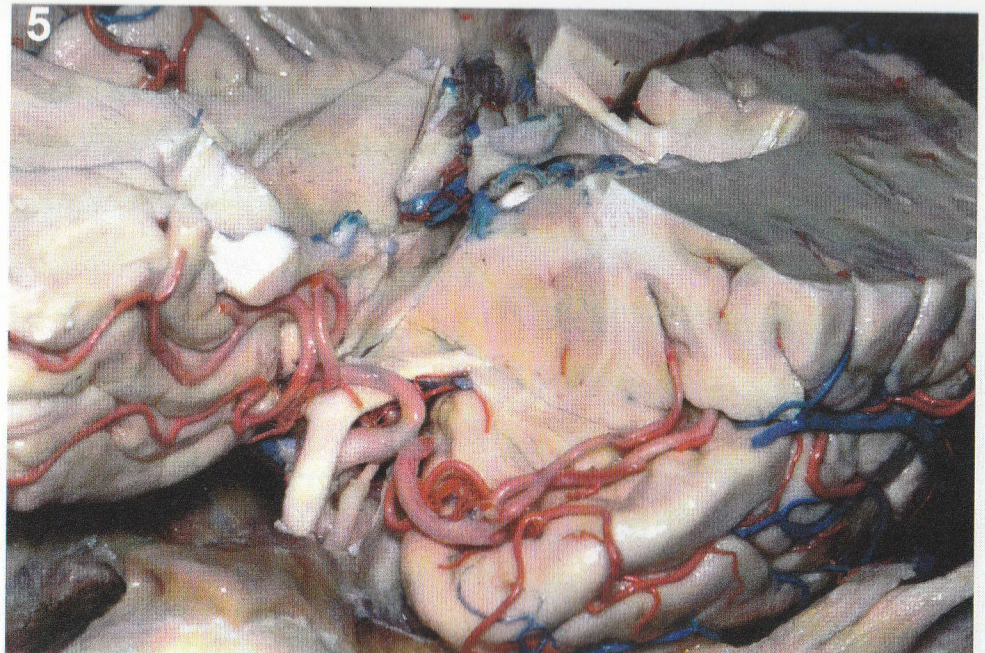
Identify the lettered structures:

A. ______________	**D.** ______________
B. ______________	**E.** ______________
C. ______________	

8. The whole temporal horn and atrium has been exposed using a combination of sagittal, axial and coronal cuts through the thalamus and posterior part of the insula.

Identify the lettered structures:

A. ______________	**F.** ______________
B. ______________	**G.** ______________
C. ______________	**H.** ______________
D. ______________	**I.** ______________
E. ______________	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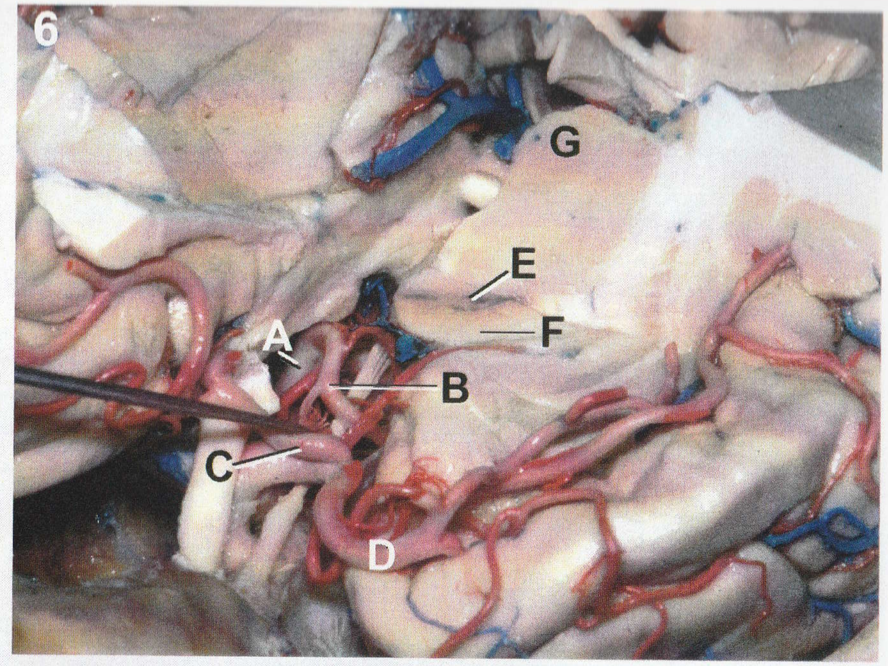
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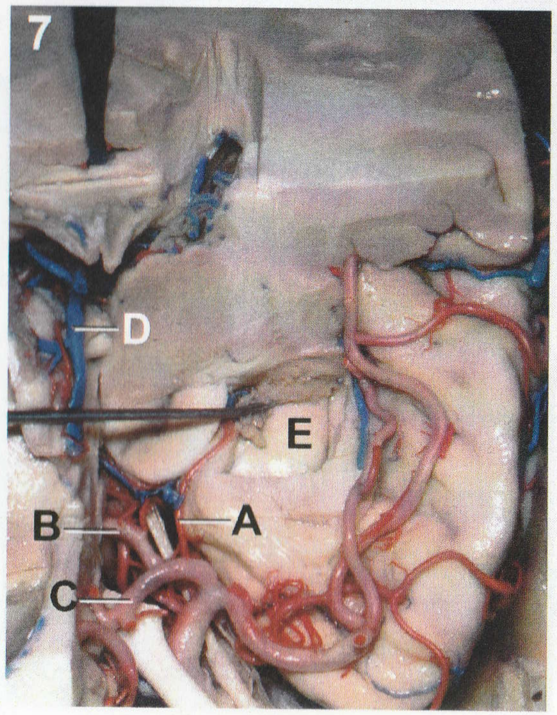
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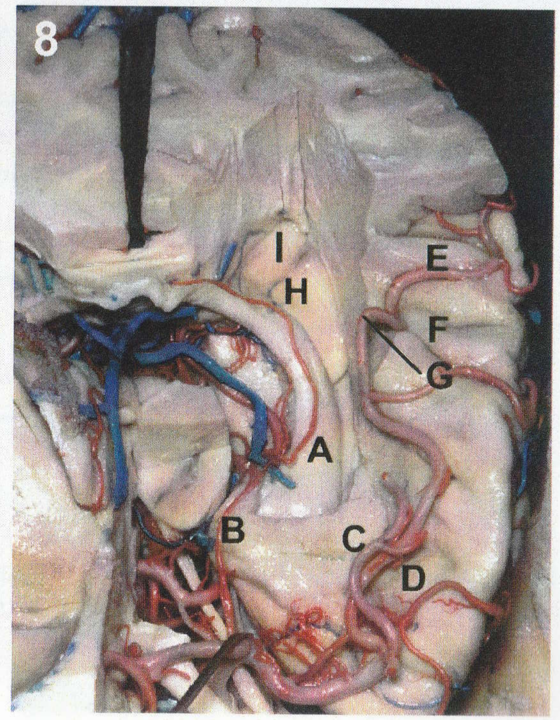
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9. The cerebral peduncle and uncus have been retracted to expose the crural and ambient cisterns. The crural cistern is located between the uncus and the cerebral peduncle. The ambient cistern is located behind the uncus, between the medial part of the temporal lobe and the midbrain.

Identify the lettered structures:

A. ______________________	**D.** ______________________
B. ______________________	**E.** ______________________
C. ______________________	

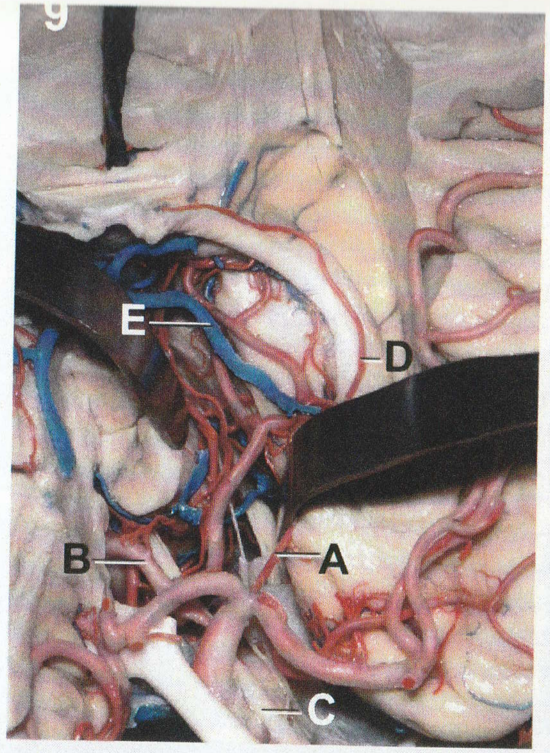
10. The coronal cuts have been extended into the temporal lobe. The first coronal cut is located at the level of the limen insula. Note the relationship of the uncus to the oculomotor nerve and of the fimbria of the fornix to the medial temporal lobe.

11. The next cut is located at the level of the angle between anterior and posterior limbs of the uncus and is situated at the anterior limit of the temporal horn and the anterior edge of the midbrain. Note the relationship of the amygdalae (arrow) to the medial surface of the uncus and the anterior portion of the temporal horn.

12. The next section is situated at the level of the junction between the head and body of the hippocampus and corresponds with the level of the lateral mesocephalic vein. Note the relationship between the collateral sulcus (arrow) and the collateral eminence located in the floor of the temporal horn lateral to the hippocampus. Note the relationship of the insular branches of the middle cerebral artery to the temporal horn.

Identify the lettered structures:

A. ______________________	**F.** ______________________
B. ______________________	**G.** ______________________
C. ______________________	**H.** ______________________
D. ______________________	**I.** ______________________
E. ______________________	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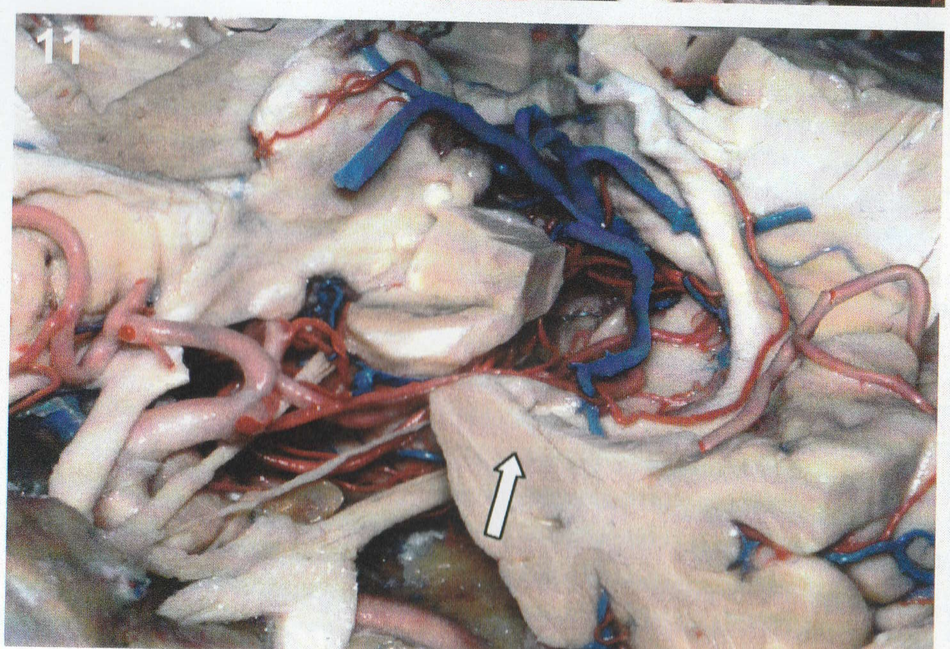
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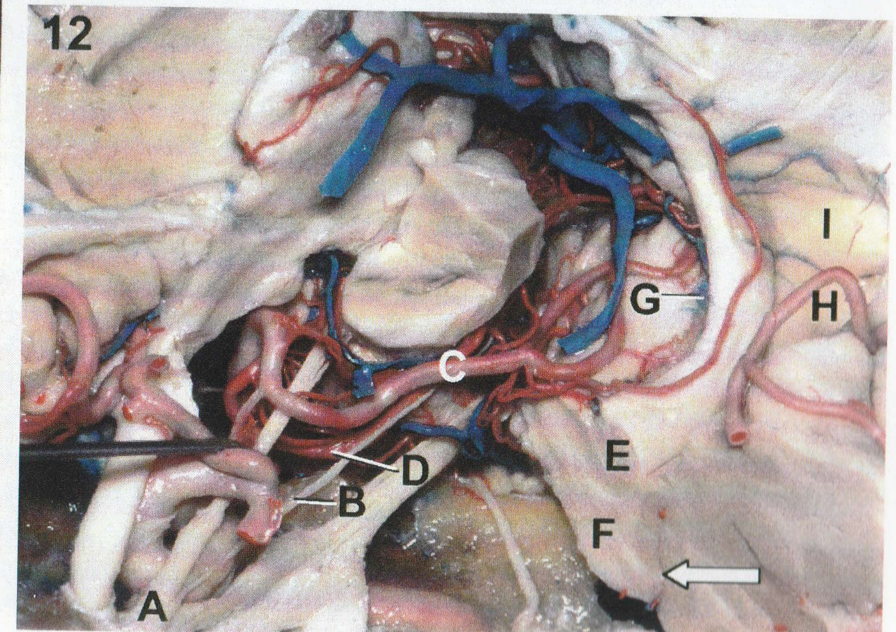
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13. The next section is located at the level of the anterior part of the atrium.

Identify the lettered structures:

A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________

14. Note the relationship of the lateral wall of the third ventricle to the optic chiasm and pineal gland.

Identify the lettered structures:

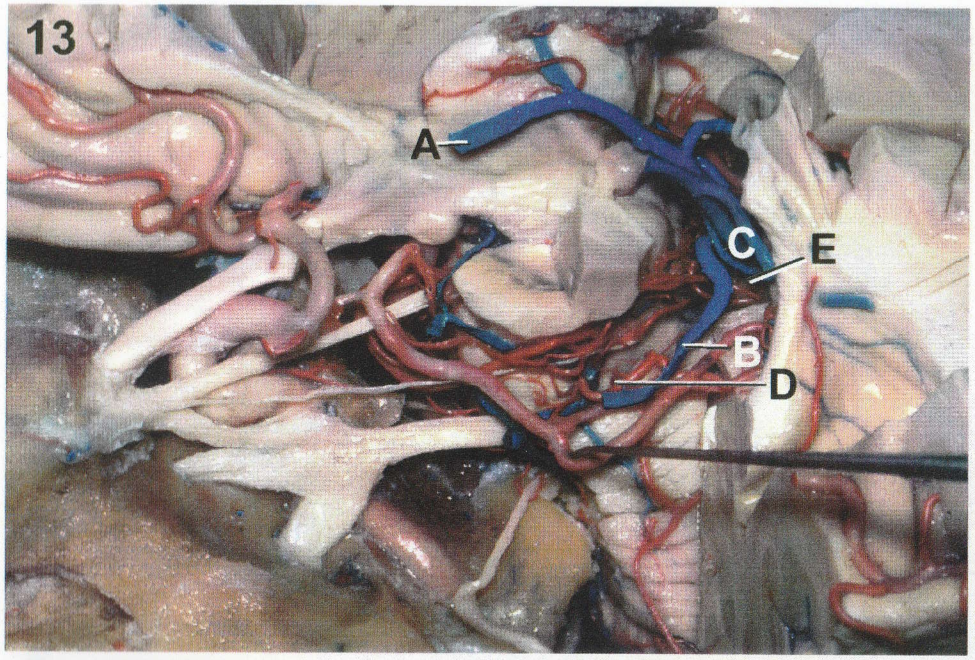
A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________

15. The last section is located at the level of the calcar avis in the lower part of the medial wall of the atrium. Note how deeply the calcarine sulcus (arrow) extends into the medial surface of the hemisphere and forms a prominence, the calcar avis, in the medial wall of the atrium. Also note how deeply the calcarine artery courses in the calcarine sulcus.

Identify the lettered structures:

A. ______________________ **E.** ______________________
B. ______________________ **F.** ______________________
C. ______________________ **G.** ______________________
D. ______________________ **H.** ______________________

16. The occipital lobe and splenium have been removed to expose the superior aspect of the quadrigeminal cistern. Note that a portion of the pulvinar is located in the anterior (horizontal arrow) wall of the atrium and a portion is located in the lateral wall of the quadrigeminal cistern (vertical arrow).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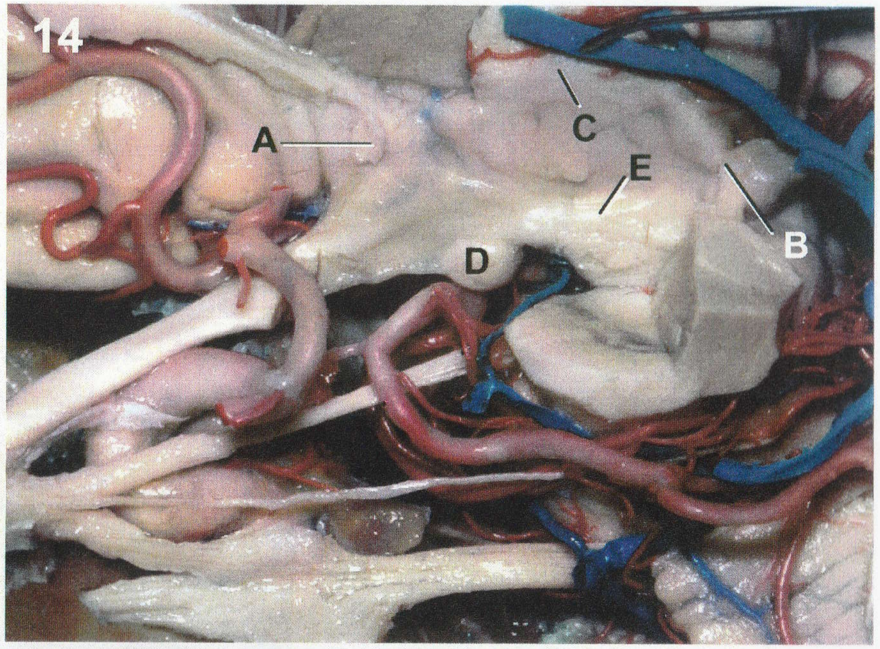
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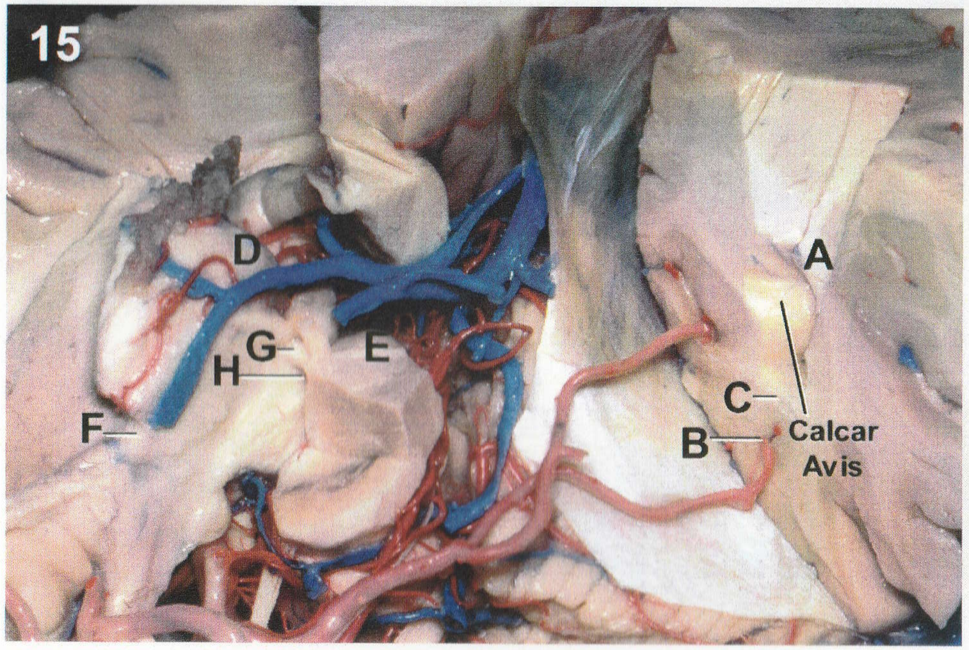
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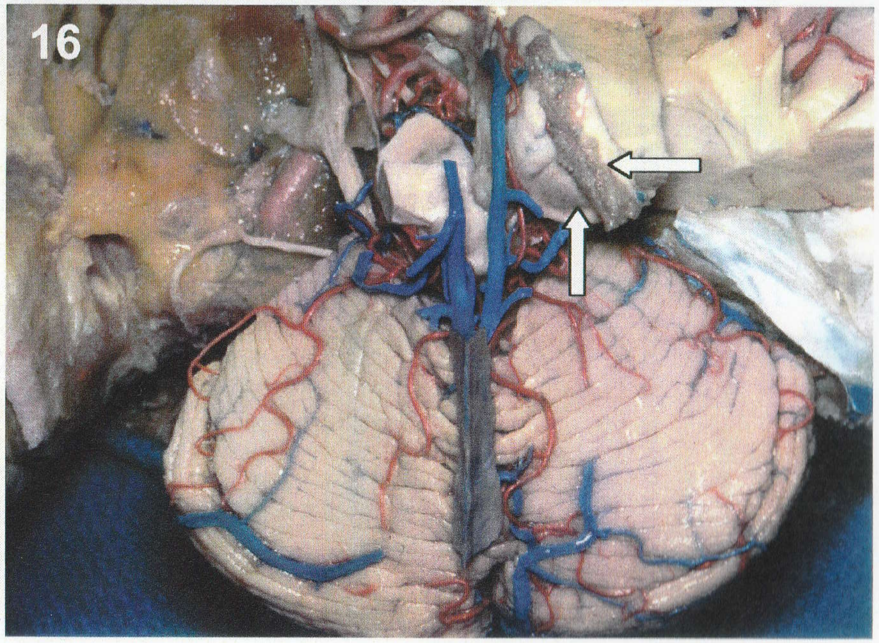
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Answers (Coronal Cuts)

Figure 2
A. Caudate nucleus
B. Lenticular nucleus
C. Anterior limb of internal capsule
D. Lenticulostriate arteries
E. Oculomotor nerve

Figure 4
A. Superior temporal gyrus
B. Planum polare
C. Lamina terminalis
D. Caudate nucleus
E. Recurrent artery

Figure 6
A. Basilar artery
B. Posterior cerebral artery
C. Anterior cerebral artery
D. Middle cerebral artery
E. Substantia nigra
F. Cerebral peduncle
G. Thalamus

Figure 7
A. Anterior choroidal artery
B. Posterior cerebral artery
C. Anterior cerebral artery
D. Internal cerebral vein
E. Hippocampus

Figure 8.
A. Hippocampus
B. Uncus
C. Limen insulae
D. Planum polare
E. Planum temporale
F. Heschl's gyrus
G. Sylvian point
H. Collateral trigone
I. Calcar avis

Figure 9
A. Anterior choroidal artery
B. P1 segment of posterior cerebral artery
C. Oculomotor nerve
D. Fimbria of fornix
E. Basal vein

Figure 12
A. Oculomotor nerve
B. Trochlear nerve
C. Posterior cerebral artery
D. Superior cerebellar artery
E. Amon's horn
F. Parahippocampal gyrus
G. Dentate gyrus
H. Calcar avis
I. Bulb of the corpus callosum

Figure 13
A. Internal cerebral vein
B. Basal vein
C. Vein of Galen
D. Ambient cistern
E. Quadrigeminal cistern

Figure 14
A. Anterior commissure
B. Habenular commissure
C. Stria medullaris thalami
D. Mamillary body
E. Hypothalamic sulcus

Figure 15
A. Tapetum of corpus callosum the at the junction of the roof and lateral wall of the atrium
B. Collateral sulcus
C. Collateral eminence
D. Right pulvinar
E. Left pulvinar
F. Anterior commissure
G. Posterior commissure
H. Aqueduct

