MEDICAL EDUCATION RESOURCE

Cranial Cavity

Introduction

- The cranial cavity contains the brain, meninges, dural venous sinuses, cranial nerves, parts of the internal carotid and vertebral arteries, and organs for special senses.
- The anterior branch of the middle meningeal artery runs beneath the pterion and can rupture ? extradural (epidural) hematoma.

Contents of the Cranial Cavity

- The roof (vault) is smooth; the base is irregular and divided into anterior, middle, and posterior cranial fossae supporting the brain.
- Three meninges: dura (outer), arachnoid (middle), pia (inner).
- Potential subdural space between dura–arachnoid; true subarachnoid space between arachnoid–pia contains CSF and cerebral vessels.

Dissection (key steps)

- Remove the calvaria about 1 cm above orbital margins and inion; protect the thin temporal bone; free the endosteal dura carefully.
- Detach falx cerebri from crista galli; sequentially divide optic nerve, internal carotid artery, pituitary stalk; then cranial nerves III and IV along the free edge of the tentorium; release tentorium from petrous ridges.
- Cut cranial nerves V–VIII, then IX–XII; divide vertebral arteries at the foramen magnum; lift out brain with meninges.

- On the specimen, open ventral dura to display dural folds: falx cerebri, tentorium cerebelli, falx cerebelli, diaphragma sellae.

Cerebral Dura Mater

- Tough outer meninx with two layers:
    - **Endosteal (periosteal) layer** lines the inner skull and is continuous with periosteum through sutures and foramina; adherent at sutures, skull base, and foramen magnum; contributes to nerve sheaths (e.g., optic sheath).
    - **Meningeal layer** is the true dural covering of brain; continuous with spinal dura; forms dural folds—**falx cerebri**, **tentorium cerebelli**, **falx cerebelli**, **diaphragma sellae**.
- Venous sinuses lie where the two layers separate; they drain most intracranial venous blood.

Clinical Anatomy (high-yield)

- **Extradural hematoma**: rupture of anterior branch of middle meningeal artery at pterion; classic lucid interval may occur.
- **Cavernous sinus syndrome**: cavernous sinus receives ophthalmic veins and communicates with facial vein and pterygoid plexus via valveless channels; thrombosis can follow facial infections (“dangerous area”), producing severe orbital pain and ophthalmoplegia (III, IV, VI palsies).
- **Vertebral venous plexus spread**: valveless vertebral/basilar plexuses allow pelvic tumors (e.g., prostate) to seed intracranial structures.

Venous Sinuses of Dura Mater

- Venous sinuses are endothelial-lined channels between the two layers of dura mater.
- They lack valves and muscular walls.
- They drain venous blood from the brain, meninges, and skull bones.
- Some sinuses also receive cerebrospinal fluid via arachnoid villi.
- Emissary veins connect intracranial sinuses with extracranial veins — maintaining pressure balance.
- Total sinuses: **23** — **8 paired** and **7 unpaired**.

Paired Sinuses

1. Cavernous sinus
2. Superior petrosal sinus
3. Inferior petrosal sinus
4. Transverse sinus
5. Sigmoid sinus
6. Sphenoparietal sinus
7. Petrosquamous sinus
8. Middle meningeal sinus/veins

Unpaired Sinuses

1. Superior sagittal sinus
2. Inferior sagittal sinus
3. Straight sinus
4. Occipital sinus
5. Anterior intercavernous sinus
6. Posterior intercavernous sinus
7. Basilar plexus

Cavernous Sinus

Location and Extent

- Found on either side of the body of sphenoid bone in the middle cranial fossa.
- Extends from the superior orbital fissure to the apex of the petrous temporal bone.

Structure and Relations

- Contains a meshwork of venous channels (cavernous appearance).
- **Lateral wall (superior to inferior)**:
    - Oculomotor nerve (III)
    - Trochlear nerve (IV)
    - Ophthalmic division of trigeminal (V1)

    - Maxillary division of trigeminal (V2)

- **Within the sinus** (medial aspect):
    - Internal carotid artery surrounded by sympathetic plexus
    - Abducent nerve (VI)
- **Medial wall**: body of sphenoid and pituitary gland.
- **Roof**: formed by the dura of the middle cranial fossa.

