The Scalp

Structure

The scalp consists of five layers, the first three of which are intimately bound together and move as a unit (Fig. 11.37). To assist one in memorizing the names of the five layers of the scalp, use each letter of the word **SCALP** to denote the layer of the scalp.

- **S**kin, which is thick and hair bearing and contains numerous sebaceous glands
- **C**onnective tissue beneath the skin, which is fibrofatty, the fibrous septa uniting the skin to the underlying aponeurosis of the occipitofrontalis muscle (Fig. 11.37). Numerous arteries and veins are found in this layer. The arteries are branches of the external and internal carotid arteries, and a free anastomosis takes place between them.
- **A**poneurosis (epicranial), which is a thin, tendinous sheet that unites the occipital and frontal bellies of the occipitofrontalis muscle (Figs. 11.37 and 11.38). The lateral margins of the aponeurosis are attached to

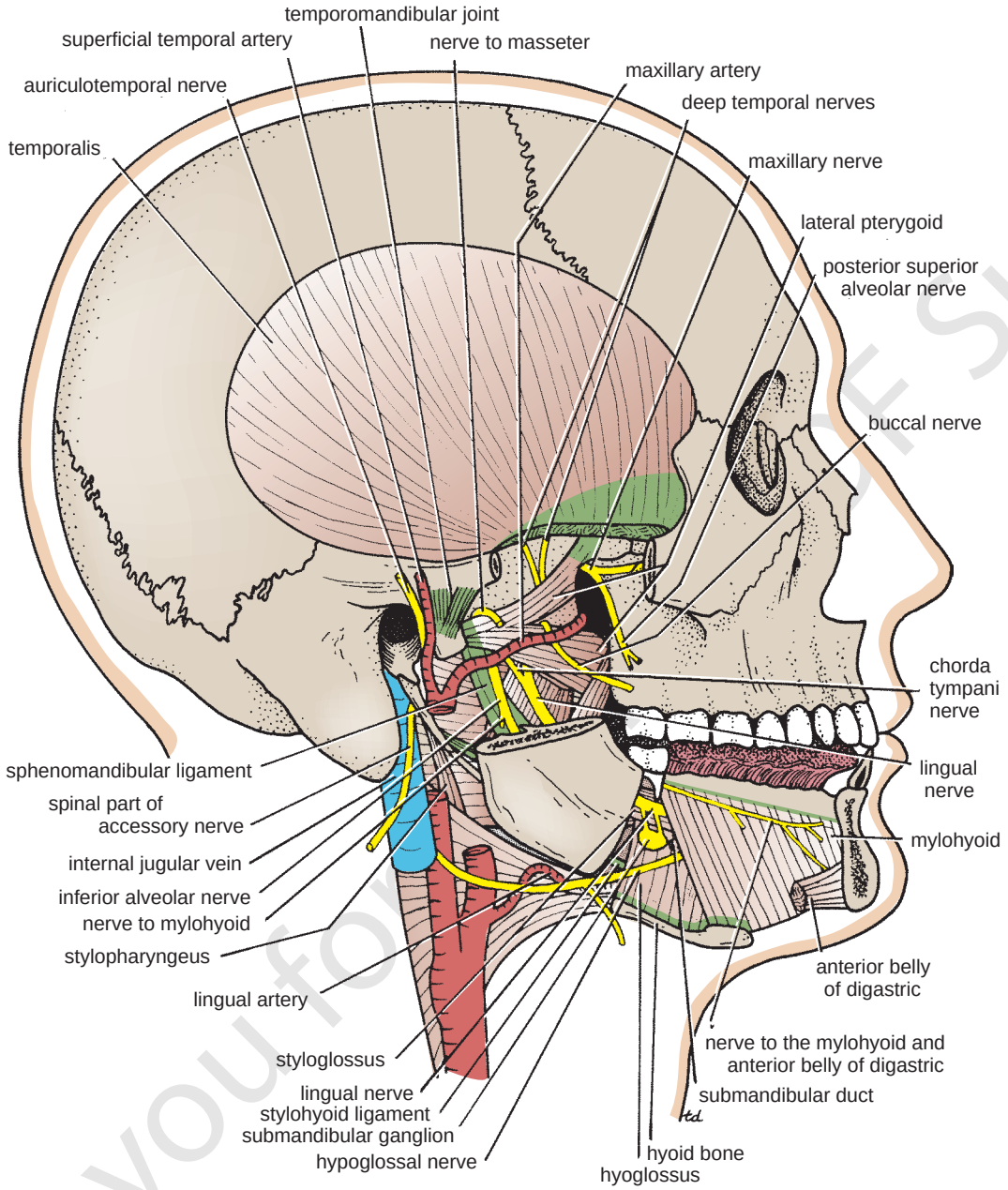

FIGURE 11.36 Infratemporal and submandibular regions. Parts of the zygomatic arch, the ramus, and the body of the mandible have been removed to display deeper structures.

