Facial danger zones: Avoiding nerve injury in facial plastic surgery

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BR Seckel. Facial danger zones: Avoiding nerve injury in facial plastic surgery. Can J Plast Surg 1994;2(2):59-66. With today's new emphasis on more aggressive and deeper facial dissection during rhytidectomy, the peripheral nerve branches of cranial nerves V and VII in the face are more often exposed closer to the plane of dissection and more likely to be injured in the course of composite, extended sub-submuscular aponeurotic system (sub-SMAS), and subperiosteal rhytidectomy. It is important to have a keen and thorough understanding of the location of these nerves to avoid injury. I divide the face into seven facial danger zones based on known anatomic locations of the branches of the peripheral nerves of the face and the location in which they are most easily injured in the course of facial dissection. A description of the nerve and consequence of injury, the anatomic location of the zone, and the technique for safe surgical dissection for each facial danger zone is presented.

Key Words: *Cranial nerves, Face lift, Facial rejuvenation, Peripheral facial nerves, Rhytidectomy*

Zones faciales à risque: prévenir l'atteinte des nerfs lors de chirurgies esthétiques du visage

RÉSUMÉ : L'importance accordée de nos jours à une dissection faciale plus agressive et plus profonde durant la rhytidectomie fait que les ramifications périphériques des nerfs crâniens V et VII du visage sont plus souvent exposées et accolées au plan de dissection et donc plus susceptibles d'être atteintes dans le cadre d'un système composite aponévrotique sous-musculaire étendu (sub-SMAS) et de la rhytidectomie sous-périostéale. Il est important de bien comprendre la localisation de ces nerfs afin d'éviter toute lésion. Cet article divise le visage en sept zones à risque sur la base de la localisation anatomique connue des branches des nerfs périphériques du visage et des endroits où ils sont le plus facilement lésés au cours d'une dissection faciale. Une description du nerf et des conséquences d'une atteinte, la localisation anatomique des zones, et la technique à appliquer pour une dissection chirurgicale sans danger, en fonction de chaque zone à risque, sont présentées dans ces pages.

Injury to one of the major facial nerve branches creates a catastrophic and occasionally irreversible facial deformity. Even patients in whom muscle function recovers after nerve injury are often left with permanent involuntary muscle twitching or distortion of the face by contracture and shortening of partially denervated muscles. Additionally, interruption of one of the major sensory nerves in the face can result in permanent disability secondary to numbness or, worse, intractable dysesthesia and pain. With today's new emphasis on more aggressive and deeper facial dissection in the course of face lift surgery (1-13), the peripheral nerves of the face are more often exposed, they are closer to the plane of dissection and are more likely to be injured. It is important, therefore, to have a keen and thorough understanding of the location of these nerves to avoid injury.

It is helpful to divide the face into seven arbitrary facial danger zones in which one is most likely to encounter and, thus, injure these peripheral nerves of the face. The following discussion focuses on each of these facial danger zones individually with regard to the nerve and consequence of injury, the anatomic borders of the facial danger zone, and techniques for safe surgical dissection.

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FACIAL DANGER ZONE 1

The nerve and consequence of injury

Facial danger zone 1 includes the area in which the great auricular nerve emerges from beneath the sternocleidomastoid muscle, becomes more superficial and is thus most susceptible to injury. Permanent injury to this nerve results in numbness of or, in the case of a neuroma, painful dysesthesia of the lower two thirds of the ear and adjacent neck and skin of the cheek. Another unusual but troublesome syndrome is that caused by compression of the nerve by a nonabsorbable suture used to plicate the platysma-submuscular aponeurotic system (SMAS) to the mastoid fascia. This results in painful dysesthesia in the ear, which can be induced by tapping the nerve at the point of compression.

Anatomic location

Facial danger zone 1 (Figure 1) is best located by first identifying the point described by McKinney and Katrana (14). The patient's head is turned to the opposite side. The sternocleidomastoid muscle is palpated, and a straight line is dropped from the caudal edge of the external auditory canal to a point 6.5 cm below on the midpoint of the muscle belly. I arbitrarily define zone 1 as the area described by a circle with a radius of 3.0 cm drawn around this point that includes the point of emergence of the great auricular nerve from beneath the sternocleidomastoid muscle at 9 cm below the

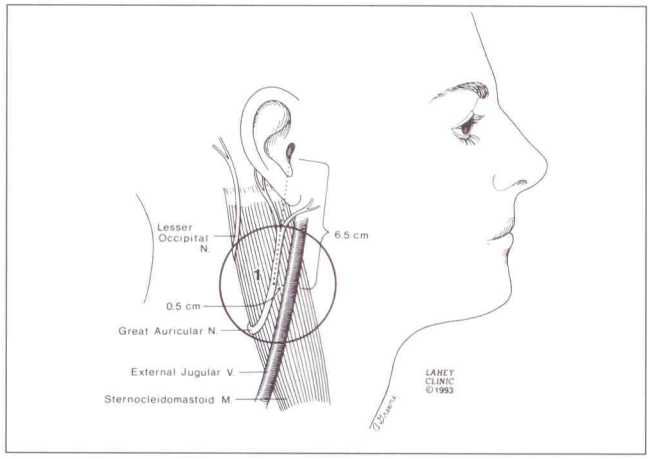

Figure 1) *Facial danger zone 1 is centered around a point in the middle of the sternocleidomastoid muscle belly 6.5 cm below the caudal edge of the external auditory canal (Reprinted by permission of Lahey Clinic)*

