Transtemporal Midface Lift

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Background

History

The philosophy of facial rejuvenation surgery evolved through the course of the twentieth century. Initially surgeons focused their efforts on reversing the effects of gravity developing rhytidectomy techniques to lift and remove excess skin. With time the focus of facial rejuvenation shifted more toward three-dimensional evaluation of facial aging. The importance of volume particularly in the midface was recognized as an important aspect of a youthful appearance. This led to the development and evolution of various surgical procedures for rejuvenation of the middle third of the face. The history of the transtemporal midface lift, as we know it, traces back to the development of the subperiosteal forehead lift. This was first reported by Tessier in 1979 when he presented his results on subperiosteal frontal rhytidectomy [1]. Following this, in the early 1980s Tessier, Psillakis, and Santana went on to describe midface lifting in the subperiosteal plane [2]. Hinderer described a subperiosteal elevation of the periorbital region from an open pretrichial approach. He demonstrated an improvement in the forehead periorbital tissues [3]. Psillakis also described success in midfacial lifting from a coronal approach with subperiosteal dissection in the periorbital and midface regions [4]. Their techniques all faced a similar challenge in the high risk of injury to the frontal branch of the facial nerve. They described rates of frontal branch injury of up to 20% [2]. These frontal branch injuries led some surgeons to limit their dissection to the anterior third of the zygoma; however this resulted in a less optimal lift. Ramirez later found that elevating the anterior 2/3 of the zygomatic periosteum could allow for more a favorable redraping of the midfacial tissues [5]. Then in the 1990s with the advent and application of the endoscope, surgeons were able to effectively elevate the forehead, temporal regions, and eventually midfacial tissues with smaller incisions and fewer frontal branch complications owning to the benefit of direct visualization of the dissection planes [2]. During this time, Ramirez described a combined endoscopic and transoral route for elevating the midfacial tissues with minimal complications compared previous reports [5].

Justification for Transtemporal Midface Lifting

Numerous techniques and approaches have been reported for lifting the midfacial tissues including transtemporal, transpalpebral, transoral, endoscopic, or combinations of all of the above [5]. The goals of all these procedures are all the same: to efface the nasolabial fold (NLF) and resuspend the descended malar and suborbicularis fat pads with their associated soft tissue and skin. When the endoscopic technique is applied, the midface is typically lifted in combination with an endoscopic forehead or temporal lift [5]. Our favored approach is through the transtemporal endoscopic method, which will be described in detail. We have found that with endoscopic guidance, curved dissectors, and appropriate technique, the midfacial tissues can be elevated effectively transtemporally without an intraoral incision. Additionally, the transtemporal approach to the midface lift imparts a more favorable vector of pull (more superolaterally) as compared to the preauricular or deep plane facelift approach [6].

There has also been variety in the proposed dissection planes for the midface lift. We prefer elevating the midface in the subperiosteal plane [7]. In the subperiosteal plane, we believe we can achieve an even elevation and resuspension of the tissues. Also, in this plane, we avoid risk of injury to the zygomatic and buccal branches of the facial nerve, which lie several layers superficial to this plane. Our technique for midface lifting produces benefit in several midfacial aesthetics: correction of midface ptosis and infraorbital hollowing,

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improvement in the depth of the nasolabial fold and even a degree of improvement in the of lower face jowling [8].

Anatomy

Perhaps more than in any other area in facial plastic surgery, a thorough and precise knowledge of the anatomy is essential to successful completion of endoscopic transtemporal midface lift without complication. Mastery of the fascial layers and understanding the location and depth of critical nerves and vascular structures can ensure safety during this surgery particularly in avoiding injury to the frontal branch of the facial nerve.

Scalp and Forehead

The scalp is comprised of five layers some of which extend into and continue into fascial structures in the temporal and midfacial regions. From most superficial to deep, the scalp comprises the skin, a dense subcutaneous layer of connective tissue, the aponeurosis also called the galea, loose areolar tissue, and the pericranium, which acts as the periosteum of the skull. The galea is made up of an inelastic tendinous sheet, which connects the frontalis muscle to the occipitalis muscle. The galea is continuous with the superficial muscular aponeurotic system (SMAS) and the temporoparietal fascia also called the superficial temporal fascia [7]. The frontalis muscle is located superficial to the periosteum of the forehead. Because the dissection in this region is subperiosteal, the frontalis is not encountered during the endoscopic forehead lift [7]. The depressor muscles of the brow include the corrugator supercilii, orbicularis oculi, and procerus which also lie above the periosteum but deep to the frontalis and can be dissected from beneath endoscopically [7].

