The Face

Skin of the Face

The skin of the face possesses numerous sweat and sebaceous glands. It is connected to the underlying bones by loose connective tissue, in which are embedded the muscles of facial expression. **No deep fascia is present in the face.**

Wrinkle lines of the face result from the repeated folding of the skin perpendicular to the long axis of the underlying contracting muscles, coupled with the loss of youthful skin elasticity. Surgical scars of the face are less conspicuous if they follow the wrinkle lines.

Sensory Nerves of the Face

The skin of the face is supplied by branches of the three divisions of the trigeminal nerve, except for the small area over the angle of the mandible and the parotid gland (Fig. 11.41), which is supplied by the great auricular nerve (C2 and 3). The overlap of the three divisions of the trigeminal nerve is slight compared with the considerable overlap of dermatomes of the trunk and limbs. The ophthalmic nerve supplies the region developed from the frontonasal process; the maxillary nerve serves the region developed

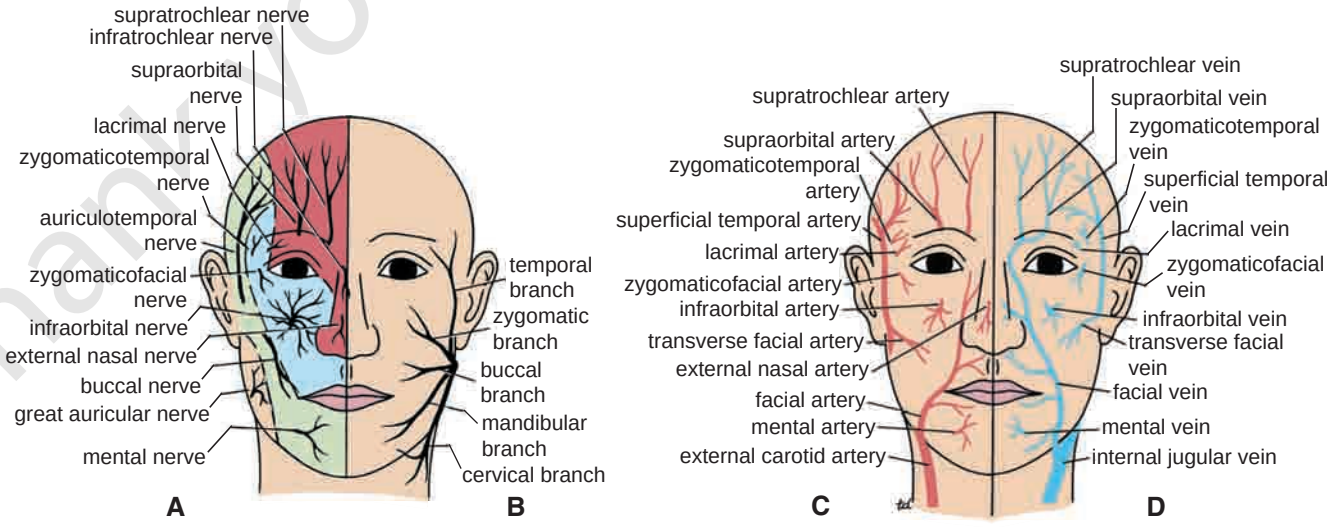

FIGURE 11.41 **A.** Sensory nerve supply to the skin of the face. **B.** Branches of the 7th cranial nerve to muscles of facial expression. **C.** Arterial supply of the face. **D.** Venous drainage of the face.

from the maxillary process of the first pharyngeal arch; and the mandibular nerve serves the region developed from the mandibular process of the first pharyngeal arch.

These nerves not only supply the skin of the face, but also supply proprioceptive fibers to the underlying muscles of facial expression. They are, in addition, the sensory nerve supply to the mouth, teeth, nasal cavities, and paranasal air sinuses.

Ophthalmic Nerve

The ophthalmic nerve supplies the skin of the forehead, the upper eyelid, the conjunctiva, and the side of the nose down to and including the tip. Five branches of the nerve pass to the skin.