the temporal fascia. The subaponeurotic space is the potential space beneath the epicranial aponeurosis. It is limited in front and behind by the origins of the occipitofrontalis muscle, and it extends laterally as far as the attachment of the aponeurosis to the temporal fascia.

- **L**oose areolar tissue, which occupies the subaponeurotic space (Fig. 11.37) and loosely connects the epicranial aponeurosis to the periosteum of the skull (the pericranium). 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. 11.37).
- **P**ericranium, which is the periosteum covering the outer surface of the skull bones. It is important to remember that at the sutures between individual skull bones, the periosteum on the outer surface of the bones becomes continuous with the periosteum on the inner surface of the skull bones (Fig. 11.37).

Muscles of the Scalp

Occipitofrontalis

The origin, insertion, nerve supply, and action of this muscle are described in Table 11.4.

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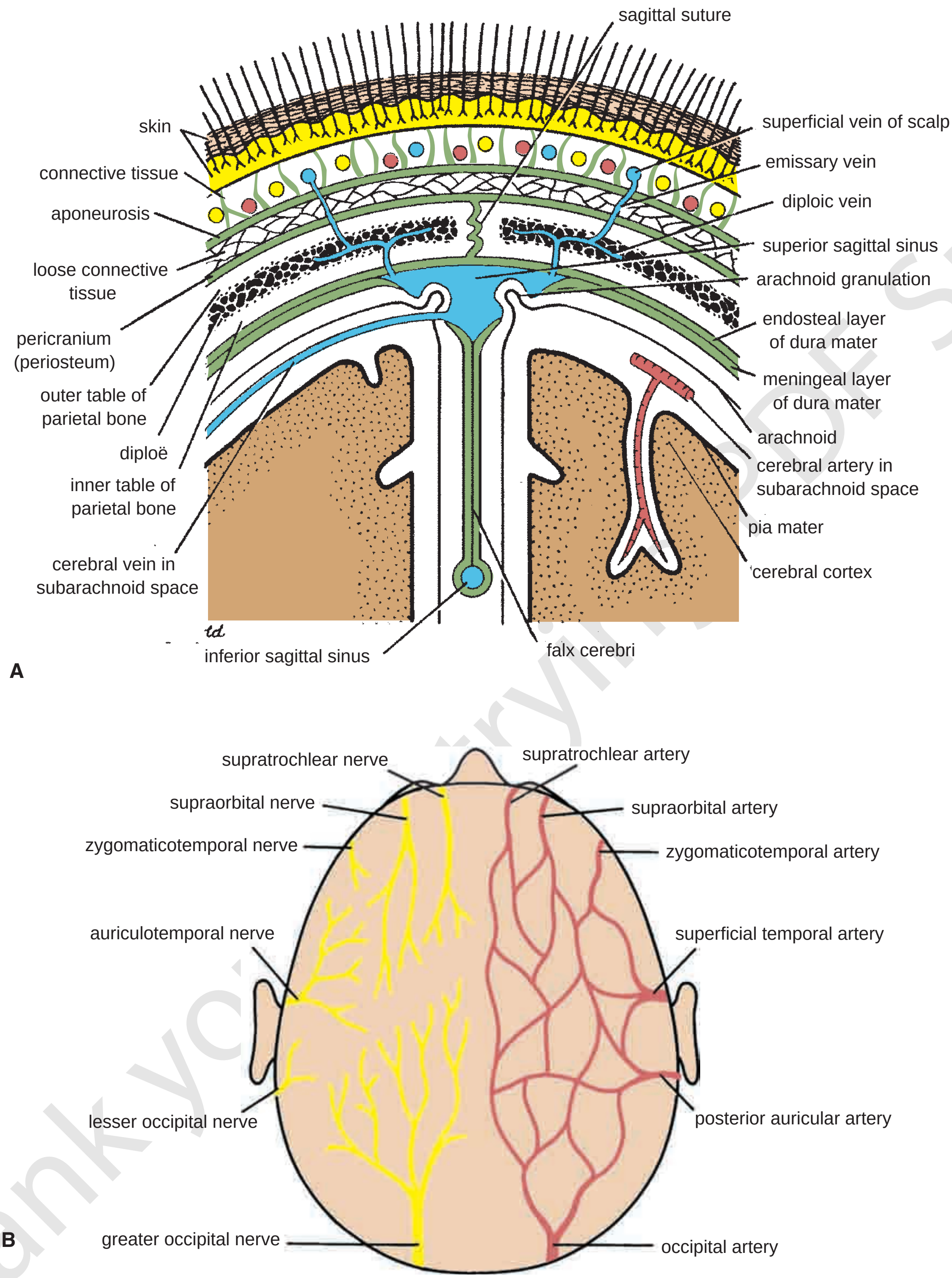

