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Video 13.1 Establishing an Office-Based Surgery Center

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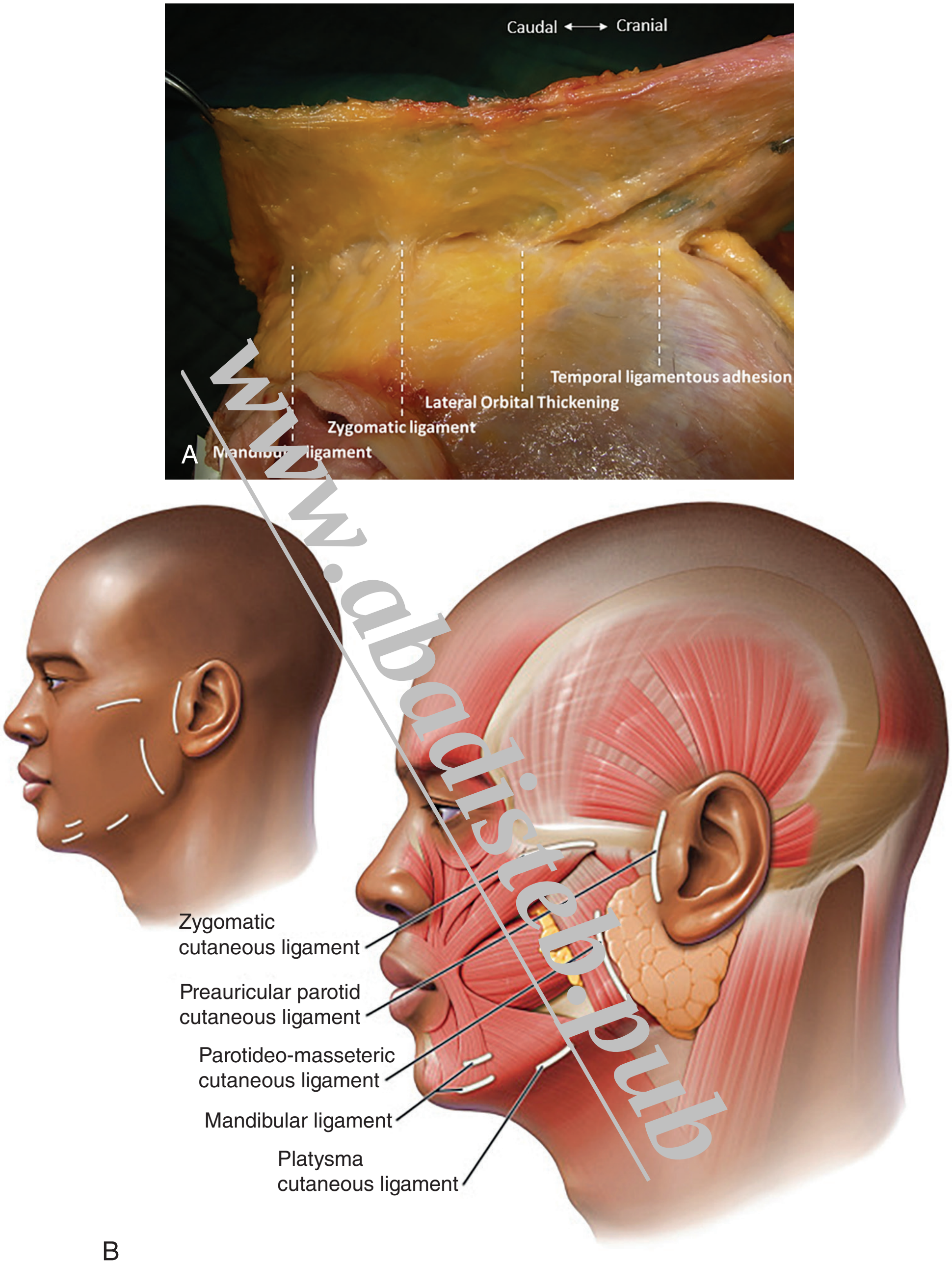

Fig. 1.2 (A) The four facial ligaments that contribute to the formation of the *line of ligaments*. (Courtesy of Dr. Cotofana). (B) The retaining ligaments of the cheek receive their origin from deep-fixed structures and then transit superficially through the superficial musculo-aponeurotic system (SMAS) to insert into the skin as the retinacular cutis. Not all ligaments are of the same density, and the parotidocutaneous, lateral zygomatic and upper masseteric ligaments tend to be the stoutest fibers within the cheek. (From Niamtu, J. *Cosmetic Facial Surgery*, 2nd ed. [2018]. Philadelphia, PA: Elsevier. Fig. 3.15. Page 42.)