Temple

In the temporal region, the fascial layers and locations are of great importance (Fig. 30.1). Just deep to the skin and subcutaneous fat is the temporal parietal fascia (TPF). The TPF is also sometimes referred to as the superficial temporal fascia [9]. The TPF is in a continuous layer that corresponds with the galea in the scalp and the SMAS in the face below the zygomatic arch [9]. The frontal branch of the facial nerve travels in this layer as it crosses the zygomatic arch. Some

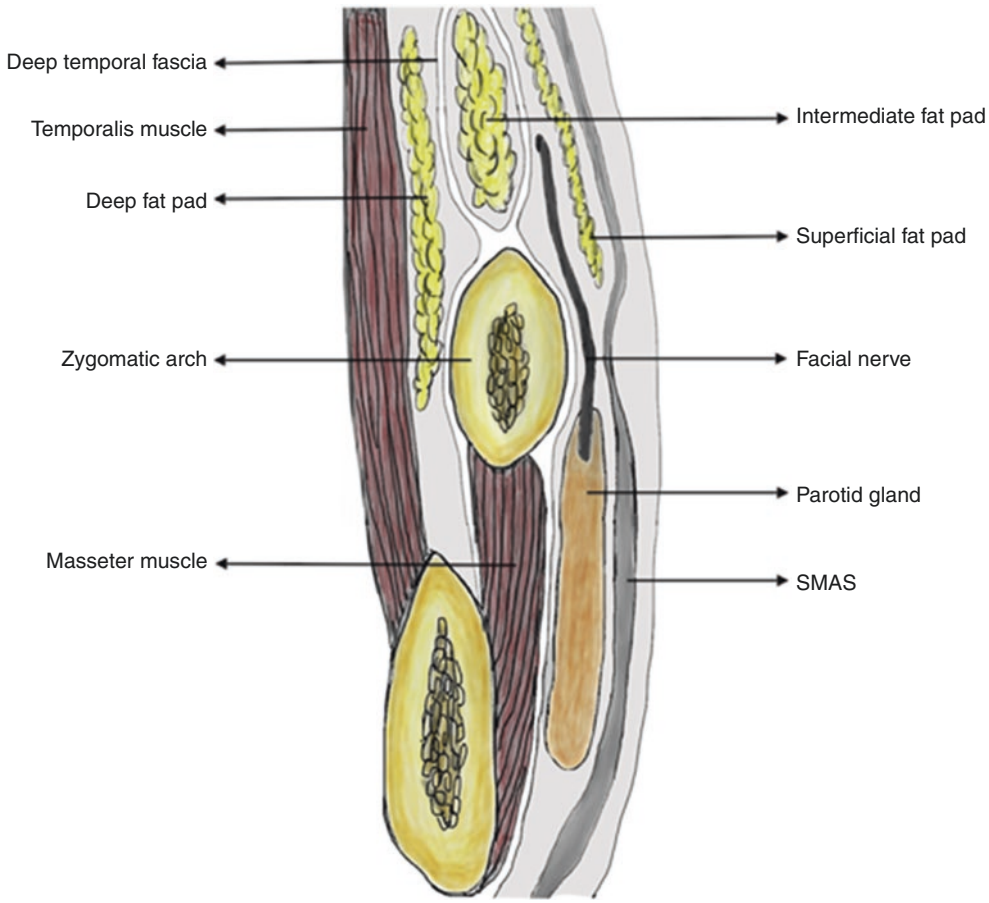

Fig. 30.1 The fascial planes through a coronal cut crossing the midportion of the zygomatic arch. One can observe the relationship between the facial nerve exiting the parotid gland and crossing superficially to the zygomatic arch and the intermediate temporal fat pad

