Human Anatomy

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The Scalp

The scalp consists of five layers, the first three of which are bound together and move as a whole on the skull. The first letter of each layer combines to spell the acronym Scalp.

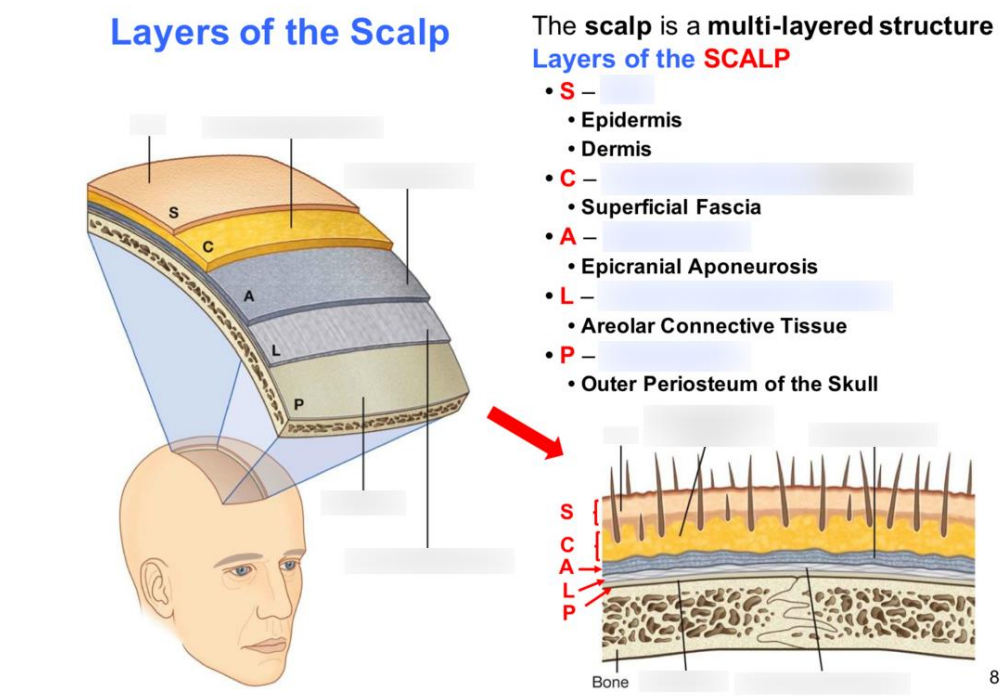
These layers are:

Skin: This is thick and hair bearing and contains numerous sebaceous glands.

Connective tissue: This is a dense fibrofatty layer containing fibrous septa that unite the skin to the underlying epicranial aponeurosis. This layer contains numerous **blood vessels**. The arteries are derived from both the external and internal carotid arteries, and free anastomoses occur between them. **(Fig. 1).**

Aponeurosis (epicranial): This is a thin, tendinous sheet that unites the occipital and frontal bellies of the occipitofrontalis muscle **(Figs. 1 & 2).** The lateral margins of the aponeurosis are attached to the temporal fascia.

Loose areolar tissue: This occupies the subaponeurotic space and loosely connects the epicranial aponeurosis to the periosteum of the skull (the pericranium) (Fig. 1). This is the plane of movement of the scalp, that is, when the scalp moves, the first three layers (SCA) slide along this layer relative to the underlying periosteum. The areolar tissue contains a few small arteries, but it also contains some important **emissary veins**. The emissary veins are valveless and connect the superficial veins of the scalp with the diploic veins of the skull bones and with the intracranial venous sinuses **(Fig. 1).**