Cerebellum and Fourth Ventricle

Cerebellum and Fourth Ventricle

1. The tentorium has been removed to expose the tentorial surface of the cerebellum. Notice that the vermis on the tentorial surface rises above the level of the cerebellar hemispheres.
   Identify the corresponding divisions of the vermis and hemisphere on the tentorial surface:

Vermis	Hemisphere	Vermis	Hemisphere
A. ______		**D.** ______	
B. ______		**E.** ______	
C. ______			

   List the main fissures of the tentorial surface:
   F. ______ **G.** ______ **H.** ______

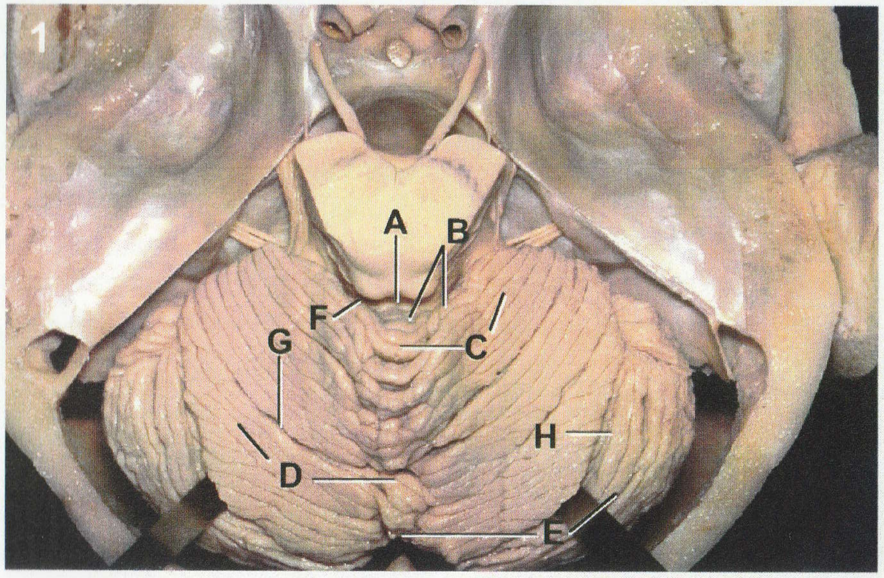
2. The tentorial surface of the cerebellum is supplied by the superior cerebellar artery. The rostral trunk of the artery gives branches to the vermis and the caudal trunk gives branches to the hemisphere. The branches of the superior cerebellar artery, prior to reaching the tentorial surface, course in the fissure between the midbrain and cerebellum called the cerebellomesencephalic fissure.
   List the arteries which gives branches to the superior colliculi (A) and to the inferior colliculi (B):
   A. ______ **B.** ______

3. The posterior lip of the cerebellomesencephalic fissure has been retracted to expose the depths of the fissure. The superior cerebellar artery usually arises as a single main trunk which divides into rostral and caudal trunks as it passes around the midbrain. In this case the rostral and caudal trunks arise directly from the basilar artery as a duplicate superior cerebellar artery. The superior cerebellar artery, in its course to the tentorial surface, passes below the oculomotor nerve and above the trigeminal nerve and is often intimately involved with the trochlear nerve. The bifurcation into the rostral and caudal trunk is usually located above the trigeminal nerve, but it can be situated either proximal or distal to that site. Within the depths of the cerebellomesencephalic fissure, the artery gives rise to branches to the superior cerebellar peduncle which pass to the dentate nucleus and are a frequent site of cerebellar hemorrhage.
   Identify the lettered tributaries of the superior petrosal vein (Dandy):
   A. ______ **B.** ______ **C.** ______

   Identify the other lettered structures:
   D. ______ **G.** ______ **J.** ______
   E. ______ **H.** ______
   F. ______ **I.** ______

4. The part of the posterior wall of the cerebellomesencephalic fissure that corresponds to the right quadrangular lobe has been removed.
   Identify the lettered structures:
   A. ______ **C.** ______ **E.** ______
   B. ______ **D.** ______

1



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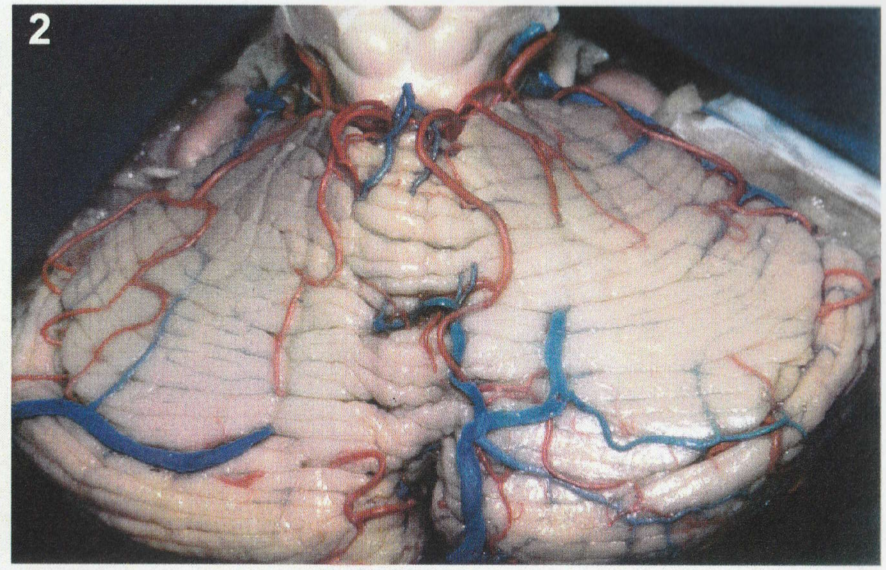

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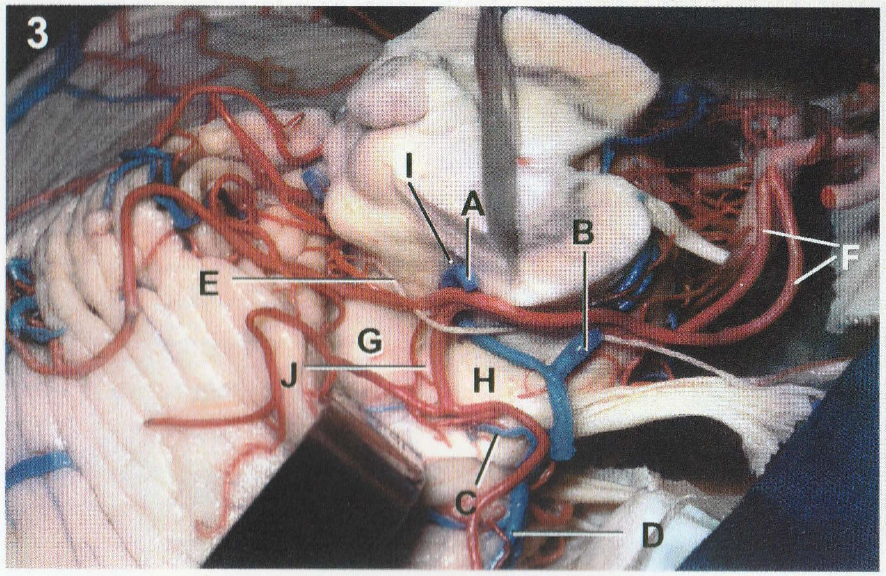

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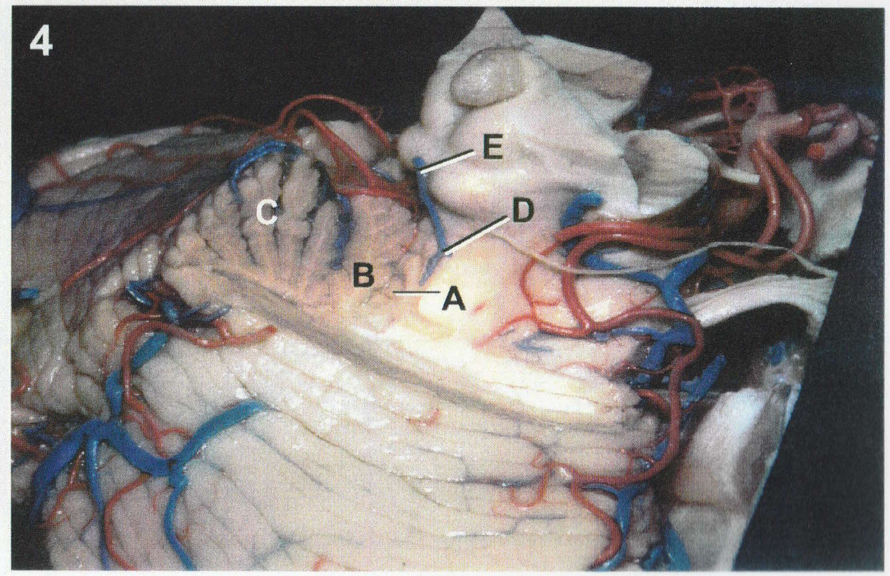


5. The posterior wall of the cerebellomesencephalic fissure has been removed on both sides to expose the colliculi, lingula, superior cerebellar peduncles and the origin of the trochlear nerves from the midbrain. It may be possible to separate a portion of the lingula from the superior medullary velum which spans the interval deep to the lingula between the superior cerebellar peduncles. The lingula and superior medullary velum together form a part of the upper half of the roof of the fourth ventricle. **Identify the lettered structures:**

A. ____________ **C.** ____________ **E.** ____________
B. ____________ **D.** ____________ **F.** ____________

Do the trochlear nerves cross in the midline before exiting the brainstem? G. ____________

6. An incision has been made through the lingula and superior medullary velum, and the margin of the incision has been retracted laterally to expose the upper part of the floor of the fourth ventricle. **Identify the lettered structures:**

A. ____________ **E.** ____________ **H.** ____________
B. ____________ **F.** ____________ **I.** ____________
C. ____________ **G.** ____________ **J.** ____________
D. ____________

7. The second surface of the cerebellum to be reviewed is the petrosal surface which is the surface which faces the posterior surface of the temporal bone and is elevated to expose the nerves in the cerebellopontine angle. The main fissure on this surface is the horizontal fissure which at its anterior edge separates into superior and inferior limbs between which is located the middle cerebellar peduncle. This surface is related predominately to the pons and is supplied by the AICA. In this case, the superior cerebellar artery is very large and gives rise to a marginal branch which supplies the majority of the petrosal surface. The AICA is very small or hypoplastic, in this case. When the AICA is small, either the PICA or the superior cerebellar artery will supply the petrosal surface. The abducens nerve arises near the midline at the lower margin of the pons near the pontomedullary sulcus and the facial and vestibulocochlear nerves arise laterally in the margins of the pontomedullary sulcus. The choroid plexus and flocculus protrude laterally from the margin of the foramen of Luschka.
Identify the lettered structures:

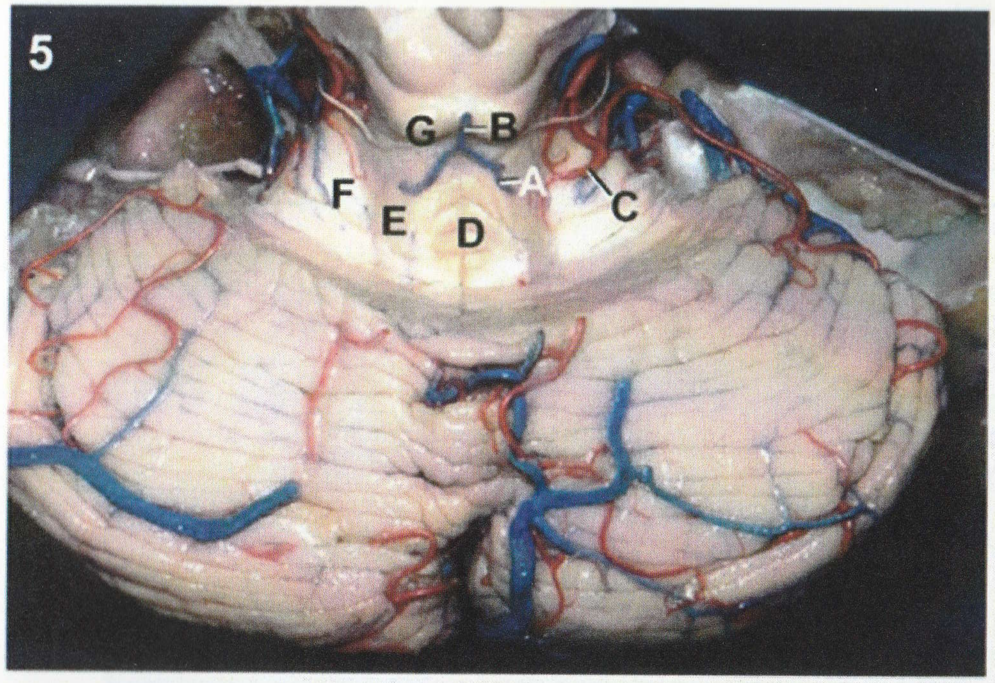
A. ____________ **E.** ____________ **I.** ____________
B. ____________ **F.** ____________ **J.** ____________
C. ____________ **G.** ____________ **K.** ____________
D. ____________ **H** ____________

8. The suboccipital surface of the cerebellum is the surface which is exposed in a wide suboccipital craniectomy and is situated below the transverse sinuses between the two sigmoid sinus. This surface, in contrast to the tentorial surface, has the vermis buried deep in the posterior cerebellar incisura between the hemispheres. The PICA, which supplies the suboccipital surface, encircles the medulla to reach this surface.
Identify the corresponding parts of the vermis and hemispheres on the suboccipital surface:

	Vermis	Hemisphere		Vermis	Hemisphere
A.	____________		**C.**	____________	
B.	____________				

List the main fissures on the suboccipital surface of the cerebellum:

D. ____________ **F.** ____________
E. ____________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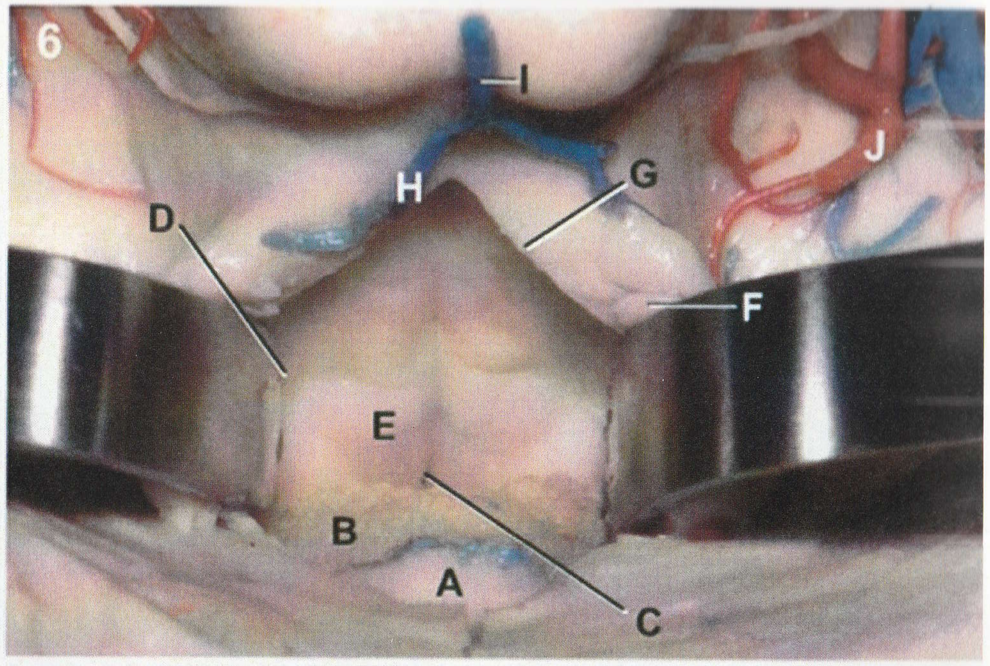
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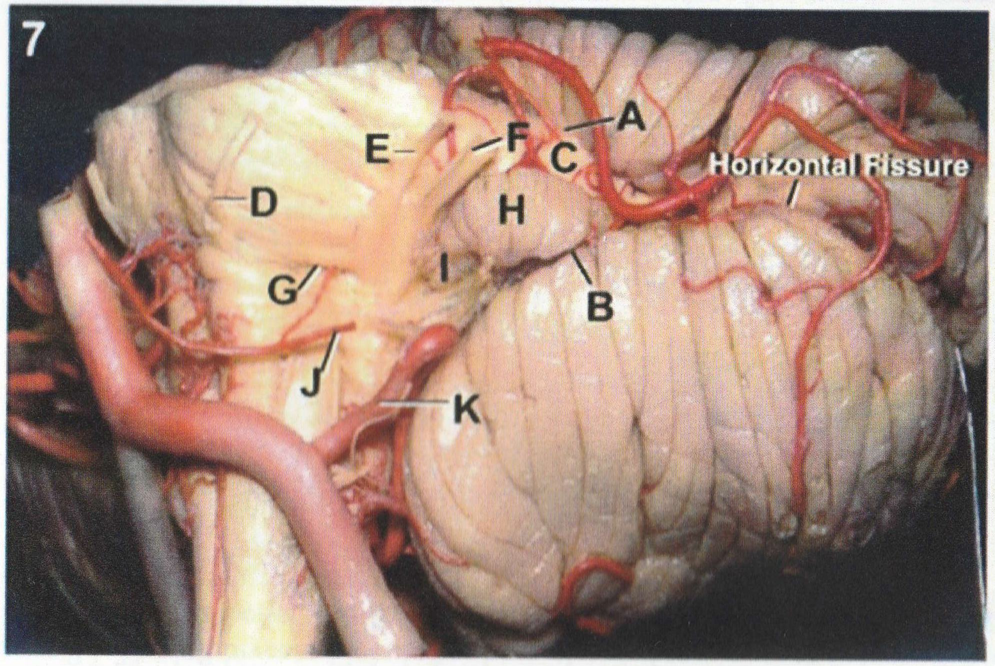
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Horizontal Fissure
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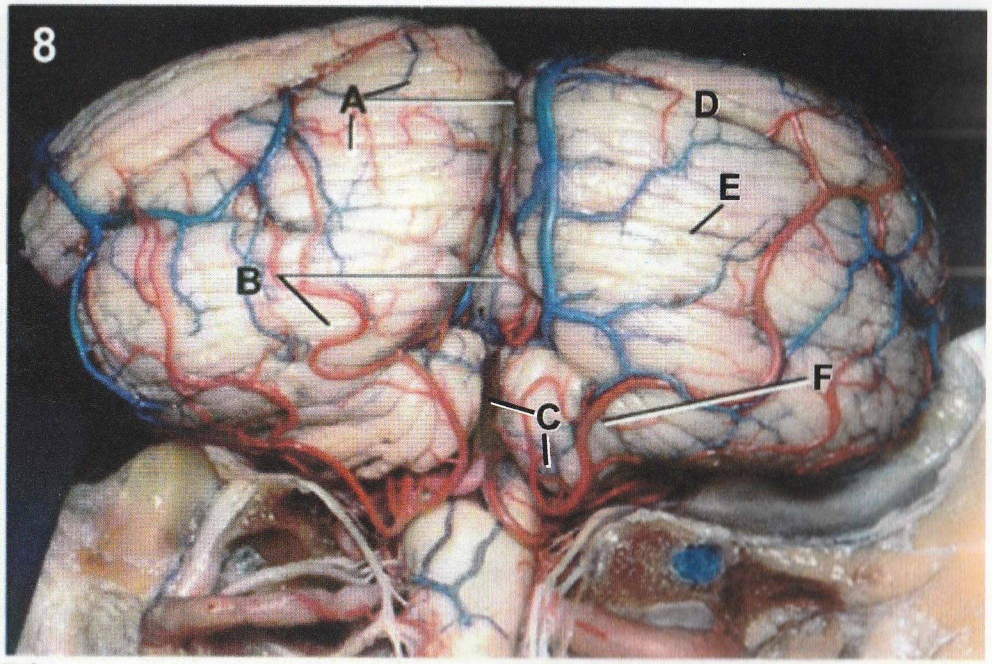
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9. The left biventral lobule has been elevated to expose the glossopharyngeal, vagus and accessory nerves entering the left jugular foramen. The cerebellar tonsils have been separated in the midline to expose the course of the PICAs along the roof of the fourth ventricle and cerebellomedullary fissure.

Identify the lettered structures:

A. ______________	**E.** ______________
B. ______________	**F.** ______________
C. ______________	**G.** ______________
D. ______________	**H.** ______________

10. The cerebellar tonsils have been retracted laterally away from the side of the uvula and pyramid to show the course of the PICAs through the cerebellomedullary fissure. The cranial loop of the PICAs curve around the upper pole of the tonsils between the tonsils on the lower side, and the tela choroidea and inferior medullary velum on the upper side of the fissure.

Identify the lettered structures:

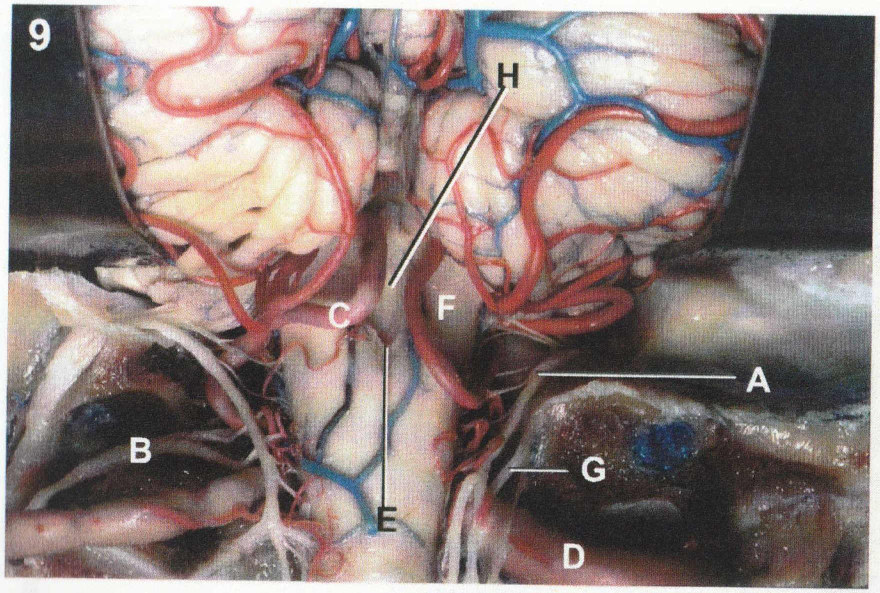
A. ______________	**C.** ______________
B. ______________	

11. The fissure between the right tonsil and the adjacent part of the biventral lobule has been opened. We call this fissure the tonsillobiventral fissure. The peduncle, which attaches the tonsil to the remainder of the cerebellum, is located along the upper part of the lateral surface of the tonsil. The remainder of the tonsil is separated from the adjacent structures by a fissure. It is separated on the anterior, medial and upper side from the medulla, tela choroidea, inferior medullary velum, pyramid and uvula by the cerebellomedullary fissure. On the lateral side, it is separated from the biventral lobule by the tonsillobiventral fissure. It is connected to the remainder of the cerebellum along the upper part of its lateral surface by the tonsillar peduncle. Dividing the tonsillar peduncle allows the tonsil to be rotated out of the cerebellomedullary fissure.