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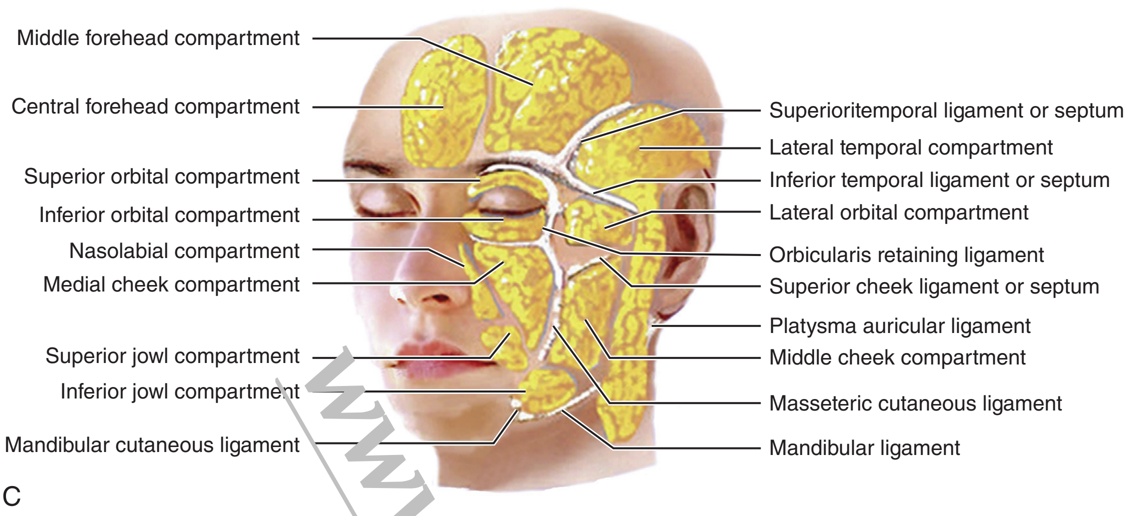

Fig. 1.2, cont'd (C) Frontal oblique drawing of the face showing the ligaments and septae that contain the facial fat pads. As we age, due to bone resorption and stretching of the facial ligaments, fat compartments descend and contribute to the stigmata of aging. (Modified from Alghoul M, Codner MA. Retaining ligaments of the face: review of anatomy and clinical applications. *Aesthet Surg J*. 2013 Aug 1;33(6):769-82.)

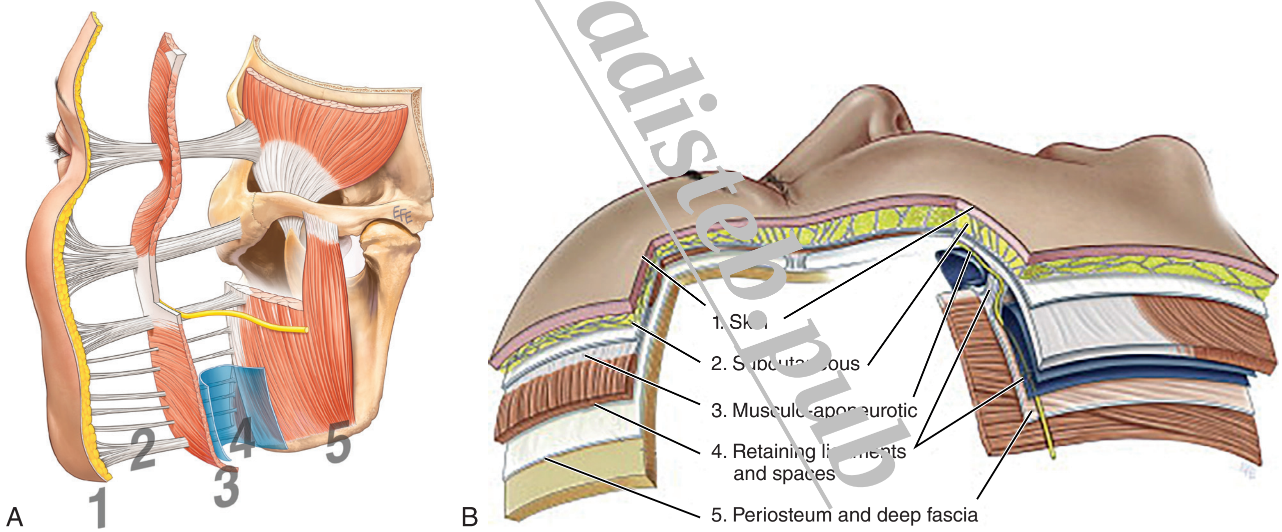

Fig. 1.3 (A) Schematic illustration of the facial layers exemplified for the lateral face. The Layers indicated are: 1 = Skin with subdermal fat, 2 = Subdermal plane showing retinacula cutis (note that the subdermal fatty layer has been removed), 3 = Musculoaponeurotic plane which includes the platysma, the SMAS, the orbicularis oculi muscle, and the superficial temporal fascia, 4 = Supraperiosteal plane with the demonstration of true osteocutaneous ligaments like the lateral orbital thickening, and mandibular ligament (the masseteric ligaments are shown but they do not classify as true osteocutaneous), 5 = In this plane the periosteum or the deep fascia can be found which covers temporalis or masseter muscles. (From Facial Plastic Surgery Clinics of North America Volume 30, Issue 2 Copyright © 2022 Elsevier Inc.) (B) Similar view of the lateral face as in (A) showing the standard five-layered arrangement of the face: 1 = Skin, 2 = Superficial fatty layer, 3 = Musculuo-aponeurotic layer, 4 = Deep fat compartments and spaces bounded by ligaments, 5 = Periosteum and deep fascia. (From Mendelson BC, Jacobson SR. Surgical anatomy of the midcheek: facial layers, spaces, and the midcheek segments. *Clin in Plast Surg* 2008;35:395–404; with permission.)

