The Face

Pictorial Atlas of Clinical Anatomy

Ralf J. Radlanski
Karl H. Wesker

Second Edition

QUINTESSENCE PUBLISHING

The Face

Pictorial Atlas of Clinical Anatomy

Ralf J. Radlanski
Karl H. Wesker

Contents

1.1.2 Regions of the face

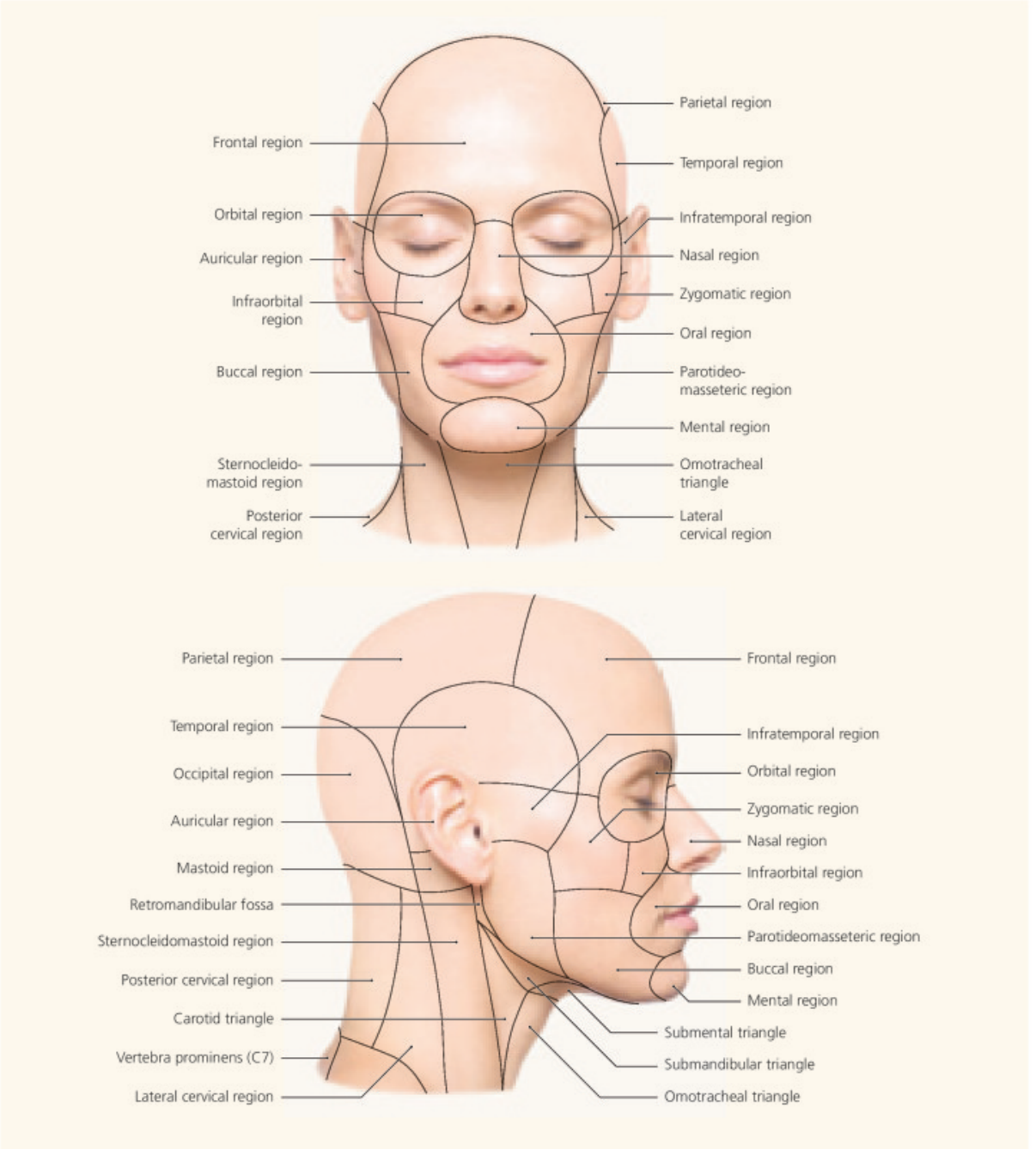

Fig 1-3 Regions of head and neck in anterior view.
Fig 1-4 Regions of head and neck in lateral view.

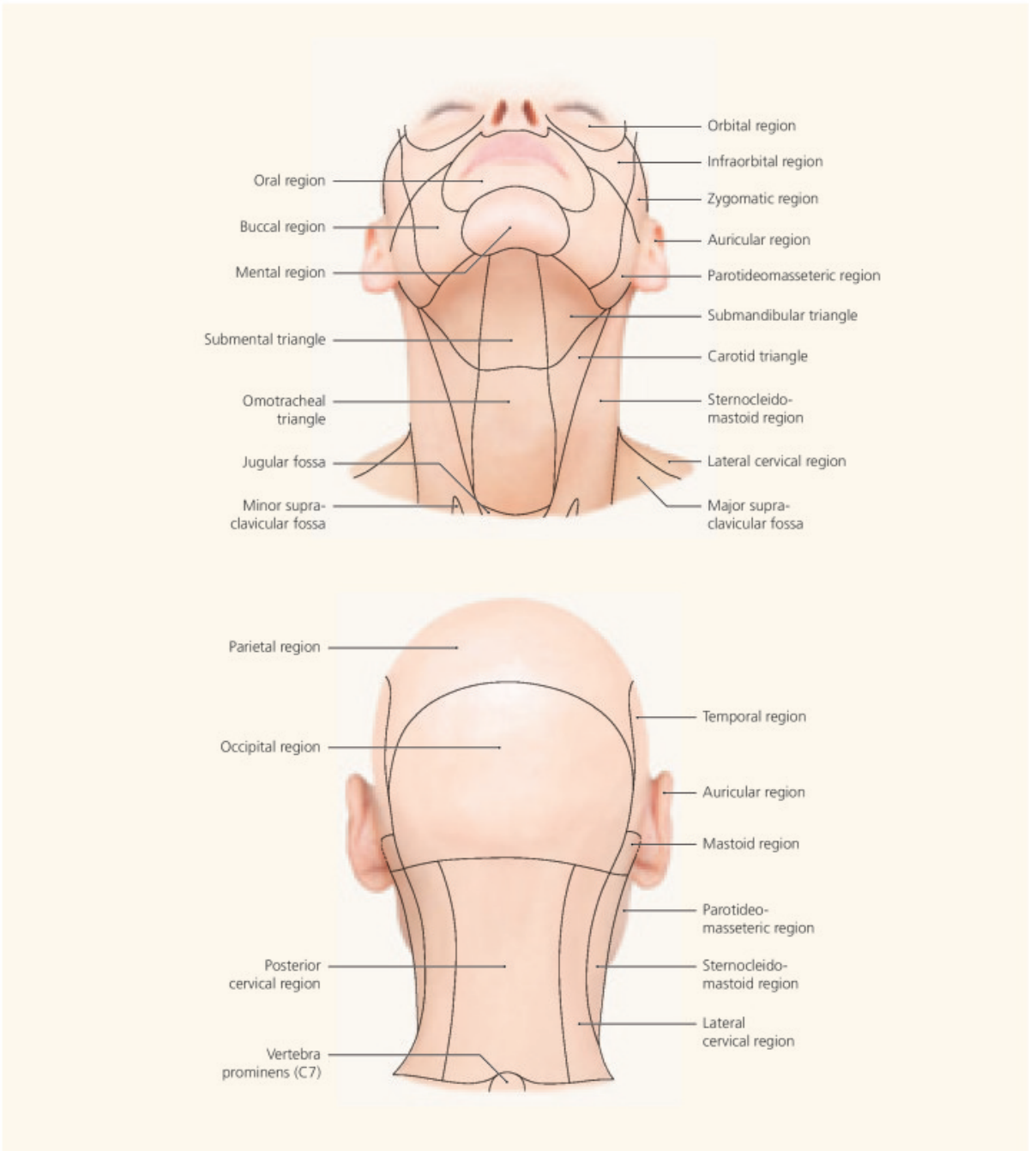

Fig 1-5 Regions of the neck and the face in anterior view.
Fig 1-6 Regions of head and neck in dorsal view.

■ **Fig 1-20** The German orthodontist A. M. Schwarz (1936) introduced a method to evaluate the sagittal relation between the upper and the lower face, which he called the "Fotostat" technique. For this, the profile and lateral views are mounted so that the measuring points tragus (Trg) and infraorbital point (Or') are on a common horizontal line. Vertical lines are drawn from the glabella (Gl; line b) and from the infraorbital point (Or'; line a). The diagnosis of the sagittal position of the maxilla is made by the position of subnasal point (Sn) in relation to line (b). If the maxilla is anterior of this line, it is a prognathic face; if it is posterior then the face is retrognathic. An average face is observed when Sn is on line (b). The diagnosis of the position of the mandible is made by the position of the soft tissue pogonion (Pg'). The face is "balanced" when Pg' is in the middle between the two perpendicular lines (a) and (b). A retrognathic face is found when Pg' is approaching or exceeding the orbital line (a). A prognathic face occurs when Pg' approaches or exceeds line (b).

In this evaluation method, the jaw profile field lies between the vertical lines (a) and (b). In our model, however, both the critical reference points for the upper jaw (Sn) and for the mandible (Pg') are located well anterior to the glabella line (b). It would, therefore, be identified as a prognathic face with slight mandibular protusion based on this evaluation. Our model, however, is without any question esthetically flawless.