12. The tonsillar peduncle has been divided and the right tonsil has been rolled out of the cerebellomedullary fissure to expose the inferior medullary velum and tela choroidea which form the lower half of the roof of the fourth ventricle. The inferior medullary velum is all that remains of the connection between the nodulus and flocculus which formed the primitive flocculonodular lobe of the cerebellum. Note that the tela choroidea with attached choroid plexus extends laterally behind the jugular foramen to form a rhomboid lip on the foramen of Magendie and the lateral recess to the fourth ventricle. As the PICA courses through the upper part of the cerebellomedullary fissure, it passes directly behind the tela choroidea and inferior medullary velum

Identify the lettered structures:

A. ______________	**D.** ______________
B. ______________	**E.** ______________
C. ______________	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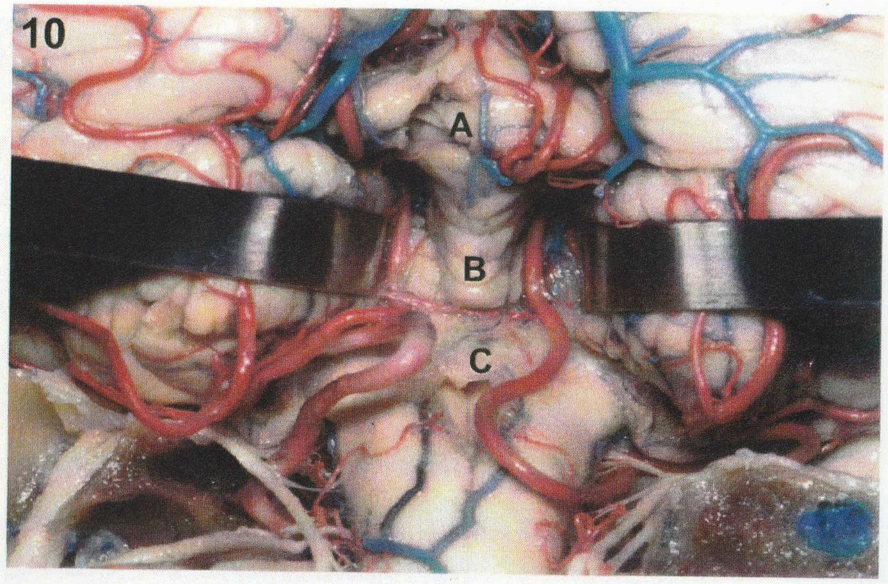
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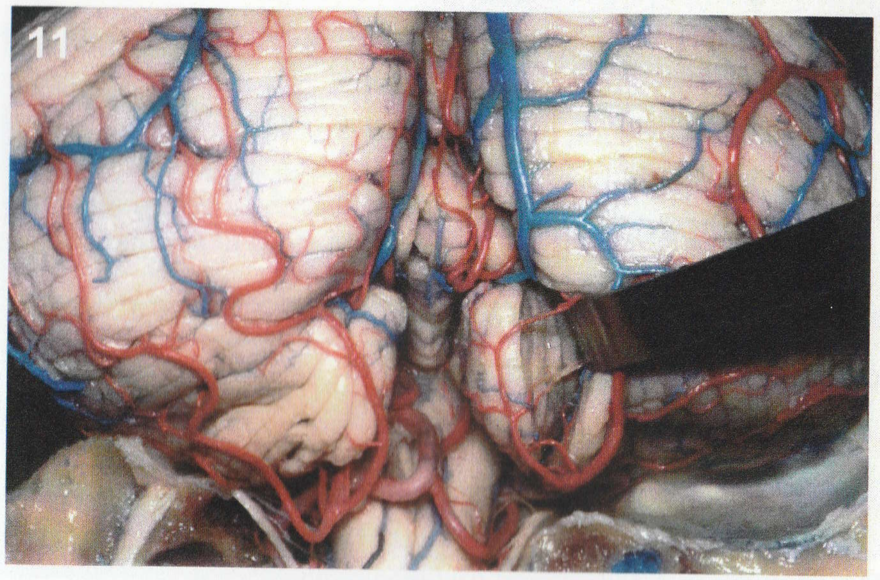
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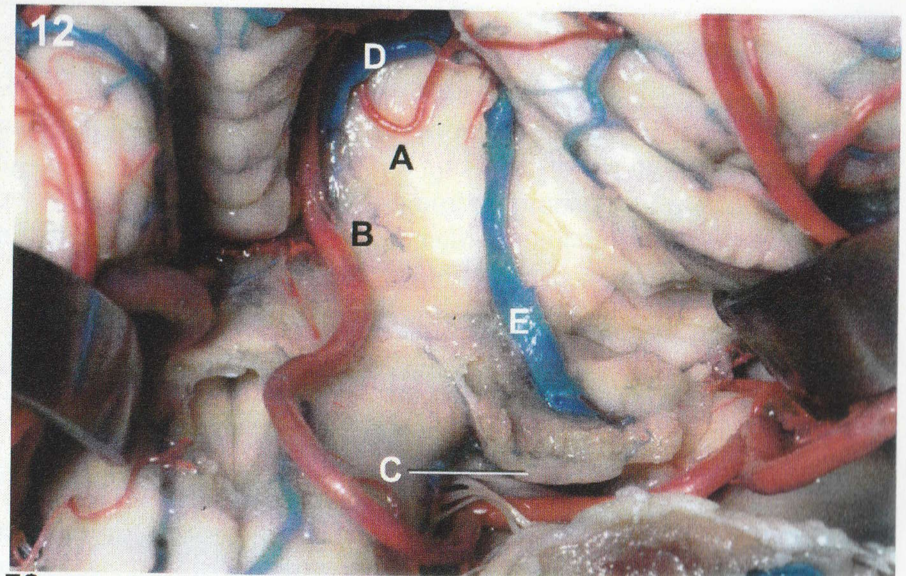
12
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13. The cerebellar tonsils have been removed on both sides by dividing the tonsillar peduncles. The arrow is on the left tonsillar peduncle. The lower half of the roof of the fourth ventricle is formed by the inferior medullary velum and tela choroidea. Note the relationship of the PICAs to the cerebellomedullary fissure. The PICAs divide into medial and lateral trunks. The medial trunk passes to the vermis and the lateral trunk passes to the hemisphere. The bifurcation can take place at any point along the course of the artery around the medulla or through the cerebellomedullary fissure. On the left side the bifurcation takes place in the fissure. On the right side the bifurcation takes place before the artery reaches the fissure.

Identify the lettered structures:

A. ______________________ D. ______________________
B. ______________________ E. ______________________
C. ______________________

14. Enlarged view of the cerebellomedullary fissure. The tonsils form much of the posterior wall of the cerebellomedullary fissure, and the tela choroidea and inferior medullary velum form much of the anterior wall. The PICAs give off choroidal branches to the choroid plexus as they pass through the fissure. The junction between the inferior medullary velum and tela choroidea is called the telovelar junction. The tela can be easily separated from the inferior medullary velum along the telovelar junction. The tenia are the site of attachment of the tela choroidea to the lateral margin of the fourth ventricle.

Identify the lettered structures:

A. ______________________ E. ______________________
B. ______________________ F. ______________________
C. ______________________ G. ______________________
D. ______________________

15. The tela choroidea and choroid plexus have been removed to expose the lower portion of the fourth ventricle. The inferior medullary velum has been left undisturbed.

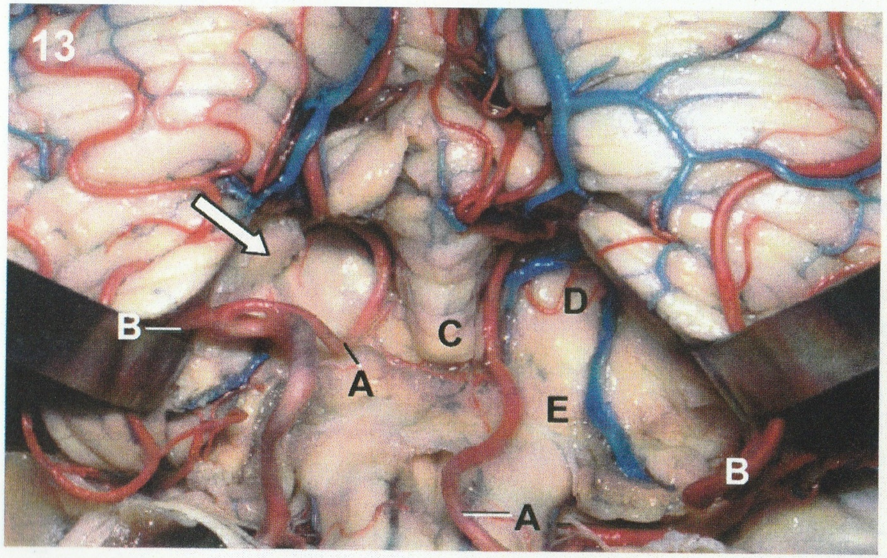
Identify the lettered structures:

A. ______________________ E. ______________________
B. ______________________ F. ______________________
C. ______________________ G. ______________________
D. ______________________ H. ______________________

16. Enlarged view of the lateral recess of the fourth ventricle.

List the structures which form the walls of the lateral recess:

Superior wall A. ______________________ **Anterior wall C.** ______________________
Inferior wall B. ______________________ **Posterior wall D.** ______________________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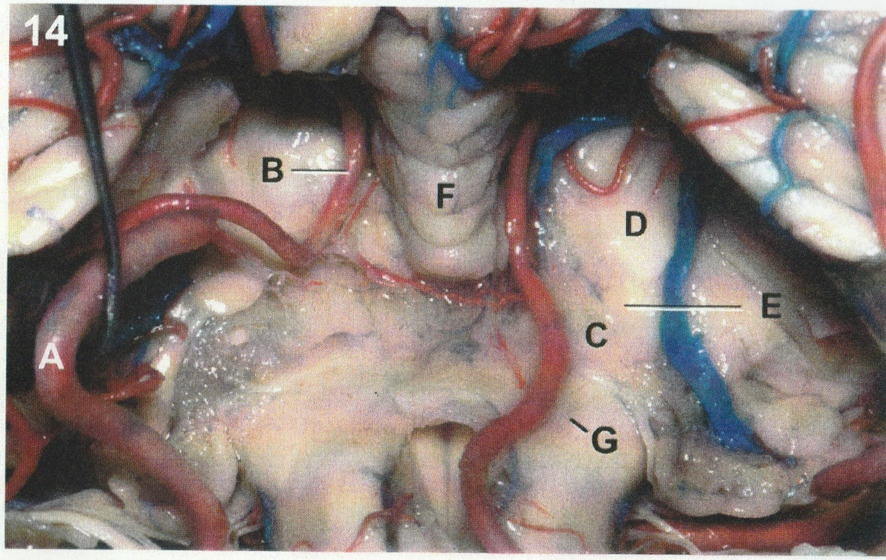
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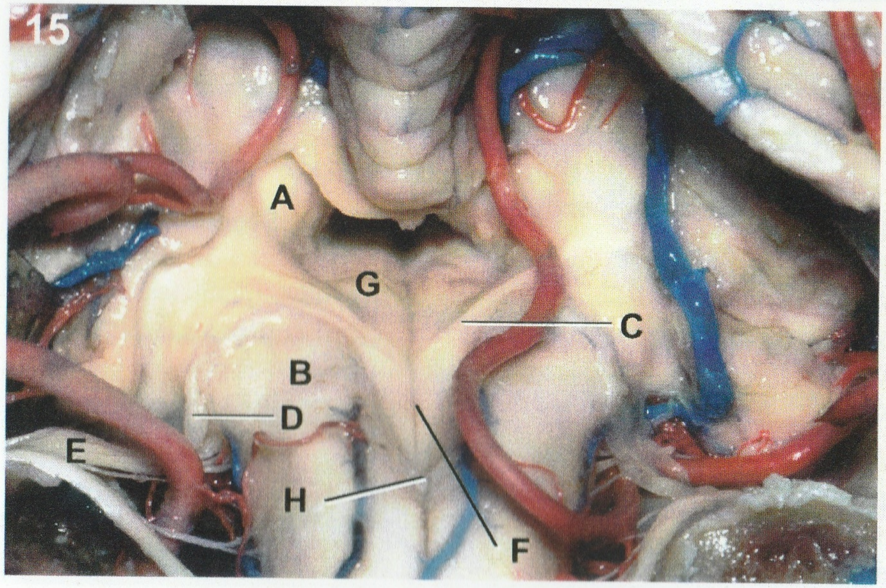
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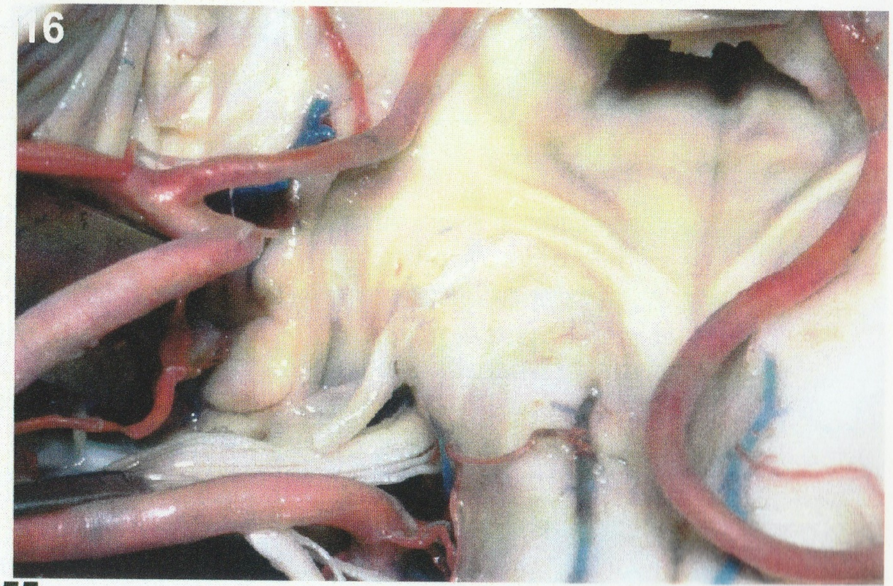

16

17. The right biventral lobule has been removed and the right hemisphere elevated to expose the flocculus, nodulus and inferior medullary velum. The inferior medullary velum connects the nodulus and flocculus which form the flocculonodular lobe of the cerebellum. The velum sweeps laterally from the surface of the nodule and becomes adherent to the inferior cerebellar peduncle in the upper margin of the lateral recess. It then blends into the flocculus which protrudes laterally behind the vestibulocochlear and glossopharyngeal nerves. The inferior medullary velum is a thin membranous structure which can be opened easily to expose the interior of the fourth ventricle. The portion of the velum which attaches the flocculus to the margin of the lateral recess is called the peduncle of the flocculus.

18. Elevating the flocculus exposes the nerves entering the internal acoustic meatus and the jugular foramen. The flocculus protrudes laterally behind these nerves. The PICA segment which extends from the origin of the hypoglossal nerve from the medulla to the origin of the nerves entering the jugular foramen is called the lateral medullary segment. The segment which extends from the origin of the glossopharyngeal, vagus and accessory nerves and around the lower pole of the tonsil is called the tonsilomedullary segment. The segment of the artery which extends upward in the cerebellomedullary fissure between the tela choroidea, inferior medullary velum and tonsil is called the telovelotonsillar segment. The loop which wraps around the superior pole of the tonsil is called the cranial loop.

Identify the lettered nerves in the cerebellopontine angle:

A. ______________________ **C.** ______________________

B. ______________________ **D.** ______________________

Identify the PICA segments and loops:

E. ______________________ **H.** ______________________

F. ______________________ **I.** ______________________

G. ______________________

19. Sagittal and parasagittal cuts through the cerebellar hemisphere have been completed to expose the fourth ventricle. The cut extends through the dentate nucleus and exposes the fibers of the superior cerebellar peduncle, which are ascending in the upper half of the wall of the fourth ventricle.

20. The remainder of the right cerebellar hemisphere has been removed by sectioning the cerebellar peduncles. The hypoglossal and vagal nuclei and area postrema are stacked one above the other in the lower part of the fourth ventricle which gives the appearance of a writing quill and thus, that region is called calamus scriptorius.

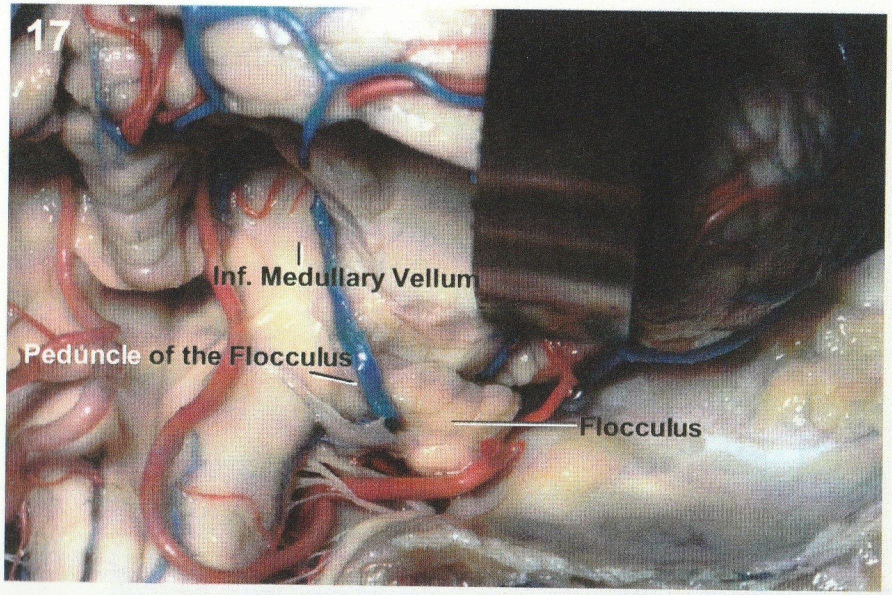
Which peduncles have a surface directly on the wall of the fourth ventricle?

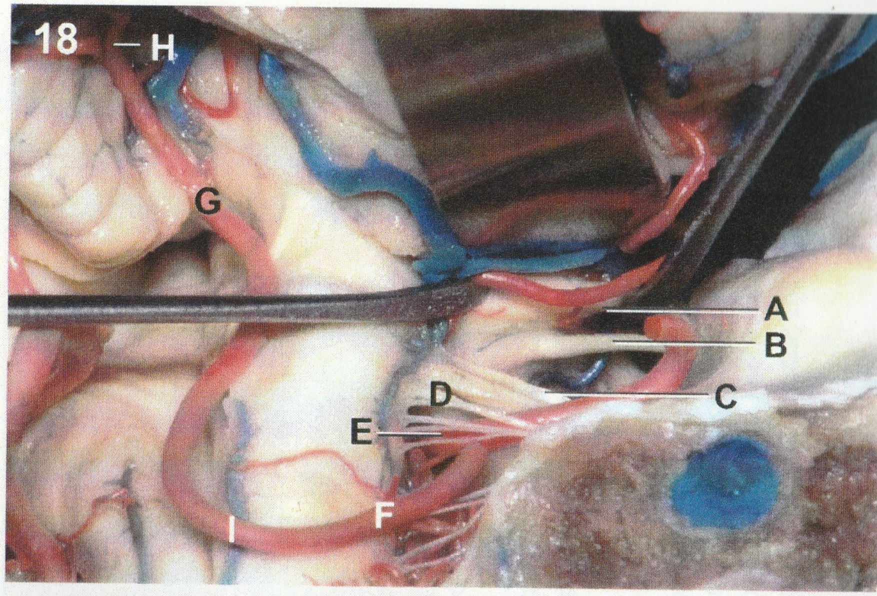
A. ______________________ B. ______________________

Which peduncle does not have a surface directly on the wall of the fourth ventricle?

C. ______________________

The middle cerebellar peduncle forms the largest part of the peduncular mass but it is separated from the surface of the fourth ventricular by the superior and inferior cerebellar peduncles, but does have a prominent surface between the superior and inferior limb of the cerebellopontine fissure.


17
Inf. Medullary Vellum
Peduncle of the Flocculus
Flocculus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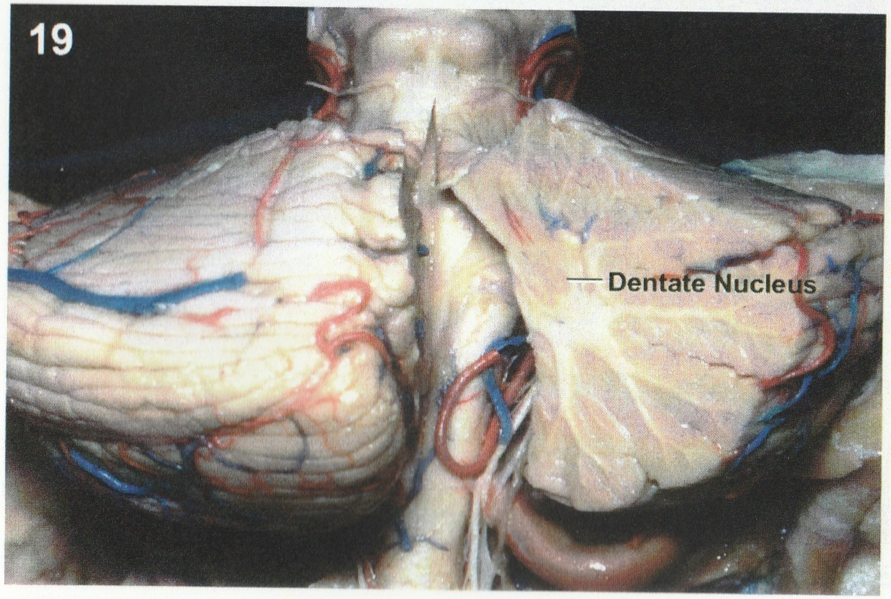
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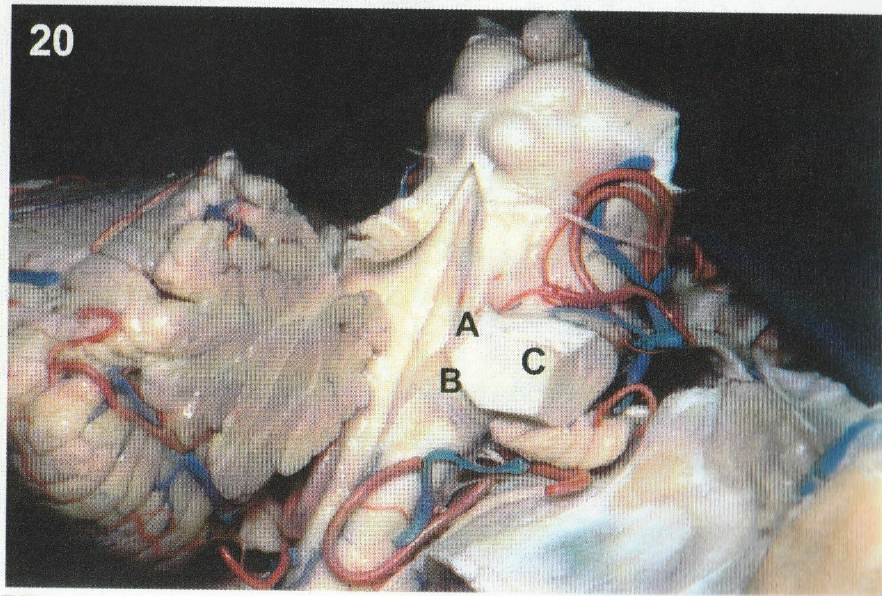
Dentate Nucleus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21. The nodulus has been elevated to provide a view into the left lateral recess of the fourth ventricle. Note that the superior half of the roof of the fourth ventricle is formed by the lingula and superior medullary velum in the midline and the superior cerebellar peduncles laterally. The inferior half of the roof of the fourth ventricle is formed by inferior medullary velum and tela choroidea. The fastigium (arrow) is located in the midline at the junction of the superior and inferior half of the roof of the fourth ventricle. Note that the superior cerebellar artery courses on the superior cerebellar peduncle. The AICA courses on the middle cerebellar peduncle. The PICA courses on the inferior cerebellar peduncle.

22. The cerebellar hemispheres have been removed to expose the floor of the fourth ventricle. The tela choroidea is attached along the lateral margins of the inferior half of the fourth ventricle along small elevated ridges, called the tenia.

