

Back of the Neck

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Introduction

The back of the neck forms the **posterior part of the cervical region**, extending from the **external occipital protuberance and superior nuchal line** above to the **spine of the seventh cervical vertebra** below. It includes a complex of **muscles, fasciae, and neurovascular structures** that stabilize and move the head and neck.

Dissection

During dissection:

- Make a **midline incision** from the external occipital protuberance to the spine of C7.
- Reflect the skin laterally to expose **superficial fascia** containing **cutaneous nerves** and **small veins**.
- The deeper layer reveals **trapezius, splenius, semispinalis, and suboccipital muscles**.

The **greater occipital nerve** and **occipital artery** are key landmarks during dissection.

Nerve Supply of Skin

- **Posterior primary rami** of cervical spinal nerves supply the skin of the back of the neck.
 - **C2 (Greater occipital nerve)**: supplies skin over occiput up to vertex.

- **C3 (Third occipital nerve):** supplies skin of upper posterior neck.
 - **C4 and below:** supply lower cervical and upper thoracic regions.
 - These nerves pierce **trapezius** near the midline and travel upwards.
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Muscles of the Back

The muscles are arranged in **three layers**:

1. Superficial Layer

- **Trapezius:** Elevates, retracts, and rotates scapula.
- **Latissimus dorsi:** Extends, adducts, and medially rotates the humerus.

2. Intermediate Layer

- **Levator scapulae:** Elevates scapula.
- **Rhomboideus major and minor:** Retract scapula.

3. Deep (Intrinsic) Layer

- **Splenius capitis and cervicis:** Extend and rotate head and neck.
 - **Semispinalis capitis, multifidus, rotatores:** Extend and stabilize vertebral column.
 - **Erector spinae group (spinalis, longissimus, iliocostalis):** Maintain posture and extend the spine.
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Suboccipital Region

A small, deep compartment below the occipital bone and posterior to atlas and axis.

Boundaries of Suboccipital Triangle:

- **Medial:** Rectus capitis posterior major
- **Lateral:** Obliquus capitis superior
- **Inferior:** Obliquus capitis inferior
- **Roof:** Semispinalis capitis
- **Floor:** Posterior atlanto-occipital membrane and posterior arch of atlas

Contents:

- **Third part of vertebral artery**
- **Suboccipital nerve (dorsal ramus of C1)**
- **Suboccipital venous plexus**

Dissection of Suboccipital Region

- Reflect semispinalis capitis to expose the **suboccipital muscles**.
- Identify the **vertebral artery** as it curves medially above the posterior arch of atlas.
- Locate the **suboccipital nerve** entering the triangle and the **greater occipital nerve** emerging below the obliquus capitis inferior.

Muscles

The suboccipital muscles form a small muscular group deep to semispinalis capitis, situated around the **atlas and axis**.

1. Rectus capitis posterior major

- **Origin:** Spinous process of the axis (C2)
- **Insertion:** Lateral part of inferior nuchal line of occipital bone
- **Nerve supply:** Suboccipital nerve (dorsal ramus of C1)
- **Action:** Extension and rotation of head to the same side

2. Rectus capitis posterior minor

- **Origin:** Posterior tubercle of atlas (C1)
- **Insertion:** Medial part of inferior nuchal line
- **Nerve supply:** Suboccipital nerve
- **Action:** Extension of head

3. Obliquus capitis superior

- **Origin:** Transverse process of atlas (C1)
- **Insertion:** Between superior and inferior nuchal lines on occipital bone
- **Nerve supply:** Suboccipital nerve

- **Action:** Extension and lateral bending of head

4. **Obliquus capitis inferior**

- **Origin:** Spinous process of axis (C2)
- **Insertion:** Transverse process of atlas (C1)
- **Nerve supply:** Suboccipital nerve
- **Action:** Rotation of atlas and head to same side

Exposure of Suboccipital Triangle

Boundaries

- **Medial:** Rectus capitis posterior major
- **Lateral:** Obliquus capitis superior
- **Inferior:** Obliquus capitis inferior
- **Roof:** Semispinalis capitis
- **Floor:** Posterior arch of atlas and posterior atlanto-occipital membrane

Contents

- Third part of vertebral artery
- Suboccipital nerve (dorsal ramus of C1)

- **Suboccipital venous plexus**

Dissection Steps

1. Reflect semispinalis capitis to reveal **suboccipital muscles**.
2. Identify the **vertebral artery** curving medially above the posterior arch of atlas.
3. Trace the **suboccipital nerve** entering the triangle.
4. Observe the **greater occipital nerve** emerging below obliquus capitis inferior.