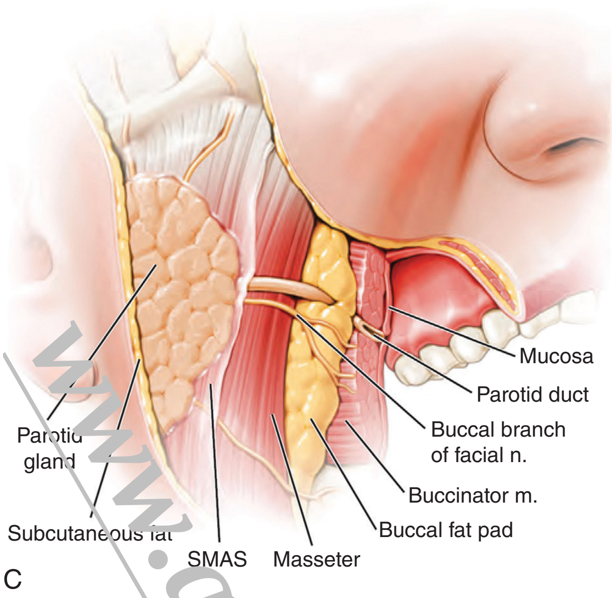

Fig. 1.3, cont'd (C) Facial musculature and the relation between parotid duct, masseter and buccinator muscles. (From Cosmetic Facial Surgery. Niamtu, Joe; Fakih Gomez, Nabil; Diepenbrock, Ryan. Published December 31, 2022. © 2023.)

parotideo-masseteric fascia. Sub-SMAS facelifting procedures are safe in this area if they do not penetrate the parotideo-masseteric fascia.

Once the anterior margin of the masseter muscle is reached, the facial nerve branches enter the facial vein canal and run inside its roof, superficial to the facial/angular vein. Here, the facial nerve branches exit the facial vein canal and change planes from deep to more superficial. The change in planes is accompanied by fascial adhesions, which have been previously termed as masseteric ligaments, despite their absent connection to the masseter muscle and lack of criteria in order to be termed a ligament. Sub-SMAS facelifting procedures must be performed with caution when passing the anterior margin of the masseter muscle due to the risk of damaging the facial nerve motor branches (see Fig. 1.4).

Since most of the mimetic muscles are situated superficially to the facial nerve plane, they receive their nerve supply along their deeper surfaces. To prevent motor branch injury, dissection should be performed along the superficial surface of a mimetic muscle (i.e., superficial to the platysma in the cheek and neck). Typically, facial nerve branches lie deep to the deep fascia until they reach the muscles they innervate. Once they reach the muscles, they penetrate the deep fascia to innervate them along their deep surfaces. The temporal and cervical branches are exceptions to this rule. In the illustration of Fig. 1.3A and B see the plane of the nerves in relations to the fascial layers. In Fig. 1.4, the deep fascia has been removed to demonstrate the depth of nerve branches relative to the innervated muscles. The cervical branch usually penetrates the deep fascia laterally, lying within the plane between superficial and deep fascia, just deep to the platysma, before innervating the platysma medially. Similarly, the temporal branch travels in the plane between superficial and deep fascia after it travels superiorly to the zygomatic arch (Fig. 1.6A). It is important to note that the temporal branch is positioned cranial to the ligament, and to reach the ligament, from a facelift incision one must cross its pathway. The author EL approaches this ligament, when needed from the lower blepharoplasty incision to reduce the risk of its inadvertent injury.

Releasing the zygomatic ligament (= McGregor's patch) (Fig. 1.5A) or the mandibular ligament (see Fig. 1.5B) have been shown to provide enhanced lifting opportunities as greater mobility for the overlying soft tissues can be achieved. Transecting the zygomatic ligament can result in substantial bleeding as the