Tributaries (Incoming)

- From orbit:
    - Superior ophthalmic vein
    - Branch or entire inferior ophthalmic vein
    - Central vein of retina (sometimes directly)
- From brain:
    - Superficial middle cerebral vein
    - Inferior cerebral veins from temporal lobe
- From meninges:
    - Sphenoparietal sinus
    - Frontal trunk of middle meningeal vein

Drainage (Outgoing)

- To transverse sinus via **superior petrosal sinus**
- To internal jugular vein via **inferior petrosal sinus** and venous plexus around internal carotid artery
- To **pterygoid venous plexus** via emissary veins through foramen ovale, foramen lacerum, and sphenoidal emissary foramen
- To **facial vein** through the superior ophthalmic vein
- Communicates with opposite side via **intercavernous sinuses** and **basilar plexus**
- All connections are valveless; blood flow can be bidirectional.

Mechanisms Aiding Drainage

- Pulsation of internal carotid artery
- Gravity
- Position of head

Clinical Anatomy

- **Cavernous sinus thrombosis**:
    - Caused by infections from the face (“dangerous area”), nasal cavities, or sinuses.
    - **Symptoms**:
        - Severe pain in the eye and forehead (ophthalmic nerve area)

        - Paralysis of ocular muscles (III, IV, VI) ? ophthalmoplegia
        - Eyelid and corneal edema, exophthalmos (due to venous congestion)

- **Carotico-cavernous fistula**:
    - Injury to internal carotid within sinus may produce pulsating, protruding eyeball (pulsating exophthalmos).

Superior Sagittal Sinus

Location

- Lies in the attached upper convex border of falx cerebri.
- Begins anteriorly at crista galli (by union of meningeal veins) and may connect with nasal veins via foramen caecum.
- Runs upward and backward, enlarging as it goes, and ends near internal occipital protuberance by turning usually to the right ? becomes continuous with the right transverse sinus.
- Joins with other sinuses at the **confluence of sinuses**.

Interior Features

- Openings of superior cerebral veins
- Openings of venous lacunae (usually three on each side)
- Arachnoid villi and granulations projecting into sinus and lacunae
- Fibrous bands crossing its inferior angle

Tributaries

- Superior cerebral veins (directly open into sinus)
- Parietal emissary veins
- Venous lacunae receiving diploic and meningeal veins before joining the sinus
- Occasionally nasal vein via patent foramen caecum

Clinical Anatomy

- **Superior sagittal sinus thrombosis**:
    - Caused by spread of infection from scalp, nasal cavity, or diploic veins.
    - **Effects**:
        - Raised intracranial pressure due to impaired CSF absorption
        - Delirium or convulsions from venous congestion of cerebral cortex
        - Upper motor neuron paraplegia due to bilateral paracentral lobule involvement (area for lower limb and perineum)

Straight Sinus

- Lies in the median plane at the junction of the **falx cerebri** and **tentorium cerebelli**.
- **Formation**: by the union of the **inferior sagittal sinus** and **great cerebral vein**.

- **Termination**: continues posteriorly to the **internal occipital protuberance**, where it joins the **transverse sinus** (usually the left).
- **Tributaries**: receives **superior cerebellar veins**.
- A **ball-valve–like sinusoidal plexus** at the great cerebral vein opening regulates CSF flow.

Transverse Sinuses

- Paired large sinuses along the **posterior part of the attached margin of the tentorium cerebelli**.
- **Right sinus** is usually a continuation of the **superior sagittal sinus**, and **left sinus** continues the **straight sinus**.
- Each runs from the **internal occipital protuberance** to the **posteroinferior angle of the parietal bone**, then curves downward to become the **sigmoid sinus**.
- **Tributaries**:
    1. Superior petrosal sinus
    2. Inferior cerebral veins
    3. Inferior cerebellar veins
    4. Diploic (posterior temporal) vein
    5. Inferior anastomotic vein

Sigmoid Sinuses

- S-shaped sinuses that are direct continuations of the **transverse sinuses**.
- Extend from the **posteroinferior angle of the parietal bone** to the **posterior part of the jugular foramen**, where they become the **superior bulb of the internal jugular vein**.
- Groove the **mastoid part of the temporal bone**, separated from mastoid air cells by a thin plate of bone.
- **Tributaries**:
    1. Mastoid and condylar emissary veins
    2. Cerebellar veins
    3. Internal auditory vein

Clinical Anatomy

- **Sigmoid sinus thrombosis** usually follows **middle ear infection** or **mastoiditis**.
- During **mastoid surgery**, caution is needed to avoid exposing or injuring the sinus.