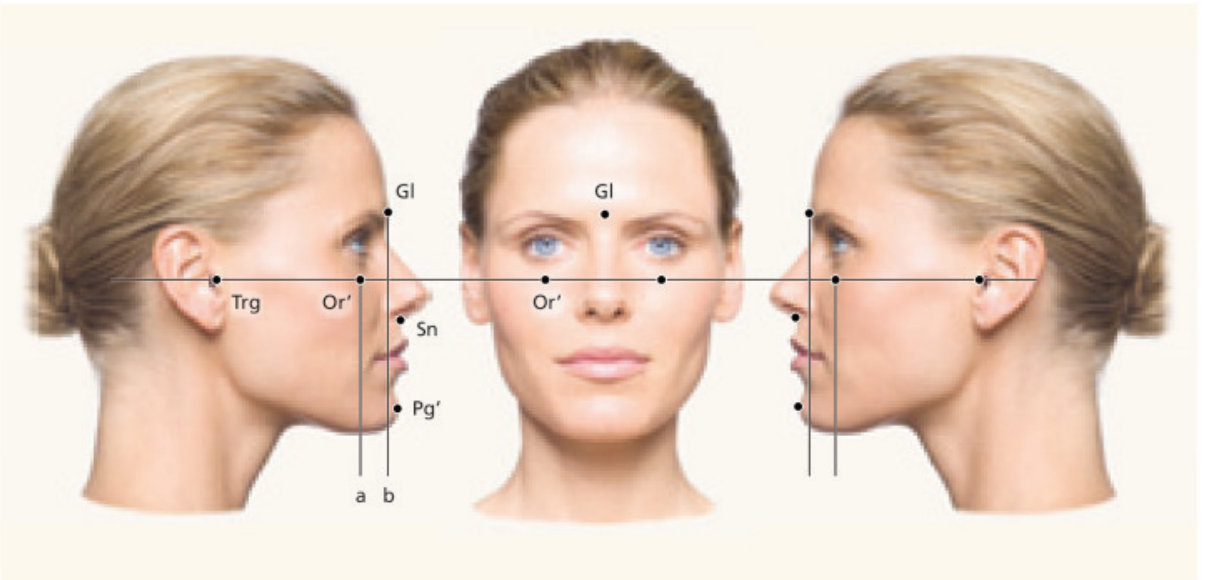

Fig 1-20 The "Fotostat" assessment according to Schwarz (1936).

■ **Fig 1-21** Common measurement points on the skull and the soft tissue in anterior view.

SOr: supraorbital point
Or: orbital point (orbitale)
N: nasion
Sn: subnasale
Mx: maxillare (palpable, deepest point in the molar region at the transition of the maxilla to the zygomatic bone)
M: Mastoid
Md: mandibulare (palpable alveolar process in the molar region)
Go: gonion (jaw angle point)
Go': jaw angle on the soft tissue
Me: menton (chin prominence in the middle)
Mer: menton on the right (the most inferior lateral point on the anterior inferior border of the mandible, right)
Mel: menton on the left (the most inferior lateral point on the anterior inferior border of the mandible, left)
Me': soft tissue chin point

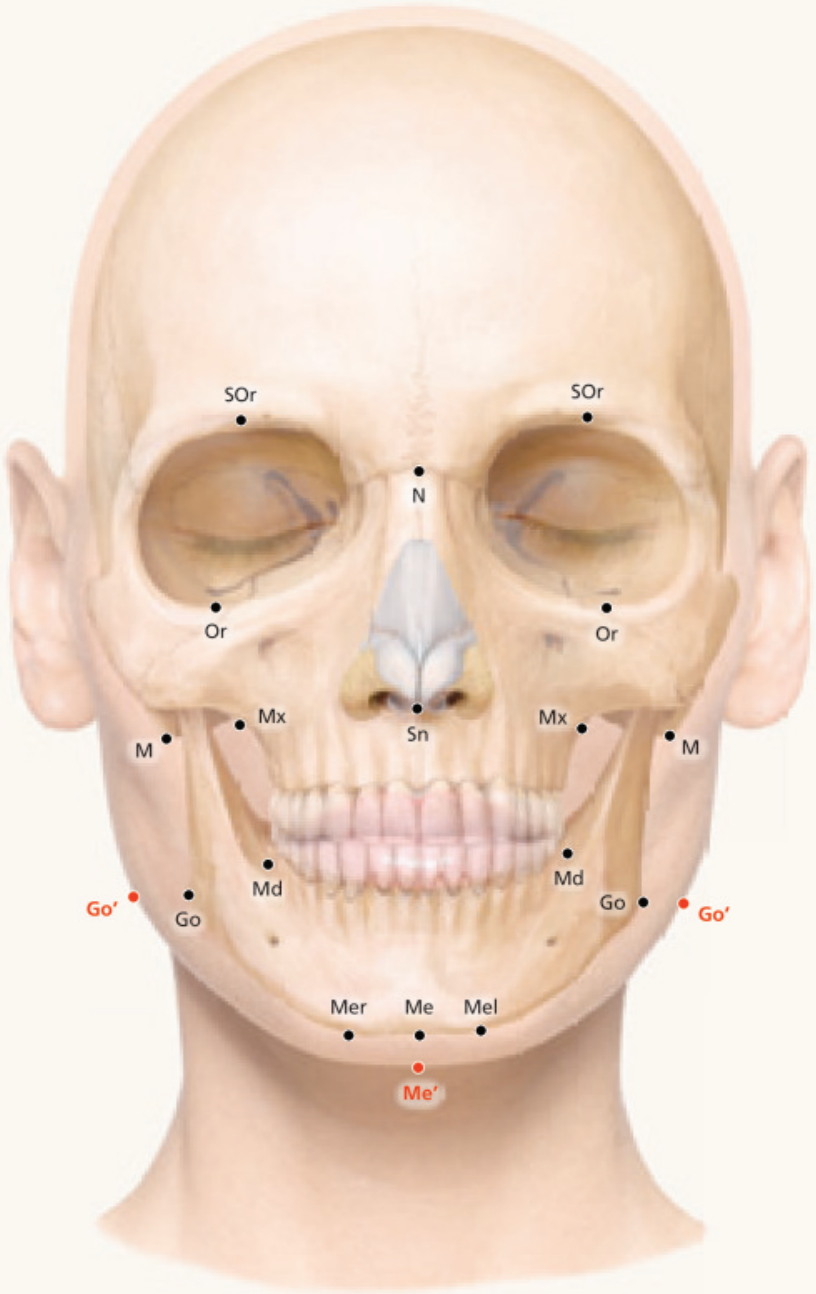

Fig 1-21 Common measurement points on the skull and the soft tissue in anterior view.

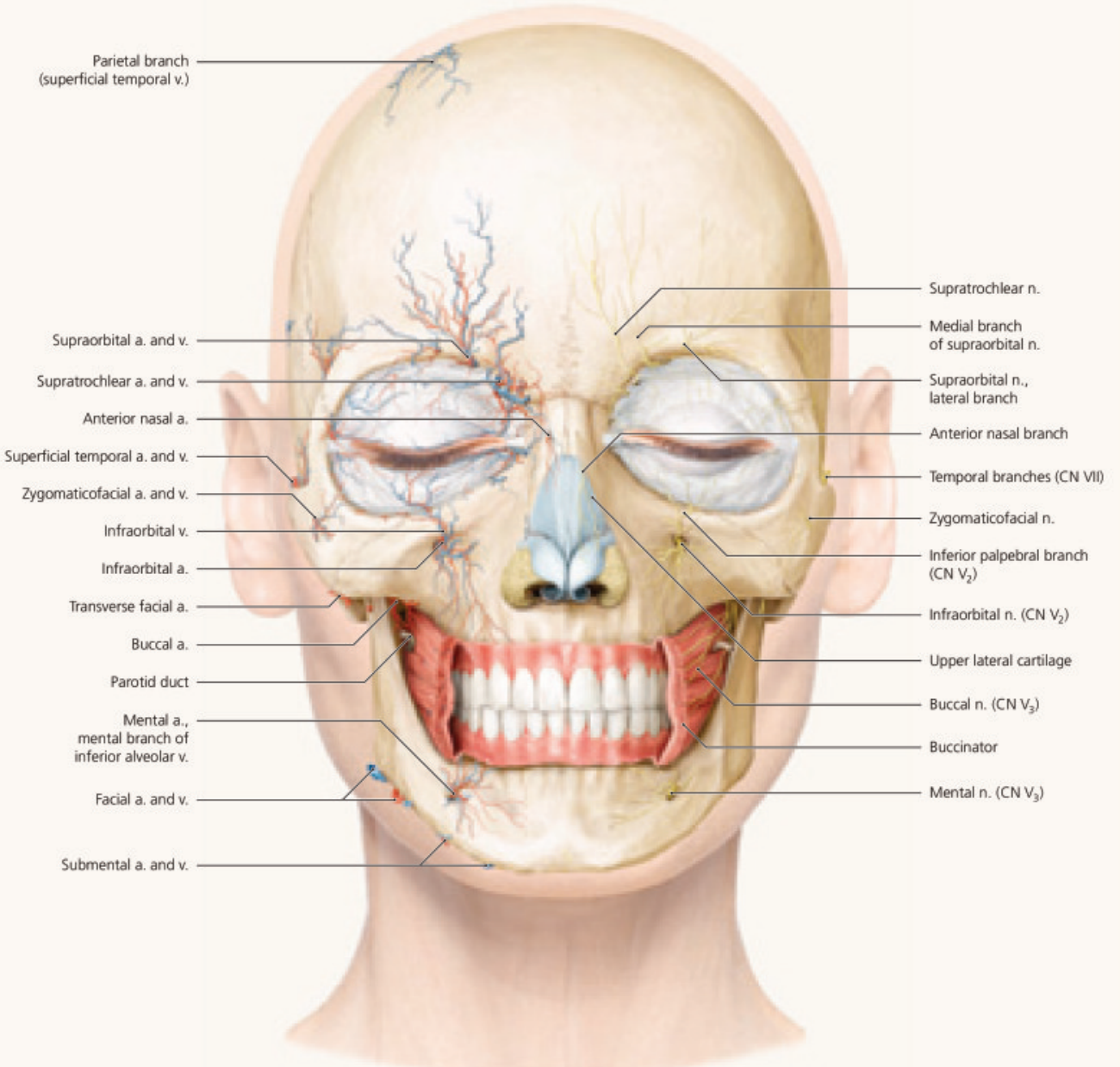

Fig 1-45 Deep arteries and veins (right half of the face), and deep nerves (left half of the face).