Identify the lettered structures:

A. ______________________ **E.** ______________________
B. ______________________ **F.** ______________________
C. ______________________ **G.** ______________________
D. ______________________ **H.** ______________________

23. Enlarged view of the floor of the fourth ventricle.

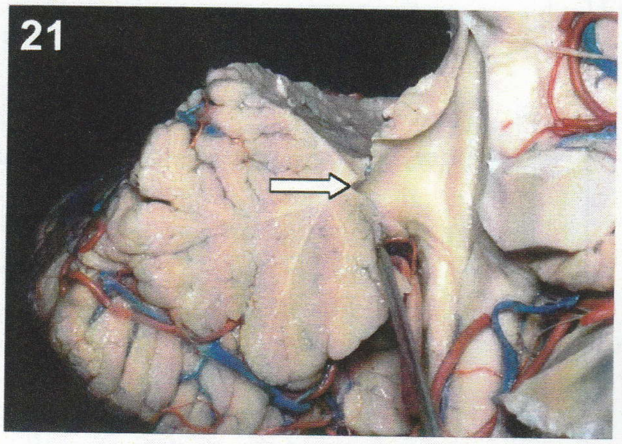
Identify the lettered structures:

A. ______________________ **H.** ______________________
B. ______________________ **I.** ______________________
C. ______________________ **J.** ______________________
D. ______________________ **K.** ______________________
E. ______________________ **L.** ______________________
F. ______________________ **M.** ______________________
G. ______________________ **N.** ______________________

24. Anterior view of the brainstem and the major cerebellar arteries.

Identify the lettered structures:

A. ______________________ **G.** ______________________
B. ______________________ **H.** ______________________
C. ______________________ **I.** ______________________
D. ______________________ **J.** ______________________
E. ______________________ **K.** ______________________
F. ______________________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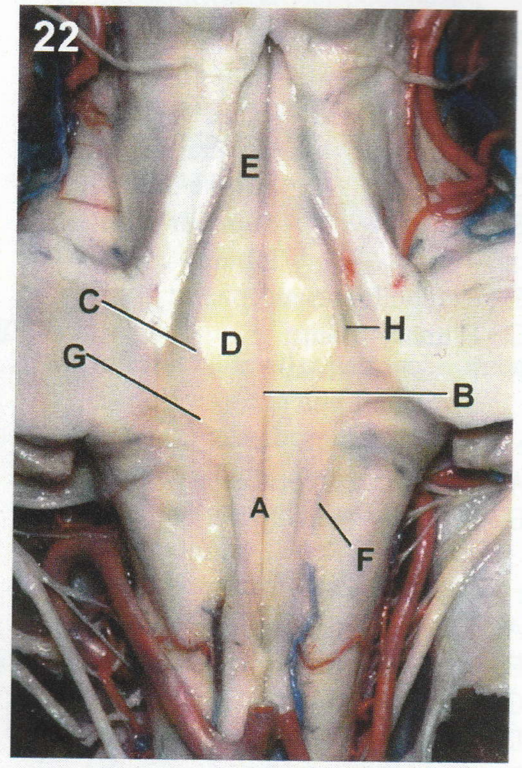
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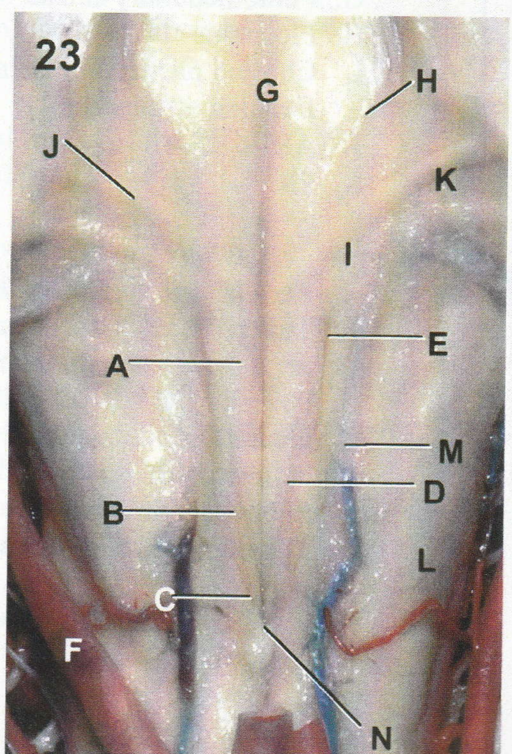
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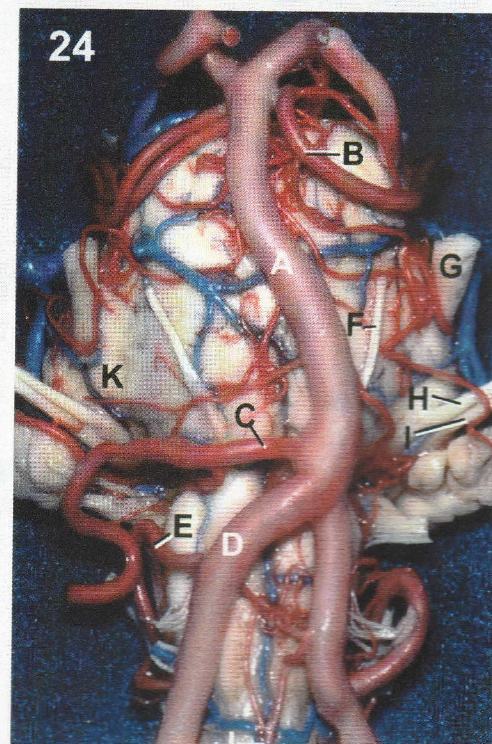
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Answers (Cerebellum and Fourth Ventricle)

Figure 1

	Vermis	*Hemisphere*
A.	Lingula	None
B.	Central lobule	Wings of central lobule
C.	Culmen	Quadrangular lobule
D.	Declive	Simple lobule
E.	Folium	Superior semilunar lobule

F. Cerebellomesencephalic fissure
G. Primary fissure
H. Postclival fissure

Figure 2
A. Posterior cerebral artery
B. Superior cerebellar artery

Figure 3
A. Lateral mesencephalic vein
B. Vein of pontomesencephalic sulcus
C. Pontotrigeminal vein
D. Hemispheric vein
E. Trochlear nerve
F. Duplicate superior cerebellar artery
G. Superior cerebellar peduncle
H. Middle cerebellar peduncle
I. Lateral mesencephalic sulcus
J. Interpeduncular sulcus

Figure 4
A. Lingula
B. Central lobule
C. Culmen
D. Vein of superior cerebellar peduncle
E. Vein of cerebellomesencephalic fissure (precentral vein)

Figure 5
A. Vein of superior cerebellar peduncle
B. Vein of cerebellomesencephalic fissure
C. Superior cerebellar artery
D. Lingula
E. Superior cerebellar peduncle
F. Middle cerebellar peduncle
G. Yes

Figure 6
A. Nodule
B. Choroid plexus
C. Median sulcus
D. Sulcus limitans
E. Facial colliculus
F. Lingula
G. Superior medullary velum
H. Vein of superior cerebellar peduncle
I. Vein of cerebellomesencephalic fissure
J. Superior cerebellar artery

Figure 7
A. Superior limb of cerebellopontine fissure
B. Inferior limb of cerebellopontine fissure
C. Middle cerebellar peduncle
D. Abducens nerve
E. Facial nerve
F. Vestibulocochlear nerve
G. Pontomedullary sulcus
H. Flocculus
I. Choroid plexus protruding from the foramen of Luschka
J. AICA
K. PICA

Figure 8

	Vermis	*Hemisphere*
A.	Tuber	Gracile and inferior semilunar lobule
B.	Pyramid	Biventral lobule
C.	Uvula	Tonsil

D. Horizontal fissure
E. Suboccipital fissure
F. Tonsillobiventral (secondary) fissure

Figure 9

A. Accessory nerve
B. Hypoglossal nerve
C. PICA
D. Vertebral artery
E. Obex
F. Inferior cerebellar peduncle
G. Dentate ligament
H. Foramen of Magendie and floor of fourth ventricle

Figure 10

A. Pyramid
B. Uvula
C. Tela choroidea in the roof of the fourth ventricle

Figure 12

A. Inferior medullary velum
B. Tela choroidea
C. Rhomboid lip
D. Vein of the cerebellomedullary fissure
E. Vein of the lateral recess

Figure 13

A. Medial trunks of the PICAs
B. Lateral trunks of the PICAs
C. Uvula
D. Inferior medullary velum
E. Tela choroidea

Figure 14

A. Main trunk of the left PICA
B. Medial trunk of the left PICA
C. Tela choroidea with choroid plexus
D. Inferior medullary velum
E. Telovelar junction
F. Uvula
G. Tenia choroidea

Figure 15

A. Superior cerebellar peduncle
B. Inferior cerebellar peduncle
C. Stria of medullaris
D. Rhomboid lip of lateral recess
E. Vagus nerve
F. Median sulcus
G. Facial colliculus
H. Obex

Figure 16

A. Inferior cerebellar peduncle, Inferior medullar velum and flocculi
B. Junction tela choroidea and rhomboid lip
C. Inferior cerebellar peduncle and rhomboid lip
D. Tela choroidea

Figure 18

A. Trigeminal nerve
B. Vestibulocochlear nerve
C. Glossopharyngeal nerve
D. Vagus nerve
E. Lateral medullary segment PICA
F. Tonsilomedullary segment PICA
G. Telovelotonsillar segment PICA
H. Cranial loop PICA
I. Caudal loop PICA

Figure 20

A. Superior cerebellar peduncle
B. Inferior cerebellar peduncle
C. Middle cerebellar peduncle

Figure 22

A. Calamus scriptorius
B. Median sulcus
C. Sulcus limitans
D. Facial colliculus
E. Locus ceruleus
F. Tenia choroidea
G. Stria medullaris
H. Superior fovea

Answers (Cerebellum and Fourth Ventricle) Continued

Figure 23

A. Hypoglossal triangle
B. Vagal triangle
C. Area postrema
D. Funiculus separans
E. Inferior fovea
F. PICA
G. Median sulcus
H. Sulcus limitans
I. Vestibular area
J. Stria medullaris
K. Cochlear area
L. Inferior cerebellar peduncle
M. Tenia choroidea
N. Obex

Figure 24

A. Basilar artery
B. Superior cerebellar artery
C. AICA
D. Vertebral artery
E. PICA
F. Abducens nerve
G. Trigeminal nerve
H. Facial nerve
I. Vestibulocochlear nerve
J. Anterior spinal artery
K. Middle cerebellar peduncle

Two-piece Orbitozygomatic Craniotomy

Two-piece Orbitozygomatic Craniotomy

1. The scalp flap has been elevated to expose the frontotemporal region in preparation for the two-piece orbitozygomatic craniotomy. The superficial layer of temporalis fascia has been opened and an interfascial exposure done to protect the frontal branches of the facial nerve.

   Identify the lettered bones:

   A. ______________________ **C.** ______________________
   B. ______________________

2. The temporalis muscle has been reflected downward. A cuff of fascia has been left along the superior temporal line to aid in the closure.

   Identify the lettered points on the bone:

   A. ______________________ **B.** ______________________

   Identify the sutures:

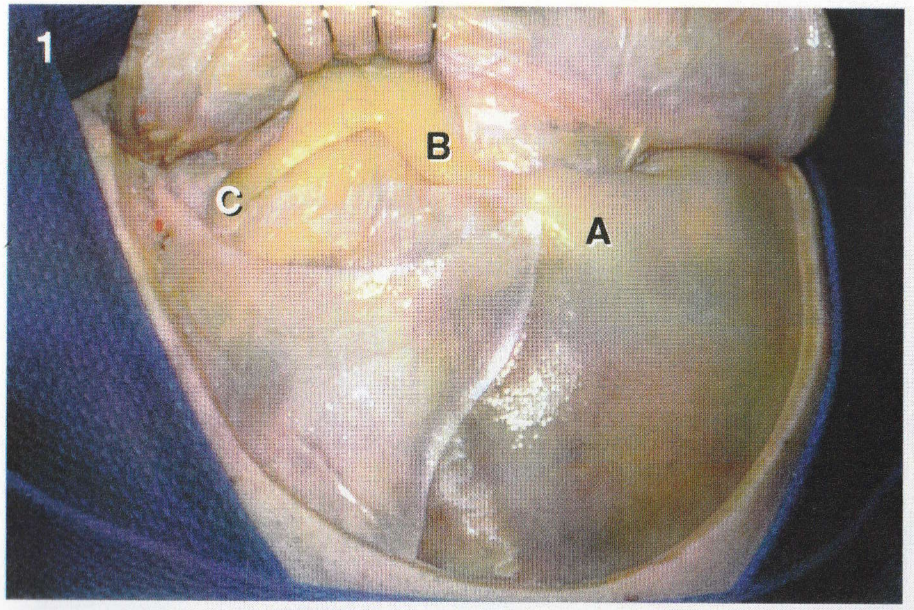
   C. ______________________ **E.** ______________________
   D. ______________________

3. The bone flap for the pterional portion of the exposure has been outlined and the bone cuts completed.

4. The two-piece orbitozygomatic exposure includes elevating a pterional flap and then a fronto-orbitozygomatic osteotomy as a separate piece.

   Identify the lettered structures:

   A. ______________________ **D.** ______________________
   B. ______________________ **E.** ______________________
   C. ______________________ **F.** ______________________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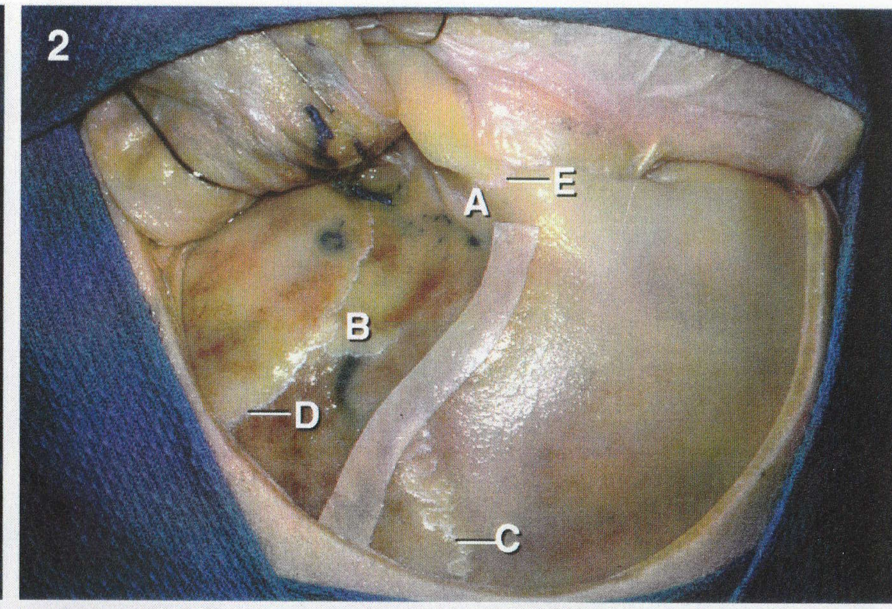
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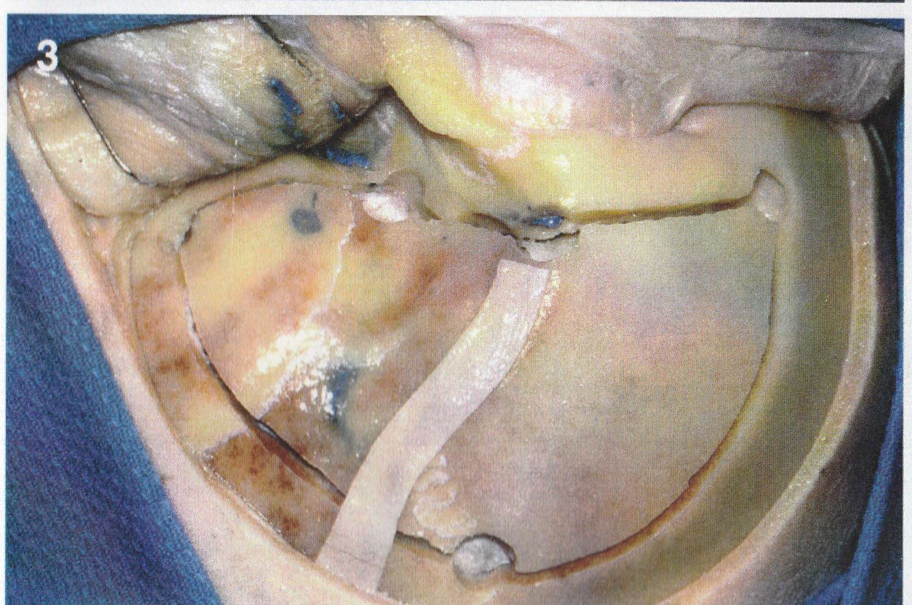
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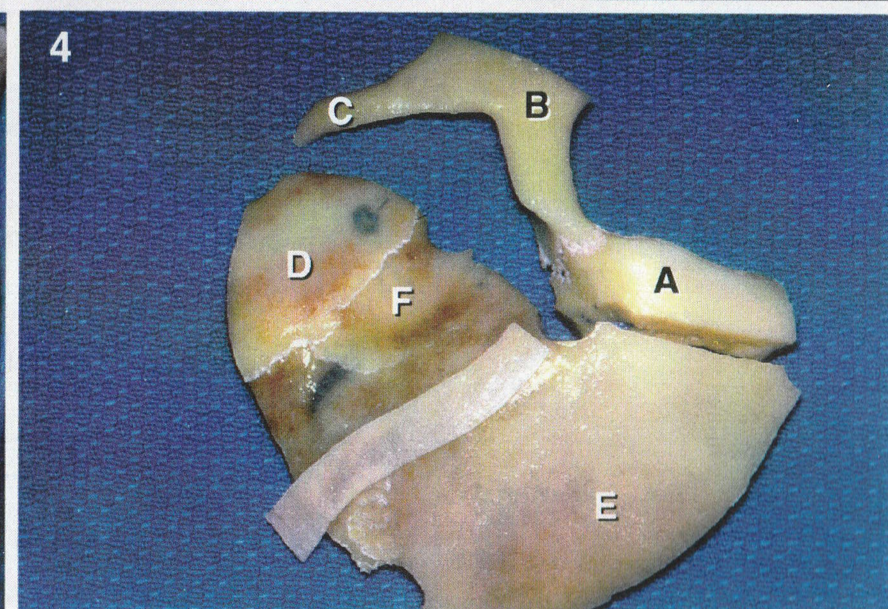
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5. The dura has been opened and the frontal and temporal lobes retracted to expose the structures in the supra and para sellar areas.

Identify the lettered structures:

A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________

6. The frontal lobe has been elevated to expose the anterior communicating area above the optic chiasm.

Identify the lettered structures:

A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________

7. The optic nerve has been elevated and the internal carotid artery depressed to provide an exposure through the opticocarotid triangle.

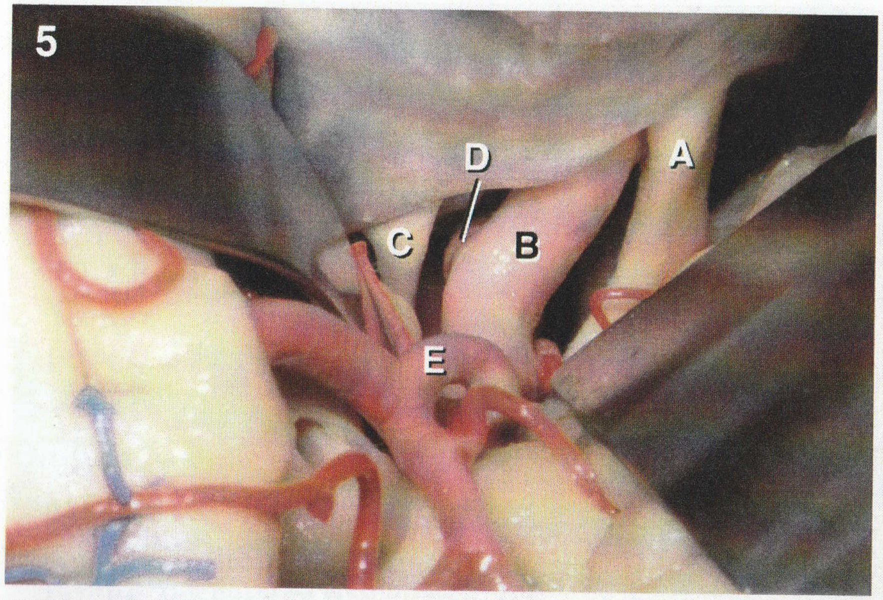
Identify the lettered structures:

A. ______________________ **C.** ______________________
B. ______________________

8. The middle cerebral artery has been elevated to expose a large fetal posterior communicating artery.

Identify the lettered structures:

A. ______________________ **C.** ______________________
B. ______________________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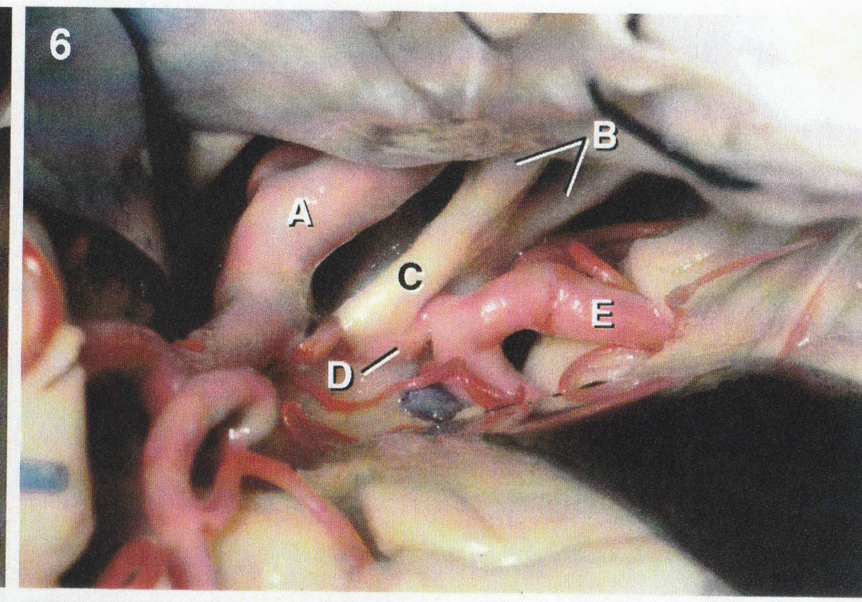
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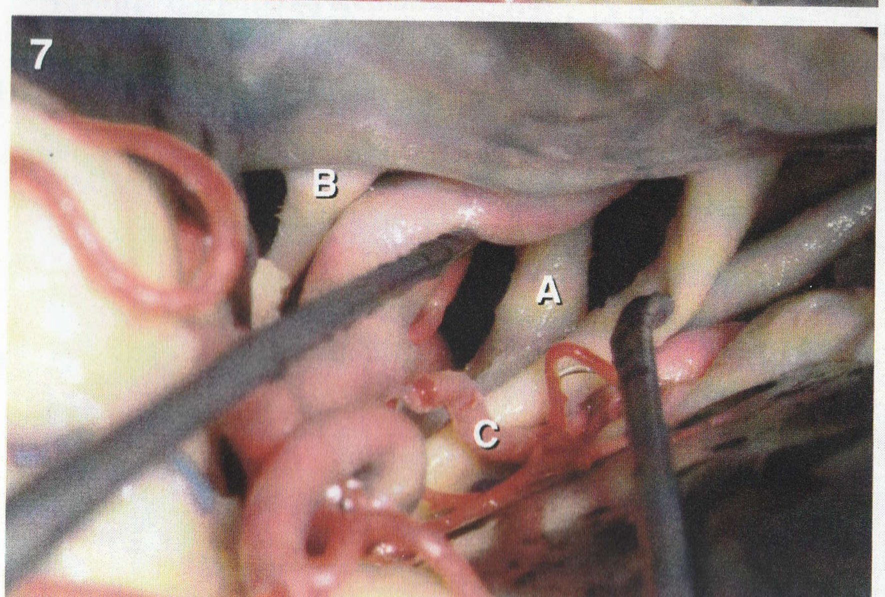
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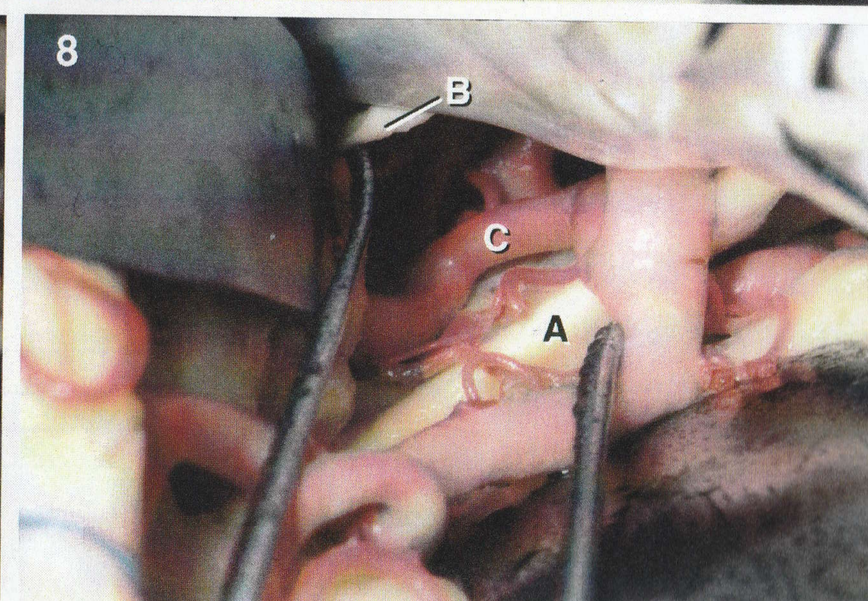
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9. The anterior clinoid process has been removed to expose the clinoid segment of the carotid artery.