Hypophysis Cerebri (Pituitary Gland)

Location and Description

- Lies in the **hypophyseal fossa (sella turcica)** of the sphenoid bone.
- Roofed by the **diaphragma sellae**; its **stalk (infundibulum)** pierces this roof to connect with the **floor of the third ventricle**.
- **Shape**: oval; **Size**: 8 mm anteroposterior × 12 mm transverse; **Weight**: ~500 mg.

- Known as the **master gland** because it regulates several other endocrine glands.

Dissection

- Identify and incise the **diaphragma sellae** over the hypophyseal fossa.
- Remove the gland carefully and examine under magnification.

Relations

- **Superior**: Diaphragma sellae, optic chiasma, tuber cinereum, infundibular recess of third ventricle.
- **Inferior**: Venous channels between dural layers lining the fossa.
- **Inferior to fossa**: Sphenoidal air sinuses.
- **Lateral**: Cavernous sinuses and their contents.

Subdivisions / Parts and Development

Parts

1. **Adenohypophysis (anterior lobe)**
    - **Pars distalis / anterior lobe** – largest part, secretes most pituitary hormones.
    - **Pars intermedia** – thin strip separated by a cleft (remnant of Rathke's pouch).
    - **Pars tuberalis** – wraps around the infundibular stalk.
2. **Neurohypophysis (posterior lobe)**

- **Pars nervosa** – stores and releases ADH and oxytocin from hypothalamic neurons.
- **Infundibulum** – stalk connecting gland to hypothalamus.

Development

- **Adenohypophysis** arises from **Rathke's pouch**, an ectodermal outgrowth from the roof of the primitive mouth (stomodeum).
- **Neurohypophysis** develops as a **downward extension of the diencephalon**.
- Both fuse and remain connected to the hypothalamus via the **infundibulum**.
- Pituitary formation is regulated by specific **transcription and growth factors**; their disruption leads to **developmental anomalies and hormonal defects**.

Molecular Regulation

- Development of the pituitary gland is controlled by a precise sequence of **transcription and growth factors**.
- These molecular signals guide:
  - **Formation of Rathke's pouch** (the primordium of adenohypophysis).
  - **Alignment and fusion** of anterior and posterior lobes.
  - **Cell differentiation** of hormone-producing cells in both lobes.
  - **Hormonal regulation** by hypothalamic influence.

- Disturbance of these regulatory genes leads to **congenital pituitary malformations** and **hormonal imbalances** such as hypopituitarism or ectopic pituitary tissue.

Histology of the Pituitary Gland

Anterior Lobe (Adenohypophysis)

- Constitutes about 75% of the gland.
- Two major cell types:
    1. **Chromophils (50%)** — hormone-secreting cells.
        - **Acidophils (?-cells, ~43%)**
            - *Somatotrophs*: secrete Growth Hormone (GH).
            - *Mammotrophs*: secrete Prolactin (PRL).
        - **Basophils (?-cells, ~7%)**
            - *Thyrotrophs*: secrete Thyroid-Stimulating Hormone (TSH).
            - *Corticotrophs*: secrete Adrenocorticotropic Hormone (ACTH).
            - *Gonadotrophs*: secrete Follicle-Stimulating (FSH) and Luteinizing Hormone (LH).
    2. **Chromophobes (50%)** — resting or precursor cells; non-secreting phase.

Intermediate Lobe

- Contains basophils and chromophobes around colloid-filled cysts.

- Secretes **Melanocyte-Stimulating Hormone (MSH)**.

Posterior Lobe (Neurohypophysis)

- Made of:
    - Nonmyelinated fibers of **hypothalamo-hypophyseal tract**.
    - Modified glial cells called **pituicytes**.
- Hormones stored here:
    - **ADH (Vasopressin)** — acts on renal tubules for water retention.
    - **Oxytocin** — contracts uterine and mammary smooth muscles.
- These hormones are produced by **hypothalamic nuclei** and transported via the tract to the posterior lobe.