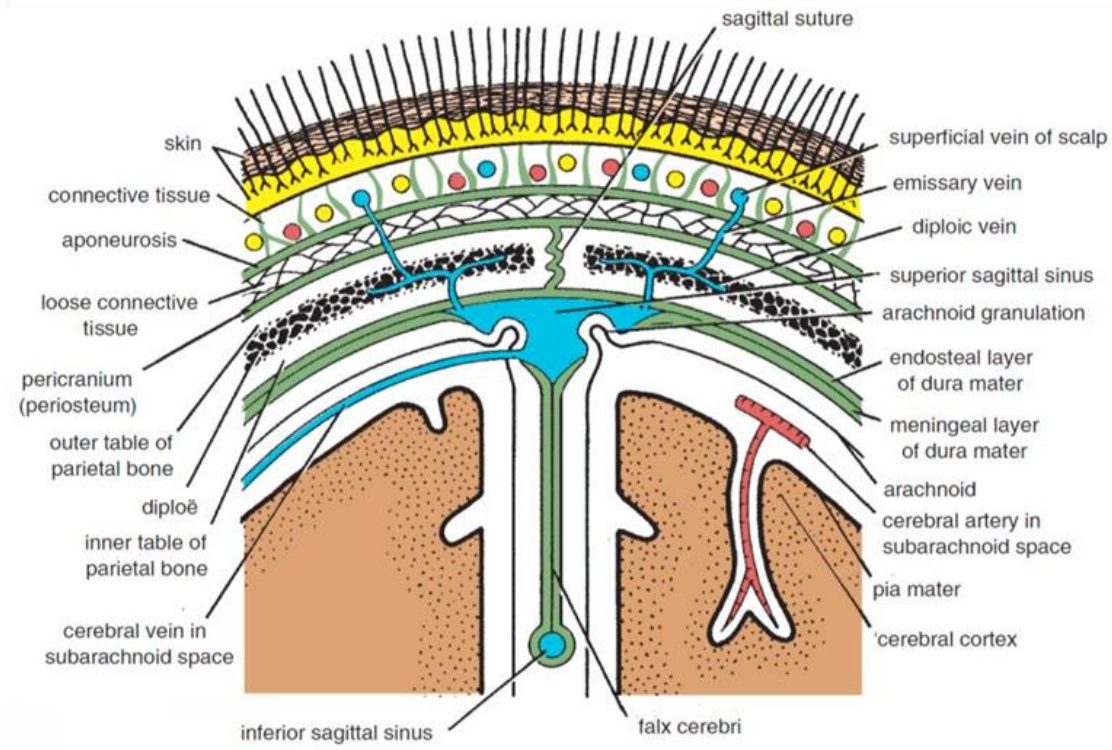


Figure 1: Coronal section of the upper part of the head showing the layers of the scalp.

Pericranium: The pericranium is covering the outer surface of the skull bones. The pericranium is continuous with the periosteum on the inner surface of the skull bones **(endosteum)** at the sutures between the individual skull bones.

Scalp Occipitofrontalis muscle: The origin, insertion, nerve supply, and action of this muscle are described in the following Table. When this muscle contracts, the first three layers of the scalp move forward or backward, the loose areolar tissue of the fourth layer of the scalp allowing the aponeurosis to move on the pericranium. The frontal bellies of the occipitofrontalis can raise the eyebrows in expressions of surprise or horror (Fig.2).