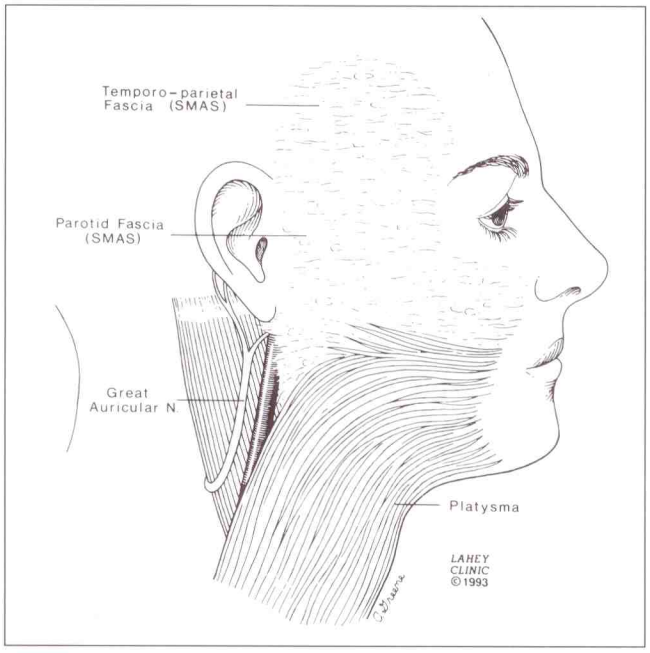

Figure 2) *The great auricular nerve is posterior to and not protected by the platysma-SMAS layer through most of its course (Reprinted by permission of Lahey Clinic)*

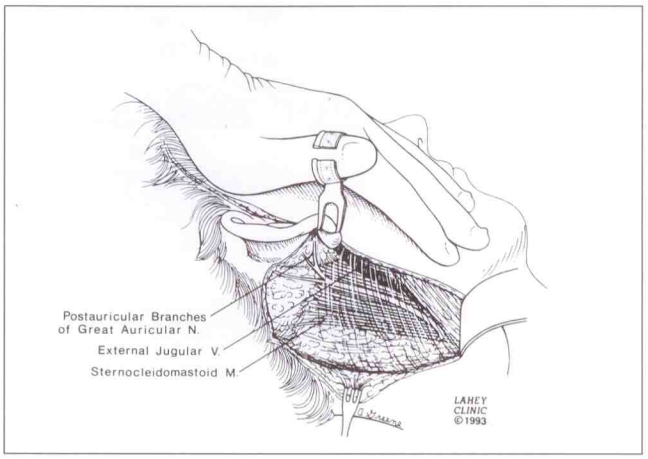

Figure 3) *During dissection with anterior pull on the ear lobule, small terminal postauricular branches of the great auricular nerve can be seen and provide an important clue to the proper plane of dissection in this area (Reprinted by permission of Lahey Clinic)*

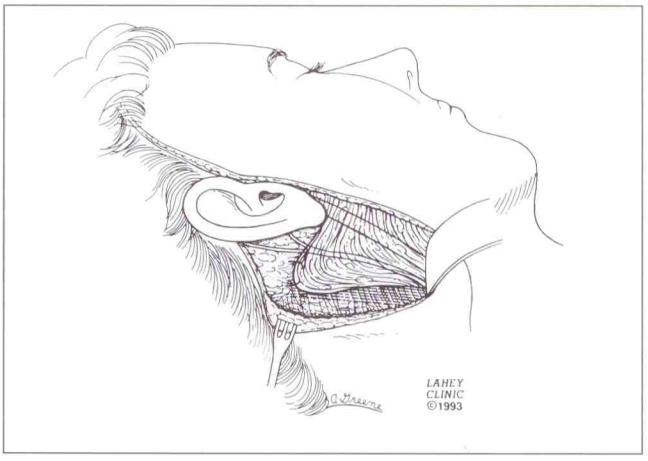

Figure 4) *When the platysma-SMAS layer is plicated to the mastoid fascia behind the ear, the platysma-SMAS layer must be folded over the nerve, and the suture must not touch or compress the nerve or a painful compressive neuropathy may result (Reprinted by permission of Lahey Clinic)*

external auditory canal. The lesser occipital nerve emerges higher and stays along the posterior edge of the muscle belly.

Surgical dissection

After the postauricular incision is made, it is helpful to begin the dissection superficially, just deep to the subcutaneous fat, which is thin and superficial to the deep cervical fascia and the sternocleidomastoid muscle. The nerve is posterior to and superficial to the platysma-SMAS at this point (Figure 2). When the ear lobule is pulled forward, one or two tiny postauricular branches of the great auricular nerve can often be seen (Figure 3). Identification of these branches is helpful in establishing the proper plane for dissection inferiorly over the deep cervical fascia and the sternocleidomastoid muscle.

Another helpful anatomic relationship is that of the external jugular vein, which runs about 0.5 cm to 1 cm anterior to the great auricular nerve.