■ **Fig 1-46** Some branches of the supratrochlear and supraorbital arteries and veins run so close to the bone that they are covered by the corrugator supercilii muscle. Other branches of these vessels pass over the muscle in a cranial direction. The lateral and medial branches of the supraorbital and the supratrochlear nerves run underneath, through and over the corrugator supercilii muscle. The motor innervation is supplied by the anterior temporal branches of the facial nerve (CN VII).

The temporalis muscle is supplied by the deep temporal arteries and veins and also by the deep temporal nerve (from CN V_3). It also receives innervation from temporal branches of the facial nerve.

The superficial temporal artery and vein and the main trunk of the temporal rami (from the facial nerve) run over the zygomatic arch and, therefore, have been cut in this stage of preparation.

Vessels and nerves that emerge from the infraorbital foramen (artery, vein and infraorbital nerve) supply the region around the foramen and reach well into the eyelid (inferior palpebral rami) and also reach the nose muscles and the upper lip.

The facial artery and vein pass around the edge of the mandible, anterior to the masseter muscle. They cross over the buccinator muscle medially and stretch obliquely in a multicurved pattern. They lie above the branches of the infraorbital artery and vein. Here, a pulse can be felt.

Buccal branches of the facial nerve supply the buccinator muscle.

The blood vessels and nerves coming from the mandibular canal emerge through the mental foramen. The mental artery and the mental ramus of the inferior alveolar vein supply the lower lip and the chin region. The mental nerve reaches the skin and the soft tissues of the lower lip and chin region. Motor innervation of the muscles of this region is maintained by the marginal mandibular branches of the facial nerve (CN VII).

■ **Fig 1-47** The frontal belly of the occipitofrontalis muscle is penetrated by branches of the supratrochlear and supraorbital arteries and veins. Lateral and medial branches of the supraorbital and supratrochlear nerves run through and above the muscle. Its motor innervation is supplied by the anterior temporal branches of the facial nerve.

The dorsum of the nose is innervated by the external nasal branches arising from the anterior ethmoidal nerve. The nerve penetrates the suture between the nasal bone and the lateral nasal cartilage and runs on the surface of this cartilage. Branches from the infraorbital nerve (external nasal branches) reach the nasal wings. The motor innervation is maintained by the zygomatic branches of the facial nerve (CN VII).

■ **Fig 1-48** Further venous drainage is supplied by additional branches of the supratrochlear vein in the forehead region.

The orbicularis oculi muscle covers the orbital septum. It is well supplied with thin branches of the medial and lateral palpebral artery, which empty into the venous superior palpebral arch (upper eyelid) and inferior palpebral arch (lower eyelid). The lateral palpebral artery arises from the lacrimal artery, and the medial palpebral artery from the ophthalmic artery; both of these originate from the internal carotid artery. The venous blood of the upper and lower eyelids is collected by the superior and inferior palpebral veins and then redirected to the angular vein (medially); laterally it is collected by the superior ophthalmic vein (upper eyelid) and the inferior ophthalmic vein (lower eyelid).

The procerus and depressor supercilii muscles cover the glabellar and supraorbital region. They are penetrated by branches of the lateral and medial rami of the supratrochlear nerve. Their motor innervation is maintained by the temporal rami of the facial nerve (CN VII).

The muscles of the nose are supplied by branches of the angular artery. Further cranially, the terminal branch of the angular artery, the dorsal nasal artery, takes over the arterial supply. The venous drainage is through the external nasal veins, which empty into the angular vein. The infraorbital vein also drains blood from the nose. The sensory innervation is supplied by the ramus of the external nasal nerve (nasalis externus ramus), which is a branch of the ethmoidal frontal nerve. The motor innervation is maintained by zygomatic branches of the facial nerve.

The levator anguli oris muscle now covers the upper and lateral corners of the orbicularis oris muscle. The facial artery and vein, as well as the superior labial rami, branches from the infraorbital nerve, run at its surface.

The depressor labii inferioris muscle covers the mental foramen

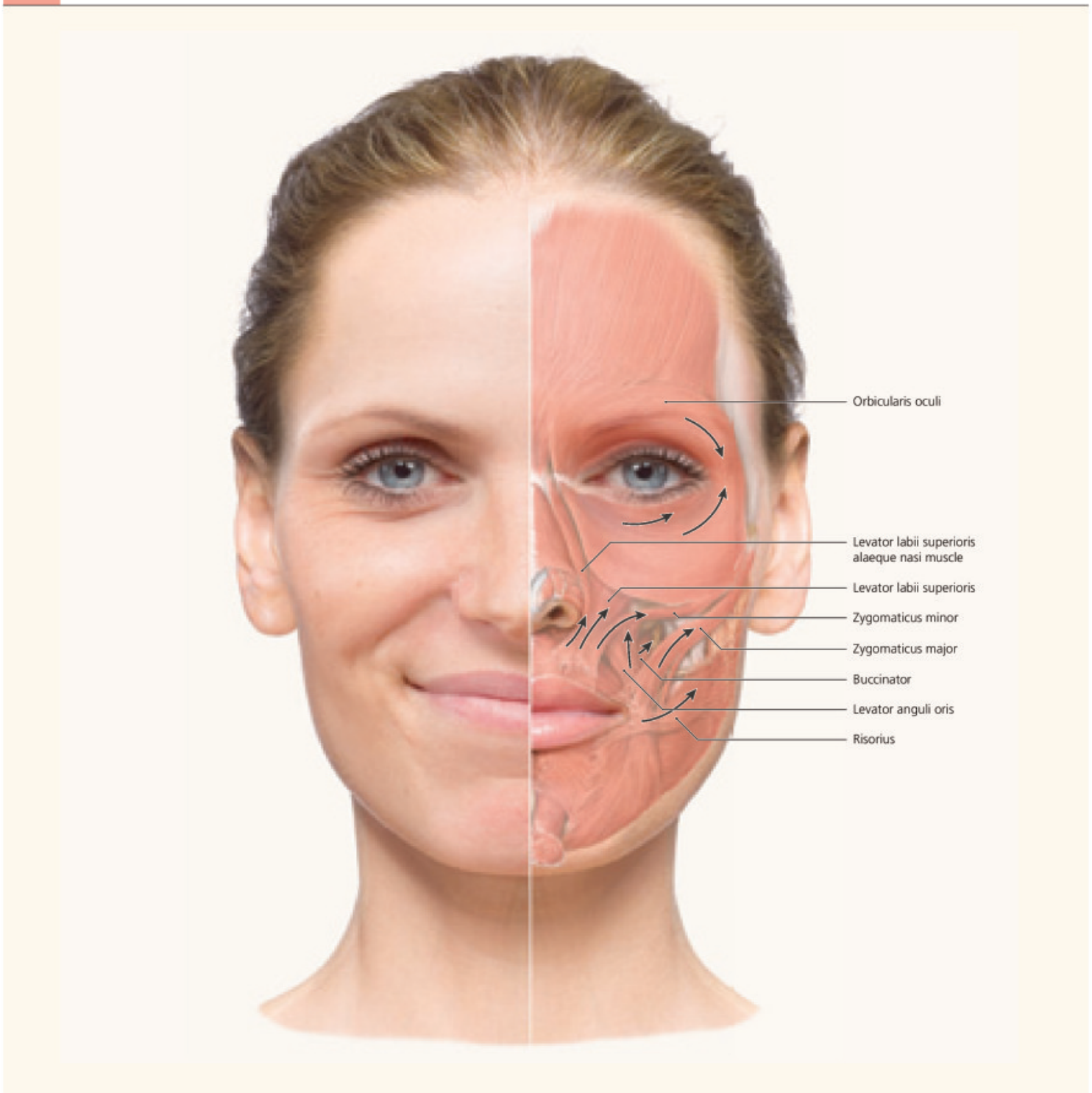

Fig 1-131 Smiling with the mouth closed.

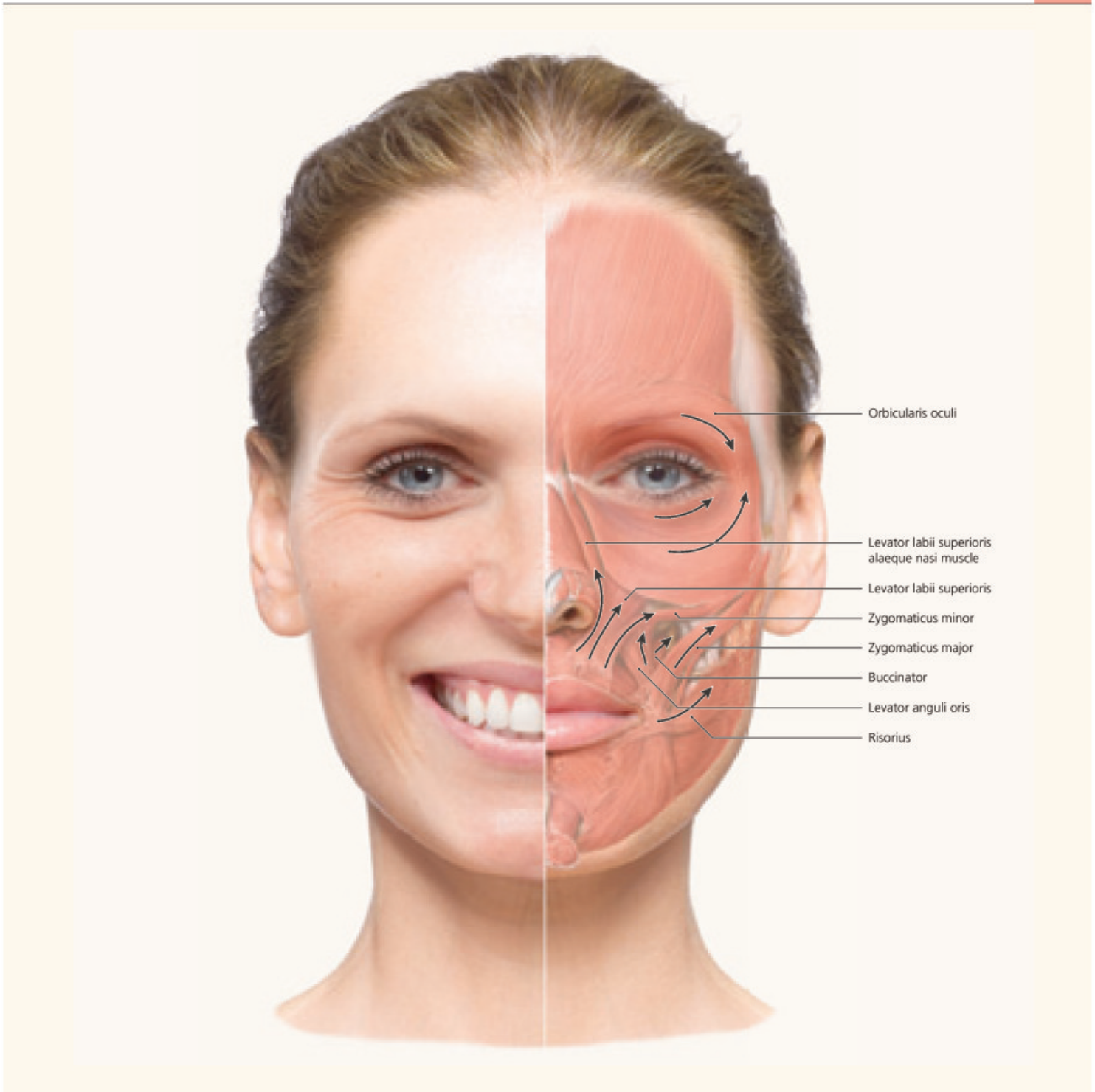

Fig 1-132 Smiling with the mouth opened.