- The **lacrimal nerve** supplies the skin and conjunctiva of the lateral part of the upper eyelid (Fig. 11.41).
- The **supraorbital nerve** winds around the upper margin of the orbit at the supraorbital notch (Fig. 11.41). It divides into branches that supply the skin and conjunctiva on the central part of the upper eyelid; it also supplies the skin of the forehead.
- The **supratrochlear nerve** winds around the upper margin of the orbit medial to the supraorbital nerve (Fig. 11.41). It divides into branches that supply the skin and conjunctiva on the medial part of the upper eyelid and the skin over the lower part of the forehead, close to the median plane.
- The **infratrochlear nerve** leaves the orbit below the pulley of the superior oblique muscle. It supplies the skin and conjunctiva on the medial part of the upper eyelid and the adjoining part of the side of the nose (Fig. 11.41).
- The **external nasal nerve** leaves the nose by emerging between the nasal bone and the upper nasal cartilage. It supplies the skin on the side of the nose down as far as the tip (Fig. 11.41).

Maxillary Nerve

The maxillary nerve supplies the skin on the posterior part of the side of the nose, the lower eyelid, the cheek, the upper lip, and the lateral side of the orbital opening. Three branches of the nerve pass to the skin.

- The **infraorbital nerve** is a direct continuation of the maxillary nerve. It enters the orbit and appears on the face through the infraorbital foramen. It immediately divides into numerous small branches, which radiate out from the foramen and supply the skin of the lower eyelid and cheek, the side of the nose, and the upper lip (Fig. 11.41).
- The **zygomaticofacial nerve** passes onto the face through a small foramen on the lateral side of the zygomatic bone. It supplies the skin over the prominence of the cheek (Fig. 11.41).
- The **zygomaticotemporal nerve** emerges in the temporal fossa through a small foramen on the posterior surface of the zygomatic bone. It supplies the skin over the temple (Fig. 11.41).

Mandibular Nerve

The mandibular nerve supplies the skin of the lower lip, the lower part of the face, the temporal region, and part of the auricle. It then passes upward to the side of the scalp. Three branches of the nerve pass to the skin.

- The **mental nerve** emerges from the mental foramen of the mandible and supplies the skin of the lower lip and chin (Fig. 11.41).
- The **buccal nerve** emerges from beneath the anterior border of the masseter muscle and supplies the skin over a small area of the cheek (Fig. 11.41).
- The **auriculotemporal nerve** ascends from the upper border of the parotid gland between the superficial temporal vessels and the auricle. It supplies the skin of the auricle, the external auditory meatus, the outer surface of the tympanic membrane, and the skin of the scalp above the auricle (Fig. 11.41).

CLINICAL NOTES

Sensory Innervation and Trigeminal Neuralgia

The facial skin receives its sensory nerve supply from the three divisions of the trigeminal nerve. Remember that a small area of skin over the angle of the jaw is supplied by the great auricular nerve (C2 and 3). **Trigeminal neuralgia** is a relatively common condition in which the patient experiences excruciating pain in the distribution of the mandibular or maxillary division, with the ophthalmic division usually escaping. A physician should be able to map out accurately on a patient's face the distribution of each of the divisions of the trigeminal nerve.

Arterial Supply of the Face

The face receives a rich blood supply from two main vessels: the facial and superficial temporal arteries, which are supplemented by several small arteries that accompany the sensory nerves of the face.

The **facial artery** arises from the external carotid artery (Figs. 11.55 and 11.59). Having arched upward and over the submandibular salivary gland, it curves around the inferior margin of the body of the mandible at the anterior border of the masseter muscle. **It is here that the pulse can be easily felt** (Fig. 11.132). It runs upward in a tortuous course toward the angle of the mouth and is covered by the platysma and the risorius muscles. It then ascends deep to the zygomaticus muscles and the levator labii superioris muscle and runs along the side of the nose to the medial angle of the eye, where it anastomoses with the terminal branches of the ophthalmic artery (Fig. 11.41).