Clinical Anatomy of Pituitary Gland

- **Pituitary tumors** cause two categories of effects:

A. General Effects (Pressure symptoms)

- Enlargement of **sella turcica**.
- Pressure on **optic chiasma** ? **bitemporal hemianopia** (loss of peripheral vision).
- Compression of **hypothalamus** ? disturbances like **Fro?hlich’s syndrome (obesity, hypogonadism)**.

- Large tumors can press the **third ventricle**, increasing intracranial pressure.

B. Specific Hormonal Effects

- **Acidophil adenoma** ? Acromegaly (in adults) / Gigantism (in children).
- **Basophil adenoma** ? Cushing's syndrome.
- **Chromophobe adenoma** ? Hypopituitarism (panhypopituitarism).
- **Posterior lobe damage** ? Diabetes insipidus (due to ADH deficiency).

Trigeminal Ganglion

- Sensory ganglion of the **fifth cranial nerve (Trigeminal)**; equivalent to dorsal root ganglia of spinal nerves.
- Formed of **pseudounipolar neurons** with T-shaped processes — one central, one peripheral.
- **Shape**: crescentic (semilunar) with convexity directed anterolaterally.
- **Divisions emerging** from convex border:
    1. Ophthalmic (V1)
    2. Maxillary (V2)
    3. Mandibular (V3)
- **Receives** the sensory root of trigeminal nerve at its posterior concave border.

Situation and Coverings

- Lies on **trigeminal impression** on anterior surface of **petrous temporal bone**, near apex.
- Enclosed in a **dural recess (Meckel's cave)** lined by pia and arachnoid; contains CSF.
- Located ~5 cm deep from preauricular point.

Relations

- **Medial**: Internal carotid artery, posterior part of cavernous sinus.
- **Lateral**: Middle meningeal artery.
- **Superior**: Parahippocampal gyrus.
- **Inferior**: Motor root of trigeminal nerve, greater petrosal nerve, apex of petrous temporal bone, foramen lacerum.

Associated Roots and Branches

- **Central processes** ? form sensory root entering pons.
- **Peripheral processes** ? form V1, V2, V3 divisions.
- **Motor root** lies superomedial to sensory root; joins mandibular nerve at foramen ovale.

Blood Supply

- Derived from **internal carotid**, **middle meningeal**, **accessory meningeal**, and **ascending pharyngeal arteries**.

Clinical Anatomy

- Injury to ophthalmic division ? loss of **corneal reflex** (afferent limb).
- Injury to maxillary division ? loss of **sneeze reflex**.
- Injury to mandibular division ? **flaccid paralysis of muscles of mastication**, weakness in biting, and loss of **jaw jerk reflex**.
- **Trigeminal neuralgia**: severe, stabbing facial pain due to ganglion irritation or vascular compression.

Other Structures Seen in Cranial Fossae after Removal of Brain

- After removing the brain, visible structures include:
  - **Twelve cranial nerves**
  - **Cavernous part of internal carotid artery**
  - **Four petrosal nerves**
  - **Fourth part of vertebral artery**

    bd-chaurasias-human-anatomy-vol…

Anterior Cranial Fossa

- Crista galli, cribriform plate of ethmoid, orbital plates of frontal bone, lesser wing of sphenoid.

Middle Cranial Fossa

- Middle meningeal vessels, diaphragma sellae (pierced by infundibulum), oculomotor nerves, internal carotid arteries, optic nerve, posterior cerebral artery, great cerebral vein.

Posterior Cranial Fossa

- Facial, vestibulocochlear, glossopharyngeal, vagus, accessory, and hypoglossal nerves.
- Vertebral arteries and spinal root of accessory nerve

  bd-chaurasias-human-anatomy-vol…

  .

Internal Carotid Artery

- Begins at upper border of thyroid cartilage as terminal branch of common carotid.
- Divided into **four parts**:

1. **Cervical Part**
    - Within carotid sheath; no branches.
2. **Petrous Part**
    - Inside carotid canal in temporal bone.
    - Gives **caroticotympanic branches** and **artery of pterygoid canal**.
3. **Cavernous Part**
    - Within the cavernous sinus.

- Gives:
  - **Cavernous branches** to trigeminal ganglion.
  - **Superior and inferior hypophyseal arteries** to pituitary gland.

4. **Cerebral Part**
   - Emerges from cavernous sinus at brain base.
   - Branches:
     - Ophthalmic artery
     - Anterior cerebral artery
     - Middle cerebral artery
     - Posterior communicating artery
     - Anterior choroidal artery

Clinical Note:

- The curved course of the petrous, cavernous, and cerebral segments forms the **carotid siphon**, clearly visible in angiography

  bd-chaurasias-human-anatomy-vol…

  .