When the neck flap is dissected off the sternocleidomastoid and platysma muscles, the location of this vein is observed by first noting the location of the vein on the skin surface and watching for a blue shadow anterior to the sternocleidomastoid muscle beneath the skin flap. The great auricular nerve will be 0.5 cm to 1 cm posterior to the vein at the point where the vein comes into view during dissection. When the platysma-SMAS layer is plicated or sutured to the mastoid fascia, the nerve should not be compressed with the suture. Rather, the platysma-SMAS must cover and protect the nerve (Figure 4). Direct contact between suture and nerve can create a painful compressive neuropathy of the great auricu-

lar nerve. Hamra's (11,12) composite rhytidectomy does not include plication sutures behind the ear lobule. Rather, the platysma-SMAS is tightened in the cheek anterior to the nerve by excision and repair of the platysma bands. Thus, if one follows Hamra's (11,12) technique exactly, the great auricular nerve should not be at risk of compression by plication sutures.

FACIAL DANGER ZONE 2

The nerve and consequence of injury

Facial danger zone 2 is where the temporal branch of the facial nerve runs under the temporoparietal fascia-SMAS layer (9,15), having emerged from beneath the parotid gland at the level of the zygoma on its way to innervate the frontalis muscle in the forehead. Injury to the temporal branch results in paralysis of the frontalis muscle. Typically, the orbicularis oculi function is spared after injury to the temporal branch as the muscle receives dual innervation, with a second nerve supply coming from the zygomatic branches inferiorly. Clinically, the involved side of the forehead becomes paralyzed, with resultant ptosis of the brow, asymmetry of the eyebrows, and an asymmetric lack of animation on that side of the forehead.

Anatomic location

Facial danger zone 2 is best located by drawing a line from a point 0.5 cm below the tragus to a point 2.0 cm above the lateral eyebrow (16,17). A second line is drawn along the zygoma to the lateral orbital rim. A third line is dropped from the point above the eyebrow through the lateral end of the eyebrow to the zygoma. These three lines define a triangle (Figure 5) in which the temporal branch of the facial nerve lies on the undersurface of the temporoparietal fascia-SMAS layer and is more likely to be injured.

Surgical dissection

The temporal branch of the facial nerve emerges from beneath the parotid gland to run on the undersurface of the temporoparietal fascia-SMAS layer. Thus, dissection may be carried out deep to the temporoparietal fascia-SMAS layer or judiciously subcutaneously above this layer but not immediately beneath the temporoparietal fascia-SMAS layer. Safe dissection in facial danger zone 2 requires that the surgeon develop a 'mesotemporalis' as described by Marino (18).

This plane is developed by performing subtemporoparietal fascia-SMAS dissection from the scalp toward the supraorbital rim down to the level of the zygoma and a subcutaneous supra-SMAS dissection in the cheek from the mandibular ramus up to the zygoma (Figure 6). The point at which these two planes meet reveals the SMAS layer or 'mesotemporalis' in which the temporal branch of the facial nerve resides and can, on occasion, be seen running just inferior to the frontal branch of the superficial temporal artery. Exposure and identification of the 'mesotemporalis' help to avoid injury to this nerve.

In subperiosteal rhytidectomy or other procedures in which tissues are to be elevated from their attachment to the zygoma, the superficial lamella of the deep temporal fascia can be incised to enter the superficial temporal fat pad within this space, and dissection can proceed inferiorly and anteriorly without fear of injuring the frontal branch (5,7,9) (Figure 6).

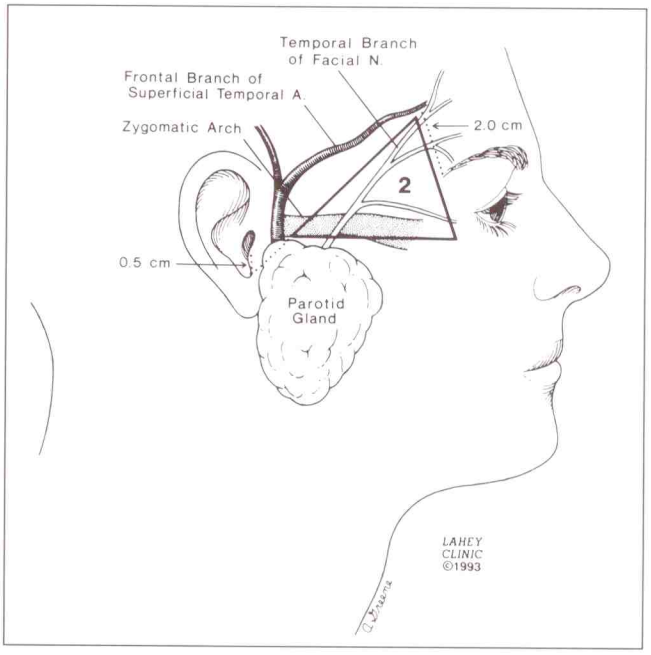

Figure 5) *Facial danger zone 2 is outlined by drawing a line 0.5 cm below the tragus to a point 2.0 cm above the lateral eyebrow, drawing a second line on the zygoma to the lateral orbital rim, and connecting these two lines with a third line (Reprinted by permission of Lahey Clinic)*