Clinical Anatomy

- **Vertebral artery entrapment:**
 - Excessive rotation or hyperextension of the head may **compress the vertebral artery** within the suboccipital triangle ? dizziness, syncope, or visual disturbances.
- **Whiplash injury:**
 - Sudden hyperextension of the neck (as in rear-end collisions) can **tear suboccipital and deep cervical muscles** or strain ligaments of the atlanto-occipital and atlantoaxial joints.
- **Torticollis (Wry neck):**
 - Due to **spasm or shortening of sternocleidomastoid** or deep neck muscles including suboccipital group.
 - Produces characteristic **tilt and rotation of head**.

- **Occipital neuralgia:**

- Irritation of **greater occipital nerve (C2)** causes pain radiating over the occipital scalp; may result from entrapment as it pierces the **semispinalis capitis**.

- **Suboccipital nerve block:**

- Used for **pain relief** in occipital neuralgia; anesthetic injected near **greater occipital nerve** at the superior nuchal line.

Mnemonics

1. Boundaries of Suboccipital Triangle

Mnemonic:

? “**ROS Loves India**”

- **R** – Rectus capitis posterior major (medial boundary)
- **O** – Obliquus capitis superior (lateral boundary)
- **S** – Obliquus capitis inferior (inferior boundary)

Roof: Semispinalis capitis

Floor: Posterior arch of atlas and posterior atlanto-occipital membrane

2. Contents of Suboccipital Triangle

Mnemonic:

? “**Very Strong Vein**”

- **V** – Vertebral artery (third part)
 - **S** – Suboccipital nerve (dorsal ramus of C1)
 - **V** – Suboccipital venous plexus
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3. Muscles forming floor of posterior triangle vs. suboccipital triangle

Mnemonic for Suboccipital Floor:

? **“MAP”**

- **M** – Membrane (posterior atlanto-occipital)
 - **A** – Arch (posterior arch of atlas)
 - **P** – Parts related (vertebral artery groove)
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4. Muscles supplied by Suboccipital Nerve

Mnemonic:

? **“ROOO”** (four O’s)

- **R** – Rectus capitis posterior major
 - **O** – Rectus capitis posterior minor
 - **O** – Obliquus capitis superior
 - **O** – Obliquus capitis inferior
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Facts to Remember

- The **back of the neck** contains deep muscles responsible for **extension, rotation, and stabilization** of the head and cervical vertebrae.
- The **suboccipital region** is located **below the occipital bone** and **between the atlas and axis** vertebrae.
- The **suboccipital triangle** is an **important landmark** in neurosurgery for exposure of the **vertebral artery** and **posterior arch of atlas**.
- **All suboccipital muscles** are supplied by the **dorsal ramus of C1 (suboccipital nerve)** — unique because it is **purely motor**.
- The **greater occipital nerve (C2 dorsal ramus)** is **sensory** to the posterior scalp and does **not** pass through the triangle.
- The **vertebral artery** forms a **loop** within the triangle before entering the **foramen magnum**. This loop allows free head movement but can be **compressed in extreme rotation**.
- The **posterior atlanto-occipital membrane** forms the **floor** of the triangle and has a **defect** where the vertebral artery passes.
- **Occipital neuralgia** can result from irritation of the **greater occipital nerve** after it pierces **semispinalis capitis**.
- **Whiplash injury** commonly involves strain or tear of suboccipital muscles and posterior neck ligaments due to **sudden hyperextension**.
- **Suboccipital nerve block** is used clinically for pain relief in occipital headache or neuralgia.