Cranial Nerves (After Removal of Brain)

1. **Olfactory (I):** 15–20 filaments per side piercing cribriform plate of ethmoid.

2. **Optic (II):** Passes through optic canal with ophthalmic artery.
3. **Oculomotor (III) and Trochlear (IV):**
    - Pierce roof of cavernous sinus and run in its lateral wall.
    - Enter orbit through superior orbital fissure.
4. **Trigeminal (V):**
    - Large sensory root and small motor root cross petrous apex beneath superior petrosal sinus.
    - Enter middle cranial fossa.
5. **Abducent (VI):**
    - Pierces posterior wall of cavernous sinus near petrous apex; runs under petrosphenoidal ligament.
    - Reaches middle of cavernous sinus.
6. **Facial (VII) and Vestibulocochlear (VIII):**
    - Pass through internal acoustic meatus along with labyrinthine vessels

      bd-chaurasias-human-anatomy-vol…

      .

Petrosal Nerves

- There are **four petrosal nerves**:

1. **Greater Petrosal Nerve:**
    - Arises from facial nerve at geniculate ganglion; carries parasympathetic fibres to pterygopalatine ganglion.
2. **Lesser Petrosal Nerve:**
    - Branch of glossopharyngeal nerve via tympanic plexus; supplies parotid gland (via otic ganglion).
3. **Deep Petrosal Nerve:**
    - Sympathetic fibres from internal carotid plexus; joins greater petrosal to form **nerve of pterygoid canal (Vidian nerve)**.
4. **External Petrosal Nerve:**
    - Small sympathetic branch connecting facial nerve with middle meningeal plexus.

Functionally:

- Petrosal nerves connect cranial nerves with autonomic ganglia (ciliary, pterygopalatine, otic, submandibular) and coordinate lacrimal, salivary, and mucous gland secretions

Mnemonics – BELL'S Palsy

Helps recall the **features of Facial Nerve (VII) paralysis**:

B – Blink reflex abnormal
E – Earache
L – Lacrimation (deficient)
L – Loss of taste in anterior two-thirds of tongue

S – Sudden onset
Palsy – of muscles supplied by facial nerve
All symptoms are ipsilateral

Facts to Remember

- **Cranial nerves I, II, VIII** ? almost **purely sensory**.
- **Cranial nerves III, IV, VI, XI, XII** ? **motor**.
- **Cranial nerves V, VII, IX, X** ? **mixed** (contain both sensory and motor fibres).
- **Oculomotor (III) nerve** carries parasympathetic fibres from the **Edinger-Westphal nucleus** to **ciliaris** and **constrictor pupillae muscles**, helping in accommodation.
- **Facial (VII) nerve** carries parasympathetic fibres from the **lacrimatory nucleus** to the **pterygopalatine ganglion**, supplying the **lacrimal gland** and glands of **nasal cavity, palate, and pharynx**.
- **Facial (VII) nerve** also transmits parasympathetic fibres from the **superior salivatory nucleus** to the **submandibular ganglion**, supplying **submandibular and sublingual glands** and **oral mucosal glands**.
- **Glossopharyngeal (IX) nerve** carries parasympathetic fibres from the **inferior salivatory nucleus** to the **otic ganglion**, which supplies the **parotid gland**.

Clinicoanatomical Problem

Case
A young person presents with small painful papules on the **right side of the forehead** following the course of a nerve. There is **redness of the eye** accompanied by **severe pain**.

Diagnosis

Herpes zoster (shingles) involving the **ophthalmic division of the trigeminal nerve**

bd-chaurasias-human-anatomy-vol…

.

Pathway of Pain Impulses

1. **Cutaneous receptors** in the skin of the forehead detect pain.
2. Impulses travel through **ophthalmic division (V1)** of the trigeminal nerve.
3. Fibers pass via **nasociliary branch ? long ciliary nerves ? cornea and eyelid**.
4. Enter the **trigeminal ganglion**, where cell bodies of sensory neurons lie.
5. Central processes enter the **pons** through the **sensory root of the trigeminal nerve**.
6. Impulses are relayed through the **spinal nucleus of the trigeminal nerve** to the **thalamus**, and then to the **somatosensory cortex** where pain is perceived.