FIGURE 11.37 **A.** Coronal section of the upper part of the head showing the layers of the scalp, the sagittal suture of the skull, the falx cerebri, the superior and inferior sagittal venous sinuses, the arachnoid granulations, the emissary veins, and the relation of cerebral blood vessels to the subarachnoid space. **B.** Sensory nerve supply and arterial supply to the scalp.

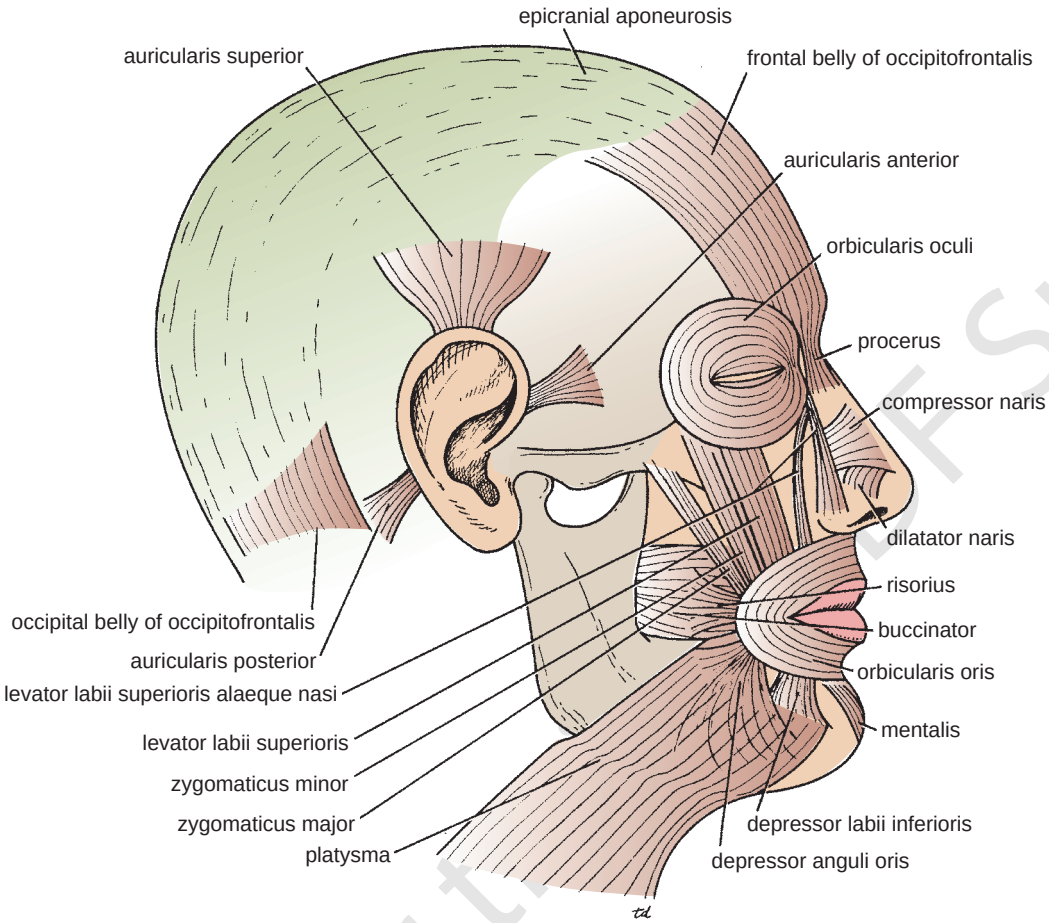

FIGURE 11.38 Muscles of facial expression.

Note that 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.

Sensory Nerve Supply of the Scalp

The main trunks of the sensory nerves lie in the superficial fascia. Moving laterally from the midline anteriorly, the following nerves are present:

The **supratrochlear nerve,** a branch of the ophthalmic division of the trigeminal nerve, winds around the superior orbital margin and supplies the scalp (Fig. 11.37). 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 (Fig. 11.37). 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 (Fig. 11.37).

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 (Fig. 11.37). Its terminal branches supply the skin over the temporal region.

The **lesser occipital nerve,** a branch of the cervical plexus (C2), supplies the scalp over the lateral part of the occipital region (Fig. 11.37) and the skin over the medial surface of the auricle.

The **greater occipital nerve,** a branch of the posterior ramus of the 2nd cervical nerve, ascends over the back of the scalp and supplies the skin as far forward as the vertex of the skull (Fig. 11.37).

Arterial Supply of the Scalp

The scalp has a rich supply of blood to nourish the hair follicles, and, for this reason, the smallest cut bleeds profusely. The arteries lie in the superficial fascia. Moving laterally from the midline anteriorly, the following arteries are present:

The **supratrochlear** and the **supraorbital arteries,** branches of the ophthalmic artery, ascend over the forehead in company with the supratrochlear and supraorbital nerves (Fig. 11.37).