1. Whiplash Injury

- Occurs due to **sudden hyperextension of the neck**, often in rear-end automobile collisions.
 - Causes **tearing of suboccipital muscles, ligaments, or joint capsules** at the craniovertebral junction.
 - May result in **neck stiffness, pain, and reduced range of motion**.
 - Severe cases can affect **spinal cord or brainstem** due to instability between **atlas and axis**.
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2. Vertebral Artery Compression

- The **third part of the vertebral artery** winds around the posterior arch of the atlas.
 - Excessive **rotation or extension of the head** can compress this artery.
 - Results in **dizziness, vertigo, blurred vision, or fainting** (vertebrobasilar insufficiency).
 - Clinically important during manipulative therapy or cervical spondylosis.
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3. Torticollis (Wry Neck)

- Characterized by **tilting of the head to one side and rotation to the opposite side**.
- May be due to **spasm or fibrosis of sternocleidomastoid or suboccipital muscles**.

- Can be **congenital** (due to birth trauma) or **acquired** (infections, inflammation, trauma).
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4. Occipital Neuralgia

- Caused by irritation of the **greater occipital nerve (C2 dorsal ramus)**.
 - Pain radiates from **upper neck to the posterior scalp**.
 - Often results from **entrapment of the nerve** as it pierces the **semispinalis capitis**.
 - May be relieved by **local anesthetic block** or **physiotherapy**.
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5. Atlanto-axial Instability

- Seen in **trauma, rheumatoid arthritis, Down's syndrome, or tuberculosis**.
 - Laxity of **transverse ligament of the atlas** causes **anterior displacement of the atlas** over the axis.
 - May compress the **spinal cord** leading to **quadriplegia** or even **death**.
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6. Surgical Access to the Vertebral Artery

- The **suboccipital triangle** provides a safe surgical approach to the **third part of the vertebral artery**.
 - Knowledge of its **boundaries and contents** is vital during vascular or neurosurgical procedures in this region.
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7. Suboccipital Nerve Block

- Given for **relief of occipital headaches**.
- Injection is made near the **greater occipital nerve** at the **superior nuchal line**, lateral to the external occipital protuberance.

Frequently Asked Questions — Back of the Neck and Suboccipital Region

1. Name the muscles forming the boundaries of the suboccipital triangle.

- **Medial boundary:** Rectus capitis posterior major
 - **Lateral boundary:** Obliquus capitis superior
 - **Inferior boundary:** Obliquus capitis inferior
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2. What forms the floor and roof of the suboccipital triangle?

- **Floor:** Posterior atlanto-occipital membrane and posterior arch of atlas.
 - **Roof:** Semispinalis capitis muscle and deep fascia.
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3. Name the contents of the suboccipital triangle.

- Third part of **vertebral artery**
 - **Suboccipital nerve (dorsal ramus of C1)**
 - **Suboccipital venous plexus**
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4. What is the nerve supply of suboccipital muscles?

- **Suboccipital nerve (dorsal ramus of C1)** supplies all the four suboccipital muscles:
 - Rectus capitis posterior major
 - Rectus capitis posterior minor
 - Obliquus capitis superior
 - Obliquus capitis inferior
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5. What is the clinical significance of the suboccipital triangle?

- It provides **surgical access** to the **third part of the vertebral artery**.
 - Important in **angiography** and **vascular surgeries** near the craniovertebral junction.
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6. What is occipital neuralgia and how does it occur?

- **Pain in the posterior scalp** due to irritation of the **greater occipital nerve (C2 dorsal ramus)**.
 - The nerve gets **compressed while piercing the semispinalis capitis**, causing sharp or throbbing pain.
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7. What are the effects of vertebral artery compression?

- Excessive **rotation or extension** of the neck can compress the artery, leading to:
 - **Vertigo**
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- **Visual disturbances**
 - **Loss of balance or syncope**
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8. What is the difference between the suboccipital and greater occipital nerves?

- **Suboccipital nerve (C1):** Purely motor; supplies suboccipital muscles; lies inside the triangle.
 - **Greater occipital nerve (C2):** Purely sensory; supplies posterior scalp; lies outside the triangle.
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9. What is torticollis?

- Abnormal **tilt and rotation of the head** caused by spasm or fibrosis of **sternocleidomastoid or suboccipital muscles**.
 - May be **congenital** (birth injury) or **acquired** (infections or trauma).
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10. Why is the vertebral artery loop important?