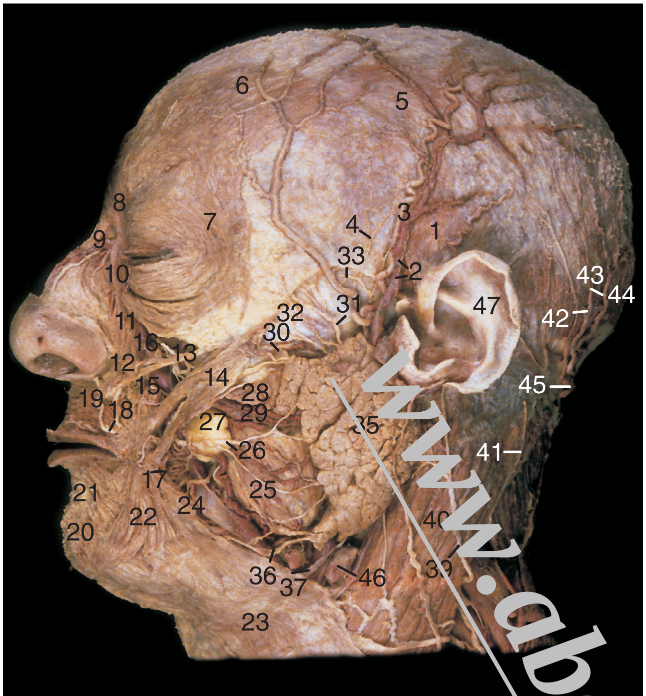

Fig. 1.4 1 Temporoparietalis 2 Auriculotemporal nerve 3 Superficial temporal artery 4 Zygomaticotemporal nerve piercing temporalis fascia 5 Epicranial aponeurosis (galea aponeurotica) 6 Frontal belly of occipitofrontalis 7 Orbicularis oculi 8 Depressor supercilii 9 Procerus 10 Nasalis 11 Levator labii superioris alaeque nasi 12 Levator labii superioris 13 Zygomaticus minor 14 Zygomaticus major 15 Levator anguli oris 16 Facial vein 17 Facial artery 18 Superior labial artery 19 Orbicularis oris 20 Mentalis 21 Depressor labii inferioris 22 Depressor anguli oris 23 Platysma 24 Risorius 25 Masseter 26 Buccal branches of facial nerve 27 Buccal fat pad 28 Accessory parotid gland 29 Parotid duct 30 Transverse facial artery 31 Zygomatic branch of facial nerve 32 Zygomatic arch 33 Temporal branches of facial nerve 35 Superficial part of parotid gland 36 Marginal mandibular branch of facial nerve 37 Cervical branch of facial nerve 39 Great auricular nerve 40 Sternocleidomastoid 41 Lesser occipital nerve 42 Greater occipital nerve 43 Occipital artery 44 Occipital belly of occipitofrontalis 45 Occipital vein 46 Cervical lymph node 47 Cartilage of pinna. (From McMinn's Color Atlas of Head and Neck Anatomy, Fifth Edition; Elsevier Ltd.)

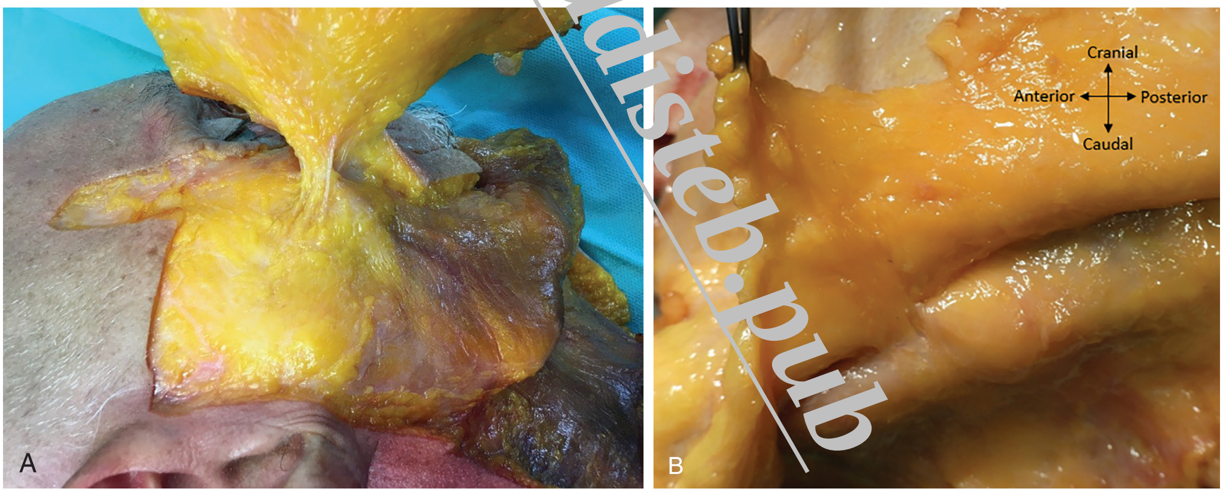

Fig. 1.5 (A) Cadaveric dissection exposing the right zygomatic ligament (McGregor's patch) and its proximity to the ligamentous branch of the transverse facial artery. (B) Subplatysmal dissection exposing the mandibular ligament. (Courtesy Dr. Cotofana.)

ligamentous branch of the transverse facial artery (a branch of the superficial temporal artery) runs inside the ligament. Releasing the mandibular ligament is controversial due to its long dissecting pathway and due to the increased risk of damaging the marginal mandibular branch of the facial nerve. This nerve runs cranial to the ligament and its pathway has to be crossed if the ligament needs to be reached.