Branches

- The **submental artery** arises from the facial artery at the lower border of the body of the mandible. It supplies the skin of the chin and lower lip.
- The **inferior labial artery** arises near the angle of the mouth. It runs medially in the lower lip and anastomoses with its fellow of the opposite side.
- The **superior labial artery** arises near the angle of the mouth. It runs medially in the upper lip and gives branches to the septum and ala of the nose.

- The **lateral nasal artery** arises from the facial artery alongside the nose. It supplies the skin on the side and dorsum of the nose.
- The **superficial temporal artery** (Fig. 11.41), the smaller terminal branch of the external carotid artery, commences in the parotid gland. It ascends in front of the auricle to supply the scalp (see page 578).
- The **transverse facial artery,** a branch of the superficial temporal artery, arises within the parotid gland. It runs forward across the cheek just above the parotid duct (Fig. 11.41).
- The **supraorbital** and **supratrochlear arteries,** branches of the ophthalmic artery, supply the skin of the forehead (Fig. 11.41).

CLINICAL NOTES

Blood Supply of the Facial Skin

The blood supply to the skin of the face is profuse so that it is rare in plastic surgery for skin flaps to necrose in this region.

Facial Arteries and Taking the Patient's Pulse

The superficial temporal artery, as it crosses the zygomatic arch in front of the ear, and the facial artery, as it winds around the lower margin of the mandible level with the anterior border of the masseter, are commonly used by the anesthetist to take the patient's pulse.

Venous Drainage of the Face

The **facial vein** is formed at the medial angle of the eye by the union of the supraorbital and supratrochlear veins (Fig. 11.41). It is connected to the superior ophthalmic vein directly through the supraorbital vein. By means of the superior ophthalmic vein, the facial vein is connected to the cavernous sinus (Fig. 11.9); this connection is of great clinical importance because it provides a pathway for the spread of infection from the face to the cavernous sinus. The facial vein descends behind the facial artery to the lower margin of the body of the mandible. It crosses superficial to the submandibular gland and is joined by the anterior division of the retromandibular vein. The facial vein ends by draining into the internal jugular vein.

Tributaries

The facial vein receives tributaries that correspond to the branches of the facial artery. It is joined to the pterygoid venous plexus by the **deep facial vein** and to the cavernous sinus by the superior ophthalmic vein.

The **transverse facial vein** joins the superficial temporal vein within the parotid gland.

Lymph Drainage of the Face

Lymph from the forehead and the anterior part of the face drains into the submandibular lymph nodes (Fig. 11.42).

CLINICAL NOTES

Facial Infections and Cavernous Sinus Thrombosis

The area of facial skin bounded by the nose, the eye, and the upper lip is a potentially dangerous zone to have an infection. For example, a boil in this region can cause thrombosis of the facial vein, with spread of organisms through the inferior ophthalmic veins to the cavernous sinus. The resulting cavernous sinus thrombosis may be fatal unless adequately treated with antibiotics.

A few buccal lymph nodes may be present along the course of these lymph vessels. The lateral part of the face, including the lateral parts of the eyelids, is drained by lymph vessels that end in the parotid lymph nodes. The central part of the lower lip and the skin of the chin are drained into the submental lymph nodes.

Bones of the Face

The bones that form the front of the skull are shown in Figure 11.42. The superior orbital margins and the area above them are formed by the **frontal bone,** which contains the **frontal air sinuses.** The lateral orbital margin is formed by the **zygomatic bone** and the inferior orbital margin is formed by the **zygomatic bone** and the **maxilla.** The medial orbital margin is formed above the maxillary process of the frontal bone and below by the frontal process of the **maxilla.**