Clinical Note

- Reactivation of **varicella-zoster virus** in the **trigeminal ganglion** leads to painful vesicular eruptions along its branches.
- **Ophthalmic division involvement** is most serious, as corneal ulceration may result in **loss of vision** if untreated

Frequently Asked Questions

1. Where do the superior and inferior sagittal venous sinuses lie?

- **Superior sagittal sinus** lies in the upper attached margin of the **falx cerebri**.
- **Inferior sagittal sinus** lies in its free lower margin.

2. What sinuses are related to the tentorium cerebelli?

- **Straight sinus** along the junction of falx cerebri and tentorium.
- **Superior petrosal sinuses** along its attached borders.
- **Transverse sinuses** along the posterior attached border.

3. How many roots does the trigeminal ganglion have? Name its branches.

- It has **two roots** — a large **sensory** and a small **motor** root.
- Three branches:
    1. **Ophthalmic (V1)** — sensory
    2. **Maxillary (V2)** — sensory
    3. **Mandibular (V3)** — mixed (sensory + motor)

4. Name the structures present in the lateral wall of the cavernous sinus.

- From above downward:
    - **Oculomotor nerve (III)**
    - **Trochlear nerve (IV)**
    - **Ophthalmic division of trigeminal (V1)**

- **Maxillary division of trigeminal (V2)**

5. Name the tributaries of the cavernous sinus.

- Superior ophthalmic vein
- Inferior ophthalmic vein (sometimes)
- Superficial middle cerebral vein
- Sphenoparietal sinus
- Central vein of retina (occasionally)

6. Name four emissary veins. What is their function and importance?

- **Mastoid**, **condylar**, **parietal**, and **sphenoidal emissary veins**.
- They connect intracranial venous sinuses with extracranial veins.
- Being **valveless**, they allow spread of infection between scalp, face, and brain.

7. Name the parts of adenohypophysis (anterior pituitary).

- **Pars distalis**, **pars intermedia**, and **pars tuberalis**.

8. Name the parts of neurohypophysis (posterior pituitary).

- **Pars nervosa** and **infundibulum**.

9. Name the cranial nerves in order.

I. Olfactory
II. Optic
III. Oculomotor

IV. Trochlear
V. Trigeminal
VI. Abducent
VII. Facial
VIII. Vestibulocochlear
IX. Glossopharyngeal
X. Vagus
XI. Accessory
XII. Hypoglossal

10. Name the four parts of the internal carotid artery.

- **Cervical**, **petrous**, **cavernous**, and **cerebral** parts.

11. Which artery lies on the inner aspect of the pterion?

- **Anterior branch of the middle meningeal artery**.

12. Which branch of the trigeminal nerve is mixed?

- **Mandibular (V3)** — both sensory and motor.

Multiple Choice Questions

1. One of the following structures is **not related to the cavernous sinus**:
a. Trochlear nerve
b. Oculomotor nerve
c. Optic nerve
d. Ophthalmic nerve
? **Answer:** c. Optic nerve

bd-chaurasias-human-anatomy-vol…

2. Which of the following statements about the **cavernous sinus** is true?
a. Oculomotor nerve lies in medial wall
b. Trochlear nerve lies on medial wall
c. Optic tract lies inferiorly
d. It drains into the transverse sinus
? **Answer:** d. It drains into the transverse sinus

---

3. What is the correct position of the **abducent (VI) nerve** in relation to the **internal carotid artery** in the cavernous sinus?
a. Medial
b. Lateral
c. Inferolateral
d. Posterior
? **Answer:** c. Inferolateral

Multiple Choice Questions

1. One of the following structures is **not related to the cavernous sinus**:
a. Trochlear nerve
b. Oculomotor nerve
c. Optic nerve
d. Ophthalmic nerve
? **Answer:** c. Optic nerve

---

2. Which of the following statements about the **cavernous sinus** is true?
a. Oculomotor nerve lies in medial wall
b. Trochlear nerve lies on medial wall
c. Optic tract lies inferiorly
d. It drains into the transverse sinus
? **Answer:** d. It drains into the transverse sinus

---

3. What is the correct position of the **abducent (VI) nerve** in relation to the **internal carotid artery** in the cavernous sinus?