DANGER ZONES

Traversing branches of the facial nerve are known to travel deep to the superficial musculoaponeurotic system and supply muscles of facial expression (mimetic muscles) from their deep surfaces. However, it is also well known that the position of these branches during their course is influenced by the stepped configuration of the layered attachments of the muscles within the fascio-skeletal facial framework, leaving them exposed in certain areas and hence more vulnerable to injury. The impact of inadvertent injury to branches of the facial nerve during superficial surgical procedures presents the patient with a risk of cosmetic and functional impairment and must, therefore, be approached with caution and confidence using knowledge of surface anatomy.

CLINICAL PEARL

The most effective application of anatomy during such procedures takes into consideration that the branches of the facial nerve are subject to anatomical variability, ethnicity, age, pathology, and previous surgical intervention.

When discussing the facial nerve, it is prudent to review facial danger zones. These are areas where a motor nerve tends to be relatively superficial and susceptible to transection, leading to deformity. The three main sites on the head and neck are the temporal branch of the facial nerve along at the zygomatic arch, the marginal mandibular branch of the facial nerve anterior to the masseter along the jaw and the spinal accessory nerve (CN XI) in the posterior triangle of the neck (Fig. 1.6A and B and Fig. 1.9).

The temporal branch of the facial nerve exits the parotid gland and travels within the temporoparietal fascia over the zygomatic arch, at which point there is only a thin fascial component of the SMAS protecting it. Different rami are ultimately sent off to innervate the superior portion of the orbicularis oculi muscle, frontalis muscle, anterior auricular muscle and temporalis muscle. Damage may lead to brow ptosis clinically.

CINICAL PEARL

The danger zone for the temporal branch of the facial nerve can be approximated by drawing a line from the tragus to the highest forehead crease and the earlobe to the lateral brow.

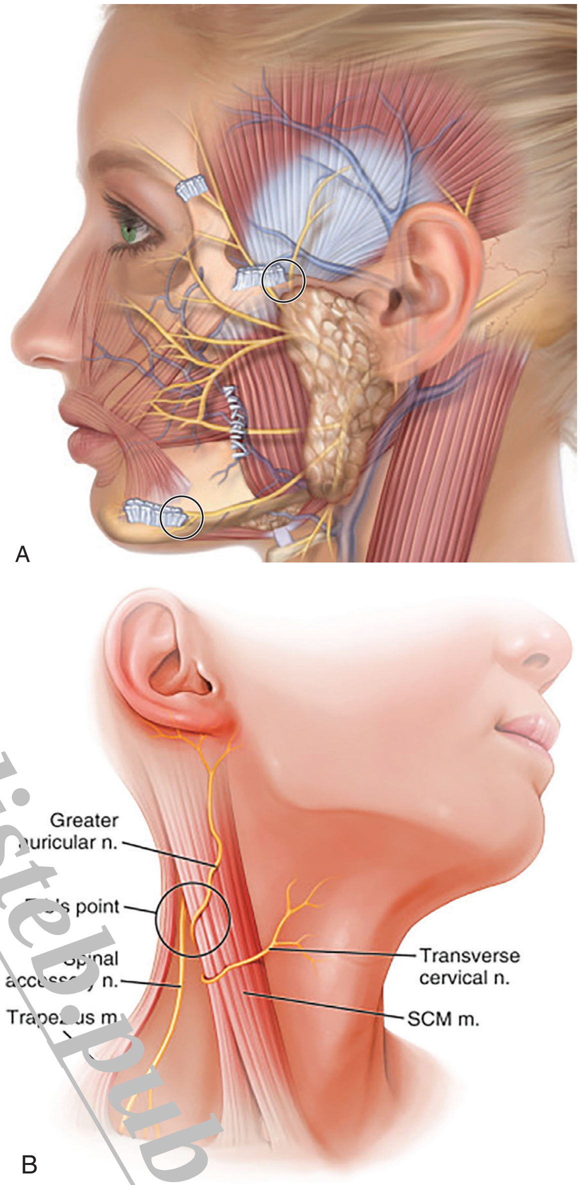

Fig. 1.6 (A) Neural danger zones of the temple: Temporal branch of the facial nerve crossing the zygomatic arch and of the jawline: Marginal mandibular branch of the facial nerve in close proximity to the mandibular ligament. (B) Neural danger zone of the neck: Erb's point = emergence of the sensory branches of the cervical plexus posterior to the sternocleidomastoideus muscle. (The Art and Science of Facelift Surgery Niamtu, Joe, DMD © 2019, Elsevier Inc. All rights reserved.)