Identify the lettered structures:

A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________ **F.** ______________________

10. The dura has been elevated from the lateral wall of the cavernous sinus.

Identify the lettered structures:

A. ______________________ **E.** ______________________
B. ______________________ **F.** ______________________
C. ______________________ **G.** ______________________
D. ______________________

11. The bone over the petrous apex behind the greater petrosal nerve and petrous carotid has been removed and the dura over the posterior fossa opened below the trigeminal nerve to expose the anterior surface of the brain stem.

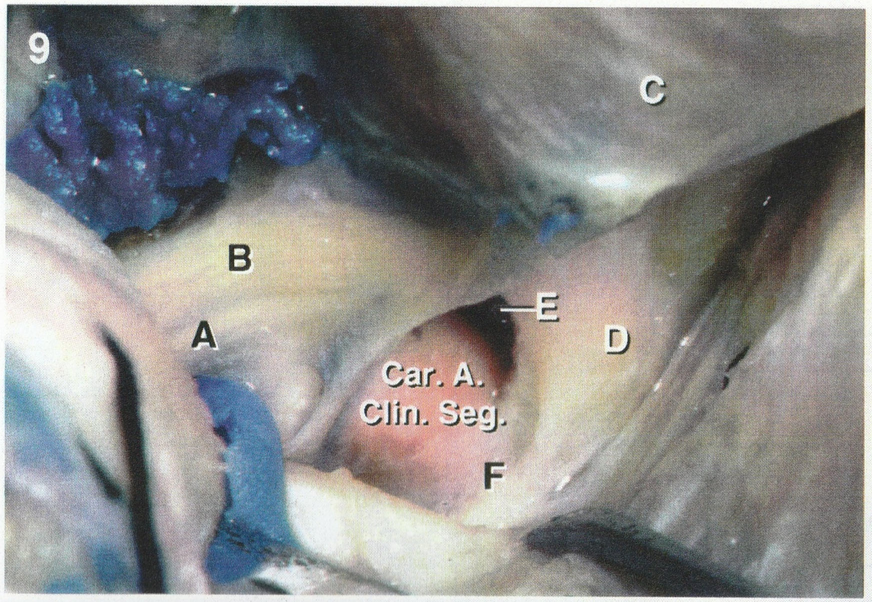
Identify the lettered structures:

A. ______________________ **C.** ______________________
B. ______________________ **D.** ______________________

12. The roof of the cavernous sinus has been removed and the exposure directed through the interval between the carotid artery and the oculomotor nerve.

Identify the lettered structures:

A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________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Clin. Seg.
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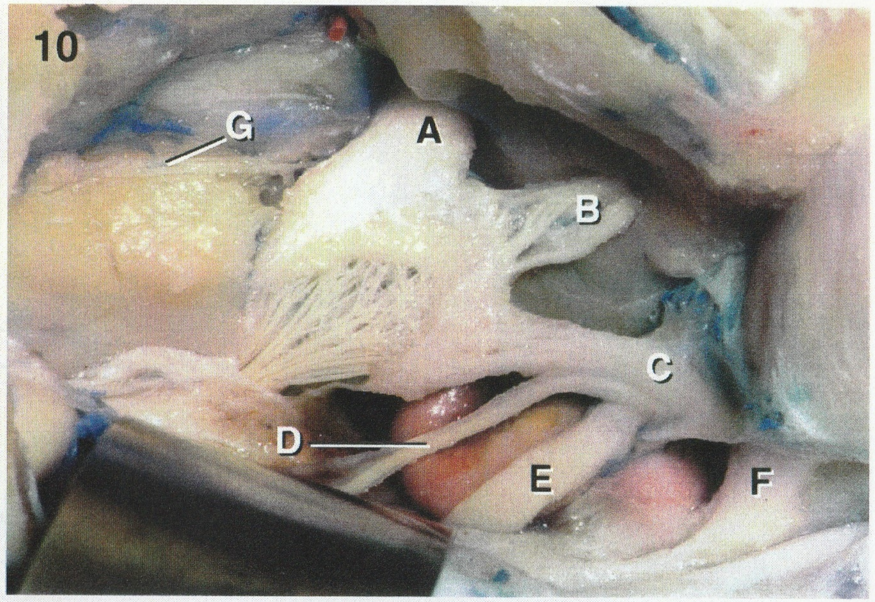
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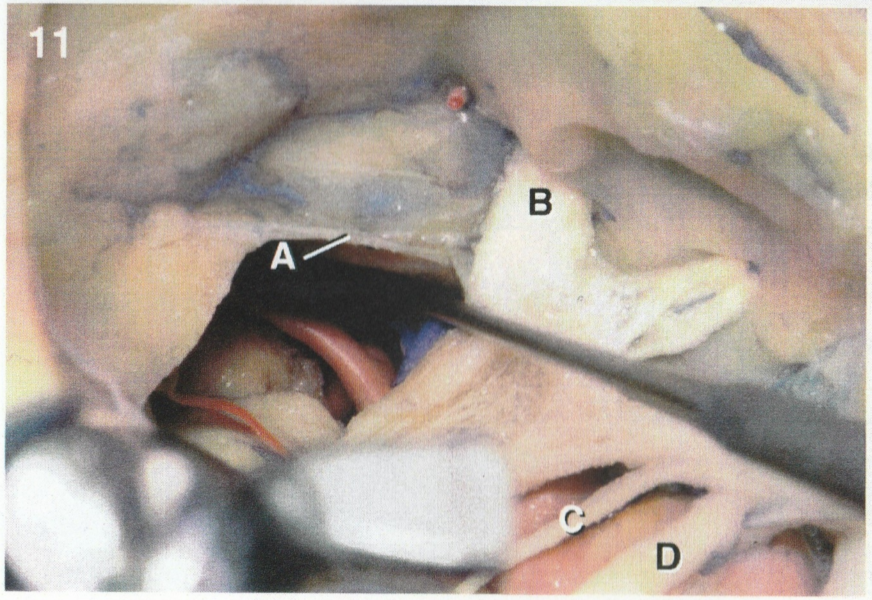
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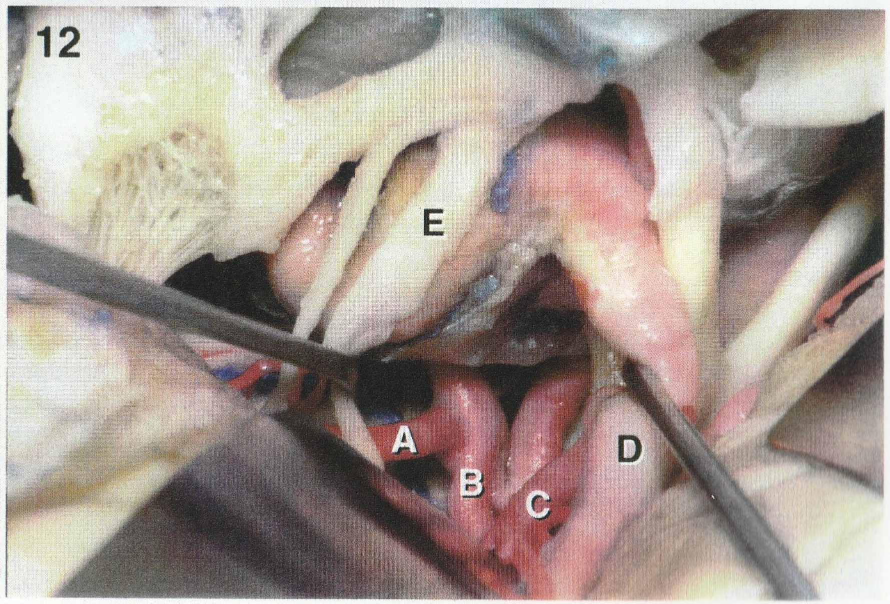
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13. The floor of the middle fossa has been removed to expose the infratemporal fossa for a subtemporal infratemporal fossa approach.

Identify the lettered structures:

A. ____________________	**D.** ____________________
B. ____________________	**E.** ____________________
C. ____________________	

14. The lateral pterygoid muscle has been removed to expose the structures in the infratemporal fossa.

Identify the lettered structures:

A. ____________________	**B.** ____________________

15. The posterior part of the floor of the middle fossa has been removed to expose the mandibular condyle. The part of the squamous temporal bone, which forms the mandibular fossa with which the condyle articulates, has been removed.

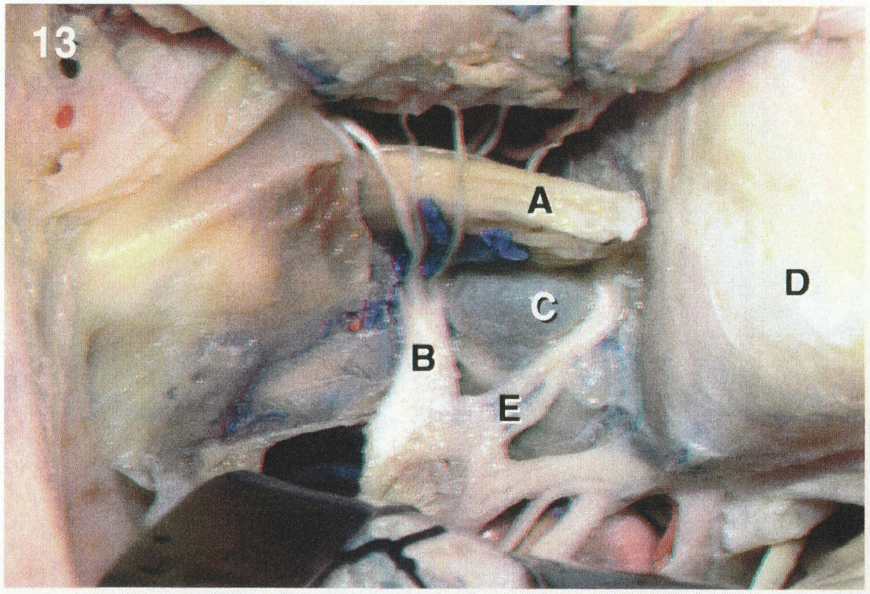
Identify the lettered structures:

A. ____________________	**D.** ____________________
B. ____________________	**E.** ____________________
C. ____________________	**F.** ____________________

16. Enlarged view of the infratemporal fossa following removal of the lateral pterygoid muscle and some branches of the mandibular nerve and maxillary artery.

Identify the lettered structures:

A. ____________________	**D.** ____________________
B. ____________________	**E.** ____________________
C. ____________________	



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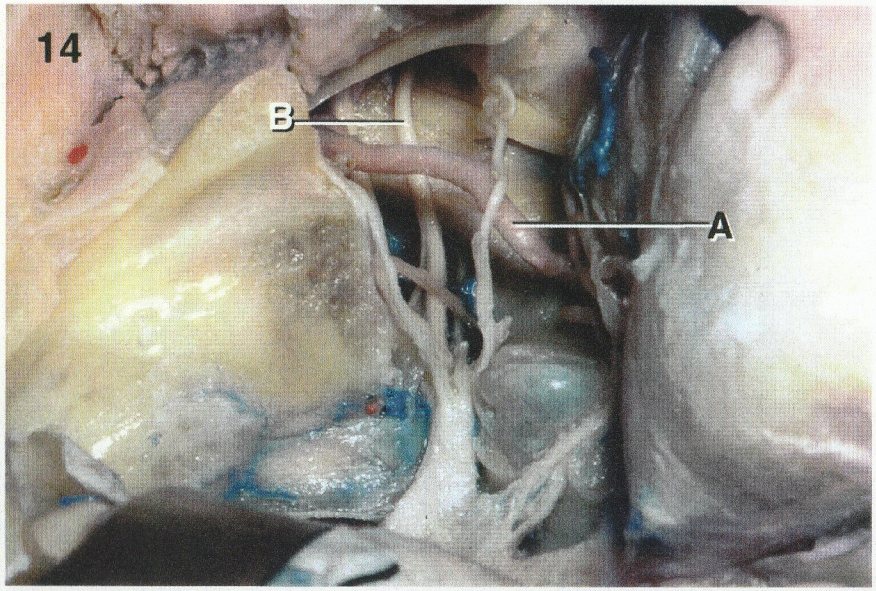

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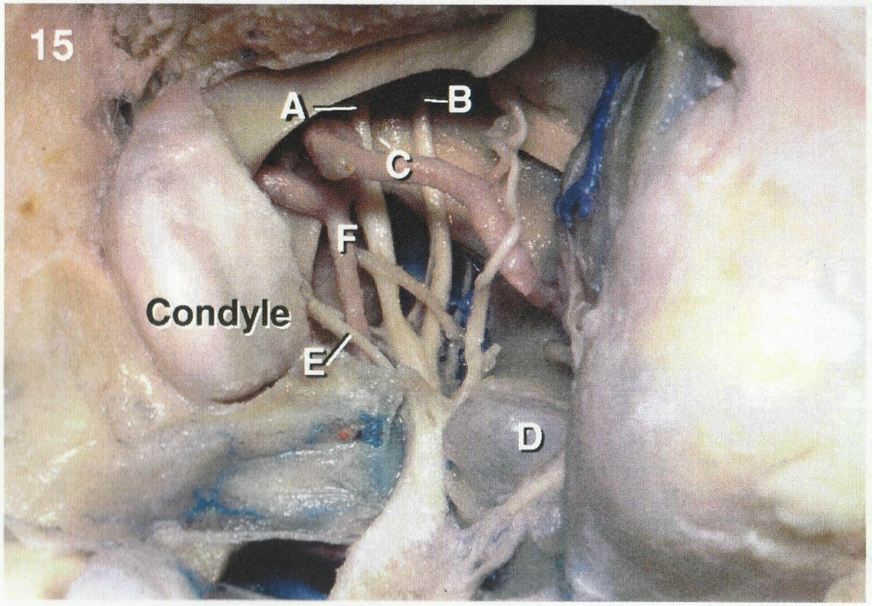

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Condyle
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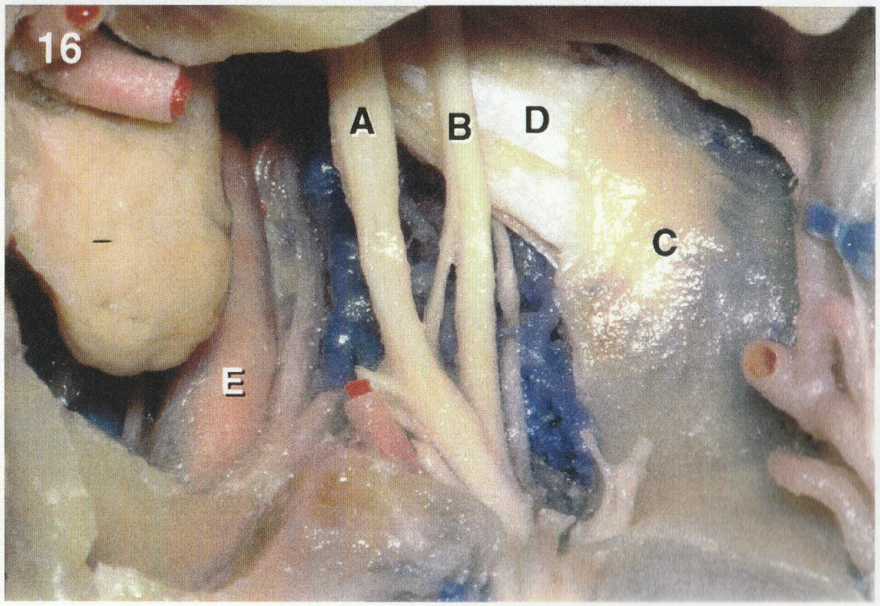

16
A
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Answers (Two-piece Orbitozygomatic Craniotomy)

Figure 1
A. Frontal bone
B. Zygomatic bone
C. Temporal bone

Figure 2
A. Keyhole
B. Pterion
C. Coronal suture
D. Squamosal suture
E. Frontozygomatic suture

Figure 4
A. Frontal bone
B. Zygomatic bone
C. Temporal bone
D. Temporal bone
E. Frontal bone
F. Sphenoid bone

Figure 5
A. Optic nerve
B. Internal carotid artery
C. Oculomotor nerve
D. Posterior communicating artery
E. Middle cerebral artery

Figure 6
A. Internal carotid artery
B. Optic nerves
C. Optic chiasm
D. Ipsilateral A-1
E. Ipsilateral A-2

Figure 7
A. Pituitary stalk
B. Oculomotor nerve
C. A-1

Figure 8
A. Optic tract
B. Oculomotor nerve
C. Posterior communicating artery

Figure 9
A. Trochlear nerve
B. Oculomotor nerve
C. Periorbita
D. Optic nerve in optic sheath
E. Optic strut
F. Upper dural ring

Figure 10
A. Mandibular nerve
B. Maxillary nerve
C. Ophthalmic nerve
D. Trochlear nerve
E. Oculomotor nerve
F. Optic nerve
G. Greater petrosal nerve

Figure 11
A. Greater petrosal nerve
B. Mandibular nerve
C. Trochlear nerve
D. Oculomotor nerve

Figure 12
A. SCA
B. PCA
C. Posterior communicating artery
D. Internal carotid artery
E. Oculomotor nerve

Figure 13
A. Upper head lateral pterygoid muscle
B. Mandibular nerve
C. Bulbus sphenoid sinus
D. Periorbita
E. Maxillary nerve

Figure 14
A. Maxillary artery
B. Lingual nerve

Figure 15
A. Inferior alveolar nerve
B. Lingual nerve
C. Maxillary artery
D. Bulbus sphenoid sinus
E. Auriculotemporal nerve
F. Middle meningeal artery

Figure 16
A. Inferior alveolar nerve
B. Lingual nerve
C. Lateral pterygoid plate
D. Medial pterygoid muscle
E. Internal carotid artery

One-piece Orbitozygomatic Craniotomy

One-piece Orbitozygomatic Craniotomy

1. The scalp flap has been reflected and the superficial layer of temporal fascia has been folded downward to protect the branches of the facial nerve.

   Identify the lettered bones:

   A. ____________________ **C.** ____________________
   B. ____________________ **D.** ____________________

2. The temporalis muscle has been reflected.

   Identify the lettered sites:

   A. ____________________ **B.** ____________________

   Identify the lettered sutures:

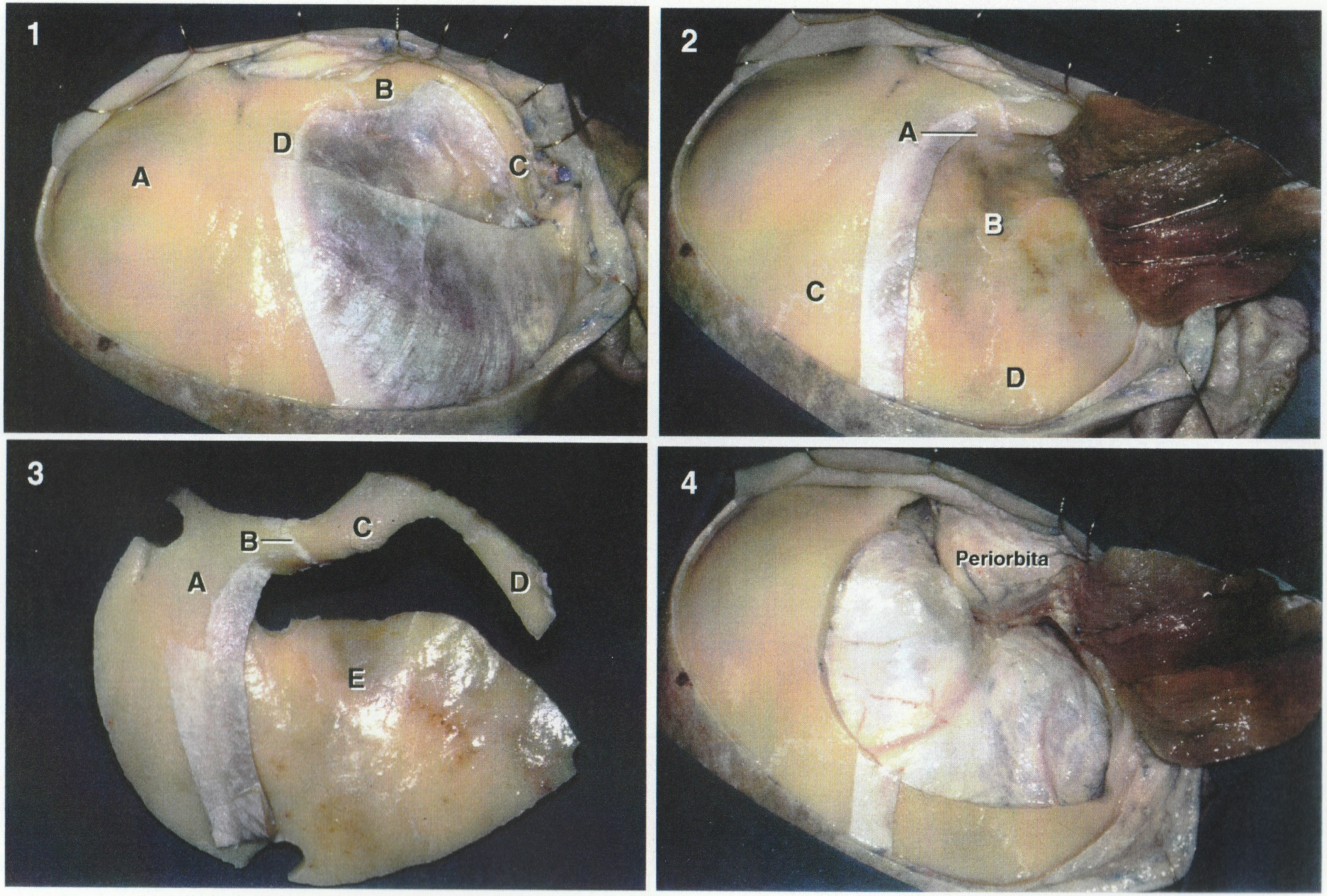
   C. ____________________ **D.** ____________________

3. The one-piece orbitozygomatic flap has been elevated. It includes some of the zygomatic arch as well as the superior and lateral orbital rim.

   Identify the lettered structures:

   A. ____________________ **D.** ____________________
   B. ____________________ **E.** ____________________
   C. ____________________

4. The orbitozygomatic craniotomy exposes the periorbita of the roof and lateral wall of the orbit and extends down to the floor of the middle fossa.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Periorbita

5. The sylvian fissure has been opened and the frontal and temporal lobes retracted to expose the carotid cistern.

Identify the lettered structures:

A. ____________________ **E.** ____________________
B. ____________________ **F.** ____________________
C. ____________________ **G.** ____________________
D. ____________________

6. The carotid artery has been retracted backwards to open the opticocarotid triangle located between the optic nerve, internal carotid artery, and the A-1.