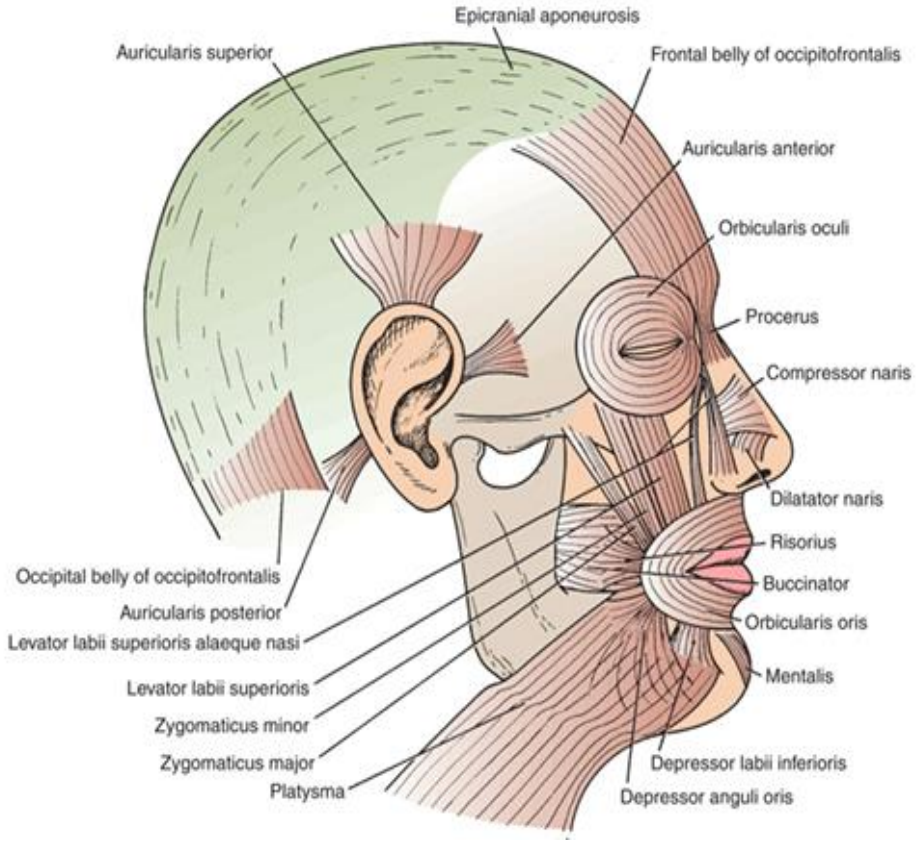


Fig 2: Muscles of the scalp and of facial expression

Table (1): Scalp Occipitofrontalis muscle

Muscle	Origin	Nerve Supply	Insersion	Action
Occipitofrontalis **Occipito belly**	**Highest nuchlear line of occipital bone**	**Facial Nerve**	**Epicranial opneurosis**	**Moves scalp on skull and raises eyebrows**

Sensory Nerve of the Scalp

The main trunks of the sensory nerves lie in the dense connective tissue layer of the scalp (Fig.3).

Trigeminal branches:

- **The supratrochlear nerve:** a branch of the **ophthalmic division** of the trigeminal nerve, winds around the superior orbital margin and supplies the scalp. It passes backward close to the median plane and reaches nearly as far as the vertex of the skull.
- **The supraorbital nerve**: a branch of the **ophthalmic division** of the trigeminal nerve, winds around the superior orbital margin and ascends over the forehead. It supplies the scalp as far backward as the vertex.
- **The zygomaticotemporal nerve**: a branch of the **maxillary division** of the trigeminal nerve, supplies the scalp over the temple.
- **The auriculotemporal nerve**: a branch of the **mandibular division** of the trigeminal nerve, ascends over the side of the head from in front of the auricle. Its terminal branches supply the skin over the temporal region (Fig.3).