surgeons argue that SMAS is not actually in continuation with the TPF but rather terminates within 1 cm of the zygomatic arch; however, both lie deep to the subcutaneous fat and superficial to the deeper layers [10]. Just deep to the TPF lies a thin superficial fat pad. Deep to the superficial fat pad is the deep temporal fascia complex. The deep temporal fascia, also called the temporalis fascia, exists as a single hearty fascial layer superiorly and then splits into two layers around the intermediate fat pad and zygomatic arch. The superficial layer of the deep temporal fascia attaches inferiorly to the lateral aspect of the zygomatic arch [9]. Between the superficial and deep layers of the deep temporal fascia sits the intermediate fat pad. The deep layer of the deep temporal fascia comprises the majority of the fascial fibers from the united single deep temporal fascia superiorly and attaches inferiorly to the medial aspect of the zygomatic arch [9]. Superiorly the deep temporal fascia directly overlies the temporalis muscle; inferiorly, after it splits into two layers, the deep temporal fat pad lies between the deep temporal fascia and the temporalis muscle fibers. The clinical significance of the deep temporal fat pad is that trauma to it can result in the appearance of temporal wasting.

The fascial layers have some variability in size and location at different levels from anterior to posterior in the coronal plane. One thing that remains constant is that the TPF, which contains the frontal branch of the facial nerve, remains superficial throughout this region and does not directly contact the bony zygomatic arch at any point. The size of the superficial fat pad between the TPF and the superficial layer of the deep temporal fascia can vary. The size of the intermediate fat pad between the superficial and deep players of the deep temporal fascia also varies; it decreases in size from anterior to posterior. Correspondingly, the location where the two layers coalesce into the single deep temporal fascia aka temporalis fascia lies more superior anteriorly and more inferior posteriorly [11].

Sensory and Motor Nerves

The sensory nerves of the forehead and scalp are the supraorbital and supratrochlear nerves and vessels exit the supraorbital notch in the forehead [7]. They can be seen endoscopically in the subperiosteal dissection of the forehead.

The frontal or temporal branch of the facial nerve is the main motor nerve that can be encountered in the dissection field in the transtemporal midface lift. Pitanguy originally described the course of the frontal branch. Pitanguy's line can be drawn as follows: First a line joining the lateral canthus to the superior portion of the tragus is identified and measured. The midpoint of this line is connected with the inferior aspect of the ear lobe, and this line bisecting the first line extending through the temple marks Pitanguy's line [9, 12] (Fig. 30.2). The frontal branch of the facial nerve crosses in the middle third of zygomatic arch and continues its course superomedially [9, 13]. This location approximately corresponds to halfway between the lateral canthus and the root of the helix [7]. The frontal branch is at greatest risk for injury as it courses over the zygomatic arch because there it has the least soft tissue thickness to protect the nerve from injury during dissection. Frequently, the frontal branch of the facial nerve exists not just as one branch but splits off into at least two smaller (sometimes up to four branches) in the temporal region as found in several cadaver studies [11–13]. In an anatomic study with fresh cadavers, Gosain et al. demonstrated that multiple rami of the frontal branch of the facial nerve cross the zygomatic arch [13]. They noted that the area of this crossing occupies less than half the length of the arch and the inferior aspect of the arch, greater than half the length of the arch on the superior aspect. These branches are centered around the midportion of the zygomatic arch [8, 13]. In the deep fascial layers between the TPF and deep temporal fascia, several veins can be seen crossing between the layers during surgical dissection. Sabini et al. performed a cadaver study that identified a series of bridging vessels crossing from the deep temporal fascia to the superficial temporal fascia [12]. The most robust among these veins, the sentinel vein, crosses between the deep temporal fascia and the TPF within 2 mm of temporal branch of the facial nerve [12].