The marginal mandibular branch of the facial nerve exits the parotid gland inferiorly, close to the angle of the jaw. It then courses anteriorly along the inferior border or below the mandible towards the lower lip. It tracks superficial to the facial artery and vein, which happens to be an area with a thin SMAS.

CLINICAL PEARL

The danger zone of the marginal mandibular nerve can be approximated by drawing a circle around a point that is 2 cm posterior to the oral commissure on the inferior border of the mandible with a 2 cm radius. Injury will lead to an asymmetric smile.

Erb's point (Fig 1.6 B) is located in the posterior triangle of the neck, where several nerves can be found covered only by skin, subcutaneous tissue, and a thin superficial fascia. The posterior triangle of the neck is bordered anteriorly by the SCM (sternocleidomastoid muscle), posteriorly by the trapezius, and inferiorly by the clavicle.

CLINICAL PEARL

The danger zone for the spinal accessory nerve and the greater auricular nerve can be approximated on the posterior border of the sternocleidomastoid (SCM) muscle by dropping a vertical line 6 cm down from the center of the line that connects the angle of the jaw and the mastoid process, with an anatomical variation within a 2 cm radius around that point.

Structures that can be found here include the spinal accessory nerve as well as nerves from the cervical plexus (greater auricular, lesser occipital, transverse cervical and supraclavicular nerves). The spinal accessory nerve (CN XI) innervates the SCM and trapezius muscles; if injured it will result in a winged-scapula and shoulder weakness.

The mental nerve is a branch of the mandibular division of the trigeminal nerve (CN V). It exits the mental foramen, which is on the anterior surface of the mandible in the mid pupillary line and provides sensory innervation to the chin and lower lip. This carries clinical significance in that it is easily accessible and blocked with local anesthesia with a nerve block. It is, however, also susceptible to injury during a chin implant or even filler placement. Greater Auricular Nerve (GAN).

One of the most novel concepts in midfacial anatomy, which has recently been considered is termed: the transverse facial septum (Fig. 1.7). The transverse facial septum is a fascial connection that extends from the underside of the zygomaticus major muscle and attaches to the maxilla, which is the osteo-muscular fascial connection. This septum has been shown to form the inferior boundary of the deep midfacial fat compartments and the superior boundary of the buccal space.[4] This further elucidated why with aging and mandibular recession the midfacial fat compartment begins to prolapse and hang over the central cheek area.

The septum is also responsible for the formation of apple cheeks during smiling. Smiling requires the contraction of the zygomaticus major muscle, leading to a conformational change in the septum: from loose to tense. Tension of the septum results in a cranial shift of the septum in contrast to the conformational change of a hammock upon tension. The content of this hammock, i.e., the deep midfacial fat compartments are being

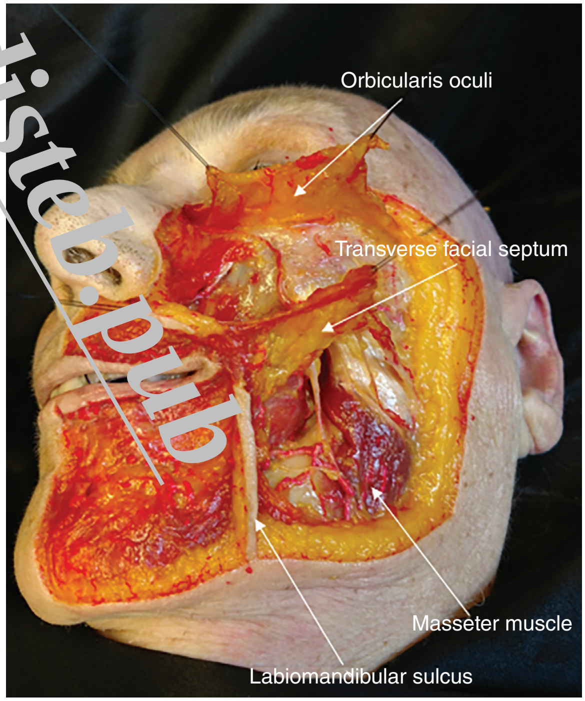

Fig. 1.7 The transverse facial septum, connecting the zygomaticus major muscle to the maxilla. Note: the undissected skin flap indicates the location of the labiomandibular sulcus (Marionette line). (Courtesy Dr. Sebastian Cotofana.)

repositioned into a more cranial position, which can be observed on the skin surface as an increase in volume and hence the appearance of "apple cheeks." The flexibility and the free oscillation of the septum is responsible for the natural soft tissue movement upon facial expressions. Changes in the flexibility of the septum result in unnatural facial appearance (increased malar volume) and unnatural facial expressions, especially upon smiling. These can be observed upon injections of unbalanced amounts of soft tissue fillers or fat into the medial midface and also after facelifting procedures where too much traction was applied upon SMAS repositioning.