Identify the lettered structures:

A. ____________________ **D.** ____________________
B. ____________________ **E.** ____________________
C. ____________________ **F.** ____________________

7. The carotid and sylvian cisterns have been opened more widely.

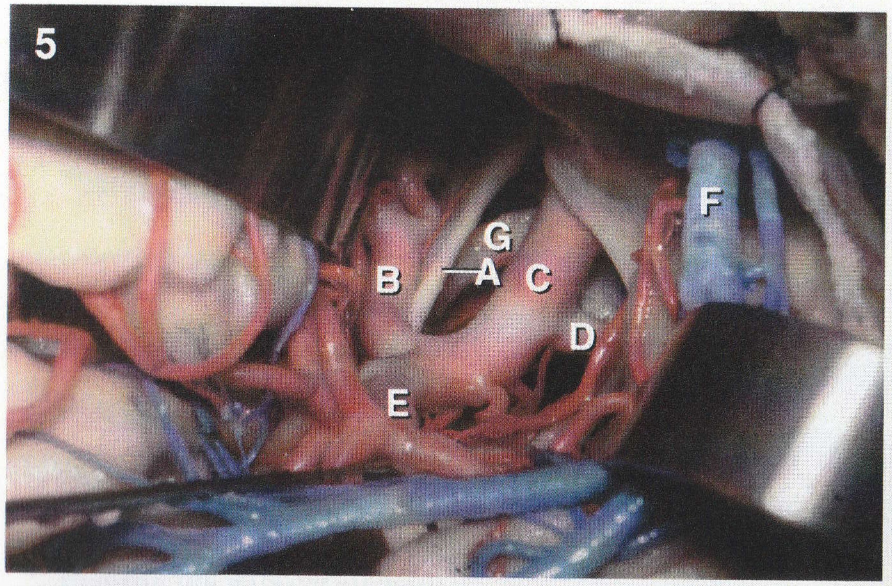
Identify the lettered structures:

A. ____________________ **D.** ____________________
B. ____________________ **E.** ____________________
C. ____________________ **F.** ____________________

8. The posterior communicating artery has been displaced downward to expose the basilar bifurcation.

Identify the lettered structures:

A. ____________________ **E.** ____________________
B. ____________________ **F.** ____________________
C. ____________________ **G.** ____________________
D. ____________________ **H.** ____________________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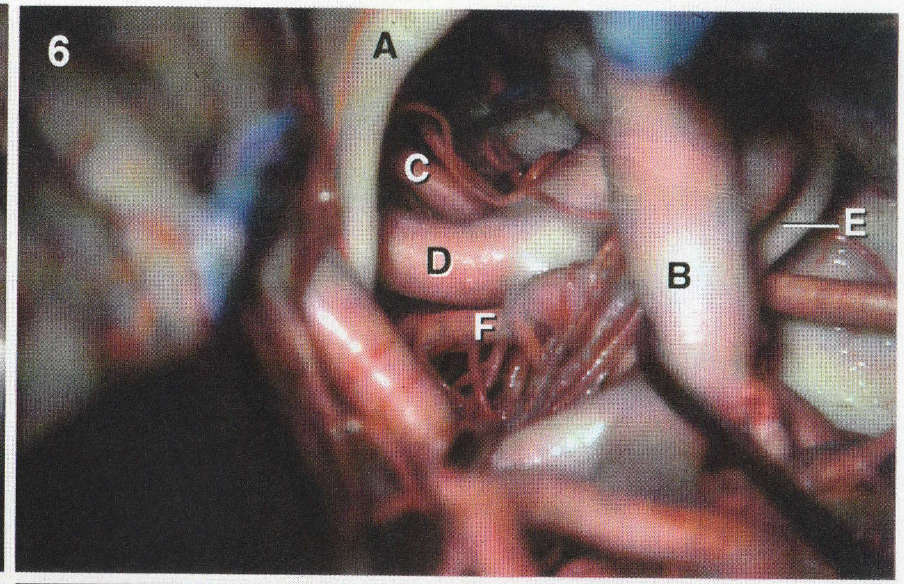
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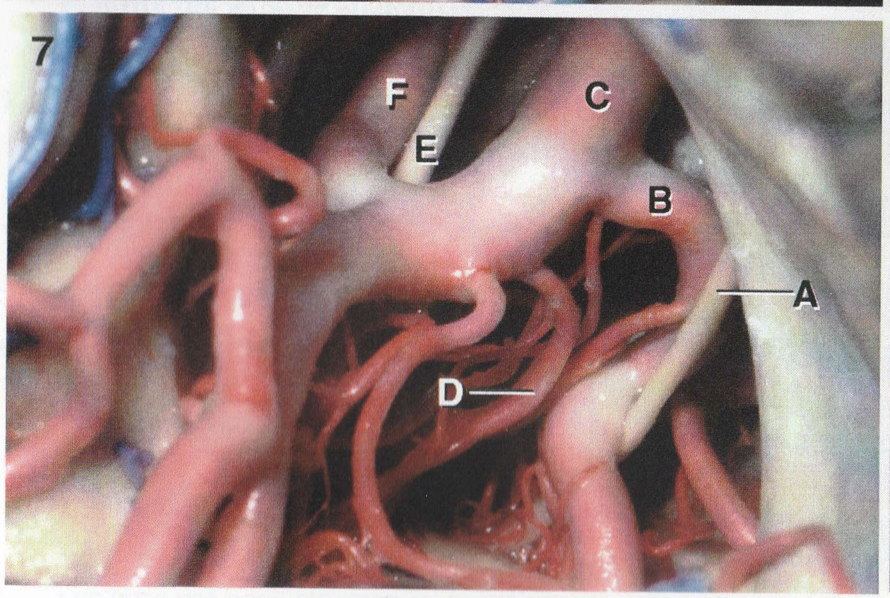
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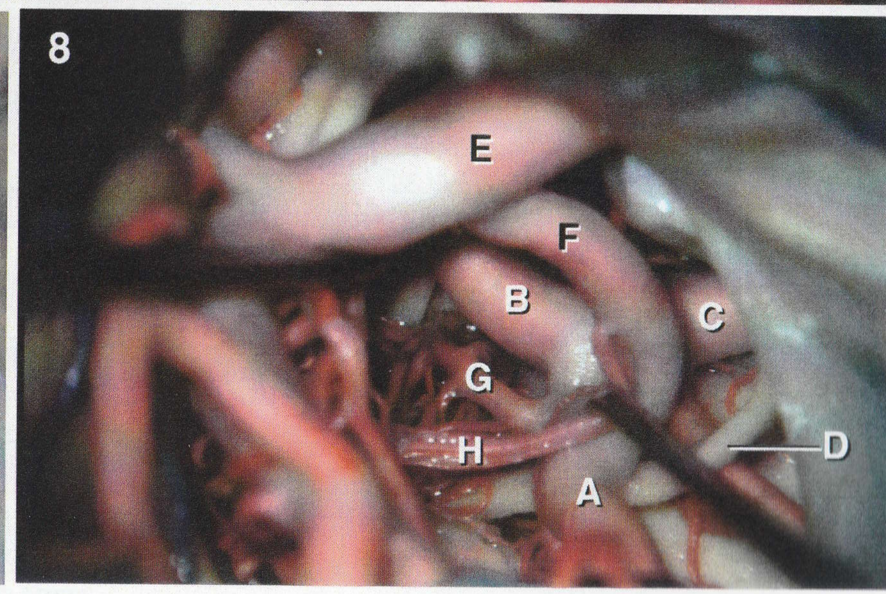
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9. The dura has been elevated from the lateral wall of the cavernous sinus.

Identify the lettered structures:

A. ____________________ **D.** ____________________
B. ____________________ **E.** ____________________
C. ____________________

10. The exposure has been extended posteriorly. The floor of the middle fossa lateral to the foramen ovale has been removed.

Identify the lettered structures:

A. ____________________ **D.** ____________________
B. ____________________ **E.** ____________________
C. ____________________ **F.** ____________________

11. The infratemporal fossa, located below the floor of the middle fossa, has been exposed and the upper head of the lateral pterygoid muscle has been removed. Branches of the mandibular nerve course among the pterygoid muscles.

Identify the lettered structures:

A. ____________________ **E.** ____________________
B. ____________________ **F.** ____________________
C. ____________________ **G.** ____________________
D. ____________________

12. The dura has been elevated further and the anterior clinoid process has been removed to expose the clinoid segment of the internal carotid artery.

Identify the lettered structures:

A. ____________________ **E.** ____________________
B. ____________________ **F.** ____________________
C. ____________________ **G.** ____________________
D. ____________________

13. The lateral pterygoid muscles have been reflected to expose the structures in the infratemporal fossa.

Identify the lettered structures:

A. ______________________ **E.** ______________________
B. ______________________ **F.** ______________________
C. ______________________ **G.** ______________________
D. ______________________

14. Enlarged view of the infratemporal fossa. The structures in the infratemporal fossa are the pterygoid muscles and venous plexus, maxillary artery, and a branch of the mandibular nerve.

15. The branches of the mandibular nerve, maxillary artery, and the pterygoid muscles have been removed to expose the levator veli palatini muscle and upper part of the cervical carotid.

Identify the lettered structures:

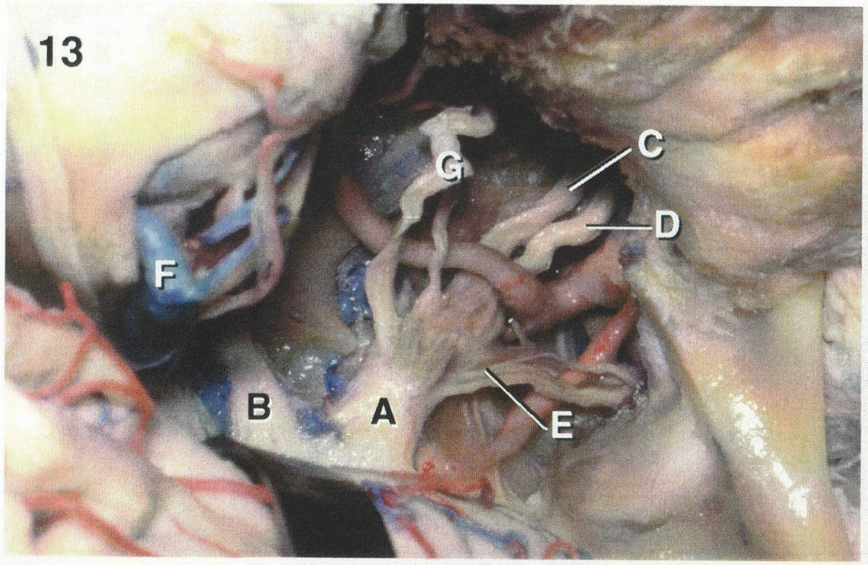
A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________

16. Bone has been removed to expose the geniculate ganglion, the site of origin of the greater petrosal nerve, the tensor tympani muscle, and the eustachian tube. The latter two structures are layered across the anterior margin of the petrous carotid.

Identify the lettered structures:

A. ______________________ **E.** ______________________
B. ______________________ **F.** ______________________
C. ______________________ **G.** ______________________
D. ______________________

13



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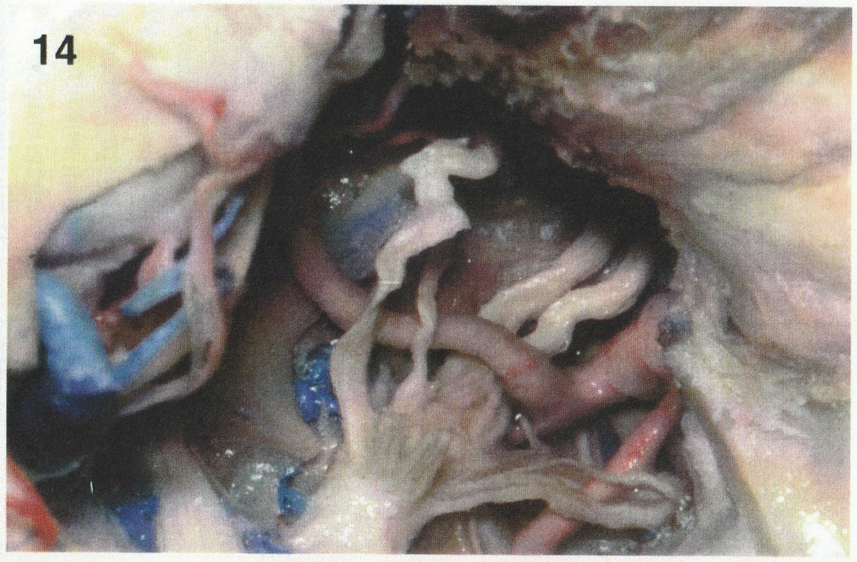

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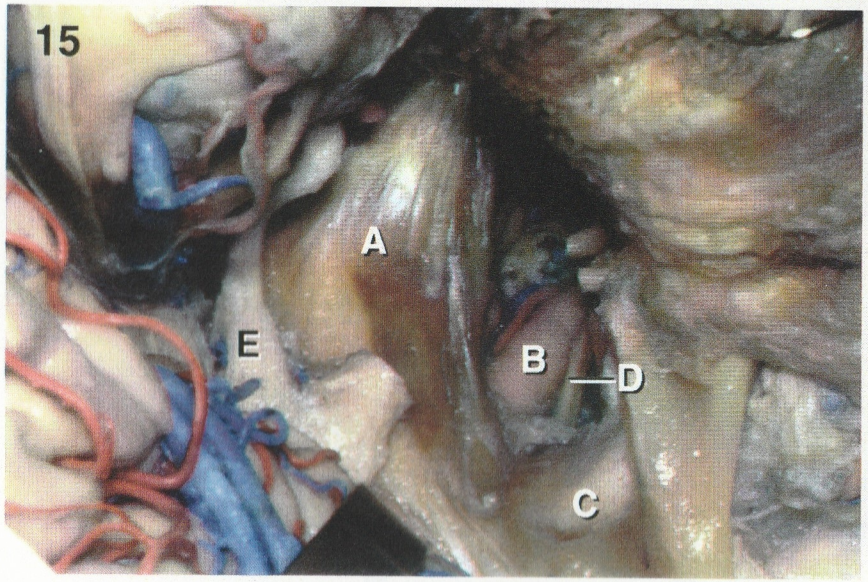

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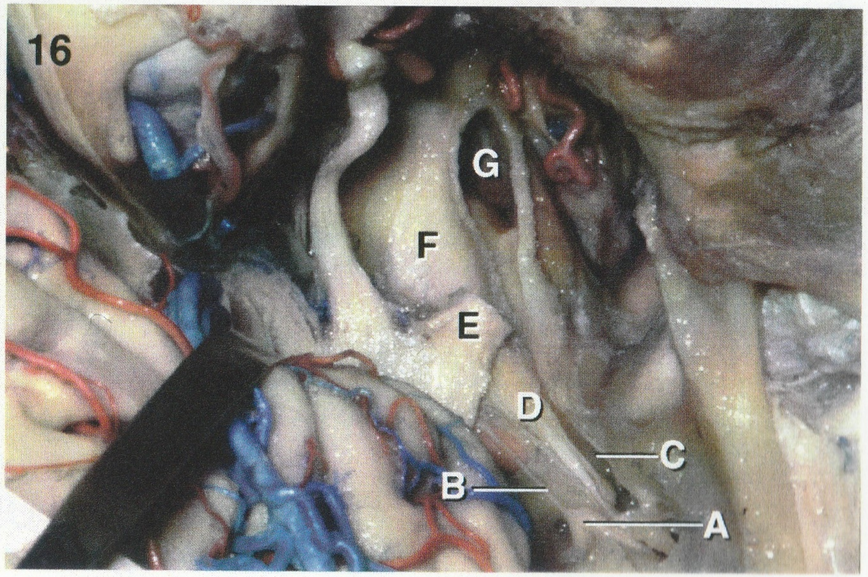


Answers (One-piece Orbitozygomatic Craniotomy)

Figure 1
A. Frontal bone
B. Zygomatic bone
C. Temporal bone
D. Superior temporal line

Figure 2
A. Keyhole
B. Pterion
C. Coronal suture
D. Squamosal suture

Figure 3
A. Frontal bone
B. Frontozygomatic suture
C. Zygomatic bone
D. Temporal bone
E. Pterion

Figure 5
A. Optic chiasm
B. A-1
C. Internal carotid artery
D. Posterior communicating artery
E. M-1
F. Sylvian vein
G. Pituitary stalk

Figure 6
A. Optic nerve
B. Internal carotid artery
C. SCA contralateral
D. PCA contralateral
E. Oculomotor nerve
F. Dominant thalamoperforating artery

Figure 7
A. Oculomotor nerve
B. Posterior communicating artery
C. Internal carotid artery
D. Anterior choroidal artery
E. Optic nerve
F. A-1

Figure 8
A. PCA ipsilateral
B. PCA contralateral
C. Basilar artery
D. Oculomotor nerve
E. Internal carotid artery
F. Posterior communicating artery
G. Posterior thalamoperforating artery
H. Anterior thalamoperforating artery

Figure 9
A. Dural layer over the oculomotor and trochlear nerves
B. Ophthalmic nerve
C. Maxillary nerve
D. Mandibular nerve
E. Optic nerve

Figure 10
A. Petrous carotid artery
B. Greater petrosal
C. Middle meningeal artery
D. Branches of mandibular nerve
E. Upper head lateral pterygoid muscle
F. Chorda tympani

Figure 11
A. Maxillary artery
B. Lower head lateral pterygoid muscle
C. Auriculotemporal nerve
D. Masseter nerve
E. Buccal nerve
F. Lateral pterygoid plate
G. Mandibular condyle

Figure 12
A. Optic nerve
B. Carotid artery (clinoid segment)
C. Oculomotor nerve
D. Trochlear nerve
E. Ophthalmic nerve
F. Maxillary nerve
G. Recurrent meningeal branch ophthalmic artery

Answers (One-piece Orbitozygomatic Craniotomy) Continued

Figure 13

A. Mandibular nerve
B. Maxillary nerve
C. Lingual nerve
D. Inferior alveolar nerve
E. Auriculotemporal nerve
F. Superior ophthalmic vein
G. Buccal nerve

Figure 15

A. Levator palatini muscle
B. Internal carotid artery
C. Mandibular condyle
D. Glossopharyngeal nerve
E. Maxillary nerve

Figure 16

A. Geniculate ganglion
B. Greater petrosal nerve
C. Eustachian tube
D. Tensor tympani muscle
E. Mandibular nerve
F. Cartilaginous part eustachian tube
G. Nasopharynx

Endonasal Approach to the Sella

Endonasal Approach to the Sella

1. Much of the frontal lobe has been removed to expose the anterior cranial fossa. Open the anterior cranial fossa floor in the midline between the orbits. Remove the frontal and ethmoid sinuses and expose the nasal septum from the area just above the nares back to the face of the sphenoid. A dissector has been placed along the course that the endonasal speculum will take.

   Identify the lettered structures:

   A. ______________________ **C.** ______________________
   B. ______________________ **D.** ______________________

2. View from above following the removal of the left orbit and upper part of the left maxillary sinus. The left alveolar process has been preserved as has been part of the nasal septum.

   Identify the lettered structures:

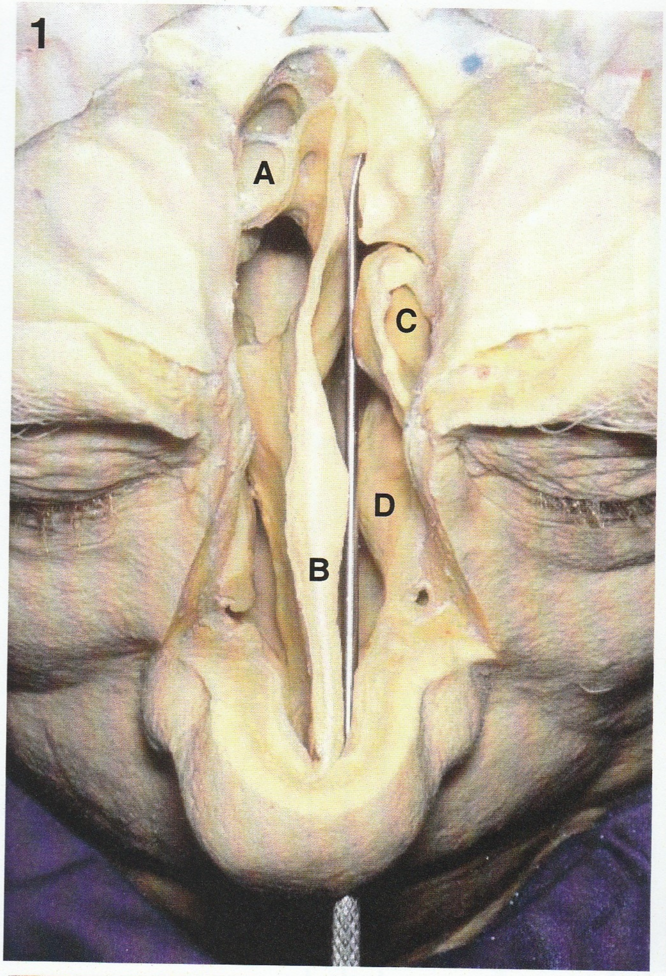
   A. ______________________ **C.** ______________________
   B. ______________________

3. The endonasal speculum has been advanced to the face of the sphenoid on the left side of the septum.

   Identify the lettered structures:

   A. ______________________ **B.** ______________________

4. The speculum has been opened so that the septum is displaced to the right of the midline. The speculum can be advanced in either nostril.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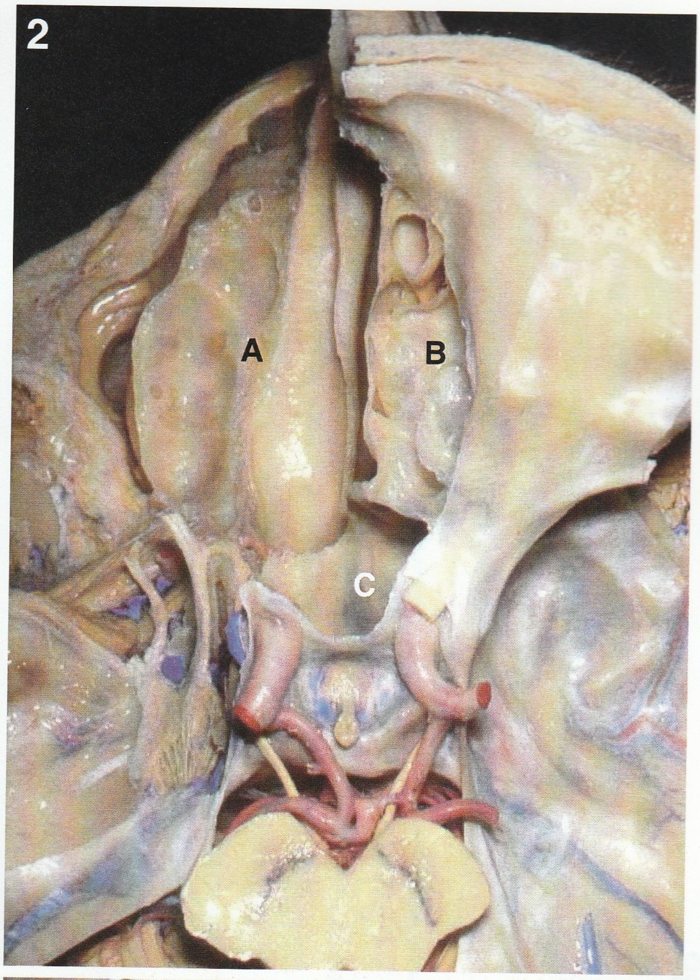
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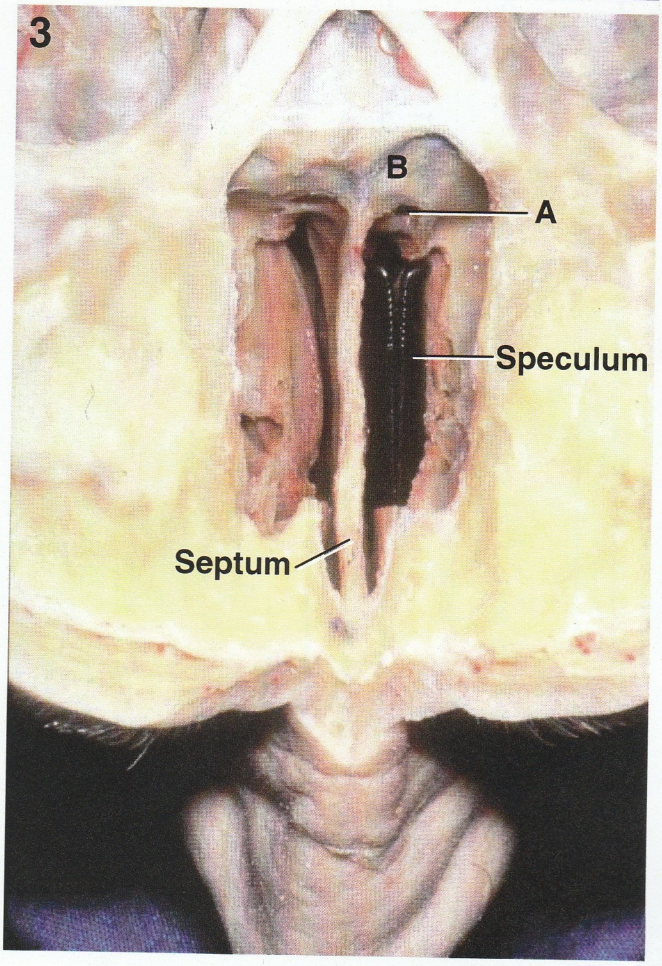
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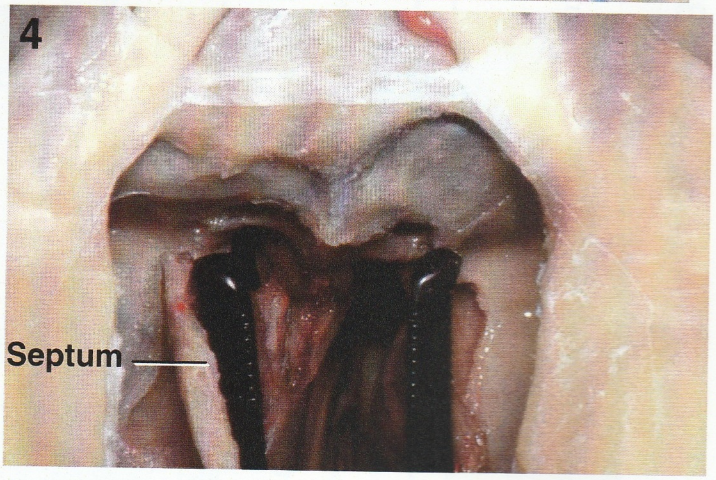
Speculum
Septum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Septum