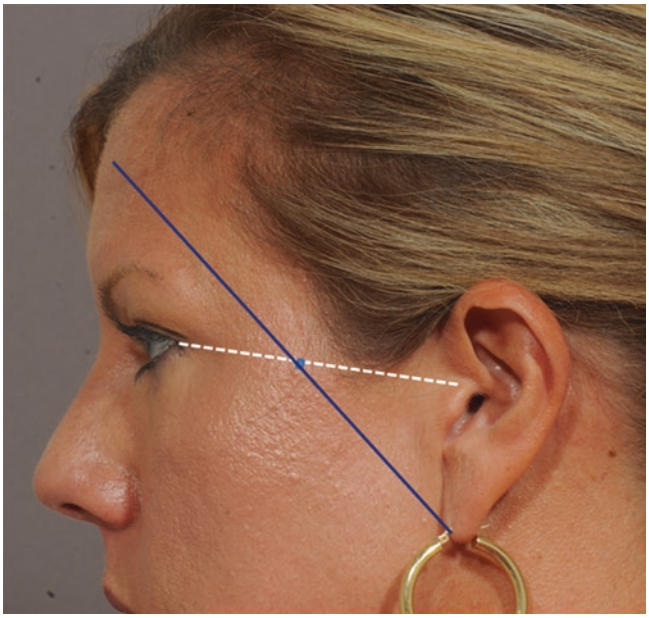

Fig. 30.2 Preoperative marking. Pitanguy's line is drawn as demonstrated. Dotted white line connects lateral canthus and root of helix. The midpoint of this line is connected with the inferior aspect of the ear lobe; extending this line creates Pitanguy's line approximating the path of the frontal branch of the facial nerve

Midface

The midface has been described as the area between the level of the mid-horizontal orbit and the mandibular margin [8]. In this region reside the lower eyelid, the bony orbital rim, the maxilla, and the malar and suborbicularis oculi fat (SOOF) pads and muscles of facial expression including the orbicularis oculi superiorly, the levator labii superioris, the zygomaticus major and minor, and the masseter deep. The lower eyelid-cheek junction can be seen as a curved line that runs slightly inferior and parallel to the infraorbital rim. The medial portion of the lower eyelid-cheek junction is sometimes referred to as the tear trough [9]. The lower eyelid-cheek junction marks the transition between the palpebral and orbital aspects of the orbicularis oculi muscle [9].

There are differences in the skin and subcutaneous tissues on either side of the lower eyelid-cheek junction. In the lower eyelid superiorly, the skin is extremely thin and lies directly over the orbicularis oculi. In contrast inferior to this junction, the skin is thicker and is separated from the orbicularis muscle by the malar fat pad [9]. Along this line in the medial portion, the orbicularis attaches firmly to the bone. Laterally, starting between the medial limbus and midpupillary line in the area of the SOOF, the orbicularis muscle attaches to the orbicularis retaining ligament, which then attaches to the bony orbital rim [9]. The SOOF contains two compartments: the medial compartment extends from the medial limbus to the lateral canthus and the lateral compartment extends from the lateral canthus to the temporal fat pad [9]. The malar fat pad comprises a triangular thickening of the subcutaneous fat in the cheek overlying the maxilla. It sits superficial to the SMAS and makes up most of the volume of the midface [9]. The zygomaticus major and minor, covered by the SMAS, lie deep to the SOOF and malar fat pads. The zygomatic branch of the facial nerve innervates the midfacial muscles of facial expression, which travel along the deep surface of these muscles. Thus, the dissection in the midface lift when carried out in a subperiosteal layer avoids these nerve branches entirely [9].

Midfacial Aging

The youthful midface contour is comprised of one continuous single smooth convexity. A number of changes can be observed during aging in the midface. The lower eyelids may develop palpebral bags. These palpebral bags can appear at an early age and are the result of pseudoherniation of orbital fat against a weak or lax orbital septum [14]. In addition, the orbicularis oculi muscle and its attachments can become lax and allow further deepening of this pseudoherniation. As aging progresses, the orbital septum weakens allowing protrusion of orbital fat and the midface descends [15].

Inferior to the orbital rim, malar mounds can develop and descend accentuating the nasolabial folds. The malar mounds are comprised of soft tissue that bulges directly from the malar prominence [14]. The appearance of these can worsen with smiling [14]. While the orbital septum protrudes, and the malar mounds descend, the arcus marginalis (which is the attachment of the orbital septum to the bony orbital rim) remains tightly adherent [15]. When the midface structures descend, the orbital rim is exposed, and the prolapsed orbital fat in the lower eyelid complex and ptotic SOOF create a double contour [7] like a beer belly over a tight belt [6, 8].