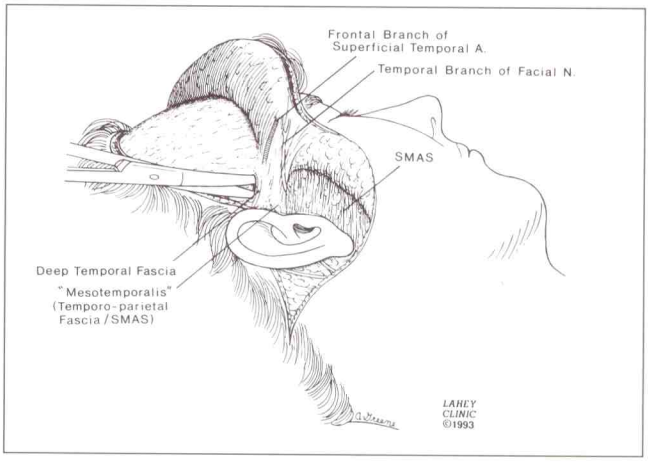

Figure 6) *Surgical exposure of the 'mesotemporalis' containing the temporal branch of the facial nerve during the course of rhytidectomy and coronal brow lift is shown. The scissors are deep to the superficial lamella of the deep temporal fascia, a safe plane for anterior dissection beneath the temporal branch. The superficial temporal fat pad is a helpful landmark for the proper plane (Reprinted by permission of Lahey Clinic)*

FACIAL DANGER ZONE 3

The nerve and consequence of injury

Facial danger zone 3 contains the marginal mandibular branch of the facial nerve at a point in its course where it is most vulnerable anteriorly as the platysma-SMAS layer thins

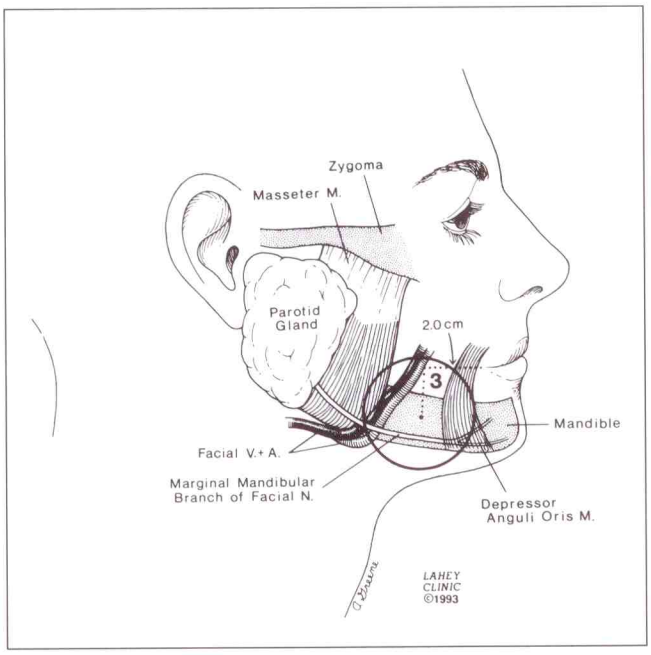

Figure 7) *Facial danger zone 3 is shown. A point on the midmandible is drawn at a level 2.0 cm posterior to the oral commissure, and a circle is drawn with a radius of 2.0 cm around this point. Note the proximity of the anterior facial artery and vein to the marginal mandibular branch of the facial nerve, which easily explains injury to this nerve seen after an attempt to cauterize a bleeding point in these vessels. Facial danger zone 3 contains the marginal mandibular branch of the facial nerve (Reprinted by permission of Lahey Clinic)*

and the nerve courses superiorly to innervate the depressor anguli oris muscle (19,20). Injury to this nerve creates a noticeable and extremely distressing deformity, especially when the patient smiles. During grimacing, the normally innervated zygomaticus major and minor muscles pull on the corner of the mouth unopposed by the denervated depressor anguli oris muscle resulting in an inability to show the lower teeth on the affected side. At rest, the tone in the normally innervated zygomaticus muscles pulls unopposed by the lack of tone in the denervated depressor anguli oris muscle and, again, pulls the corner of the mouth up so that at rest the lower lip rides high over the teeth in a unilateral 'pout'.

Anatomic location

Facial danger zone 3 is best described by drawing a point on the middle of the mandibular body 2.0 cm posterior to the oral commissure and drawing a circle with a radius of 2 cm around this point (21,22) (Figure 7). This process defines a circular area, facial danger zone 3, in which the platysma-SMAS thins, exposing the marginal mandibular branch to injury. The anterior facial artery and vein also cross this zone and are susceptible to injury.

Surgical dissection

Injury to the nerve in facial danger zone 3 occurs most commonly during the course of subcutaneous dissection in this area either from above beneath the cheek flap or from below through a submental incision, typically when trying to develop a communication between these two areas to permit a smooth redraping of skin along the inferior mandibular border.

The marginal mandibular nerve can be injured easily in facial danger zone 3 by the electrocautery during an attempt to control bleeding from the facial vein or less often from the facial artery. The facial artery and vein lie immediately medial and adjacent to the marginal mandibular branch of the facial nerve; therefore, the electrocautery current is easily conducted to the nerve causing damage.

Posterior to the facial artery and vein, the marginal mandibular branch of the facial nerve is deep to the platysma-SMAS layer, which protects the nerve from injury by dissection in the subcutaneous plane. During composite rhytidectomy or an extended SMAS dissection, the subplatysma-SMAS dissection must be kept superior to the mandible and under direct vision to avoid injury to the marginal mandibular branch of the facial nerve.

FACIAL DANGER ZONE 4

The nerve and consequence of injury

Facial danger zone 4 contains the zygomatic and buccal branches of the facial nerve that are superficial to and rest on Bichet's fat pad. Injury to these nerves can result in paralysis of the zygomaticus major and minor muscles and levator labii superioris alaeque nasi muscle, with resultant sagging of the upper lip and oral commissure on the affected side. This creates considerable asymmetry at rest, with the upper lip on the affected side sagging. The deformity is most apparent when the patient smiles. The unopposed action of the normal zygomaticus major and minor muscles on the opposite side pulls the mouth toward the normal side and creates a distorted appearance.