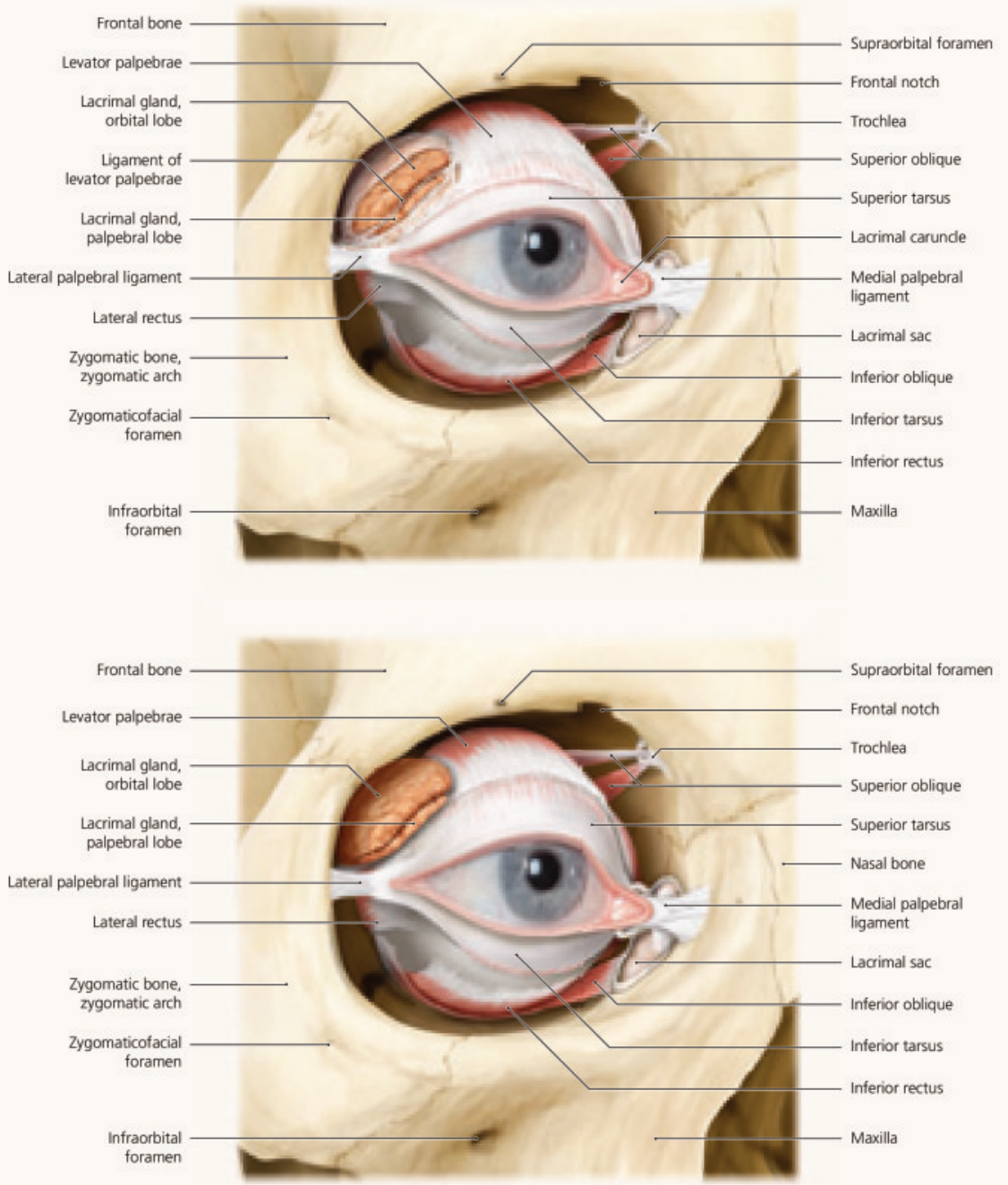

Fig 2-17 Postseptal fat removed.
Fig 2-18 Lacrimal gland exposed.

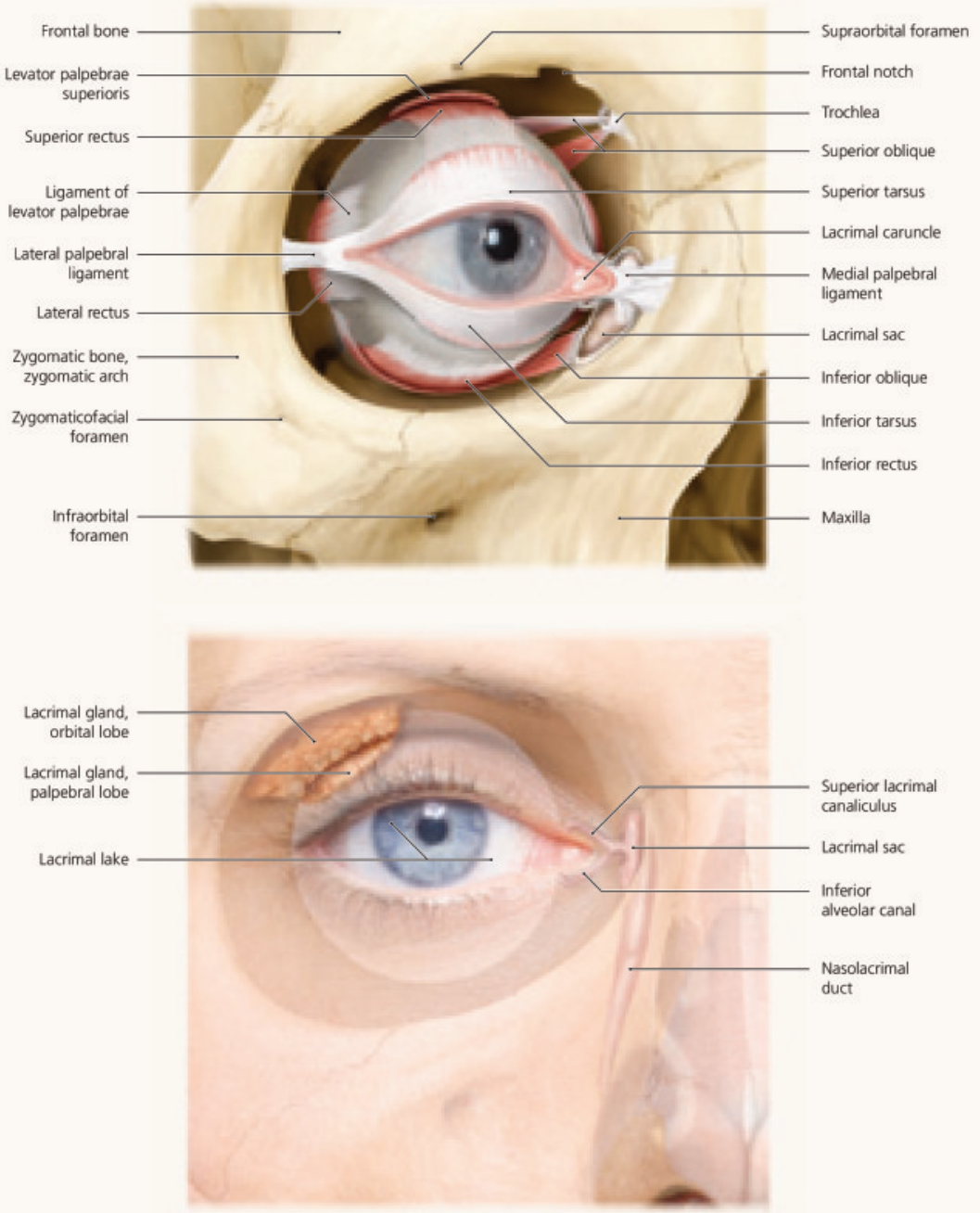

Fig 2-19 Superior tarsal muscle cut and the lacrimal gland removed.
Fig 2-20 Lacrimal apparatus.