Hamra proposed that this attachment is a large contributor to the aged appearance of the lower eyelid and midface [15]. Hamra demonstrated that this convexity can be restored by release of the arcus marginalis [15]. This explains why fat removal or malar augmentation may be unsuccessful in restoring a youthful appearance. In fact, resection of the prolapsed fat without lifting the midface can even create an undesirable hollowed look [7].

There are several anatomic structures that contribute to midfacial aging. Proper release and elevation of these structures significantly contribute to midface rejuvenation. Gamboa et al. identified several of these in a cadaver study [16]. The orbicularis retaining ligament attaches to the orbicularis muscle medially near the lacrimal crest and laterally attaches to the lateral orbital thickening. The lateral orbital thickening is in continuity with the SMAS and the TPF. The prezygotic space overlies the zygoma, and dissection of this is required for proper repositioning of the midface. The zygomatic ligaments attach malar eminence soft tissues to the zygomatic periosteum [16].

Preoperative Assessment

As mentioned earlier, the ideal midfacial contour is that of a single uninterrupted convexity. In this situation, the inferior and lateral orbital rim should be padded with malar fat and SOOF [7]. The goal of the midface lift is to redrape the descended malar and SOOF fat pads over the orbital rim to eliminate the double convexity contour that emerges with the aging process. The postoperative appearance after the transtemporal midface lift can be simulated with finger elevation of the malar fat complex when describing and demonstrating the procedure to potential patients [9].

It is critical to document any preexisting anatomic conditions with photo documentation and discuss them thoroughly with the patient. Some important characteristics to take note preoperatively include the lower eyelid position, whether and to what degree is the inferior orbital rim exposed, the eyelid-cheek junction length, the presence of lower eyelid fat pseudoherniation, the estimated volume and size of the SOOF and malar fat pads, and the depth of the nasolabial

fold [9]. Preexisting asymmetries such as brow asymmetries and eyelid ptosis should be carefully observed, noted, and pointed out to the patient preoperatively.

Patient education particularly appropriate postoperative expectations should be emphasized. Patients may experience initial tightness can have significant headache nausea in the immediate postoperative period [9]. The patient should be counseled and warned of this ahead of time. Particularly in the case of the transtemporal endoscopic midface lift, patients can expect prolonged postoperative edema 4–6 weeks as a result of the subperiosteal dissection [7]. Another important aspect of patient education prior to midface lifting is that often, midfacial descent is accompanied by volume loss. Therefore, midface lifting candidates may also benefit from midfacial volume augmentation. Patients should be made aware that in some cases lifting alone cannot comprehensively treat midfacial aging and they may need volume augmentation as well. This can be accomplished by fat grafting or filler injection [9].

Surgical Technique

In order to optimize preoperative conditions, it is helpful to treat the glabella with botulinum toxin preoperatively. This allows easier reattachment of periosteum by obviating the downward pull of the depressor muscles on the brow during the initial postoperative healing process [7].

Preoperative Marking

Preoperatively, the patient should be marked while in upright position [9] (Fig. 30.3). Important anatomic markers are drawn out including the temporalis muscle boundaries and Pitanguy's line. The patient is instructed to clench her/his jaw, and the anterior and superior border of the temporalis muscle is marked with a marking pen. Pitanguy's line, which approximates the path of the frontal branch of the facial nerve, is drawn as described above. The bilateral supraorbital notches and glabellar frown lines should be marked [9].

The planned temporal and medial scalp incisions are marked out bilaterally. The temporal incision should begin 1 cm posterolateral to the temporal hairline at a level 1.5 cm inferior to the superior edge of the temporalis. This incision continues for 3 cm posteroinferiorly remaining at least 1 cm behind the hairline. This incision should be oriented with the direction of desired pull for lateral brow [7]. The medial scalp incisions are marked 1 cm behind the frontal hairline in line with the lateral canthus. These incisions are drawn 1–2 cm back from their anterior limit.

Assessment of the eyebrow position and the plan for any changes to it should be made preoperatively in the upright position [9]. In most patients 2–4 mm of brow elevation is all that is needed to bring the lateral brow to the ideal position (for women just above the orbital rim, for men at the orbital rim). The medial brow position is maintained as elevation can result in a surprised look. The preoperative medial brow position should be noted, and patients should be counseled that dissection of the corrugators can result in widening of the medial brow [9].