Fortunately, the zygomatic and buccal branches interconnect freely; thus, paralysis is usually not permanent, although many patients have a permanent involuntary twitch or contraction of the affected muscle after partial nerve injury. Permanent paralysis of these muscles can occur, however, and when it does, the deformity is severe and difficult to treat.

Anatomic location

Facial danger zone 4 is located deep to the platysma-SMAS and parotid fascia and should be at risk only during composite rhytidectomy and extended sub-SMAS dissection in the cheek. This space is triangular and is anterior to the parotid gland, superior to the mandibular body, posterior to the zygomaticus major muscle, and superficial to Bichet's fat pad. Preoperatively, this zone can be estimated by palpating the highest point on the malar eminence and the posterior border of the mandibular angle and by placing a dot over each of these two bony points and a third dot over the oral commissure. A triangle is then drawn connecting these three dots to define a triangular space bordered anteriorly by the zygomaticus major muscle, inferiorly by the mandible, and posteriorly by the parotid gland (Figure 8). Our cadaver dissections reveal that this area is the one in which the zygomatic and buccal

branches and parotid duct are no longer protected by the parotid gland and are more susceptible to injury (unpublished data).

Surgical dissection

Injury to the zygomatic and buccal branches should occur only when the plane of dissection is beneath the SMAS. Thus, this type of injury would typically occur only in the more invasive face lift procedures, such as extended sub-SMAS or composite rhytidectomy (11,12) techniques. In the typical subcutaneous face lift dissection, these nerve branches remain protected by the SMAS and should not be encountered.

The deeper sub-SMAS rhytidectomy procedures can, however, be performed with minimal risk of injury to the zygomatic and buccal branches. The fused SMAS and parotid fascia layer is incised below the zygoma and in front of the ear and is carefully dissected as a unit off the parotid gland (Figure 9). In composite rhytidectomy (11,12), the SMAS incision is made anterior to the parotid gland, and the platysma-SMAS branches are elevated by the vertical spreading technique. This latter manoeuvre is probably best left to more experienced surgeons because too deep an initial incision could cause a zone 4 nerve injury.

With either technique, as the dissection reaches the anterior border of the parotid gland, the scissors can be turned, and a gentle vertical spreading technique is used to dissect the SMAS carefully off the zygomatic and buccal branches and Bichet's fat pad and parotid duct. In the anterior part of facial danger zone 4, the lateral portion of the zygomaticus major muscle comes into view. The zygomatic branches are most superficial just before running underneath the superior portion of the zygomaticus major muscle near the muscle's origin from the zygoma, and injury is most likely to occur here (Figure 9). In most patients, a small branch from the superior ramus of the zygomatic branch runs above the zygomaticus major muscle to innervate the inferior portion of the orbicularis oculi. This nerve is easily disrupted in the course of dissection in facial danger zone 4. However, the orbicularis oculi muscle has a second innervation from the temporal branch of the facial nerve; thus, complete orbicularis oculi palsy is unusual. Typically, full orbicularis oculi palsy is only seen with total proximal facial nerve lesions, such as after section of the trunk of the facial nerve in the facial canal during removal of an acoustic neuroma. Hamra (11) and Barton (13) recommend piercing the platysma-SMAS at the lateral border of the zygomaticus major muscle to carry the dissection into the subcutaneous plane superficial to the muscle to disrupt the connections of the SMAS to the nasolabial fold and to free the ptotic cheek fat pad for redraping superior laterally. This manoeuvre must be performed carefully under direct vision because dissection beneath the zygomaticus major muscle near its origin can easily injure the zygomatic branches of the facial nerve.

Facial danger zone 4 can be entered safely, however, with careful dissection under direct vision. Blind dissection, forceful or injudicious sharp dissection, and blind use of the electrocautery are to be avoided in this area. Failure to observe these guidelines may result in paralysis of the upper lip, a potentially debilitating complication.

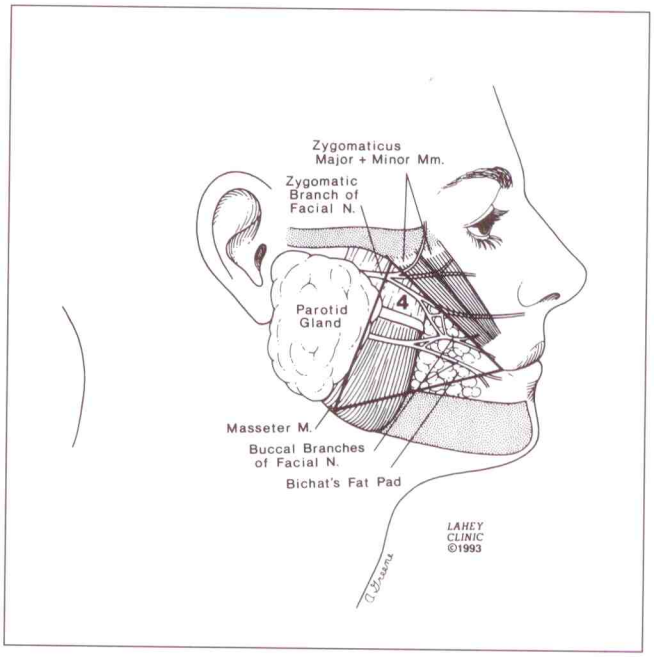

Figure 8) *Facial danger zone 4 is deep to the parotid fascia-SMAS. It may be outlined by placing a point on the highest point of malar eminence, another point on the mandibular angle, and a third point at the oral commissure. These three points are connected to form a triangle. Facial danger zone 4 is bounded by the parotid gland, zygomaticus major muscle and the mandible and contains the zygomatic and buccal branches of the facial nerve and parotid duct (Reprinted by permission of Lahey Clinic)*