CLINICAL PEARL

- The most common cause of neurapraxia in facial surgery is due to trauma of marginal mandibular branch of the facial nerve Marginal Mandibular Nerve (MMN) and this occurs often during liposuction of the submental area and the jowls. This will cause an asymmetric smile on the ipsilateral side of the injury. The most common cause of paralysis in facelift surgery is injury to the greater auricular nerve (incidence of 6-7%) and this will cause numbness of ⅔ of the auricle (Fig. 1.8). Zygomatic and buccal branches are more difficult to damage given the extensive anastomoses between the two. However, they can be transected during deep facelifting. As a general rule, transection of facial nerves medial to a vertical line drawn down from lateral canthus are less problematic and there is much higher chance for return of nerve function than transection lateral to the lateral canthus (more proximal nerve trunk).

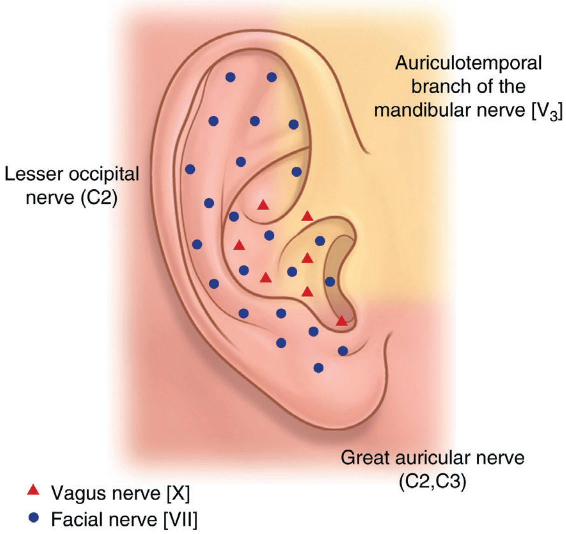

Fig. 1.8 Sensory Innervation of the Ear. The external ear is innervated by contributions from both cranial (CN V, VII, X) and spinal nerves (C2, C3 – Great auricular and Lesser Occipital Nerves). Together, these nerves overlap to supply portions of skin from superficial (external ear appendages) to the lateral aspect of the tympanic membrane, the preauricular and posterior auricular areas. The superior pinna and portion of the supra-auricular scalp are supplied by the Lesser Occipital nerve (C2, C3). The remainder inferior 2/3 of the pinna as well as the posterior auricular region is supplied by the great auricular nerve (C2, C3). The external acoustic meatus and external auditory canal is supplied superiorly by a branch of the facial nerve (CNVII), the nervus intermedius, inferiorly by the vagus nerve (CNX) and medially by the auriculotemporal nerve (CNV). In addition, the auriculotemporal nerve also supplies the pre-auricular area and the tragus. The lateral surface of the tympanic membrane is supplied by the nervus intermedius (CN VII) superiorly and the vagus nerve (CNX) inferiorly. (From *Gray's Anatomy for Students* Fifth Edition Copyright © 2024 by Elsevier Inc. All rights reserved.)

CLINICAL PEARL

- Knowledge of the surface anatomy in facial surgery can not be overemphasized. There are 8 danger zones in facial surgery which are illustrated in Fig. 1.9A and B. The approximate landmark measurements are provided below. It is important to note that there is significant variability in these numbers between genotype and sex. Furthermore, due to significant bone resorption with aging there is also significant variability in the geriatric population. Therefore, the clinical pearls below should only be use as a guideline as opposed to absolute measurements.
  - Supraorbital nerve: Distance to midline 2.4 cm (+/−0.4cm)
  - Supratrochlear nerve: Distance to midline 1.4 cm (+/− 0.3cm)
  - Infraorbital nerve: Distance to midline 2.7cm (+/− 0.3cm), distance to inferior orbital rim 0.9cm (+/− 0.2cm)
  - Metal nerve: Distance to midline on curvature of the mandible 3.1cm (+/− 0.3cm), distance to inferior mandibular border 1.5cm (+/− 0.2cm)
  - Marginal mandibular nerve: Intersection of the inferior border of mandible and lateral orbital axis (vertical line drawn down from lateral orbital rim)
  - Temporal branch of facial nerve: Inferior border of zone - a line drawn from lobule to tail of the brow, superior border of zone - a line drawn from tragus to 2cm above tail of brow (most susceptible to injury at the mid tail of the zygomatic bone)

- Greater auricular nerve: Inferior border of zone - 6.5 cm from external auditory canal, anterior border of zone - tragus, posterior border - posterior border of antitragus
- Parotid duct: Intersection of a line drawn from lobule to superior vermillion border and the lateral orbital axis.