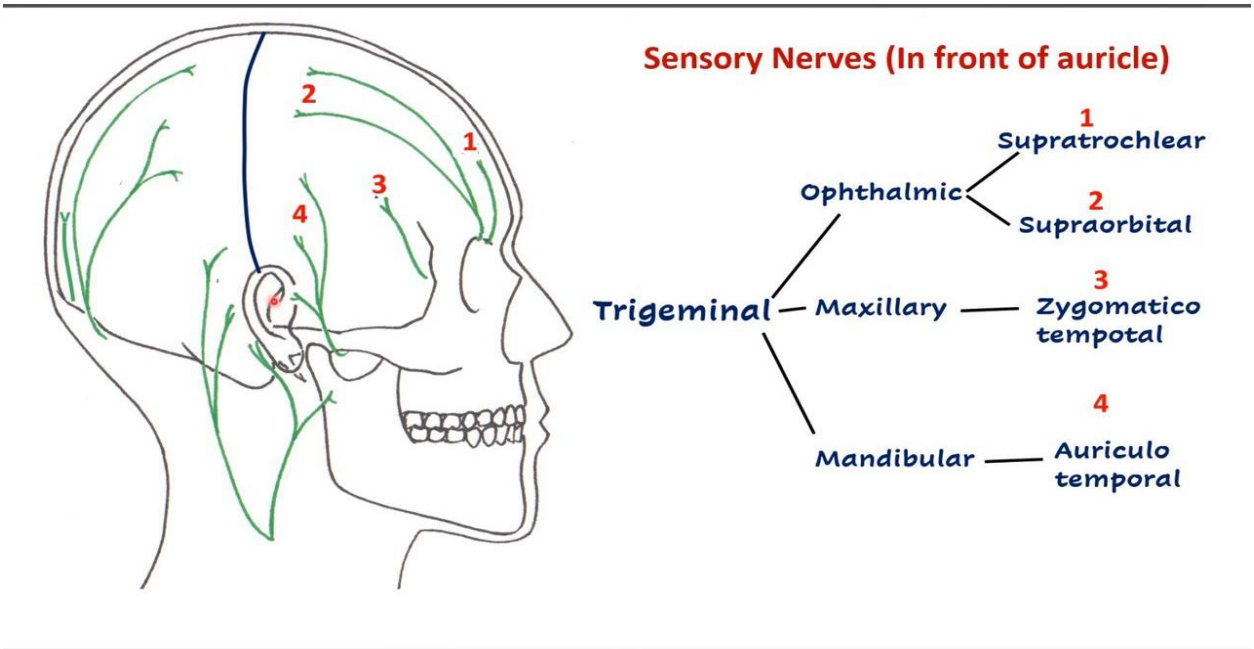


Figure 3: Sensory Nerve of the Scalp

Cervical spinal nerve branches:

Ventral Remi:

- **The Great auricular nerve (C2–C3)**: supplies the skin over parotid region and infront of auricle
- **The lesser occipital nerve (C2)**: supplies the skin of scalp behind the ear.

Dorsal Remi:

- **Greater occipital nerve (C2)**: supplies most of the posterior scalp
- **Third occipital nerve (C3)**: supplies lower posterior scalp **(Fig.4).**