- The **loop in the third part** of vertebral artery allows **head movement without stretching the vessel**.
 - Prevents ischemia during normal motion but may compress in extreme rotation.
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These questions are frequently asked in both **theory viva** and **practical examinations** to assess understanding of the **suboccipital region anatomy and its clinical relevance**

1. The suboccipital triangle is located between which two vertebrae?

- A. C1 and C2
- B. C2 and C3
- C. C3 and C4
- D. C4 and C5

? **Answer:** A. C1 and C2

Explanation: The triangle lies between the **atlas (C1)** and **axis (C2)**, deep to semispinalis capitis.

2. The nerve supply of suboccipital muscles is derived from —

- A. Dorsal ramus of C1
- B. Dorsal ramus of C2
- C. Ventral ramus of C1
- D. Ventral ramus of C2

? **Answer:** A. Dorsal ramus of C1

Explanation: The **suboccipital nerve (C1)** is purely motor and supplies all four suboccipital muscles.

3. The greater occipital nerve is —

- A. Dorsal ramus of C1
- B. Ventral ramus of C1
- C. Dorsal ramus of C2
- D. Ventral ramus of C2

? **Answer:** C. Dorsal ramus of C2

Explanation: It is the **dorsal ramus of the second cervical nerve** and supplies the posterior scalp.

4. The floor of the suboccipital triangle is formed by —

- A. Semispinalis capitis
- B. Posterior arch of atlas and posterior atlanto-occipital membrane
- C. Rectus capitis posterior major

D. Obliquus capitis inferior

? **Answer:** B. Posterior arch of atlas and posterior atlanto-occipital membrane

5. The roof of the suboccipital triangle is formed by —

A. Semispinalis capitis

B. Trapezius

C. Splenius capitis

D. Sternocleidomastoid

? **Answer:** A. Semispinalis capitis

6. The contents of the suboccipital triangle include all except —

A. Third part of vertebral artery

B. Suboccipital nerve

C. Suboccipital venous plexus

D. Greater occipital nerve

? **Answer:** D. Greater occipital nerve

Explanation: Greater occipital nerve lies **below** the triangle, not within it.

7. The vertebral artery enters the cranial cavity through —

A. Foramen lacerum

B. Foramen magnum

C. Jugular foramen

D. Foramen ovale

? **Answer:** B. Foramen magnum

8. The vertebral artery is a branch of —

A. Common carotid artery

B. Internal carotid artery

C. Subclavian artery

D. External carotid artery

? **Answer:** C. Subclavian artery

9. Which muscle rotates the atlas and head to the same side?

A. Rectus capitis posterior minor

- B. Obliquus capitis superior
 - C. Obliquus capitis inferior
 - D. Splenius capitis
- ? **Answer:** C. Obliquus capitis inferior

Explanation: It acts on the **atlantoaxial joint** to rotate the head to the **same side**.

10. Which of the following is purely motor?

- A. Greater occipital nerve
 - B. Lesser occipital nerve
 - C. Suboccipital nerve
 - D. Transverse cervical nerve
- ? **Answer:** C. Suboccipital nerve
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11. Pain radiating from the neck to the back of the scalp is due to involvement of —

- A. Suboccipital nerve
- B. Greater occipital nerve
- C. Lesser occipital nerve
- D. Accessory nerve

? **Answer:** B. Greater occipital nerve

Explanation: It supplies sensory fibers to the **posterior scalp** and is responsible for **occipital neuralgia**.

12. The vertebral artery is liable to compression during —

- A. Flexion of the neck
- B. Rotation or extension of the neck
- C. Inspiration
- D. Swallowing

? **Answer:** B. Rotation or extension of the neck

13. The muscle forming the medial boundary of suboccipital triangle is —

- A. Obliquus capitis inferior
- B. Rectus capitis posterior major
- C. Rectus capitis posterior minor
- D. Obliquus capitis superior

? **Answer:** B. Rectus capitis

14. The nerve emerging below obliquus capitis inferior is —

- A. Suboccipital nerve
- B. Accessory nerve
- C. Greater occipital nerve
- D. Lesser occipital nerve

? **Answer:** C. Greater occipital nerve

15. The suboccipital triangle is an important landmark because —

- A. It contains the accessory nerve
- B. It contains the third part of the vertebral artery
- C. It contains the brachial plexus
- D. It contains the hypoglossal nerve

? **Answer:** B. It contains the third part of the vertebral artery

Viva Voce — Back of the Neck and Suboccipital Region

Q1. What forms the posterior boundary of the neck?