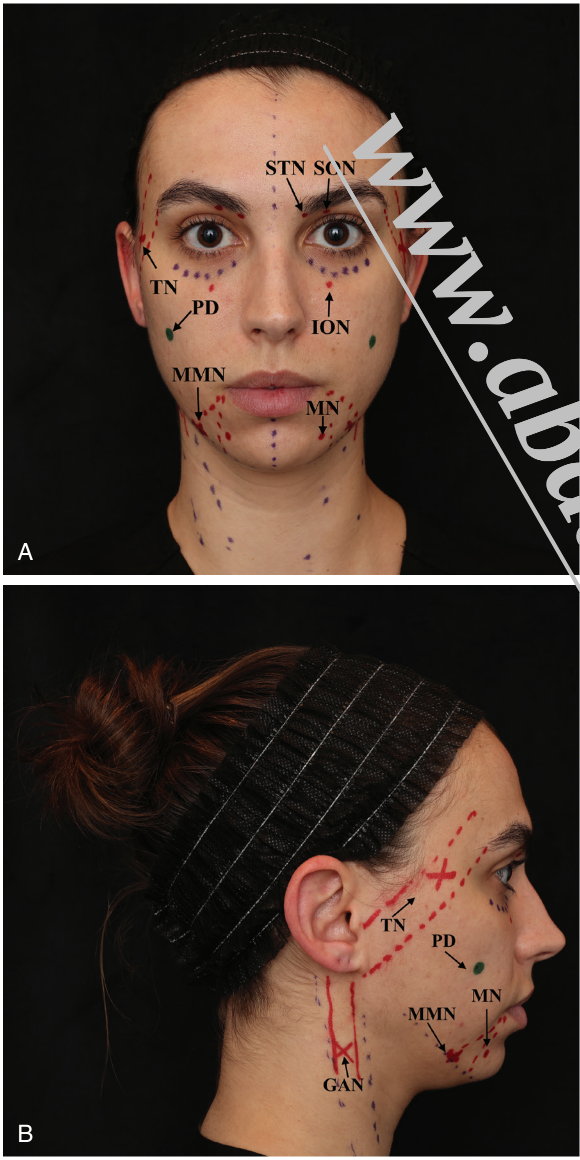

Fig. 1.9 (A) (frontal view) (B) (lateral view) Facial Danger Zones. *SON*, Supraorbital Nerve; *STN*, supratrochlear nerve; *ION*, infraorbital nerve; *MN*, mental nerve; *MMN*, marginal mandibular nerve; *TN*, temporal branch of facial nerve; *GAN*, greater auricular nerve. (See Video 1.1). (Photograph courtesy Dr. Hooman Khorasani.)

RELEVANT ANATOMY FOR BROW LIFT AND FOREHEAD LIFT

The anatomy of the forehead follows the classic rules of fascial layers. The layers of the forehead from superficial to deep are skin, superficial fat, frontalis muscle, subfrontalis fat, subfrontalis fascia, loose areolar tissue (location of the deep forehead compartments), and periosteum (Fig. 1.10A). The branches of the sensory supraorbital and supratrochlear nerves emerge in various frequencies via a foramen, a notch, or without any bony guidance from the intraorbital and are in direct contact with the superior orbital rim (see Fig. 1.10B).

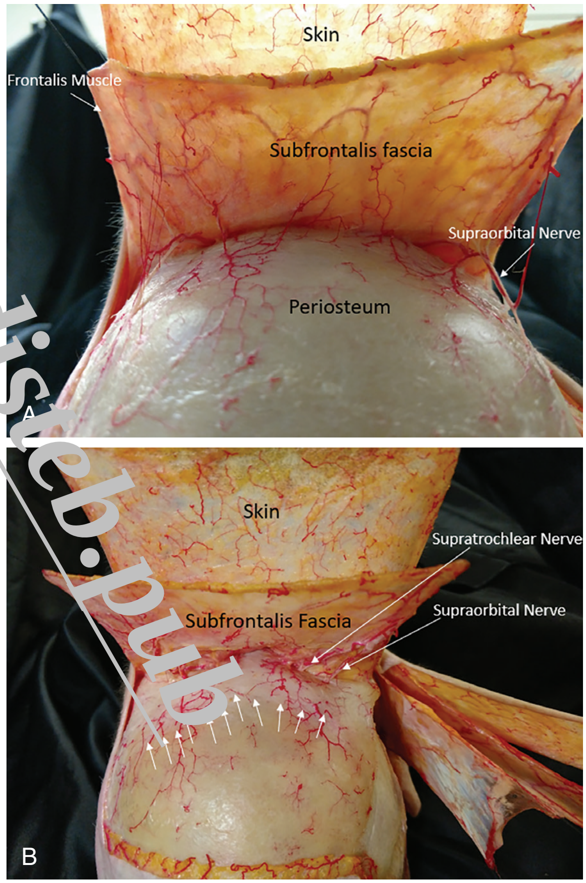

Fig. 1.10 (A) A cranial view of the supraperiosteal plane with the skin, subcutaneous fat, frontalis muscle, subfrontalis fascia reflected without the release of the inferior frontal septum. (B) A cranial view of the supraperiosteal plane with the skin, subcutaneous fat, frontalis muscle, subfrontalis fascia reflected with the release of the interior frontal septum. Arrows indicate the beginning of the frontal bar. (Courtesy Dr. Sebastian Cotofana.)