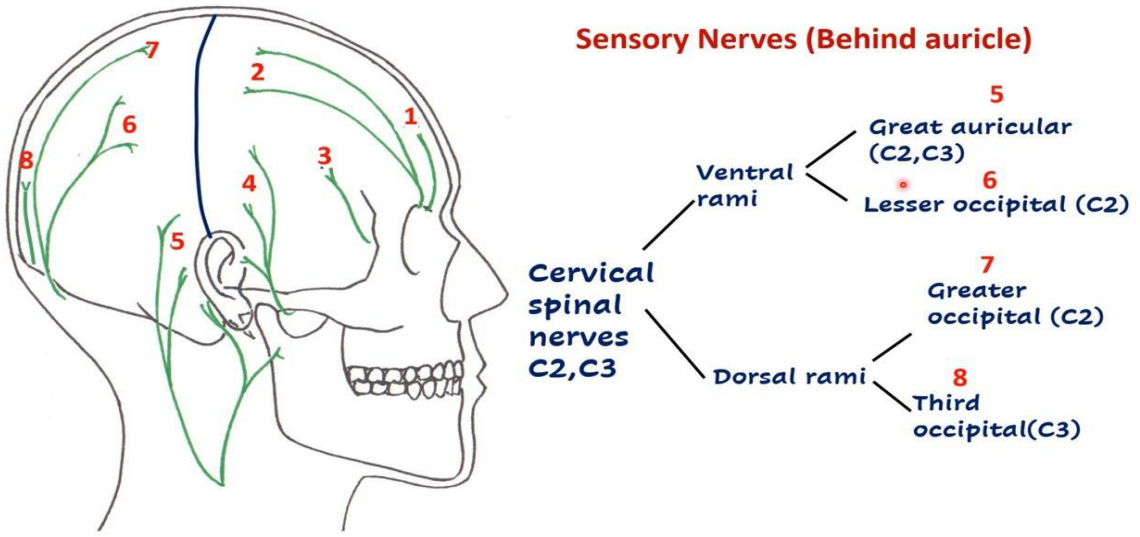
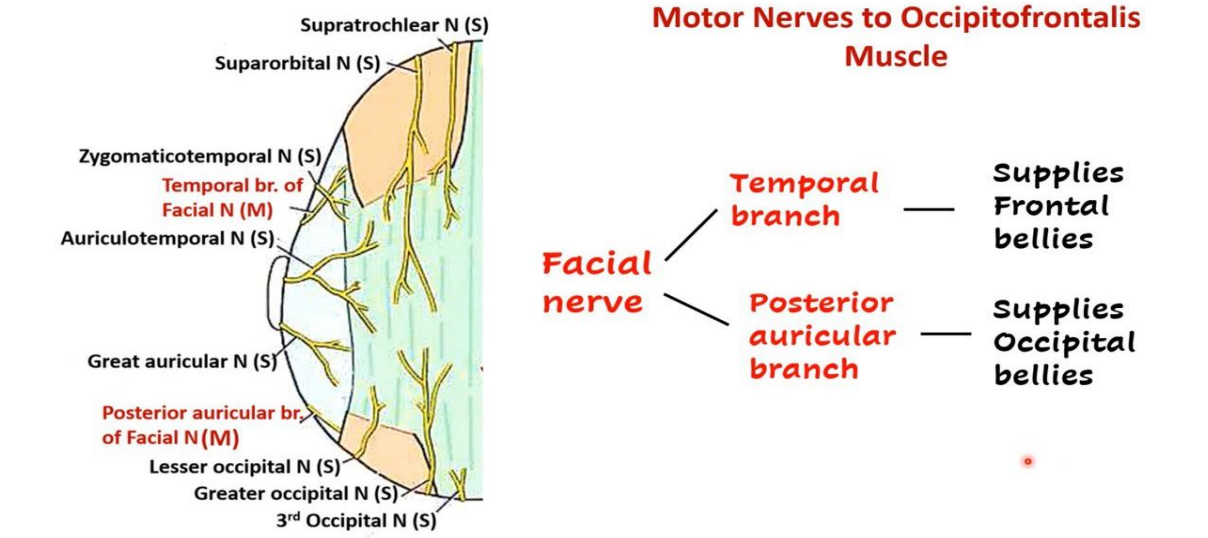


Figure 4: Cervical spinal nerve branches.

Motor Nerves to occipitofrontalis muscle

Facial Nerve

- **Temporal branch**: supplies frontal bellies.
- **Posterior auricular branch**: supplies occipital bellies.



Arterial Supply of the Scalp:

The scalp has a rich supply of blood to nourish the hair follicles; for this reason, the smallest cut bleeds profusely. The arteries lie in the superficial fascia **(Fig. 5)**

- **The supratrochlear and the supraorbital arteries**: branches of the **ophthalmic artery**, ascend over the forehead in company with the supratrochlear and supraorbital nerves.
- **The superficial temporal artery:** a branch of the **external carotid artery**, ascends in front of the auricle in company with the auriculotemporal nerve. It divides into anterior and posterior branches, which supplies the skin over the frontal and temporal regions.
- **The posterior auricular artery**: a branch of **the external carotid artery**, ascends behind the auricle to supply the scalp above and behind the auricle.
- **The occipital artery**: a branch of the **external carotid artery**, ascends in company with the greater occipital nerve. It supplies the skin over the back of the scalp and reaches as high as the vertex of the skull.