a. Medial

b. Lateral

c. Inferolateral

d. Posterior

? **Answer:** c. Inferolateral

---

4. Which of the following structures lies on the **inner aspect of the pterion**?

a. Inferior sagittal sinus

b. Anterior branch of the middle meningeal artery

c. Posterior meningeal artery

d. Middle cerebral artery

? **Answer:** b. Anterior branch of the middle meningeal artery

---

5. The **falx cerebri** is attached anteriorly to:

a. Crista galli

b. Tentorium cerebelli

c. Foramen magnum

d. Clinoid processes

? **Answer:** a. Crista galli

---

6. The **tentorium cerebelli** separates:

a. Cerebrum and cerebellum

b. Cerebrum and brainstem

c. Midbrain and pons

d. Pons and medulla

? **Answer:** a. Cerebrum and cerebellum

---

7. The **venous sinus formed at the junction of falx cerebri and tentorium cerebelli** is:

a. Straight sinus

b. Transverse sinus

c. Superior sagittal sinus

d. Inferior sagittal sinus

? **Answer:** a. Straight

---

8. Which of the following veins connect intracranial and extracranial venous systems?

a. Cerebral veins

b. Emissary veins

c. Diploic veins

d. Superficial veins

? **Answer:** b. Emissary veins

---

9. The **hypophyseal fossa (sella turcica)** is roofed by:

a. Falx cerebri

b. Tentorium cerebelli

c. Diaphragma sellae

d. Falx cerebelli

? **Answer:** c. Diaphragma sellae

---

10. Which structure passes through the **optic canal**?

a. Oculomotor nerve

b. Ophthalmic artery

c. Trochlear nerve

d. Maxillary nerve

? **Answer:** b. Ophthalmic artery (along with optic nerve)

---

11. The **internal carotid artery** in the cavernous sinus is accompanied by:

a. Abducent nerve

b. Oculomotor nerve

c. Optic nerve

d. Trochlear nerve

? **Answer:** a. Abducent nerve

---

12. The **trigeminal ganglion** lies in:

a. Falx cerebri

b. Meckel’s cave

c. Tentorium cerebelli

d. Diaphragma sellae

? **Answer:** b. Meckel’s cave

---

13. The **pituitary gland** is connected to the hypothalamus by:

a. Optic chiasma

b. Infundibulum

c. Corpus callosum

d. Interpeduncular fossa

? **Answer:** b. Infundibulum

---

14. The **anterior lobe of pituitary (adenohypophysis)** is derived from:

a. Rathke’s pouch (ectoderm)

b. Neural tube

c. Diencephalon

d. Mesoderm of cranial floor

? **Answer:** a. Rathke’s pouch (ectodermal origin)