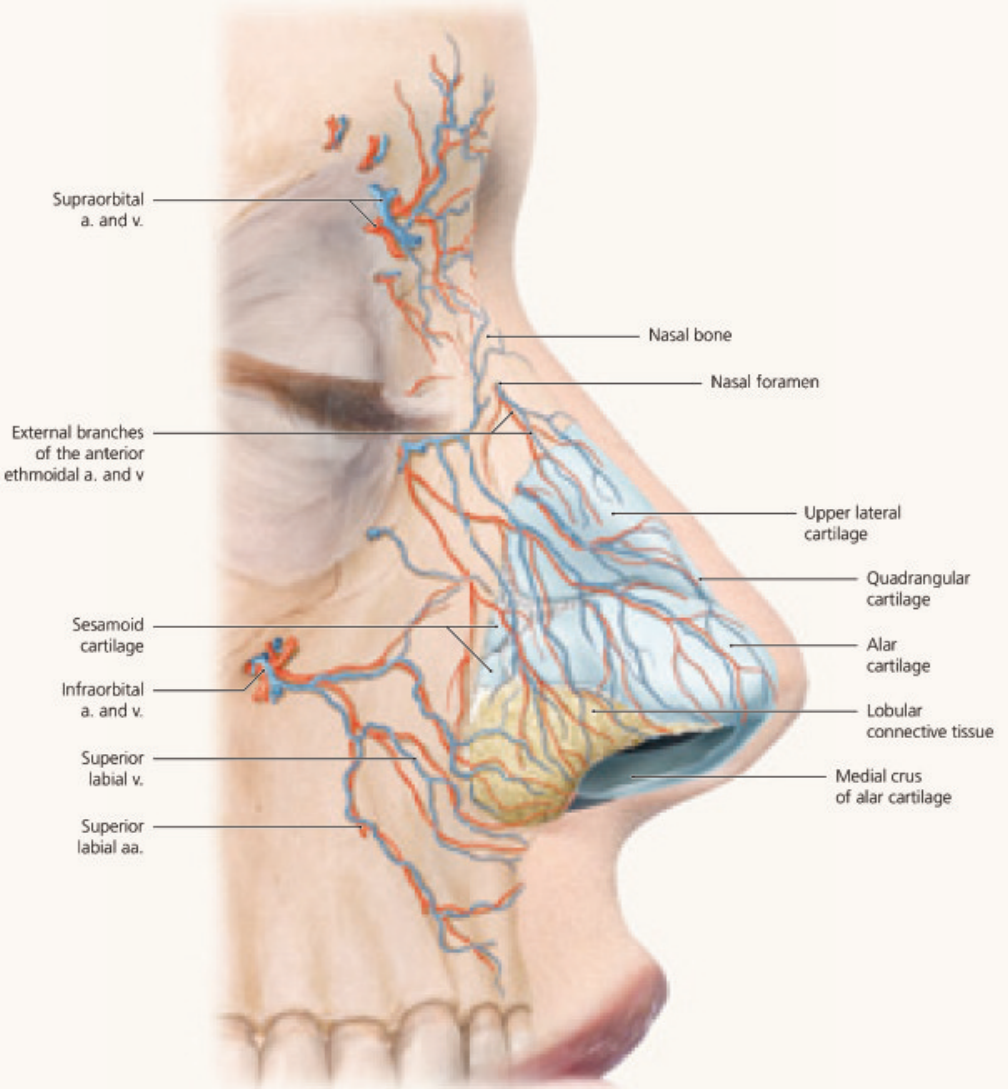

Fig 3-39 Vascular supply in the deeper nasal region in lateral view.

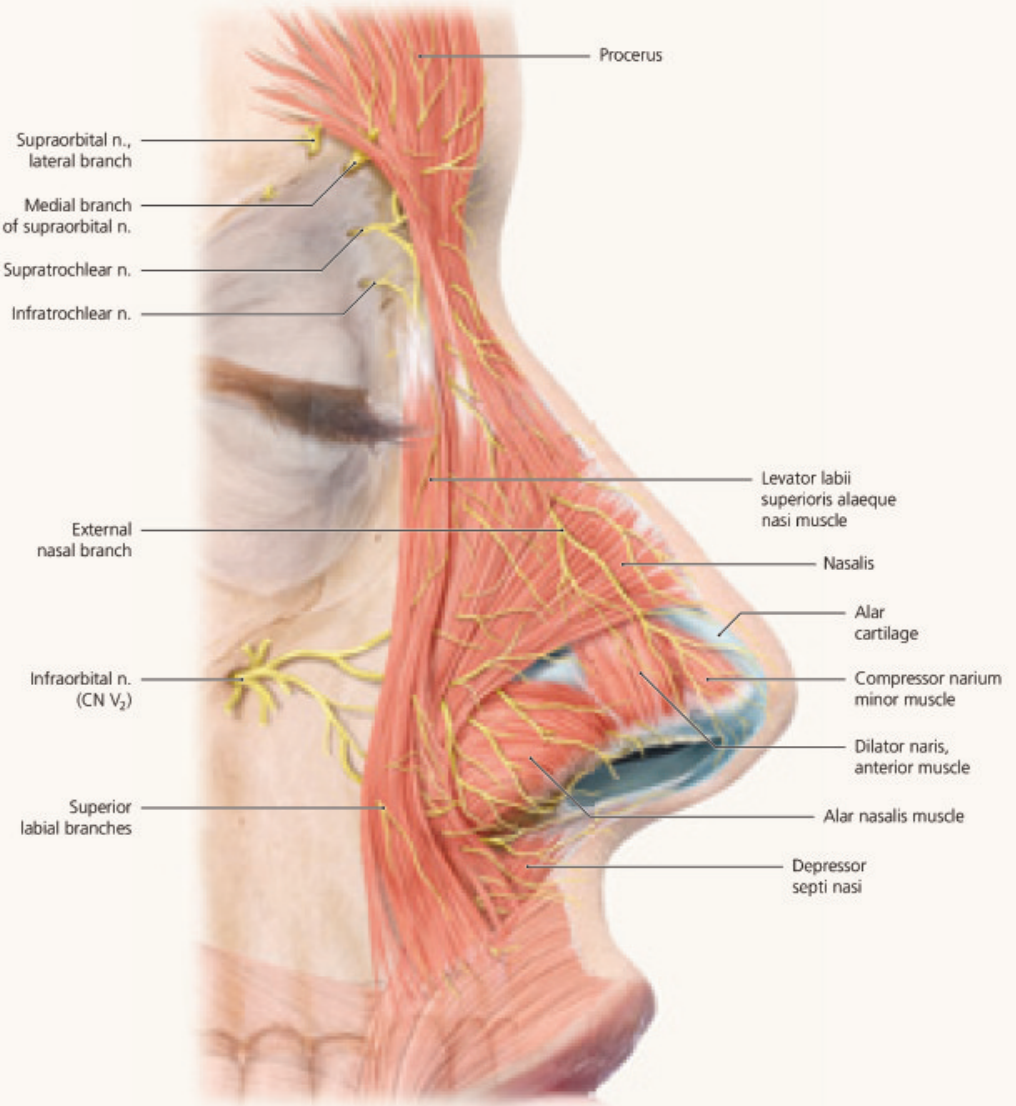

Fig 3-40 Nerve supply in relation to the arrangement of muscles in the nasal region, in lateral view.

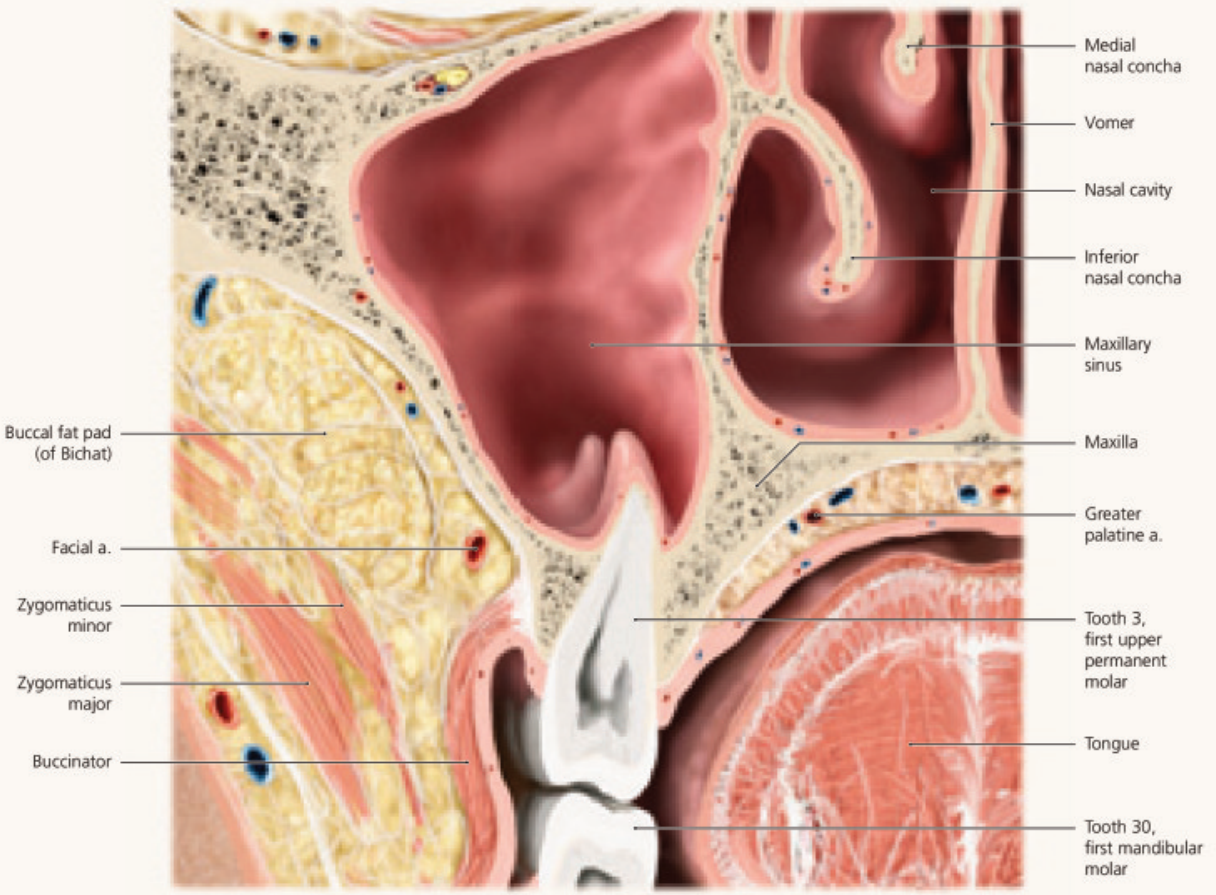

Fig 3-64 Frontal section through the maxillary sinus at the level of the first molar.