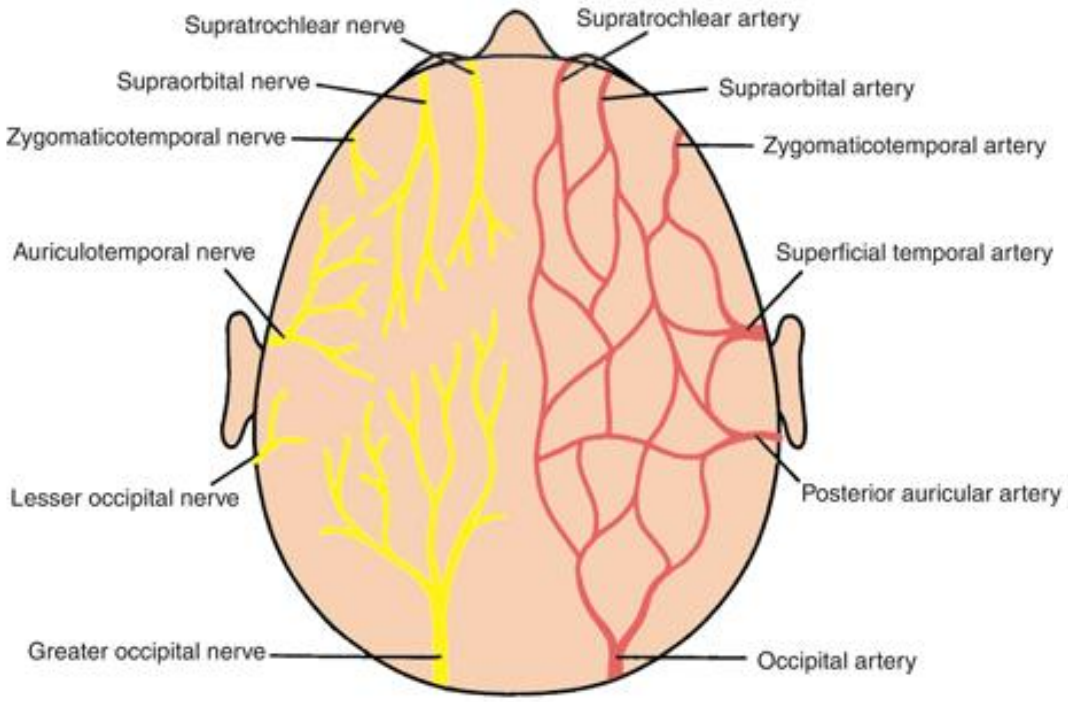


Figure 5: Arterial Supply of the Scalp

Veinous Drainage of the Scalp

The **supratrochlear** and **supraorbital veins** unite at the medial margin of the orbit to form the **facial vein**. The **superficial temporal vein unites with the maxillary vein** in the substance of the parotid gland to form the **retromandibular vein** (Fig. 6). The **posterior auricular vein** unites with the posterior division of the **retromandibular vein,** just below the parotid gland, to form the **external jugular vein** (Fig. 6). The **occipital vein** drains into the **suboccipital venous plexus,** which in turn drains into the **vertebral veins** or directly into the **external jugular vein.**