5. The anterior part of the orbit and maxillary sinus has been removed to expose the nasal cavity and maxillary sinus.

Identify the lettered structures:

A. ______________________ **C.** ______________________

B. ______________________ **D.** ______________________

6. The lateral wall of the nasal cavity has been removed to expose the nasal septum.

Identify the bony structures forming the part of the nasal septum shown at each letter:

A. ______________________ **C.** ______________________

B. ______________________

7. The upper part of the nasal septum has been removed to expose the lateral wall of the right nasal cavity.

Identify the lettered structures:

A. ______________________ **D.** ______________________

B. ______________________ **E.** ______________________

C. ______________________

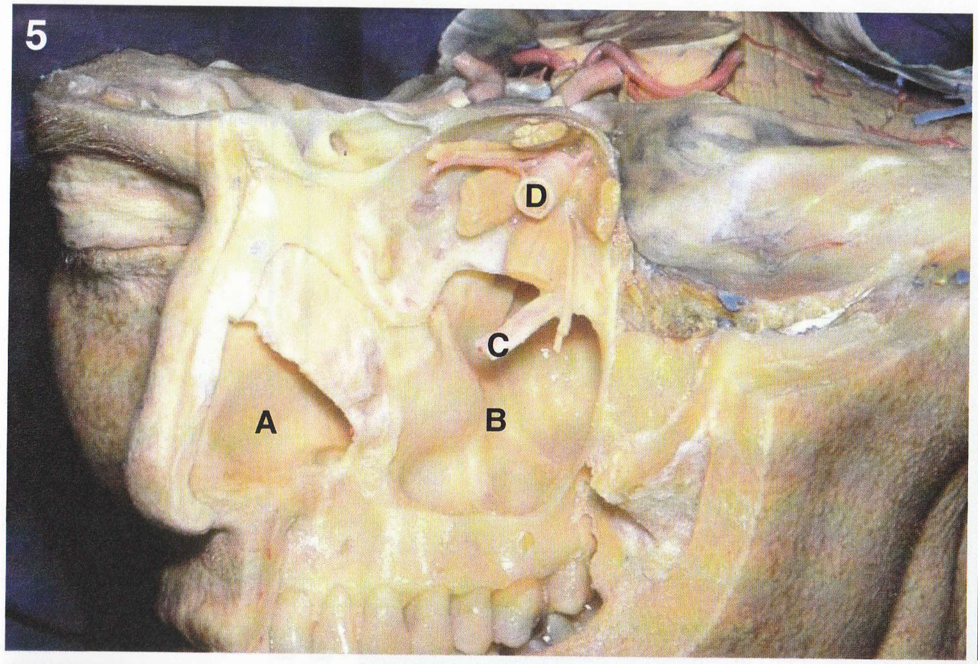
8. The anterior part of the superior and middle turbinate have been removed to expose the lateral wall of the nasal cavity.

Identify the lettered structures:

A. ______________________ **D.** ______________________

B. ______________________ **E.** ______________________

C. ______________________ **F.** ______________________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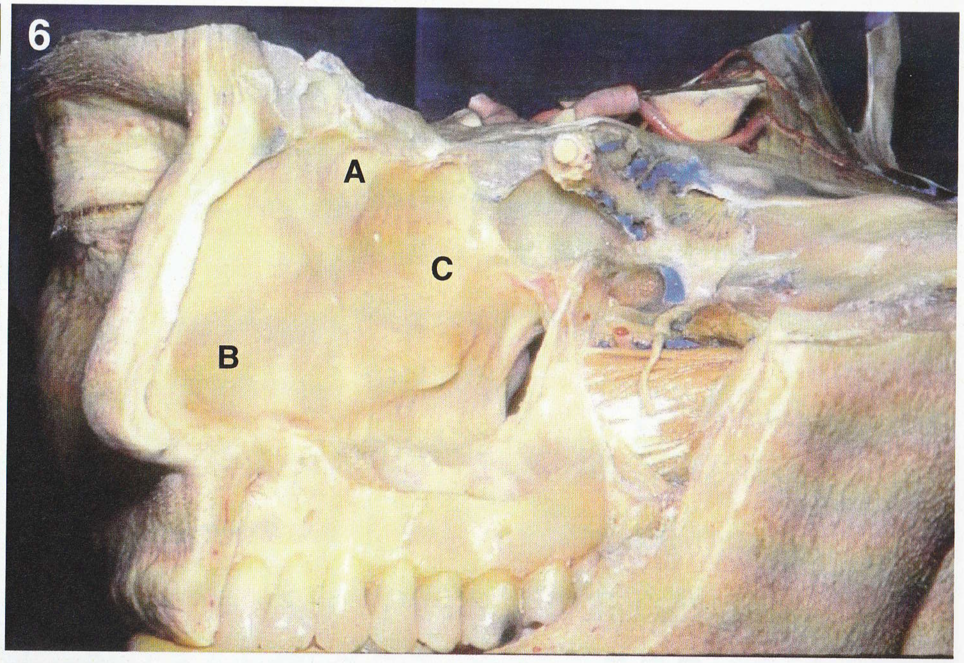
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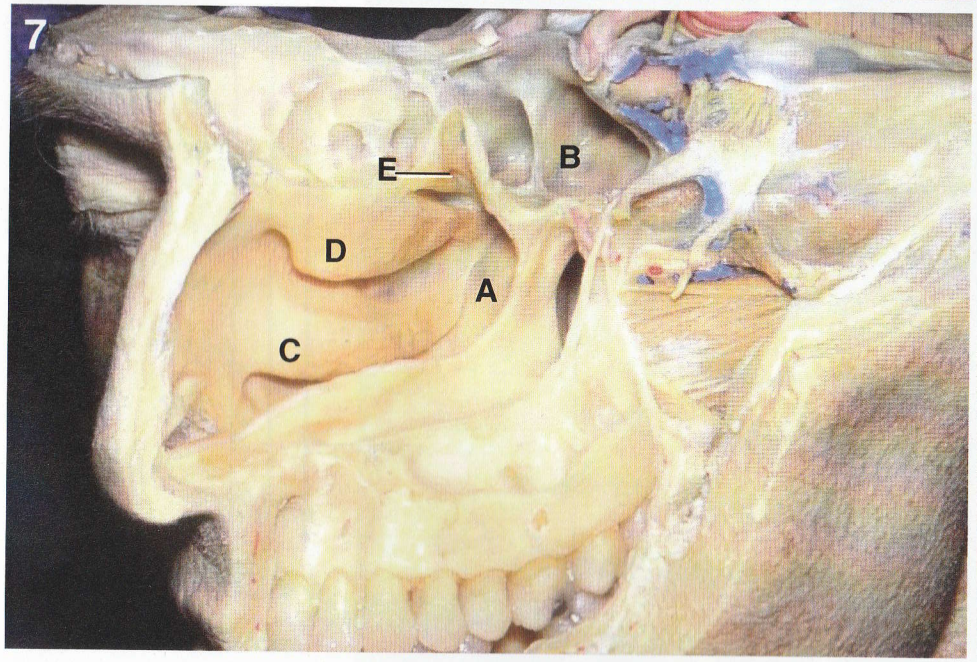
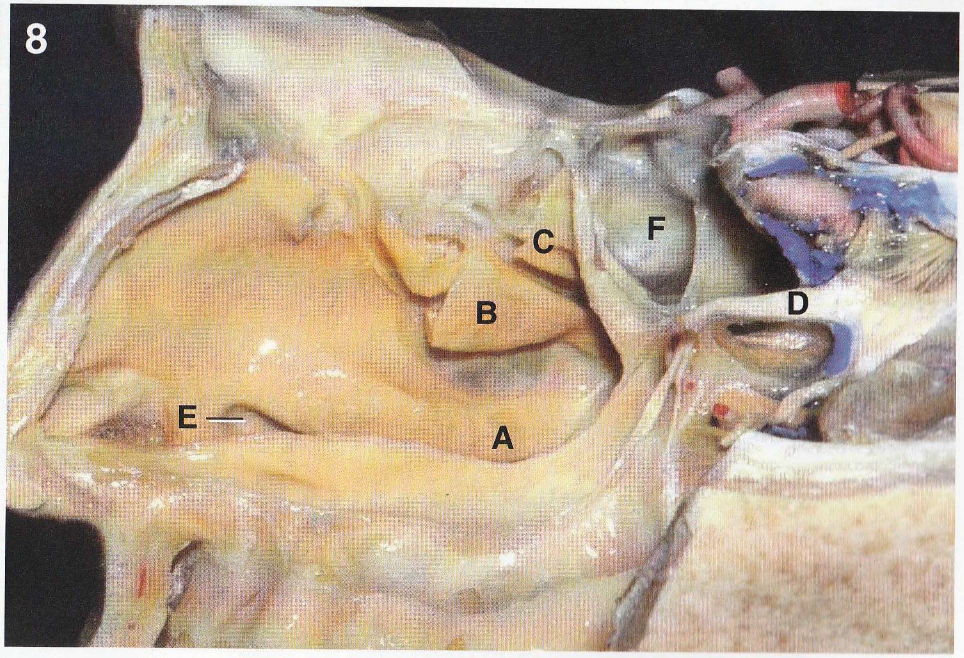
C
B


7
E
B
D
A
C


8
C
F
B
D
E
A

9. The endonasal speculum has been advanced to the face of the sphenoid sinus.

Identify the lettered structures:

A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________ **F.** ______________________

10. Lateral wall of the nasal cavity.

Identify the lettered structures:

A. ______________________ **E.** ______________________
B. ______________________ **F.** ______________________
C. ______________________ **G.** ______________________
D. ______________________

11. This is the midline view with the septum intact. The dotted line shows the area where the septum is separated from the face of the sphenoid.

12. The superior and middle turbinates have been removed.

Identify the lettered structures:

A. ______________________ **C.** ______________________
B. ______________________

13. The lateral wall of the nasal cavity has been removed to expose the ethmoid air cells in the wall of the orbit and the maxillary sinus below the orbit.

The letters are on the terminal branches of what arteries:

A. ______________________ **B.** ______________________

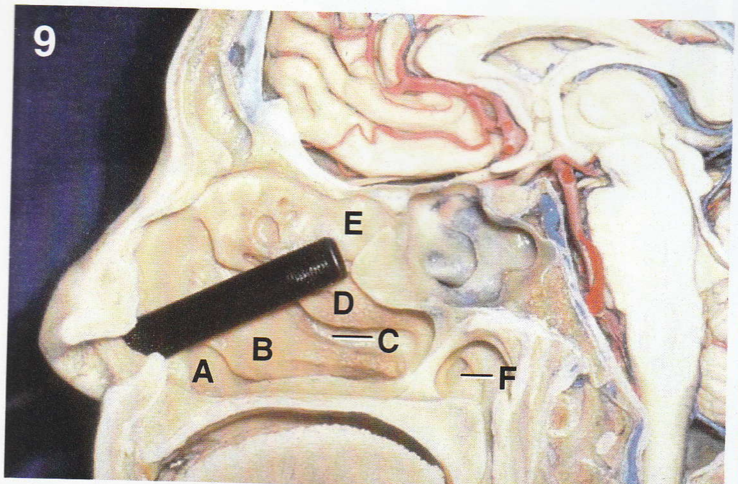
Identify the lettered structures:

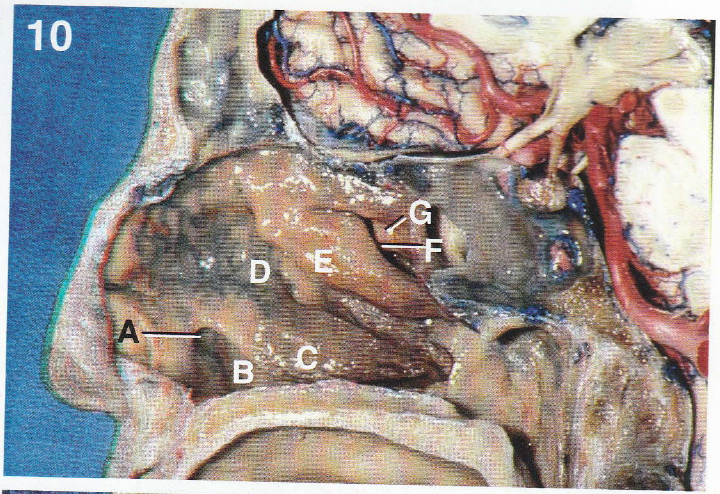
C. ______________________ **D.** ______________________

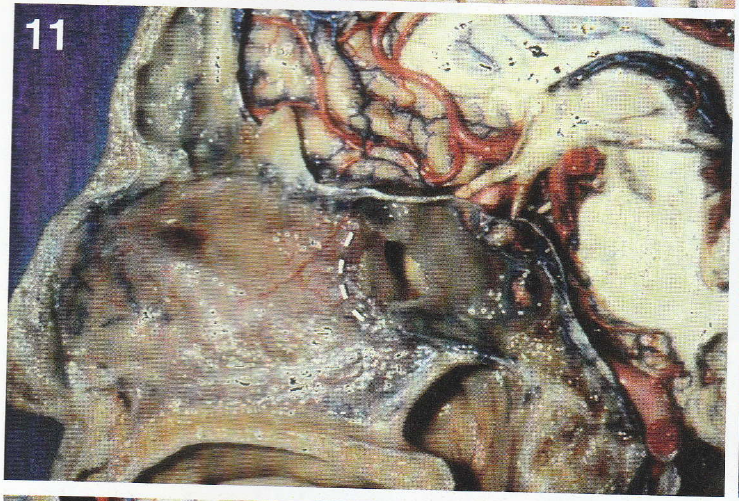
14. The lateral wall of the ethmoid air cells has been removed to expose the periorbita lateral to the nasal cavity. There are a number of prominences in the maxillary and sphenoid sinuses.

List the structures which the lettered prominences overlie:

A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________


9
E
D
C
B
A
F


10
G
F
E
D
A
B
C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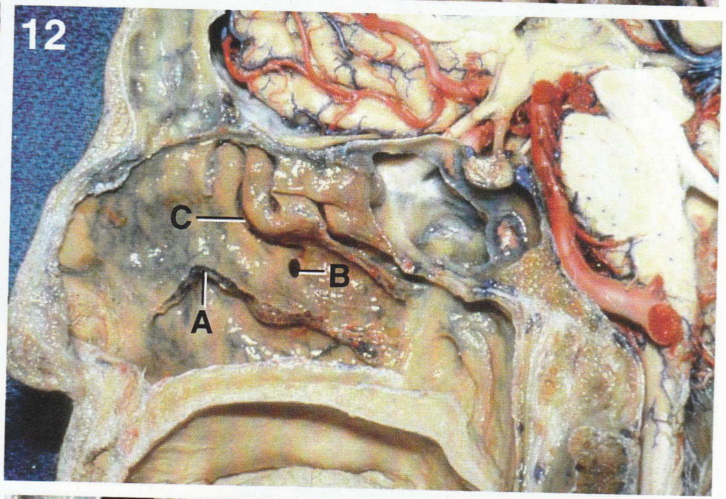
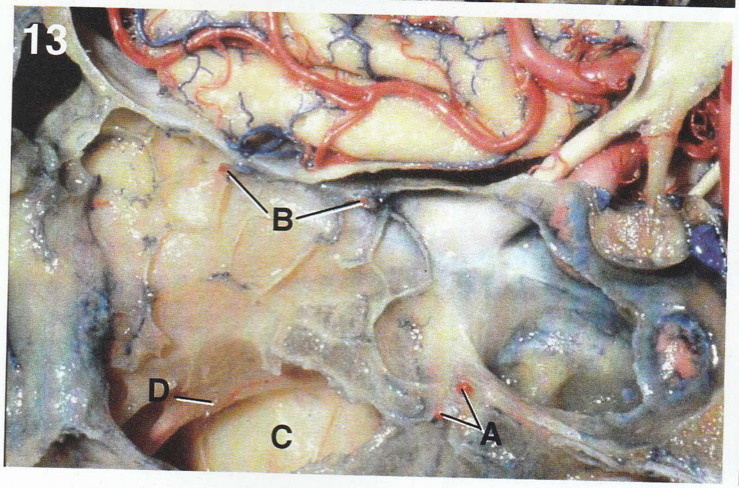
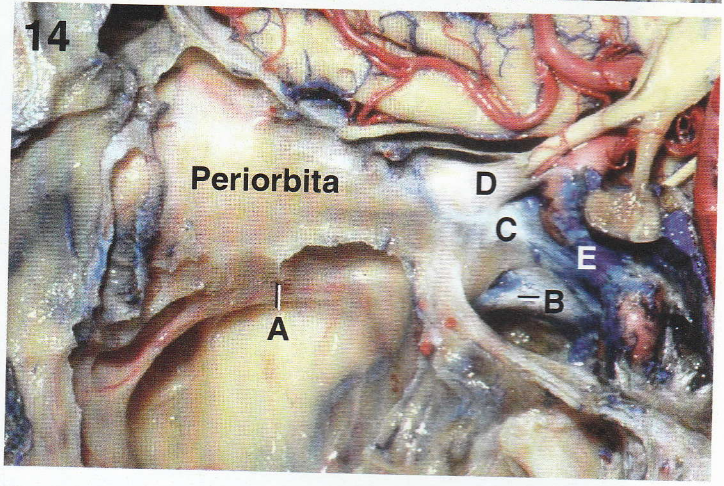

12
C
B
A


13
B
D
C
A


14
Periorbita
D
C
E
B
A

15. View of the floor of the anterior fossa with the orbital roof removed. The periorbita has been exposed.

List the nerves that can be seen through the periorbita after removing the bony roof of the orbit:

A. ____________________ **C.** ____________________
B. ____________________

16. The periorbita has been opened and the fat within the right orbit has been removed.

Identify the lettered structures:

A. ____________________ **C.** ____________________
B. ____________________ **D.** ____________________

17. Both orbits have been exposed.

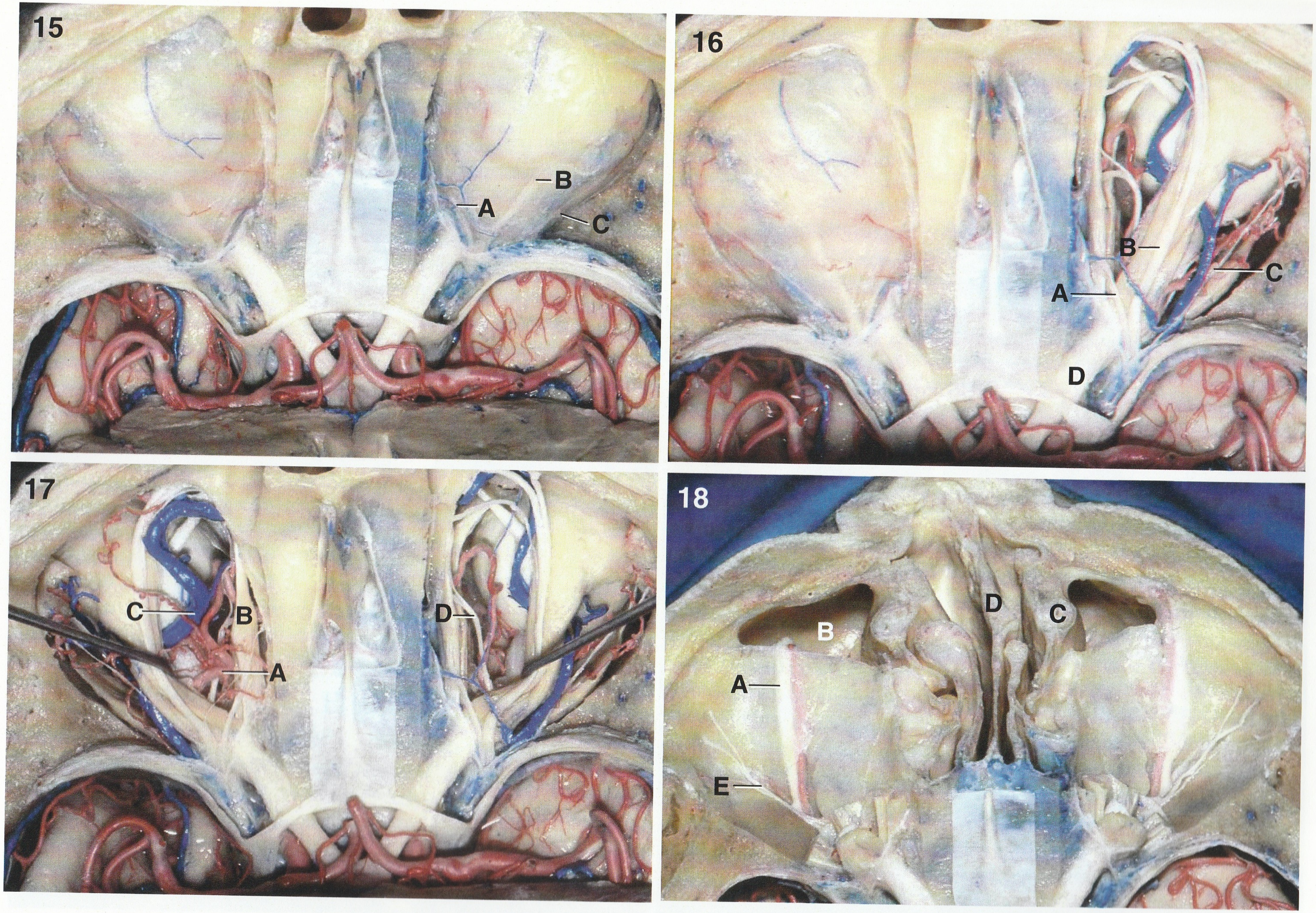
Identify the lettered structures:

A. ____________________ **C.** ____________________
B. ____________________ **D.** ____________________

18. The section has been extended through the anterior fossa, nasal cavity, and maxillary sinuses.

Identify the lettered structures:

A. ____________________ **D.** ____________________
B. ____________________ **E.** ____________________
C. ____________________


15
A
B
C
16
A
B
C
D
17
A
B
C
D
18
A
B
C
D
E

19. Anterior view of dissection shown in Figure 18. The dissection extends through the orbit, nasal cavity, and maxillary sinus.