The **external occipital protuberance** and **superior nuchal line** above, and the **spine of C7 vertebra** below, form the posterior boundary.

Q2. What are the main layers of muscles in the back of the neck?

- **Superficial layer:** Trapezius
 - **Intermediate layer:** Splenius capitis and splenius cervicis
 - **Deep layer:** Semispinalis capitis and suboccipital muscles
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Q3. Name the suboccipital muscles.

Rectus capitis posterior major, rectus capitis posterior minor, obliquus capitis superior, and obliquus capitis inferior.

Q4. Which nerve supplies all suboccipital muscles?

The **suboccipital nerve** (dorsal ramus of C1).

Q5. What are the boundaries of the suboccipital triangle?

- **Medial:** Rectus capitis posterior major
 - **Lateral:** Obliquus capitis superior
 - **Inferior:** Obliquus capitis inferior
-

Q6. What forms the floor and roof of the suboccipital triangle?

- **Floor:** Posterior arch of atlas and posterior atlanto-occipital membrane
 - **Roof:** Semispinalis capitis muscle
-

Q7. What are the contents of the suboccipital triangle?

- Third part of the **vertebral artery**
 - **Suboccipital nerve (C1 dorsal ramus)**
 - **Suboccipital venous plexus**
-

Q8. Which nerve is purely motor in this region?

The **suboccipital nerve** (C1 dorsal ramus).

Q9. Which nerve is purely sensory in the same region?

The **greater occipital nerve** (C2 dorsal ramus).

Q10. What is the difference between the suboccipital and greater occipital nerves?

- **Suboccipital nerve:** Motor; lies **within** the triangle; supplies **muscles**.
 - **Greater occipital nerve:** Sensory; lies **below** the triangle; supplies **posterior scalp**.
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Q11. Which muscle rotates the head to the same side?

Obliquus capitis inferior.

Q12. What is the action of rectus capitis posterior major?

Extension and **rotation** of the head to the same side.

Q13. What is the action of obliquus capitis superior?

Extension and **lateral flexion** of the head.

Q14. What artery passes through the suboccipital triangle?

The **third part of the vertebral artery**.

Q15. The vertebral artery is a branch of which vessel?

The **subclavian artery**.

Q16. Through which foramen does the vertebral artery enter the cranial cavity?

Through the **foramen magnum**.

Q17. Why does the vertebral artery form a loop before entering the skull?

To allow **free rotation of the head** without stretching or compressing the artery.

Q18. What is the clinical importance of the suboccipital triangle?

- It is the **surgical landmark** for exposing the **third part of vertebral artery**.
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- Site for **vertebral angiography** and **nerve blocks**.
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Q19. What is occipital neuralgia?

Pain over the **posterior scalp** due to irritation of the **greater occipital nerve** (C2 dorsal ramus), often from entrapment in **semispinalis capitis**.

Q20. What is the cause of dizziness during neck rotation?

Compression of the **vertebral artery** within the **suboccipital triangle**.

Q21. What is whiplash injury?

A **hyperextension injury of the neck**, commonly from rear-end car collisions, leading to **strain or tear of suboccipital muscles and ligaments**.

Q22. Which muscle overlies the suboccipital triangle?

Semispinalis capitis forms its **roof**.

Q23. What structure lies deep to the posterior atlanto-occipital membrane?

The **dura mater** and **spinal cord**.

Q24. Which nerve emerges below the obliquus capitis inferior muscle?

The **greater occipital nerve**.

Q25. What movements occur at the atlanto-occipital and atlantoaxial joints?

- **Atlanto-occipital joint:** Flexion and extension (“yes” movement).
- **Atlantoaxial joint:** Rotation (“no” movement).