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The **superficial temporal artery,** the smaller terminal branch of the external carotid artery, ascends in front of the auricle in company with the auriculotemporal nerve (Fig. 11.37). It divides into anterior and posterior branches, which supply 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 (Fig. 11.37).

The **occipital artery,** a branch of the external carotid artery, ascends from the apex of the posterior triangle, in company with the greater occipital nerve (Fig. 11.37). It supplies the skin over the back of the scalp and reaches as high as the vertex of the skull.

Venous 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. 11.39).

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. 11.39).

The **occipital vein** drains into the suboccipital venous plexus, which lies beneath the floor of the upper part of the posterior triangle; the plexus in turn drains into the vertebral veins or the internal jugular vein.

The veins of the scalp freely anastomose with one another and are connected to the diploic veins of the skull bones and the intracranial venous sinuses by the valveless **emissary veins** (Fig. 11.37).

Lymph Drainage of the Scalp

Lymph vessels in the anterior part of the scalp and forehead drain into the submandibular lymph nodes (Fig. 11.40). 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.

CLINICAL NOTES

Clinical Significance of the Scalp Structure

It is important to realize that the skin, the subcutaneous tissue, and the epicranial aponeurosis are closely united to one another and are separated from the periosteum by loose areolar tissue. 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.

Lacerations of the Scalp

The **scalp has a profuse blood supply** to nourish the hair follicles. 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 (see below).

In automobile accidents, it is common for large areas of the scalp to be cut off the head as a person is projected forward through the windshield. Because of the profuse blood supply, it is often possible to replace large areas of scalp that are only hanging to the skull by a narrow pedicle. Suture them in place, and necrosis will not occur.