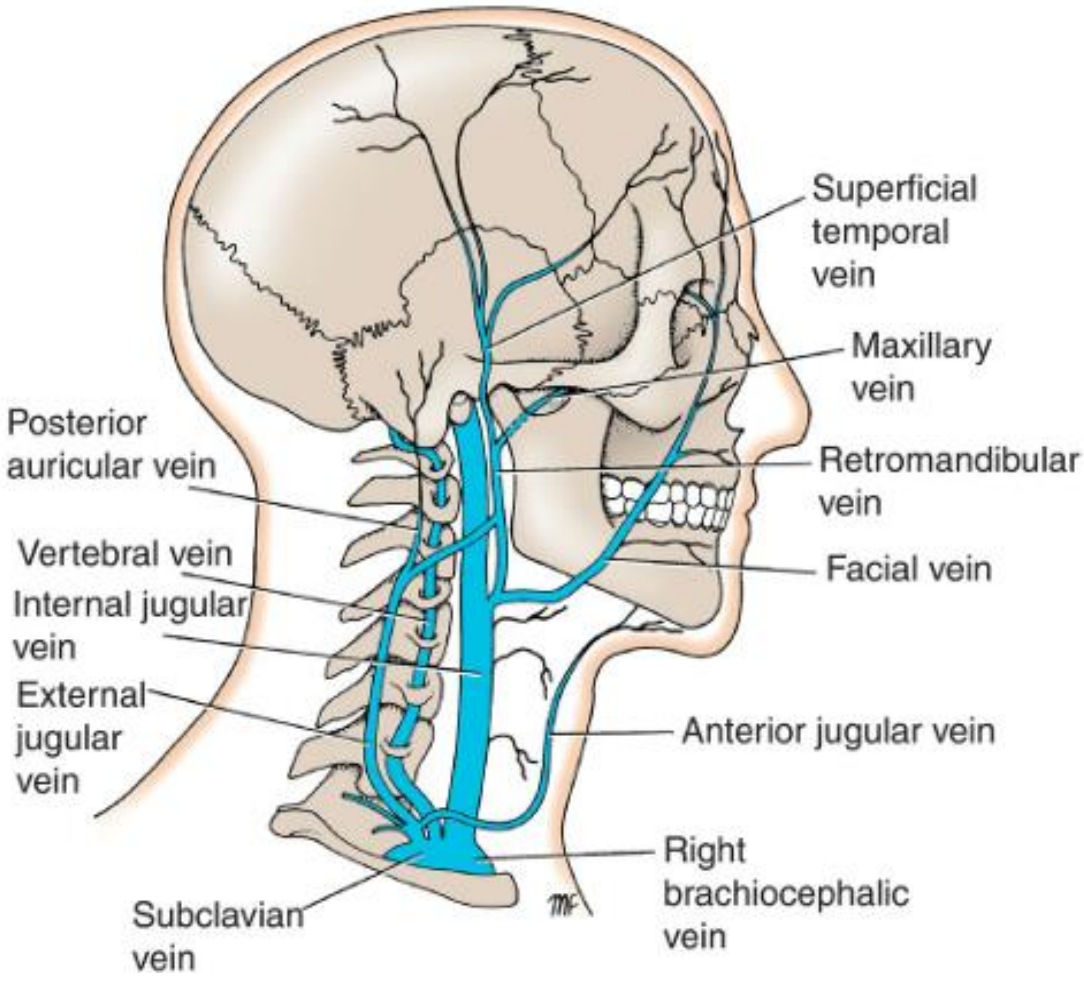


Figure 6: Main veins of the head and neck.

Lymph Drainage of the Scalp

Lymph vessels in the **anterior part** of the scalp and forehead drain into the **submandibular lymph** nodes. Drainage from the **lateral part** of the scalp above the ear is into the **superficial parotid (preauricular) nodes**; lymph vessels in the part of the scalp above and behind the ear drain into the **mastoid nodes**. Vessels in the back of the scalp drain into the **occipital nodes**

(Fig. 7).