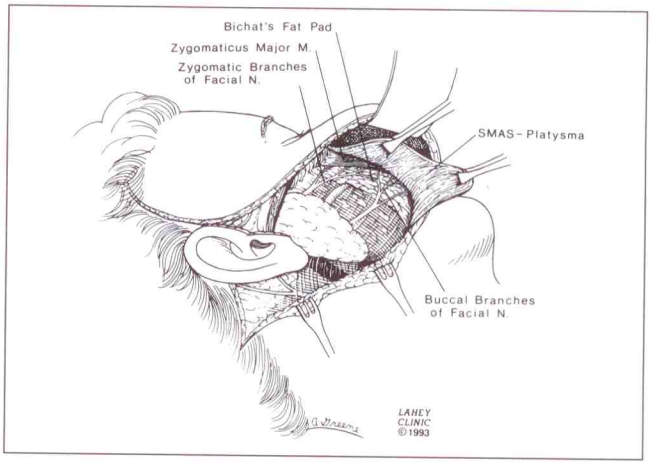

Figure 9) *Surgical exposure of facial danger zone 4 is shown. The lateral border of the zygomaticus major muscle is shown near its origin from the malar eminence and the dangerously superficial course of the zygomatic branches before the innervation of this muscle can be seen (Reprinted by permission of Lahey Clinic)*

FACIAL DANGER ZONE 5

The nerve and consequence of injury

Facial danger zone 5 contains both the supraorbital and supratrochlear nerves, which are branches of the first division of the trigeminal nerve (CN V). Both of these nerves are susceptible to injury as they emerge from the bony foramina

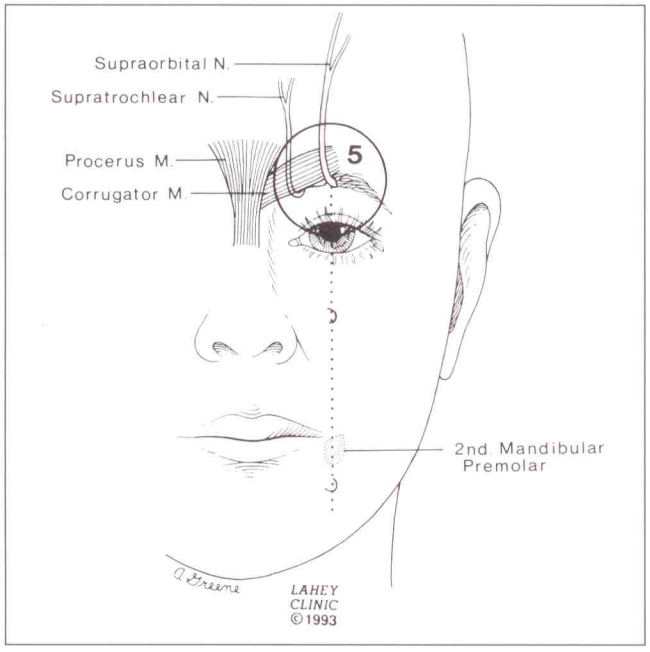

Figure 10) *In facial danger zone 5, the supraorbital foramen is palpated, and a line is dropped through the midpupil and the second mandibular premolar. This line will run through or near the supraorbital, infraorbital and mental foramina. Facial danger zone 5 is within a circle, with a radius of 1.5 cm drawn around the supraorbital foramen (Reprinted by permission of Lahey Clinic)*

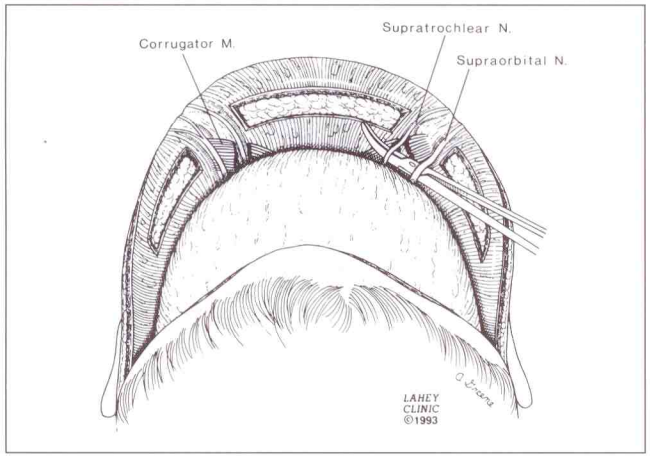

Figure 11) *Surgical exposure of the supraorbital and supratrochlear nerves beneath the coronal brow flap is shown. Nerve and vascular pedicle are left undisturbed on the undersurface of the temporoparietal fascia-SMAS. The corrugator muscle has been resected revealing the supratrochlear nerve (Reprinted by permission of Lahey Clinic)*

where they are more adherent and less easily moved or stretched.