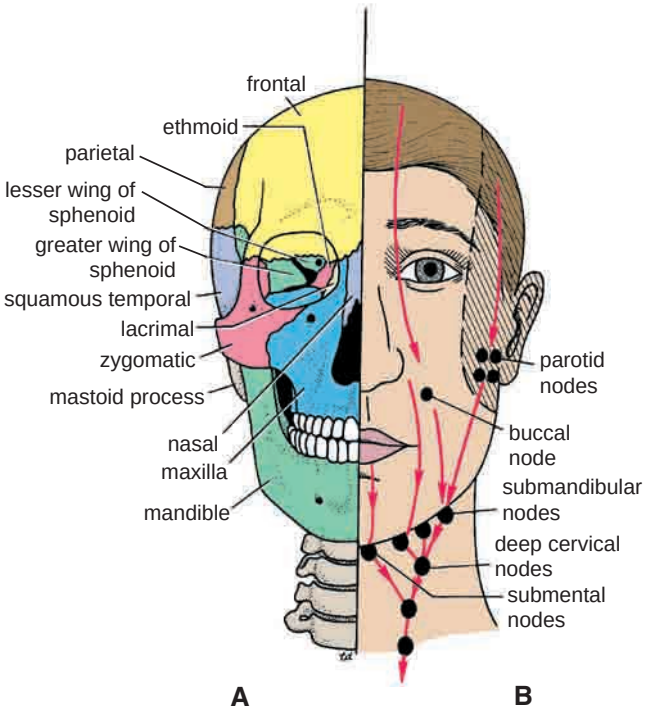

FIGURE 11.42 **A.** Bones of the front of the skull. **B.** Lymph drainage of the face.

The root of the nose is formed by the **nasal bones,** which articulate below with the maxilla and above with the frontal bones. Anteriorly, the nose is completed by upper and lower plates of hyaline cartilage and small cartilages of the ala nasi.

The important central bone of the middle third of the face is the maxilla, containing its teeth and the maxillary air sinus. The bone of the lower third of the face is the mandible, with its teeth. A more detailed account of the bones of the face is given in the discussion of the skull (see page 530).

Muscles of the Face (Muscles of Facial Expression)

The muscles of the face are embedded in the superficial fascia, and most arise from the bones of the skull and are inserted into the skin (Fig. 11.38). The orifices of the face, namely, the orbit, nose, and mouth, are guarded by the eyelids, nostrils, and lips, respectively. It is the function of the facial muscles to serve as sphincters or dilators of these structures. A secondary function of the facial muscles is to modify the expression of the face. All the muscles of the face are developed from the second pharyngeal arch and are supplied by the facial nerve.

Muscles of the Eyelids

The sphincter muscle of the eyelids is the orbicularis oculi, and the dilator muscles are the levator palpebrae superioris and the occipitofrontalis (Fig. 11.38). The levator palpebrae superioris is described on page 550. The occipitofrontalis forms part of the scalp and is described on page 575.

The origin, insertion, nerve supply, and action of the orbicularis oculi and the corrugator supercilii are described in Table 11.4.

Muscles of the Nostrils

The sphincter muscle is the compressor naris and the dilator muscle is the dilator naris (Fig. 11.38).

The origin, insertion, nerve supply, and action of the compressor naris, the dilator naris, and the procerus are shown in Table 11.4.

Muscles of the Lips and Cheeks

The sphincter muscle is the orbicularis oris. The dilator muscles consist of a series of small muscles that radiate out from the lips.

Sphincter Muscle of the Lips: Orbicularis Oris

- **Origin and insertion:** The fibers encircle the oral orifice within the substance of the lips (Fig. 11.38). Some of the fibers arise near the midline from the maxilla above and the mandible below. Other fibers arise from the deep surface of the skin and pass obliquely to the mucous membrane lining the inner surface of the lips. Many of the fibers are derived from the buccinator muscle.
- **Nerve supply:** Buccal and mandibular branches of the facial nerve
- **Action:** Compresses the lips together

Dilator Muscles of the Lips

The dilator muscles (Fig. 11.38) radiate out from the lips, and their action is to separate the lips; this movement is usually accompanied by separation of the jaws.