Identify the lettered structures:

A. ______________________ **D.** ______________________
B. ______________________ **E.** ______________________
C. ______________________

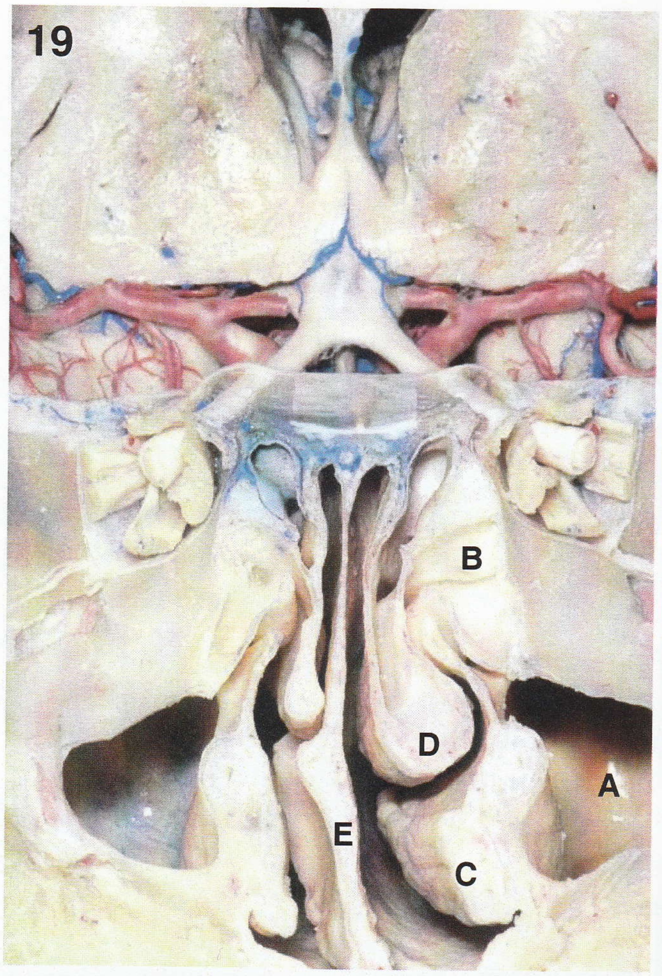
20. The posterior part of the septum has been removed to expose the body of the sphenoid and the sphenoid ostia.

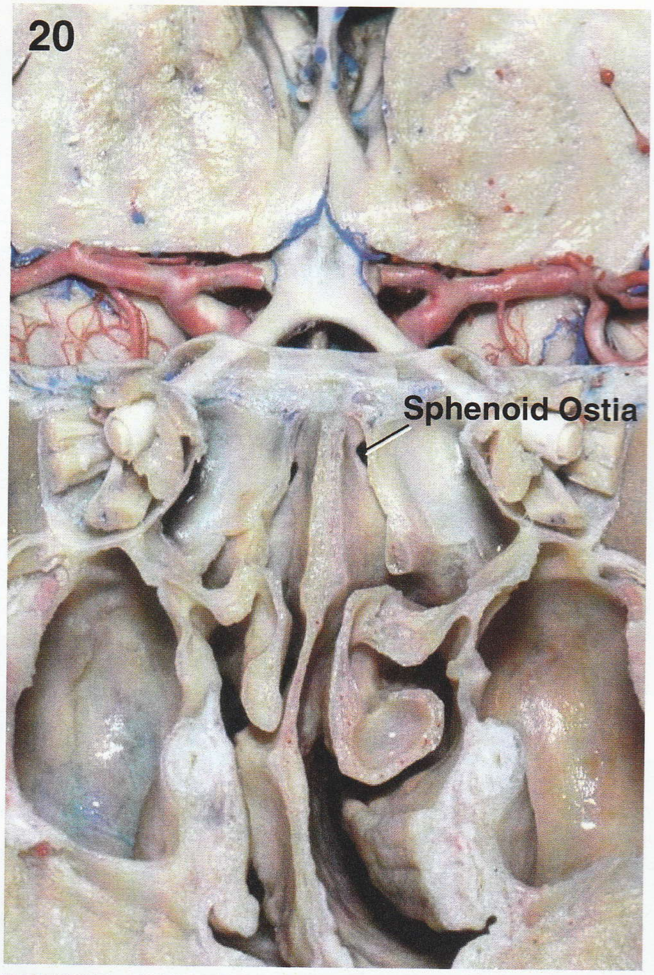
21. The sphenoid sinus has been opened.

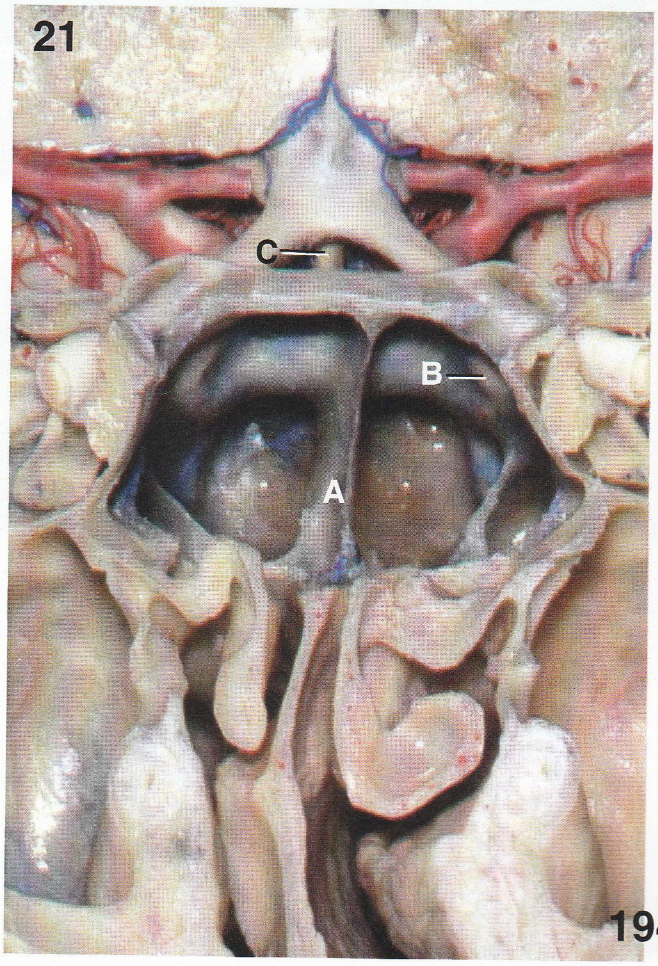
Identify the lettered structures:

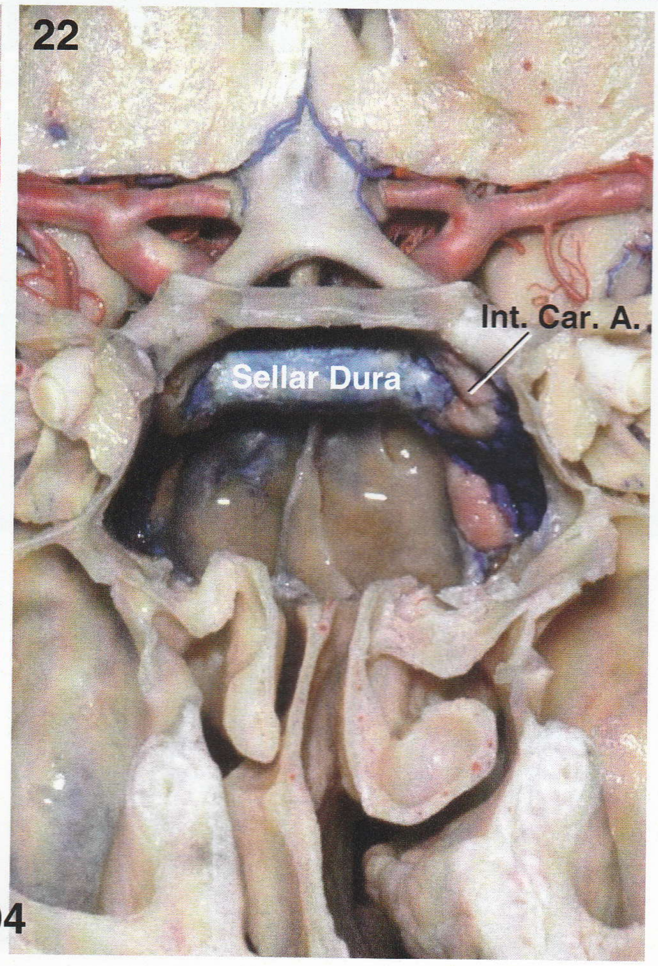
A. ______________________ **C.** ______________________
B. ______________________

22. The bone over the sella and along the medial wall of the cavernous sinus has been removed to expose the sellar dura and the cavernous segment of the internal carotid artery.


19
B
D
A
E
C


20
Sphenoid Ostia


21
C
B
A


22
Int. Car. A.
Sellar Dura

23. Another specimen, in which a section has been extended through the nasal cavity and maxillary sinus, shows the relationships at the front of the sphenoid sinus.

Identify the lettered structures:

A. ______________________ **C.** ______________________
B. ______________________

24. The turbinates have been removed to expose the ostia and the junction of the vomer with the face of the sphenoid bone.

25. Enlarged view.

26. The face of the sphenoid has been opened to identify the sphenoid septi. These septi are often not located in the midline. A better determinate of the midline is the spike on the face of the sphenoid. Note in Figure 25 that the vomer attaches to the face of the sphenoid strictly in the midline, so it is to be used to line up the nasal speculum in the midline rather than using the septae within the sinus as the predictor of the midline.

27. The bone in front of the cavernous sinus and sella has been removed.

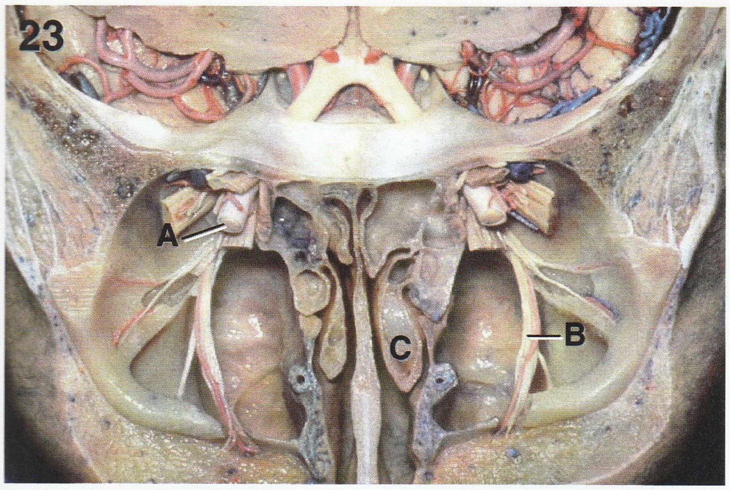
Identify the lettered structures:

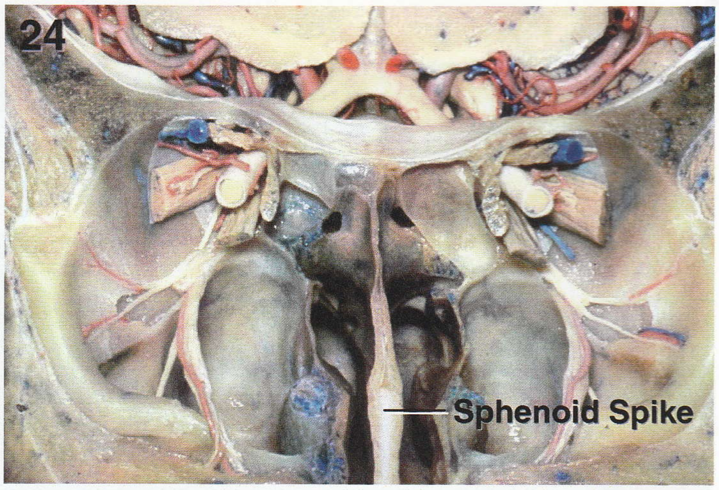
A. ______________________ **C.** ______________________
B. ______________________ **D.** ______________________

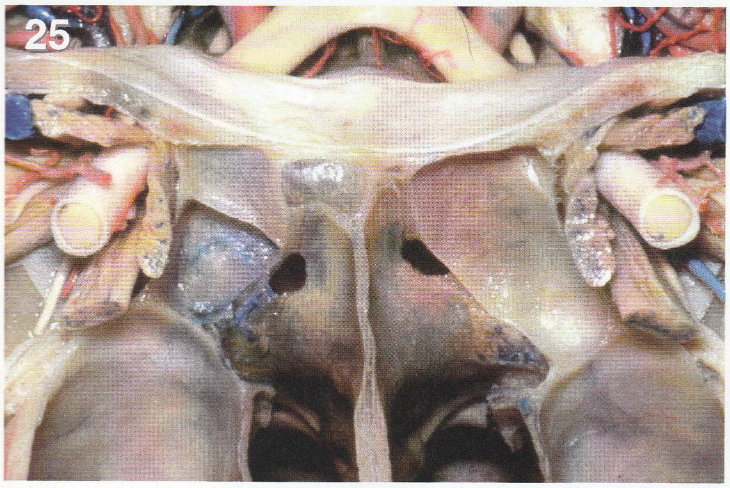
28. The optic chiasm has been elevated to expose the pituitary gland.

Identify the lettered structures:

A. ______________________ **C.** ______________________
B. ______________________


23
A
C
B


24
Sphenoid Spike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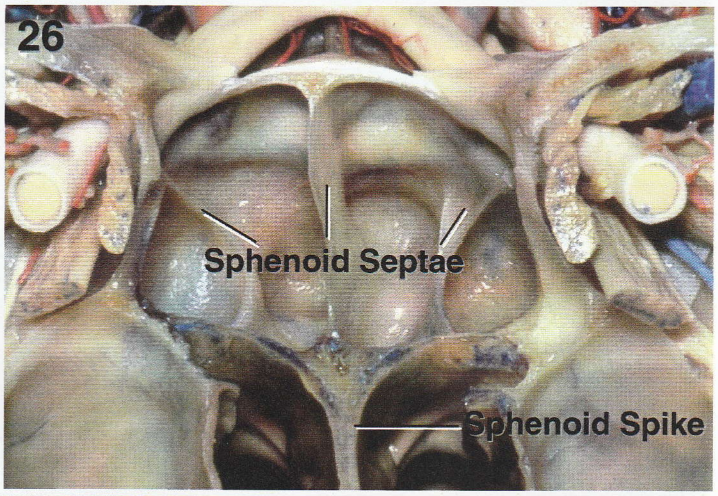
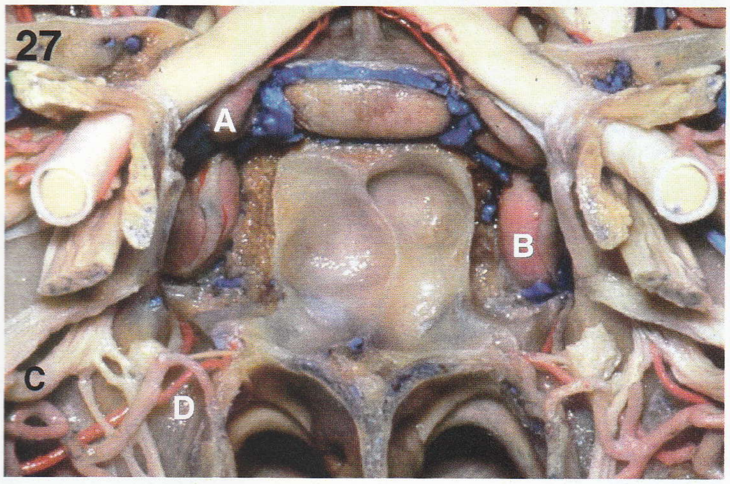
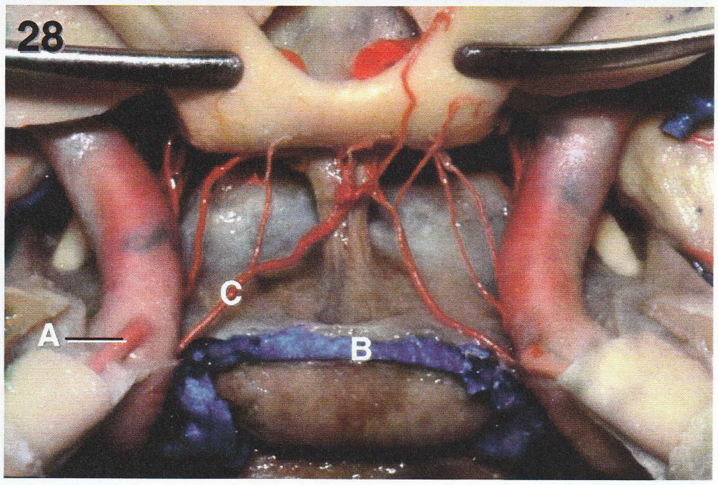
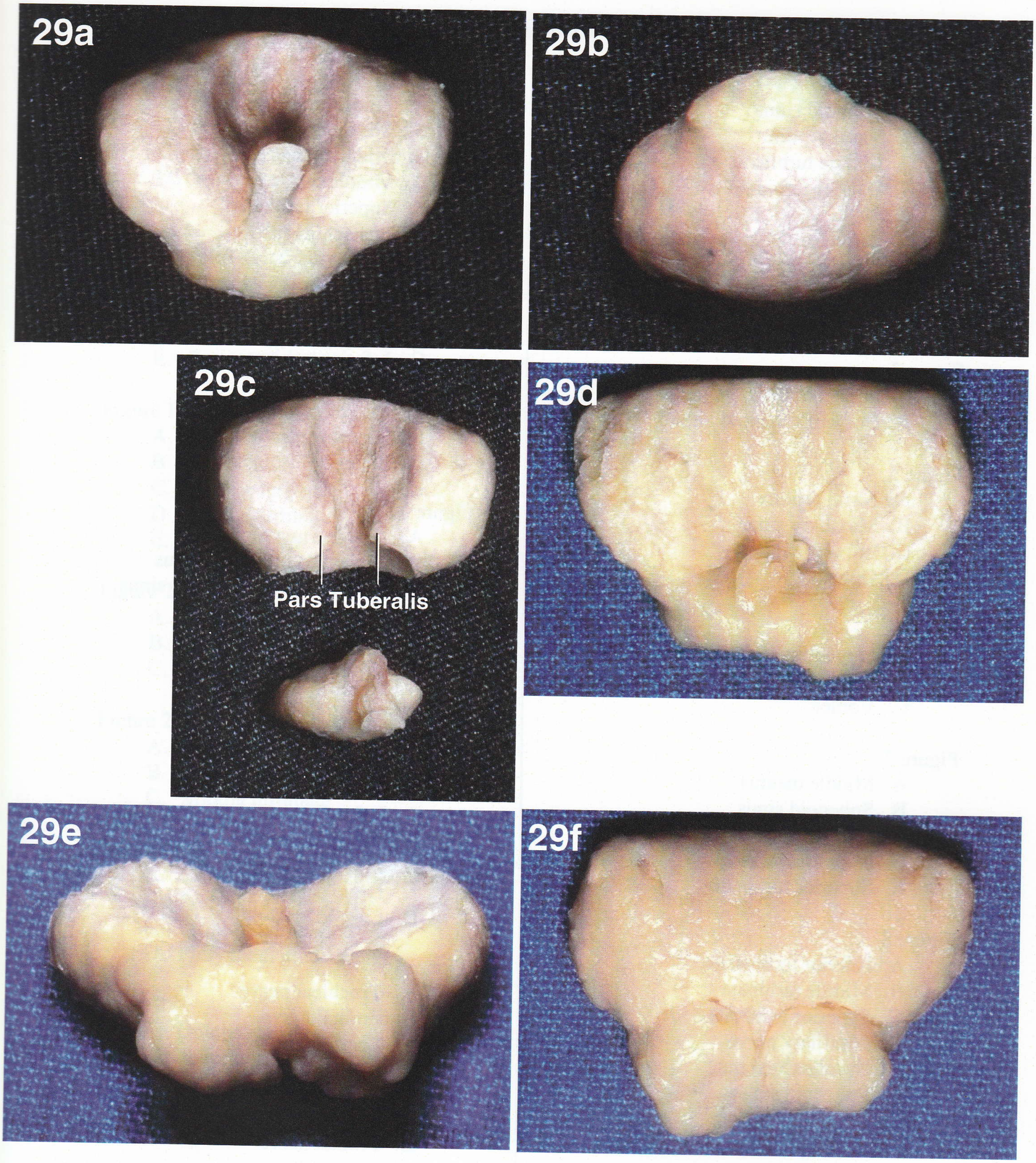

26
Sphenoid Septae
Sphenoid Spike


27
A
B
C
D


28
C
A
B

29. A-C. Upper and lower surfaces of the pituitary gland. In your dissection, try to separate the anterior and posterior lobes while preserving the stalk and pars tuberalis, which wraps around the lower part of the stalk.

D-F. Superior, posterior, and inferior views of another pituitary gland. Note the different shapes of the glands shown in A-C and D-F.


29a
29b
29c
Pars Tuberalis
29d
29e
29f

Answers (Endonasal Approach to the Sella)

Figure 1
A. Ethmoid sinus
B. Nasal septum
C. Middle turbinate
D. Inferior turbinate

Figure 2
A. Floor of maxillary sinus
B. Ethmoid air cells
C. Body of sphenoid bone

Figure 3
A. Sphenoid ostia
B. Body of sphenoid bone

Figure 5
A. Nasal septum
B. Maxillary sinus
C. Infraorbital nerve
D. Optic nerve

Figure 6
A. Perpendicular plate of ethmoid
B. Septal cartilage
C. Vomer

Figure 7
A. Middle meatus
B. Sphenoid sinus
C. Inferior turbinate
D. Middle turbinate
E. Superior turbinate

Figure 8
A. Inferior turbinate
B. Middle turbinate
C. Superior turbinate
D. Maxillary nerve
E. Nasolacrimal duct
F. Sphenoid sinus

Figure 9
A. Inferior meatus
B. Inferior turbinate
C. Middle meatus
D. Middle turbinate
E. Superior turbinate
F. Eustachian tube

Figure 10
A. Nasolacrimal duct
B. Inferior meatus
C. Inferior turbinate
D. Middle meatus
E. Middle turbinate
F. Superior meatus
G. Superior turbinate

Figure 12
A. Nasolacrimal duct
B. Ostium of maxillary sinus
C. Drainage path of frontal sinus

Figure 13
A. Maxillary artery
B. Ophthalmic artery
C. Maxillary sinus
D. Infraorbital nerve

Figure 14
A. Infraorbital nerve
B. Maxillary nerve
C. Superior orbital fissure
D. Optic nerve
E. Carotid artery

Figure 15
A. Trochlear nerve
B. Frontal nerve
C. Lacrimal nerve

Figure 16
A. Trochlear nerve
B. Frontal nerve
C. Lacrimal nerve
D. Optic nerve

Answers (Endonasal Approach to the Sella) continued

Figure 17

A. Ophthalmic artery
B. Superior oblique muscle
C. Superior ophthalmic vein
D. Nasociliary nerve

Figure 18

A. Infraorbital nerve
B. Maxillary sinus
C. Nasolacrimal duct
D. Nasal Septum
E. Zygomatic nerve

Figure 19

A. Maxillary sinus
B. Ethmoid sinus
C. Inferior turbinate
D. Middle turbinate
E. Nasal septum

Figure 21

A. Sphenoid septum
B. Cavernous segment carotid artery
C. Pituitary stalk

Figure 23

A. Optic nerve
B. Infraorbital nerve
C. Middle turbinate

Figure 27

A. Cavernous carotid artery
B. Petrous carotid artery
C. Infraorbital nerve
D. Pterygopalatine fossa

Figure 28

A. Ophthalmic artery
B. Anterior intercavernous sinuses
C. Superior hypophyseal artery