Although the supraorbital nerve courses superficial to the corrugator muscle, the supratrochlear nerve actually courses through the muscle. It can readily be seen that the supratrochlear nerve can easily be cut while the corrugator muscle is being sectioned during the course of a coronal brow lift, a common treatment for 'frown lines'. Injury to these nerves results in numbness or, in the case of a neuroma, painful dysesthesia of the medial forehead, scalp, upper eyelid and nasal dorsum.

Anatomic location

Facial danger zone 5 is best located by identifying the supraorbital foramen, which can be palpated along the supraorbital rim usually directly above the midpupil (21) (Figure 10). After this point has been marked, a circle with a radius of 1.5 cm is drawn around the point. This circle defines facial danger zone 5 and encompasses both the supratrochlear and supraorbital nerves. When a vertical line is dropped through the supraorbital foramen, the midpupil, and down to the second mandibular premolar, a line can be drawn through the infraorbital and mental foramina, making subsequent location of facial danger zones 6 and 7 much easier (22).

Surgical dissection

Injury to the supratrochlear and supraorbital nerves within facial danger zone 5 occurs typically when a coronal brow lift is performed either alone or in conjunction with a lower face lift. When the coronal brow flap is dissected, the subtemporoparietal fascia-SMAS and supraperiosteal plane are entered, and either with the electrocautery or sharp dissection, the coronal flap is turned down.

The surgeon must watch carefully the undersurface of the coronal brow flap, ie, the undersurface of the temporoparietal fascia-SMAS layer in this region, for the supraorbital nerve and the accompanying vascular pedicle. This nerve and vascular pedicle run prominently at about the junction between the lateral third and the middle third of the coronal brow flap (Figure 11). As the dissection approaches the supraorbital rim, the surgeon must be careful not to injure these nerves as they exit their respective foramina. Furthermore, when, in the course of the dissection, the surgeon wants to excise a thin layer of frontalis muscle, a small island of temporoparietal fascia-SMAS and frontalis muscle with the accompanying nerve and vessel intact must be left at the junction of the lateral and medial third of the coronal flap on each side.

It is also imperative to excise only SMAS and frontalis muscle. Removal of any of the subcutaneous fat from this region will result in a serious contour deformity. For this reason, many authors only score the undersurface of the frontalis muscle and do not remove muscle or the SMAS layer.

In the course of dissecting the corrugator muscles, the surgeon should attempt to avoid injury to the supratrochlear nerve. The supratrochlear nerve runs within the fibres of the corrugator muscle; only by careful dissection of these muscle fibres under direct vision will it be possible to preserve the supratrochlear nerve, although it is impossible to preserve this nerve in many patients. After the corrugator muscles are dissected and the electrocautery is used for cutting, the uninjured supratrochlear nerve can frequently be seen, and the supraorbital nerve should be seen running lateral to the corrugator muscle.

FACIAL DANGER ZONE 6

The nerve and consequence of injury

Facial danger zone 6 contains the infraorbital nerve, which is a branch of the second division of the trigeminal nerve (CN V). Injury to these nerves creates numbness of the lateral nose, cheek and upper lip. This numbness can interfere with a patient's ability to eat. In a worst-case scenario, injury to the nerve may cause a painful neuroma that can cause symptoms resembling tic douloureux. The zygomatic branches of the facial nerve also run through this area to innervate the levator labii superioris muscle.

Anatomic location

Facial danger zone 6 can be identified by approximating the infraorbital foramen in the following manner. The midpupil and the second mandibular premolar are sited along a vertical line running through the supraorbital foramen; a point on the anterior maxilla 1 cm below the infraorbital rim is palpated along this line to approximate the location of the infraorbital foramen. A circle with a radius of 1.5 cm is drawn around this point to include the infraorbital foramen (Figure 12).

Surgical dissection

Injury to the nerves in facial danger zone 6 is unlikely to occur in the typical subcutaneous or sub-SMAS face lift. However, the extended subperiosteal face lift involves dissection in the subperiosteal plane on the anterior maxilla, and, thus, the infraorbital nerve and the zygomatic branches of the facial nerve can be injured. This nerve may also be injured in the course of rhinoplasty, injection of local anaesthetic agent, and in the course of midface advancement surgery.

FACIAL DANGER ZONE 7

The nerve and consequence of injury

Facial danger zone 7 contains the mental nerve, which is a sensory branch of the third division of the trigeminal (CN V) or fifth cranial nerve. Injury to this nerve results in numbness in one half of the mucosal and cutaneous surfaces of the lower lip and chin. Injury to the mental nerve is a serious clinical condition in that patients may find it difficult to hold food in their mouth and may inadvertently bite their lower lip during chewing. For patients who play a wind instrument, this injury can lead to loss of this skill.

Anatomic location

The mental foramen exits the midmandible below the second mandibular premolar and in line with the previously drawn line extending from the supraorbital foramen through the midpupil. On an anteroposterior roentgenographic view, this foramen is in line with the supraorbital foramen and the infraorbital foramen (Figure 13).

Surgical dissection

Injury to this nerve occurs most commonly in the course of chin implantation surgery and when dissecting a subperiosteal or preperiosteal plane, either through a buccal or submental incision. Hamra's (11) chin procedure is medial to the foramen, and if performed exactly as he describes, injury to the mental nerve should not occur.