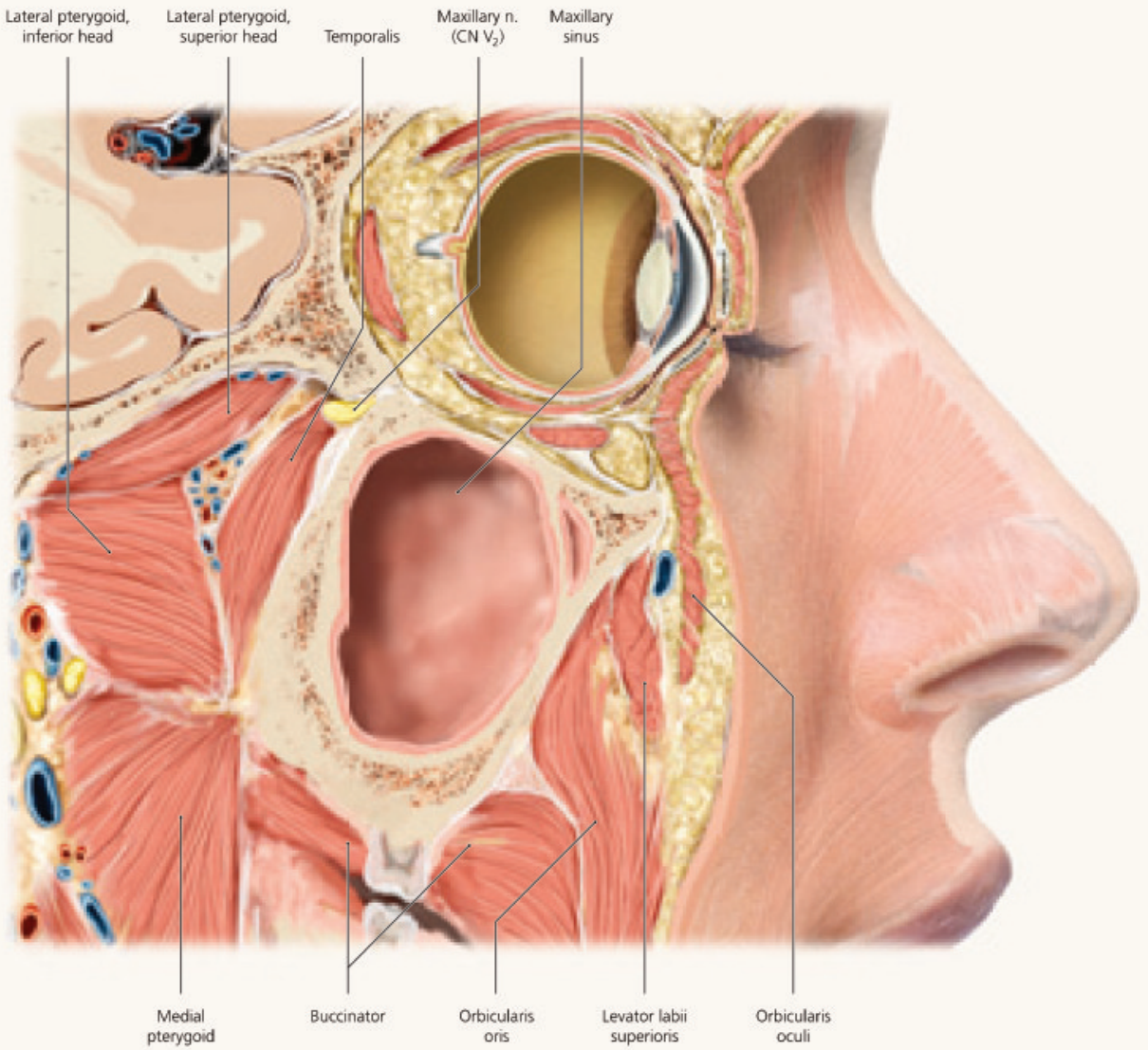

Fig 3-65 Sagittal section through the maxillary sinus at the mid-eye level.

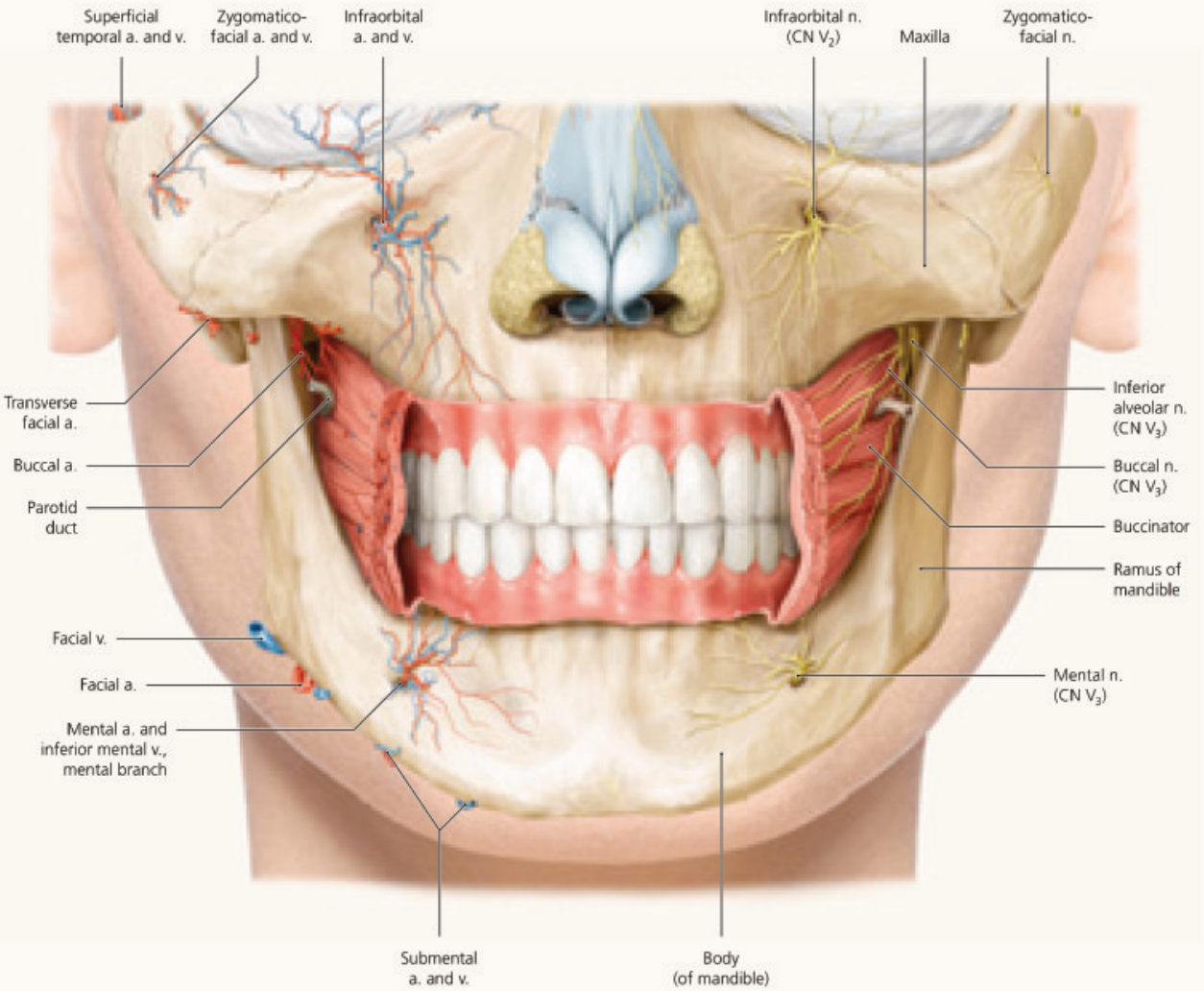

Fig 4-9 Muscles, blood vessel supply (right half of the face) and innervation (left half of the face) of the oral region, deepest layer.