The muscles arise from the bones and fascia around the oral aperture and converge to be inserted into the substance of the lips. Traced from the side of the nose to the angle of the mouth and then below the oral aperture, the muscles are named as follows:

- Levator labii superioris alaeque nasi
- Levator labii superioris
- Zygomaticus minor
- Zygomaticus major
- Levator anguli oris (deep to the zygomatic muscles)
- Risorius
- Depressor anguli oris
- Depressor labii inferioris
- Mentalis

Nerve Supply Buccal and mandibular branches of the facial nerve

Muscle of the Cheek

Buccinator

- **Origin:** From the outer surface of the alveolar margins of the maxilla and mandible opposite the molar teeth and from the pterygomandibular ligament (Fig. 11.38).
- **Insertion:** The muscle fibers pass forward, forming the muscle layer of the cheek. The muscle is pierced by the parotid duct. At the angle of the mouth the central fibers decussate, those from below entering the upper lip and those from above entering the lower lip; the highest and lowest fibers continue into the upper and lower lips, respectively, without intersecting. The buccinator muscle thus blends and forms part of the orbicularis oris muscle.
- **Nerve supply:** Buccal branch of the facial nerve
- **Action:** Compresses the cheeks and lips against the teeth

The origin, insertion, nerve supply, and action of the muscles of the lips and cheeks are shown in Table 11.4.

CLINICAL NOTES

Facial Muscle Paralysis

The facial muscles are innervated by the facial nerve. Damage to the facial nerve in the internal acoustic meatus (by a tumor), in the middle ear (by infection or operation), in the facial nerve canal (perineuritis, **Bell's palsy**), or in the parotid gland (by a tumor) or caused by lacerations of the face will cause distortion of the face, with drooping of the lower eyelid, and the angle of the mouth will sag on the affected side. This is essentially a lower motor neuron lesion. An upper motor neuron lesion (involvement of the pyramidal tracts) will leave the upper part of the face normal because the neurons supplying this part of the face receive corticobulbar fibers from both cerebral cortices.

Facial Nerve

As the facial nerve runs forward within the substance of the parotid salivary gland (see page 630), it divides into its five terminal branches (Fig. 11.41).

- The **temporal branch** emerges from the upper border of the gland and supplies the anterior and superior auricular muscles, the frontal belly of the occipitofrontalis, the orbicularis oculi, and the corrugator supercilii.
- The **zygomatic branch** emerges from the anterior border of the gland and supplies the orbicularis oculi.
- The **buccal branch** emerges from the anterior border of the gland below the parotid duct and supplies the buccinator muscle and the muscles of the upper lip and nostril.
- The **mandibular branch** emerges from the anterior border of the gland and supplies the muscles of the lower lip.
- The **cervical branch** emerges from the lower border of the gland and passes forward in the neck below the mandible to supply the platysma muscle; it may cross the lower margin of the body of the mandible to supply the depressor anguli oris muscle.

The facial nerve is the nerve of the second pharyngeal arch and supplies all the muscles of facial expression. **It does not supply the skin,** but its branches communicate with branches of the trigeminal nerve. It is believed that the proprioceptive nerve fibers of the facial muscles leave the facial nerve in these communicating branches and pass to the central nervous system via the trigeminal nerve. A summary of the origin and distribution of the facial nerve is shown in Figure 11.67.

EMBRYOLOGIC NOTES

Development of the Face

Early in development, the face of the embryo is represented by an area bounded cranially by the neural plate, caudally by the pericardium, and laterally by the mandibular process of the first pharyngeal arch on each side (Fig. 11.43). In the center of this area is a depression in the ectoderm known as the **stomodeum.** In the floor of the depression is the **buccopharyngeal membrane.** By the fourth week, the buccopharyngeal membrane breaks down so that the stomodeum communicates with the foregut.

The further development of the face depends on the coming together and fusion of several important processes, namely, the **frontonasal process,** the **maxillary processes,** and the **mandibular processes** (Fig. 11.43). The frontonasal process begins as a proliferation of mesenchyme on the ventral surface of the developing brain, and this grows toward the stomodeum. Meanwhile, the maxillary process grows out from the upper end of each first arch and passes medially, forming the lower border of the developing orbit. The mandibular processes of the first arches now approach one another in the midline below the stomodeum and fuse to form the lower jaw and lower lip (Fig. 11.43).