The tension of the **epicranial aponeurosis,** produced by the tone of the occipitofrontalis muscles, is important in all deep wounds of the scalp. If the aponeurosis has been divided, the wound will gape open. For satisfactory healing to take place, the opening in the aponeurosis must be closed with sutures.

Often, a wound caused by a blunt object such as a baseball bat closely resembles an incised wound. This is because the scalp is split against the unyielding skull, and the pull of the occipitofrontalis muscles causes a gaping wound. This anatomic fact may be of considerable forensic importance.

Life-Threatening Scalp Hemorrhage

Anatomically, it is useful to remember in an emergency that all the superficial arteries supplying the scalp ascend from the face and the neck. Thus, in an emergency situation, encircle the head just above the ears and eyebrows with a tie, shoelaces, or even a piece of string and tie it tight. Then, insert a pen, pencil, or stick into the loop and rotate it so that the tourniquet exerts pressure on the arteries.

Scalp Infections

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.

Blood or pus may collect in the potential space beneath the epicranial aponeurosis. It tends to spread over the skull, being limited in front by the orbital margin, behind by the nuchal lines, and laterally by the temporal lines. On the other hand, subperiosteal blood or pus is limited to one bone because of the attachment of the periosteum to the sutural ligaments.

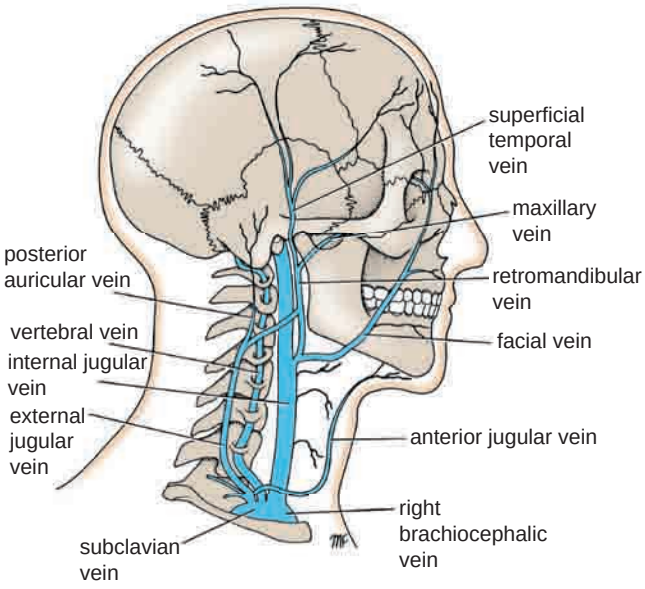

FIGURE 11.39 Main veins of the head and neck.

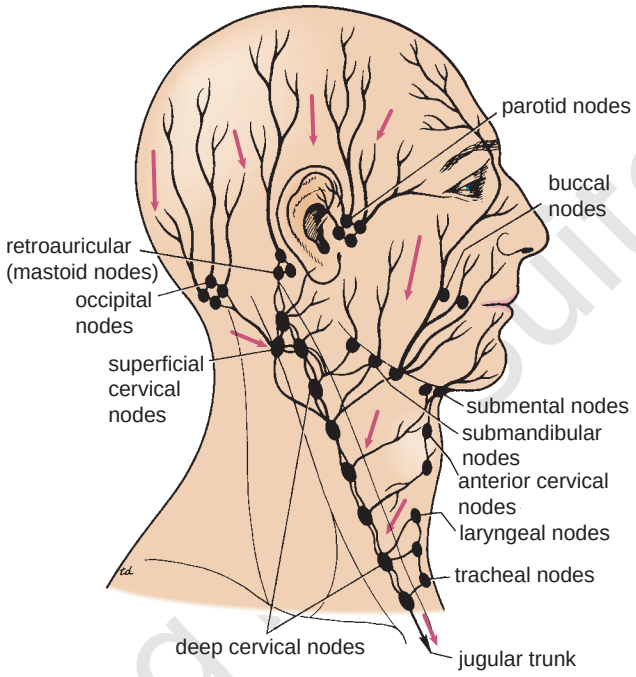

FIGURE 11.40 Lymph drainage of the head and neck.