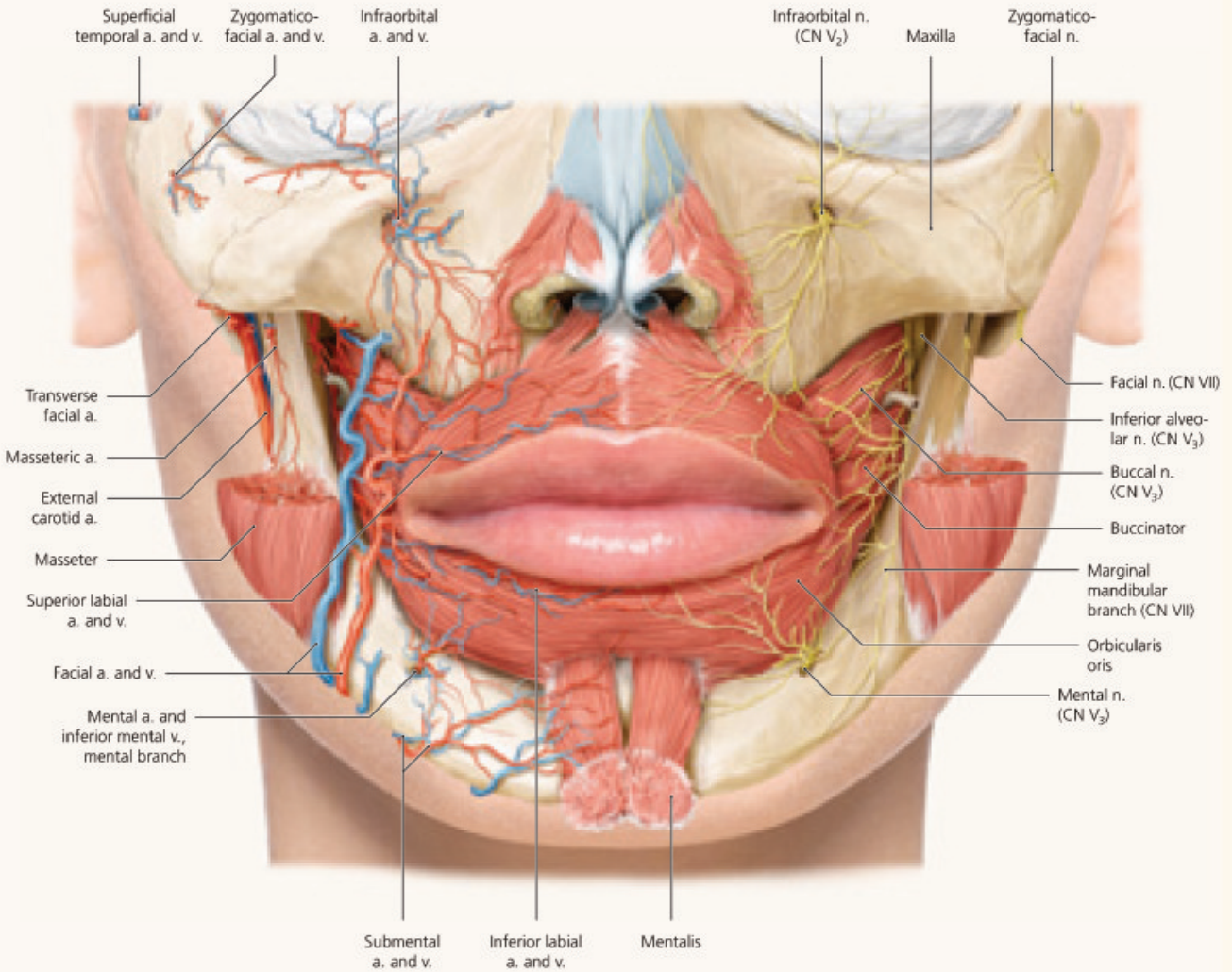

Fig 4-10 Muscles, blood vessel supply (right half of the face) and innervation (left half of the face) of the oral region, orbicularis oris muscle exposed, masseter muscle cut.

■ **Fig 4-37** The vertical section through the temporomandibular joint shows the articular disc, which creates an upper and a lower joint space. The masseter and the medial pterygoid muscles create a sling around the mandibular ramus and, together with the temporalis muscle, form the group of adductor muscles. The lateral pterygoid muscle has two bellies. The superior belly originates from the infratemporal crest of the sphenoid bone and inserts in the articular disc of the temporomandibular joint. Some fibers also attach to the condylar process. Its inferior belly originates from the lateral aspect of the lateral lamina of the pterygoid process and inserts in the condylar process of the mandible.

■ **Fig 4-38** The mandibular nerve (CN V_3) passes through the skull base in the oval foramen and reaches the infratemporal fossa. After the meningeal branch has left to re-enter the cranial cavity, the mandibular nerve divides further to provide a motor and sensory supply for the mandibular region. The auriculotemporal nerve curves laterally around the middle meningeal artery and posteriorly, at the height of the mandibular neck, runs in a lateral direction. After some branches

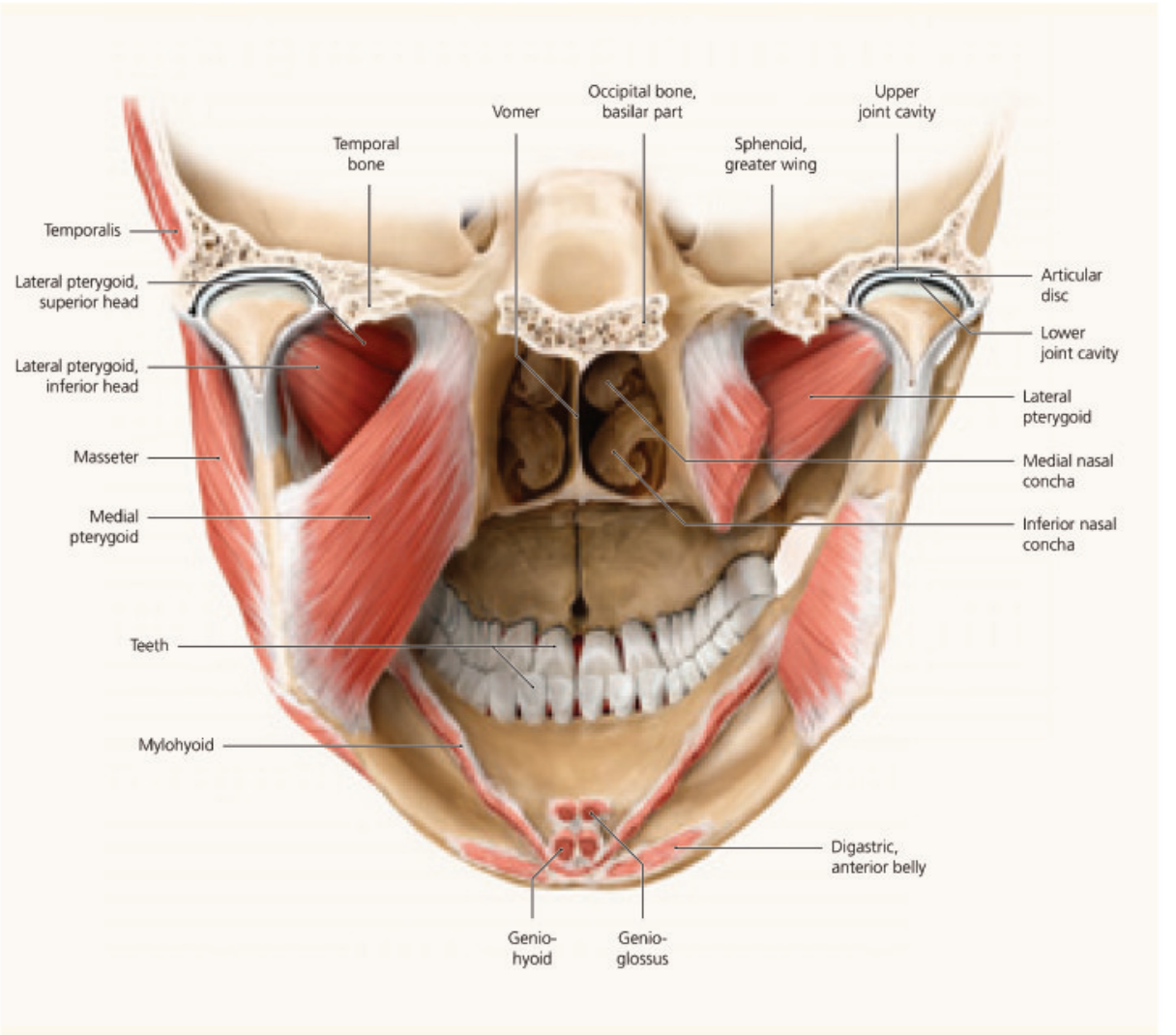

Fig 4-37 Dorsal view with a vertical section through the temporomandibular joint region.

to the temporomandibular joint have exited, the auriculotemporal nerve extends close to the ear and, together with the temporal artery and vein, to the skin of the temporal region, where it provides sensory innervation. It also gives off branches into the parotid gland. Branches of the buccal nerve penetrate the buccinator muscle but do not provide motor innervation (which is facilitated by the facial nerve, CN VII); instead, these branches transmit sensory information from the cheek mucosa. The lingual nerve is found at the medial aspect of the mandibular ramus and enters the tongue at the level of the roots of the third molar, providing sensory innervation for its oral portion. From a short stem of the mandibular nerve, the masseteric nerve arises before passing through the mandibular notch to reach the masseter muscle, providing motor innervation for this masticatory muscle. The medial pterygoid nerve, also a branch of the mandibular nerve, provides motor innervation for the medial pterygoid muscle. Before the inferior alveolar nerve enters the mandibular canal to continue on to provide sensory innervation for the dental and the periodontal structures, a motor branch exits to the mylohyoid muscle and the anterior belly of the digastric muscle.

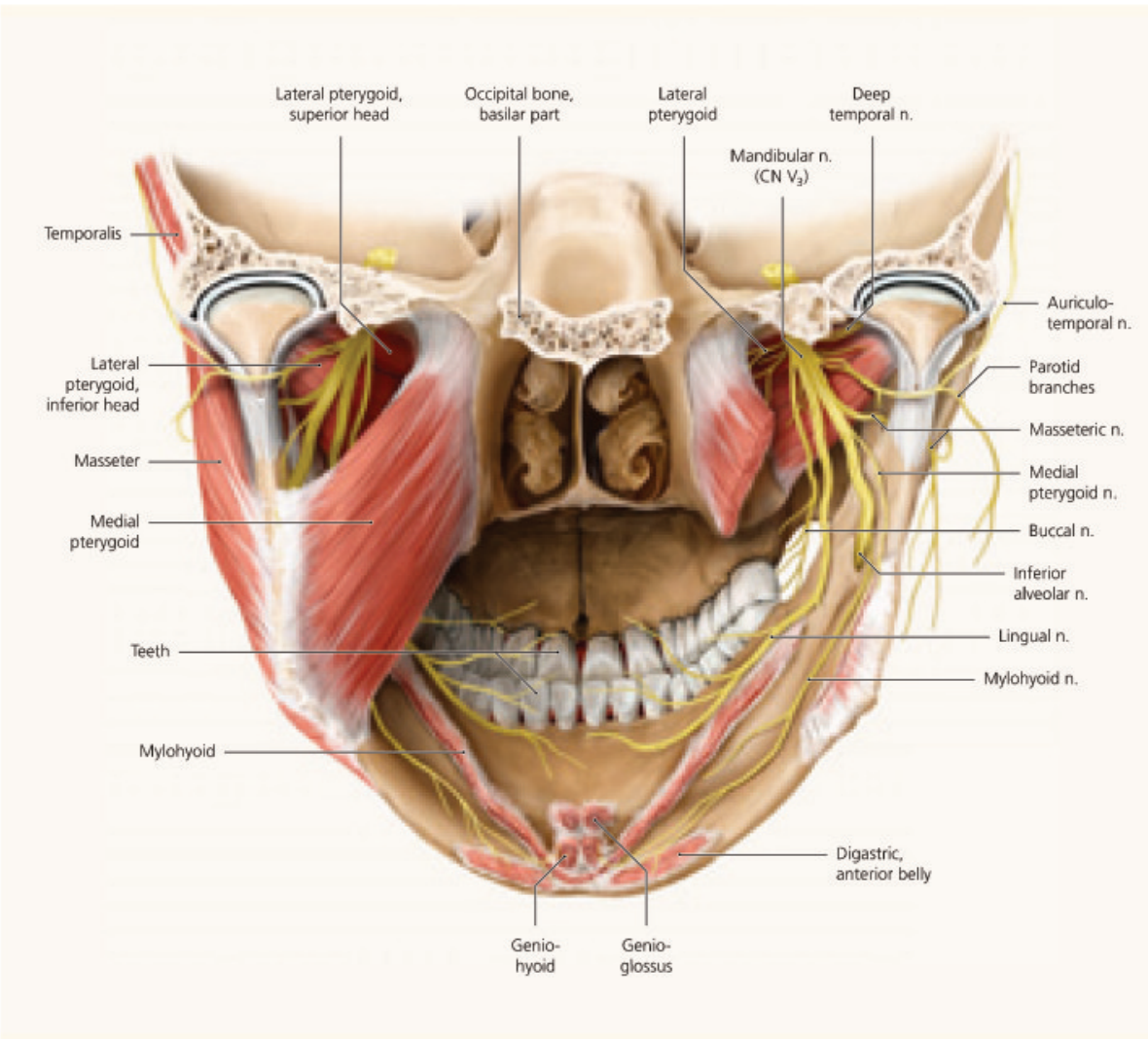

Fig 4-38 Dorsal view with a vertical section through the temporomandibular joint region.