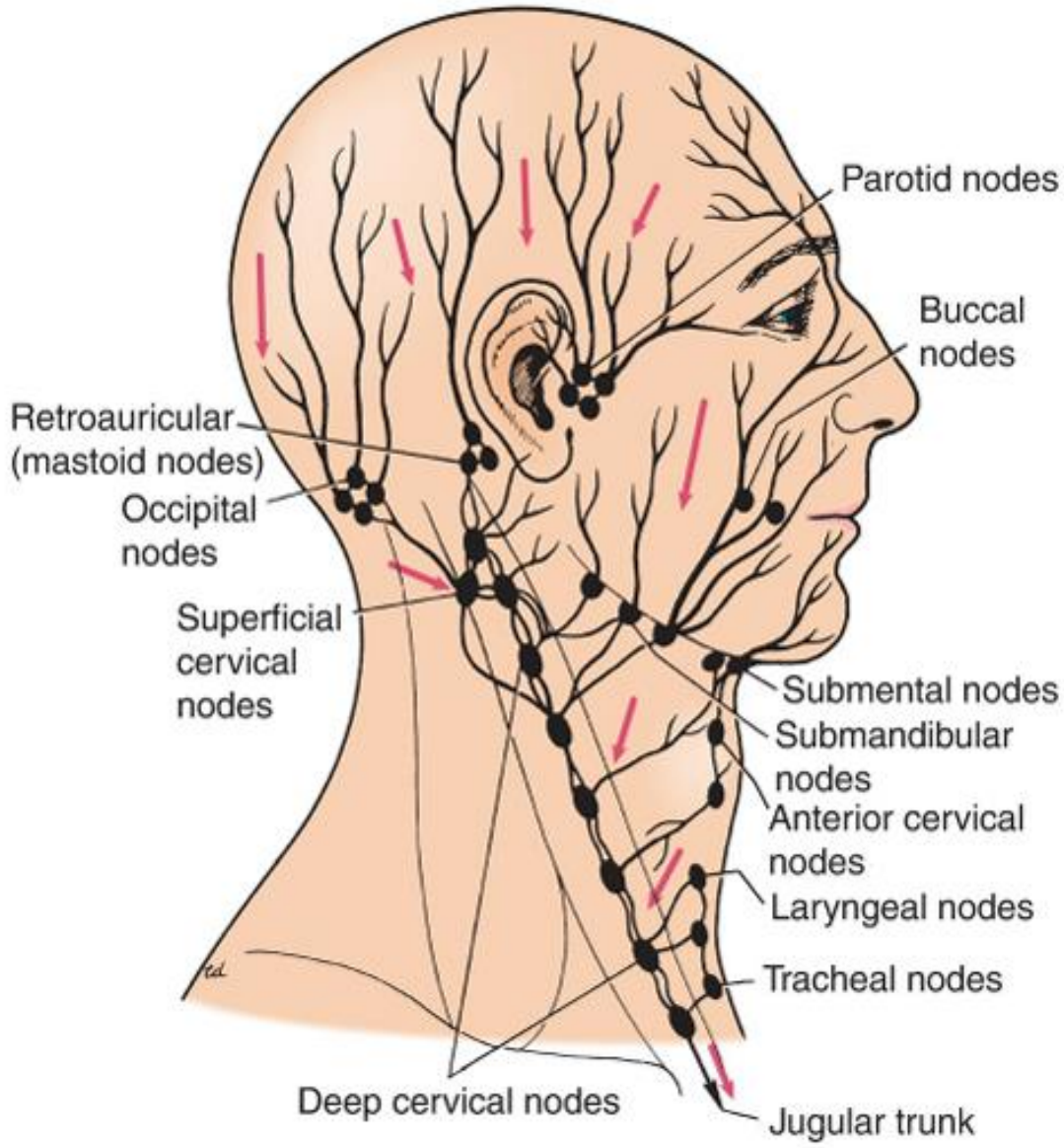


Figure 7: Lymph drainage of the head

Clinical Notes

The skin of the scalp possesses numerous sebaceous glands, the ducts of which are prone to infection and damage by combs. For this reason**,** **sebaceous cysts** of the scalp are common. Even a small laceration of the scalp can cause severe blood loss. It is often difficult to stop the bleeding of a scalp wound because the arterial walls are attached to fibrous septa in the subcutaneous tissue and are unable to contract or retract to allow blood clotting to take place. Local pressure applied to the scalp is the only satisfactory method of stopping the bleeding. Infections of the scalp tend to remain localized and are usually painful because of the abundant fibrous tissue in the subcutaneous layer. Occasionally, an infection of the scalp spreads by the emissary veins, which are valveless, to the skull bones, causing **osteomyelitis**. Infected blood in the diploic veins may travel by the emissary veins farther into the venous sinuses and produce venous sinus thrombosis. Furthermore, blood or pus may collect in the potential space beneath the epicranial aponeurosis.

Reference

1. Snell RS: Clinical anatomy by regions. Lippincott Williams & Wilkins, 2011.