The **olfactory pits** appear as depressions in the lower edge of the advancing frontonasal process, dividing it into a **medial nasal process** and two **lateral nasal processes.** With further development, the maxillary processes grow medially and fuse with the lateral nasal processes and with the medial nasal process (Fig. 11.43). The medial nasal process forms the **philtrum** of the upper lip and the **premaxilla.** The maxillary processes extend medially, forming the upper jaw and the cheek, and finally bury the premaxilla and fuse in the midline. The various processes that ultimately form the face unite during the second month.

The **upper lip** is formed by the growth medially of the maxillary processes of the first pharyngeal arch on each side. Ultimately, the maxillary processes meet in the midline and fuse with each other and with the medial nasal process (Fig. 11.43). Thus, the lateral parts of the upper lip are formed from the maxillary processes, and the medial part, or philtrum, from the medial nasal process, with contributions from the maxillary processes.

The **lower lip** is formed from the mandibular process of the first pharyngeal arch on each side (Fig. 11.43). These processes grow medially below the stomodeum and fuse in the midline to form the entire lower lip.

Each lip separates from its respective gum as the result of the appearance of a linear thickening of ectoderm, the **labiogingival lamina,** which grows down into the underlying mesenchyme and later degenerates. A deep groove thus forms between the lips and the gums. In the midline, a short area of the labiogingival lamina remains and tethers each lip to the gum, thus forming the **frenulum.**

At first, the **mouth** has a broad opening, but later this diminishes in extent because of fusion of the lips at the lateral angles.

Sensory Nerve Supply to the Skin of the Developing Face

The area of skin overlying the frontonasal process and its derivatives receives its sensory nerve supply from the ophthalmic division of the trigeminal nerve, whereas the maxillary division of the trigeminal nerve supplies the area of skin overlying the maxillary process. The area of skin overlying the mandibular process is supplied by the mandibular division of the trigeminal nerve.

Muscles of the Developing Face (Muscles of Facial Expression)

The muscles of the face are derived from the mesenchyme of the second pharyngeal arch. The nerve supply of these muscles is the nerve of the second pharyngeal arch—namely, the seventh cranial nerve.

Cleft Upper Lip

Cleft upper lip may be confined to the lip or may be associated with a cleft palate. The anomaly is usually **unilateral cleft lip** and is caused by a failure of the maxillary process to fuse with the medial nasal process (Figs. 11.44 and 11.45). **Bilateral cleft lip** is caused by a failure of both maxillary processes to fuse with

(continued)

the medial nasal process, which then remains as a central flap of tissue (Figs. 11.46 and 11.48). **Median cleft upper lip** is very rare and is caused by the failure of the rounded swellings of the medial nasal process to fuse in the midline.

Oblique Facial Cleft

Oblique facial cleft is a rare condition in which the cleft lip on one side extends to the medial margin of the orbit (Figs. 11.44 and 11.47). This is caused by the failure of the maxillary process to fuse with the lateral and medial nasal processes.

Cleft Lower Lip

Cleft lower lip is a rare condition. The cleft is exactly central and is caused by incomplete fusion of the mandibular processes (Fig. 11.44).

Treatment of Isolated Cleft Lip

The condition of isolated cleft lip usually is treated by plastic surgery no later than 2 months after birth, provided the baby's condition permits. The surgeon strives to approximate the vermilion border and to form a normal-looking lip (Fig. 11.48A–C).

Macrostomia and Microstomia

The normal size of the mouth shows considerable individual variation. Rarely, there is incomplete fusion of the maxillary with the mandibular processes, producing an excessively large mouth or macrostomia. Very rarely, there is excessive fusion of these processes, producing a small mouth or microstomia. These conditions can easily be corrected surgically.