6 The skin and aging of the face

■ **Fig 6-1** Esthetic units of the face. For practical reasons, the skin of the face is divided into esthetic units. For structural reasons, each region must be treated or reconstructed after trauma or tumor resection within itself, without disturbing any of the adjacent regions.
The forehead unit consists of a central (1a) and two lateral (1b) subunits, and the eyebrow region is considered as a third (1c) subunit. The nose is subdivided into the region of the dorsum nasi (2a) and an alar unit (2b). The eyelids need to be divided into four subunits: lower lid (3a), upper lid (3b), lateral canthal (3c) and medial canthal (3d). The cheek is also divided into four subunits: medial cheek (4a), zygomatic (4b), lateral (4c) and buccal (4d). The upper lip requires a division into a philtrum subunit (5a), lateral subunits (5b) on either side and a mucosal subunit (5c). The lower lip has only two areas, the central subunit (6a) and the mucosal subunit (6b). There is also a chin unit (7), an auricular unit (8) and a neck unit (9).

■ **Fig 6-2** The thickness of the facial skin (epidermis and dermis) ranges between 0.5 mm in the lower lid region and 2.5 mm in the chin region. The measurements of skin thickness (Gonzales-Ulloa, 1957) correlate with the esthetic regions of the face.

■ **Figs 6-3 to 6-5** Histology of the facial skin. Most of the face is covered by hairy skin. The skin (cutis, corium) consists of the upper epidermis layer and the lower dermis. Underneath the dermis is a cushion of fatty tissue, the subcutis.

The **epidermis** consists of a five-layered epithelium that constantly renews itself (Fig 6-4). The stem cells for this renewal line the basement membrane as the stratum basale (stratum germinativum). These cells divide and start to migrate to the skin surface; they differentiate into keratocytes, forming the stratum spinosum (prickle cell layer). The keratocytes continue to migrate, now producing keratohyaline granules, which are necessary for the keratinization of the skin. These granules can be seen and this further layer is known as the stratum granulosum. Often, there is a narrow stratum lucidum above this layer, indicating the beginning of the dissolution of cell organelles. The top layer, the stratum corneum, is the final layer and by this point all cell organelles and the nuclei have disintegrated and the living keratocytes have transformed into dead keratin cells. In addition to keratocytes, other cell types are found in the epidermis. **Melanocytes** are located between the basal cells. They produce melanin, which is distributed to the keratocytes through widely branching cellular processes. From these

Fig 6-1 Esthetic units of the face.

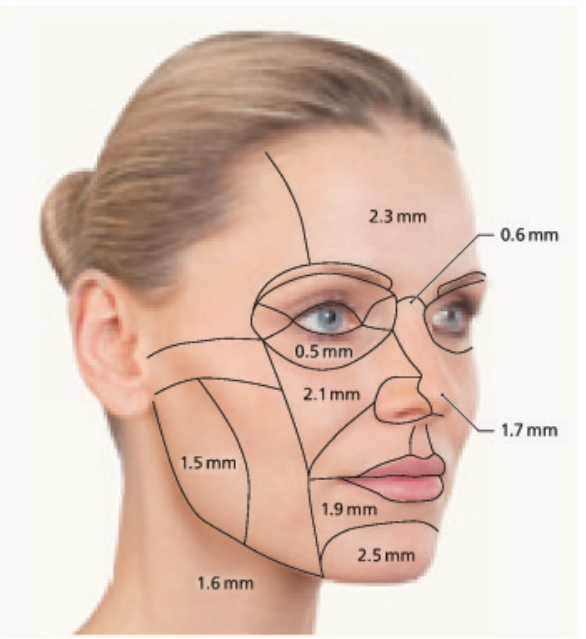

Fig 6-2 Values for varying thickness of facial skin.

melanocytes, malignant melanomas may arise. **Merkel cells** are also located in the stratum basale and act as mechanoreceptors for tactile and pressure perception. **Langerhans cells** are found in the stratum spinosum. They are descendants of hematopoietic stem cells from the bone marrow and participate in cutaneous immune responses. Between the epithelium and the dermis there is a basement membrane where the epidermis and the dermis are interlocked in a serrated pattern.

The **dermis** (corium) has two layers. The papillary dermis (stratum papillare) is the invaginated margin separated from the epidermis by the basement membrane. In this area, there are collagen fibers (type I and III) intertwined with elastic fibers. The underlying reticular dermis (stratum reticulare) is characterized by highly tensile, thick, parallel bundles of collagen fibers (type I) plus some elastic fibers. All these structural components are embedded in abundant gelatinous matrix, which consists mainly of water-binding hyaluronic acid and proteoglycans. In addition, there are fibroblasts and extravasated leukocytes, including T-lymphocytes (T-regulatory and T-helper cells), mast cells and macrophages. Hair roots with their arrector pili muscles (Fig 6-5), and the secretory parts of the sebaceous and sweat glands are located in the reticular dermis but also extend into the underlying subcutis.

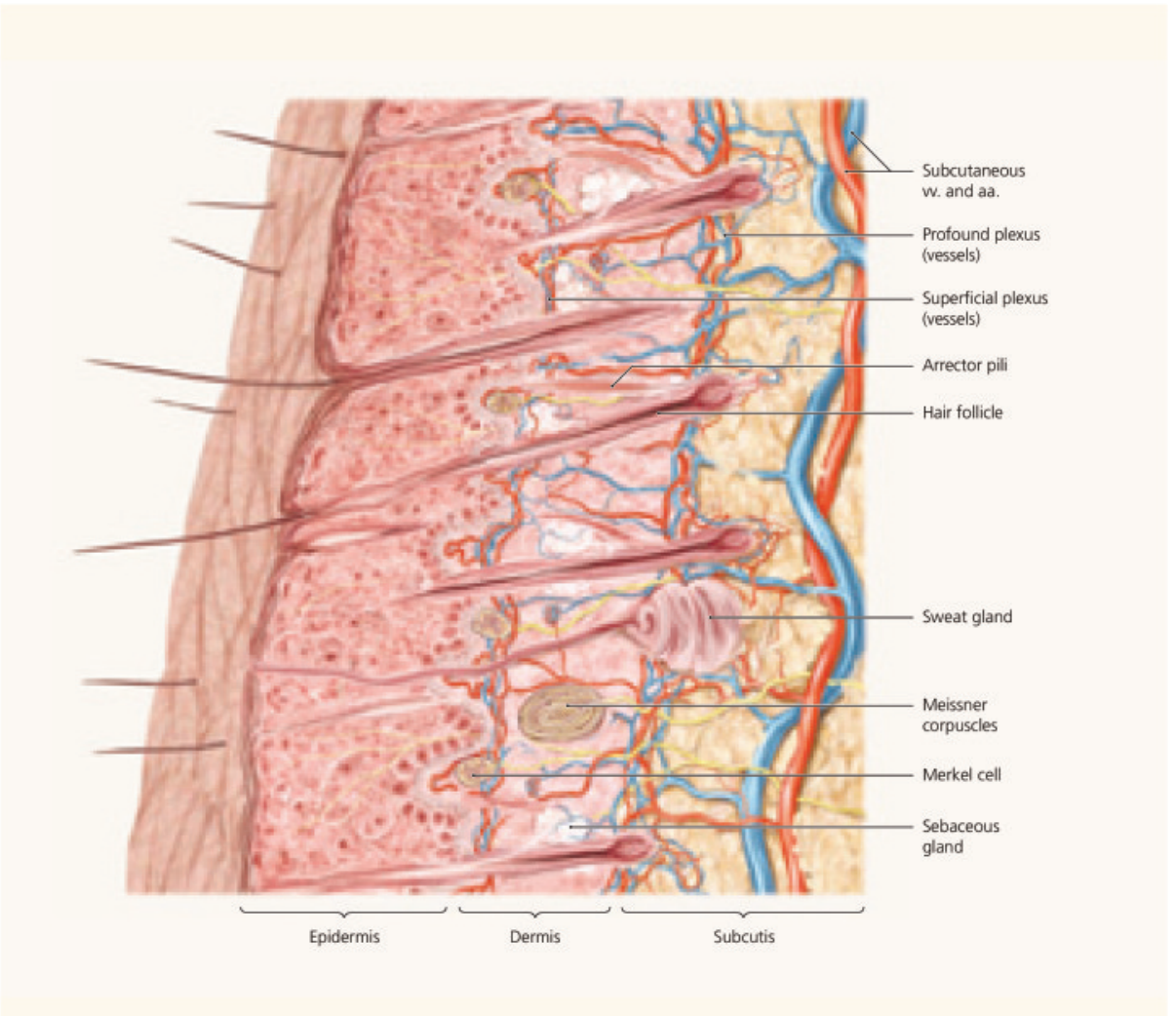

Fig 6-3 Cross-section of facial skin to show histology.