Additional MCQs

15. Which sinus runs along the attached margin of the falx cerebri?

a. Straight sinus

b. Superior sagittal sinus

c. Inferior sagittal sinus

d. Transverse sinus

? **Answer:** b. Superior sagittal sinus

---

16. Which sinus is formed by the union of the great cerebral vein and inferior sagittal sinus?

a. Superior sagittal sinus

b. Straight sinus

c. Transverse sinus

d. Sigmoid sinus

? **Answer:** b. Straight sinus

---

17. Which vein connects the facial vein with the cavernous sinus?

a. Deep facial vein

b. Superior ophthalmic vein

c. Angular vein

d. Inferior ophthalmic vein

? **Answer:** b. Superior ophthalmic vein

---

18. The cavernous sinus communicates with the opposite side through:

a. Petrosal sinus

b. Basilar plexus

c. Intercavernous sinuses

d. Straight sinus

? **Answer:** c. Intercavernous sinuses

---

19. Which structure passes through the foramen spinosum?

a. Middle meningeal artery

b. Internal carotid artery

c. Maxillary artery

d. Ophthalmic artery

? **Answer:** a. Middle meningeal artery

---

20. The middle meningeal artery is a branch of:

a. Internal carotid artery

b. Maxillary artery

c. External carotid artery

d. Ascending pharyngeal artery

? **Answer:** b. Maxillary artery

---

21. The anterior branch of the middle meningeal artery lies deep to which bone area?

a. Lambda

b. Pterion

c. Bregma

d. Inion

? **Answer:** b. Pterion

22. Rupture of the anterior branch of the middle meningeal artery causes:

a. Subdural hematoma

b. Subarachnoid hemorrhage

c. Extradural hematoma

d. Intracerebral hemorrhage

? **Answer:** c. Extradural hematoma

---

23. The venous sinuses of the dura mater are:

a. Thin-walled and valveless

b. Thick-walled and muscular

c. Valved channels

d. Endothelial-lined arteries

? **Answer:** a. Thin-walled and valveless

---

24. The inferior sagittal sinus drains into the:

a. Transverse sinus

b. Straight sinus

c. Sigmoid sinus

d. Cavernous sinus

? **Answer:** b. Straight sinus

---

25. The pituitary gland develops from:

a. Surface ectoderm and neuroectoderm

b. Mesoderm only

c. Endoderm

d. Neural crest cells

? **Answer:** a. Surface ectoderm and neuroectoderm

---

26. The hypophyseal fossa is part of which cranial bone?

a. Ethmoid

b. Sphenoid

c. Frontal

d. Temporal

? **Answer:** b.

---

27. Which cranial nerve lies in the cavernous sinus close to the internal carotid artery?

a. Abducent nerve

b. Oculomotor nerve

c. Trochlear nerve

d. Optic nerve

? **Answer:** a. Abducent nerve

---

28. Which structure pierces the diaphragma sellae?

a. Infundibulum

b. Optic nerve

c. Oculomotor nerve

d. Hypoglossal nerve

? **Answer:** a. Infundibulum

---

29. The pituitary gland is supplied by:

a. Superior and inferior hypophyseal arteries

b. Posterior cerebral artery

c. Anterior communicating artery

d. Internal jugular vein

? **Answer:** a. Superior and inferior hypophyseal arteries

---

30. The cavernous sinus receives blood from:

a. Superior ophthalmic vein

b. Great cerebral vein

c. Straight sinus

d. Inferior sagittal sinus

? **Answer:** a. Superior ophthalmic vein

Viva Voce

1. Which artery lies beneath the pterion?
? Anterior branch of the middle meningeal artery.

2. What is the common cause of extradural hemorrhage?
? Rupture of the anterior branch of the middle meningeal artery due to skull fracture at the pterion.

3. Which venous sinus lies in the attached margin of the falx cerebri?
? Superior sagittal sinus.

4. Which venous sinus lies in the free margin of the falx cerebri?
? Inferior sagittal sinus.

5. Which sinus is formed by the union of the great cerebral vein and inferior sagittal sinus?
? Straight sinus.

6. Which sinus runs along the attached margin of the tentorium cerebelli?
? Transverse sinus.

7. Which sinus runs in the junction of falx cerebri and tentorium cerebelli?
? Straight sinus.

8. Which structure connects the pituitary gland to the brain?
? Infundibulum (pituitary stalk).

9. What is Meckel’s cave?
? A dural recess enclosing the trigeminal ganglion.

10. Which nerves lie in the lateral wall of the cavernous sinus?
? Oculomotor (III), Trochlear (IV), Ophthalmic (V1), and Maxillary (V2) nerves.

11. Which nerve passes through the cavernous sinus close to the internal carotid artery?
? Abducent nerve (VI).

12. What is the chief tributary of the cavernous sinus from the orbit?
? Superior ophthalmic vein.

13. Which structure passes through the diaphragma sellae?
? Infundibulum.

14. What are the main parts of the pituitary gland?
? Adenohypophysis (anterior lobe) and Neurohypophysis (posterior lobe).

15. From which embryological structures do these lobes develop?
?

- Adenohypophysis: from Rathke's pouch (ectodermal).
- Neurohypophysis: from down-growth of diencephalon (neuroectodermal).

16. Name the branches of the internal carotid artery in the cranial cavity.
? Ophthalmic, anterior cerebral, middle cerebral, posterior communicating, and anterior choroidal arteries.

17. What is the function of the cavernous sinus?
? Drains venous blood from the orbit, superficial cortex, and deep face; also provides a cooling effect to the internal carotid artery.

18. Why is the cavernous sinus clinically important?
? Infection from the face can spread to the cavernous sinus through valveless ophthalmic veins causing thrombosis.

19. Which cranial nerves are purely sensory?
? I (Olfactory), II (Optic), and VIII (Vestibulocochlear).

20. Which cranial nerves are purely motor?
? III, IV, VI, XI, and XII.

21. Which cranial nerves are mixed?
? V, VII, IX, and X.