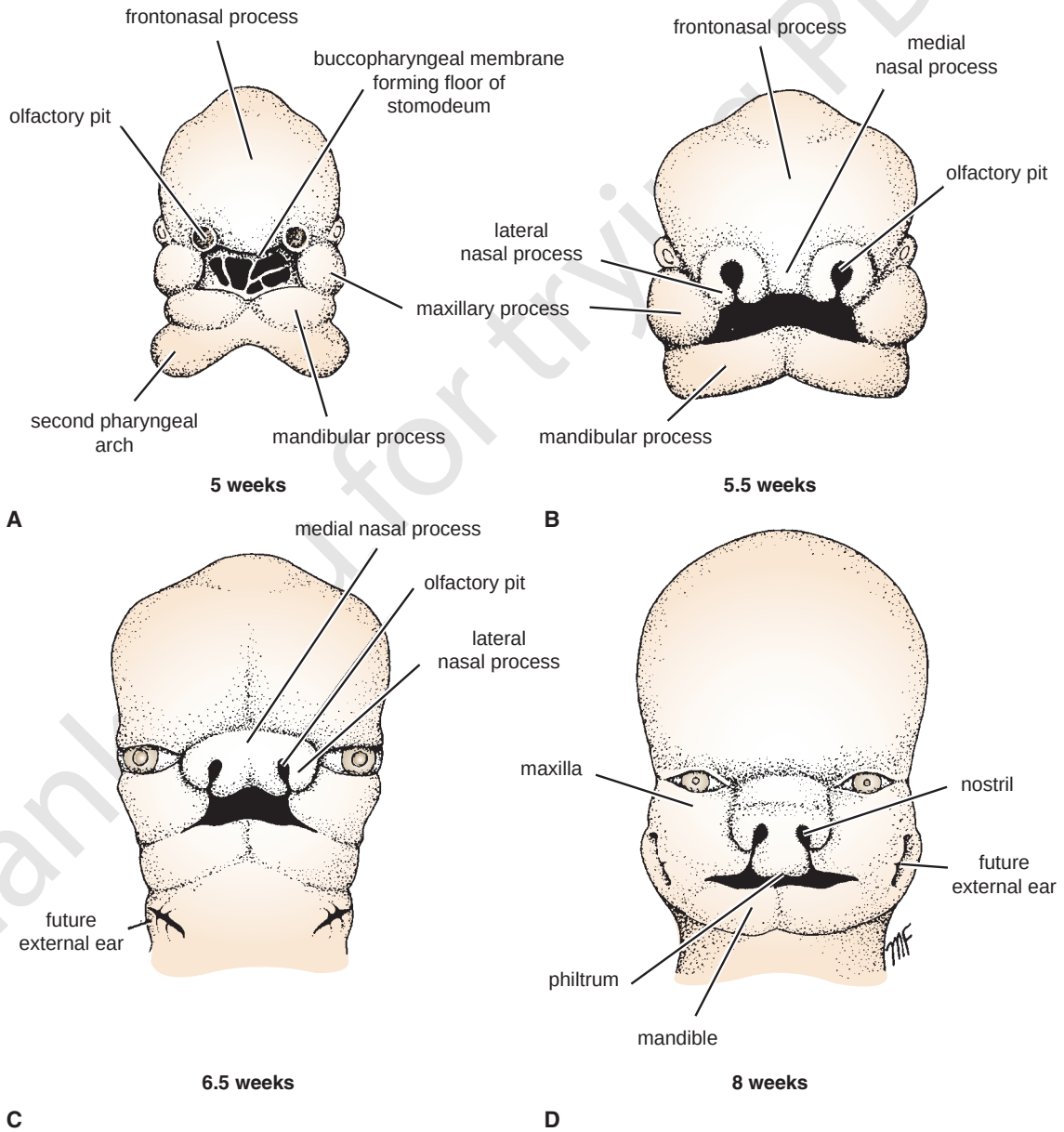

FIGURE 11.43 Different stages in development of the face.