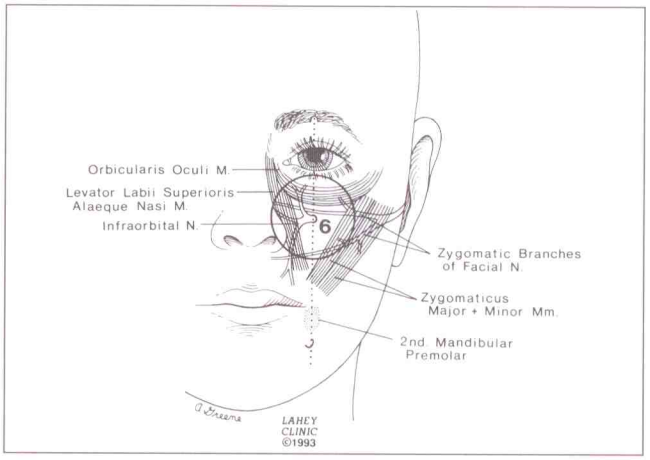

Figure 12) *Facial danger zone 6 is described by a circle with a 1.5 cm radius around the infraorbital foramen, which lies 1 cm below the inferior orbital rim along the line down through the midpupil and second mandibular premolar (Reprinted by permission of Lahey Clinic)*

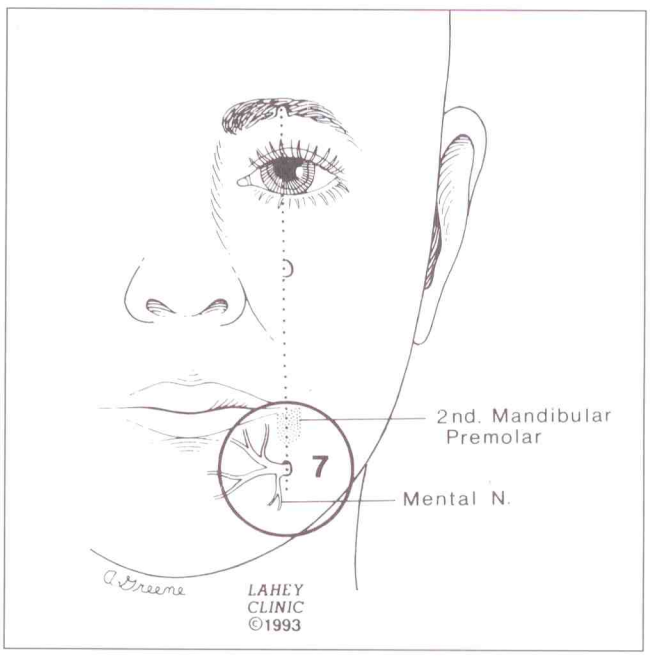

Figure 13) *Facial danger zone 7 is described by a circle with a radius of 1.5 cm around the mental foramen, which lies on the midmandible below the second premolar along the line drawn through the supraorbital foramen, midpupil and infraorbital foramen (Reprinted by permission of Lahey Clinic)*

DISCUSSION

Serious permanent injury to the peripheral nerves of the face during the course of a routine subcutaneous or limited SMAS plication face lift is, fortunately, an uncommon occurrence, averaging 0.8% and 0.1%, respectively (23). In fact, if the surgeon dissects only in the subcutaneous plane and does not penetrate the SMAS layer, it should be impossible to damage the motor branches of the facial nerve (Figure 2).

The increasing contemporary interest in and enthusiasm

TABLE 1: Facial danger zones

Facial danger zone	Midpoint location	Nerve	Relationship to SMAS	Sign of zonal injury
1	6.5 cm below external auditory canal	Great auricular	Above	Numbness inferior 2/3 of ear
2	Below a line drawn from 0.5 cm below tragus to 2.0 cm above lateral eyebrow	Temporal branch of facial	Within	Paralysis of forehead
3	Midmandible 2.0 cm posterior to oral commissure	Marginal mandibular branch of facial	Above	Paralysis of lower lip
4	Anterior to parotid gland and posterior to zygomaticus major muscle	Zygomatic and buccal branches of facial	Beneath	Paralysis of upper lip
5	Superior orbital rim above midpupil	Supraorbital and supratrochlear	Beneath	Numbness forehead, upper eyelid, nasal dorsum
6	1.0 cm below inferior orbital rim below midpupil	Infraorbital	Beneath	Numbness side of upper nose, cheek, upper lip
7	Midmandible below second premolar	Mental	Beneath	Numbness half of lower lip

SMAS Submuscular aponeurotic system

for extended dissection beneath the SMAS layers in the cheek and the temporoparietal fascia-SMAS layer in the forehead, however, place the zygomatic, buccal and temporal branches of the facial nerve closer to the plane of dissection. Although the originators of these techniques may not have noticed increased numbers of nerve injuries, I have little doubt that zone 4 (zygomatic and buccal branch) and zone 2 (temporal branch) facial nerve injuries will occur more frequently as less experienced surgeons adopt these new advanced techniques. Furthermore, subperiosteal face lifting with elevation of the periosteum of the anterior maxilla carries a higher risk of zone 6 infraorbital nerve injury. Hopefully, the popularization of these advanced techniques will stimulate a renewed interest in the detailed anatomy of the peripheral nerves in the face and significant nerve injuries will be avoided. The salient points regarding each of the facial danger zones are summarized in Table 1. A more detailed text with full colour illustrations has recently been published (24).

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