Fig. 30.3 Pitanguy's line is drawn as dotted blue line. The edge of the temporalis is mapped out as dotted blue line. The temporal incision is placed perpendicular to the direction of lifting setback from the hairline and at least 1.5 cm below the superior insertion of the temporalis. The frontal scalp incision (solid blue) is marked behind the hairline aligned with the lateral canthus

With elevation of the midfacial soft tissues, this often produces bunching of excess skin at the lower eyelid. In most cases this will require a skin pinch excision of the lower eyelid. This makes for an ideal opportunity to perform lower eyelid blepharoplasty in conjunction with transtemporal midface lift. If it is determined, transconjunctival fat removal will be necessary; the fat from the medial, middle, and lateral fat compartments should be assessed preoperatively in the upright position to identify the regions with excess orbital fat.

Incisions

A mixture of lidocaine and bupivacaine with epinephrine is injected at the marked incision sites and areas of dissection. The temporal incision is taken through the skin and TPF fascia down to but preserving the deep temporalis fascia. It is important to angle the bevel of the scalpel parallel to the hair follicles to preserve hair at the incision site [7, 9]. Up to about 5% of patients can experience telogen effluvium

characterized by an area of alopecia 1 cm around the incision sites [9]. It is also important to keep the entire incision at least 1.5 cm below the superior extent of the temporalis muscle insertion so that the temporal soft tissue can be secured superiorly to the temporalis fascia in this location. The medial incisions are aligned with the lateral canthus and are used for endoscope entry sites and for forehead periosteal fixation [9].

After the temporal incision is taken through skin subcutaneous fat and the TPF, blunt dissection proceeds along the deep temporal fascia. Blunt dissection proceeds with a blunt endoscopic dissector: Ramirez EndoForhead "T" Dissector #4, (Black and Black Surgical, Tucker, Ga) [9] with gentle but firm pushing motion at a 30–40° angle to the surface of the deep temporal fascia [9]. Once the dissection plane is established and confirmed at the temporalis muscle fascia, a lighted Aufricht retractor is used for better visualization. Superomedially, blunt dissection transitions to the subperiosteal plane after passing the tenacious temporal line. The dissection continues to the level of the occiput posteriorly and connects across the midline to the contralateral subperiosteal dissection in the forehead. By extending the subperiosteal dissection posteriorly to the occiput, we are able to ensure the temporal tissues will redrape properly and avoid bunching near the temples once the temporal suspension is completed [9].

The dissection is carried inferiorly directly on the frontal bone in a subperiosteal plane. After releasing the periosteum from the frontal bar, a curved Ramirez Endoforehead Arcus Marginalis Dissector #6, (Black and Black Surgical, Tucker, GA) is used to release the arcus marginalis from its lateral end to within 1 cm from the marked supraorbital neurovascular bundle [9]. We use a bimanual technique in releasing the arcus marginalis with one hand placed on the skin at the orbital rim to prevent injury to the orbit with inferior dissection [9].

Endoscopic Forehead

The two medial incisions made behind the hairline at the level of the lateral canthus are taken down to the bone. A blunt dissector can be used to complete elevation of the periosteum circumferentially around these incisions. A bunt dissector is used to extend the subperiosteal forehead pocket to within 1 cm from the supraorbital notch. A downbiting subperiosteal elevator is used to elevate the medial attachments over the glabella and radix [8]. As mentioned earlier the arcus marginalis is released from the orbital rim with bimanual technique. In order to adequately elevate and resuspend the brows, it is critical to achieve full periosteal separation from the orbital rim at the arcus marginalis [7]. At the lateral canthus 1 cm region of periosteal attachment is maintained and not elevated. This helps to ensure the eye position and shape will not change in the long term after acute postoperative edema resolves.

A 30° endoscope with a protective cover is inserted through the medial incision to directly visualize the supraorbital neurovascular bundle [9]. Using a curved protected endoscopic grasper directed under endoscopic guidance, the corrugator supercilii muscles are cauterized and resected bilaterally. This step eliminates the vertical glabellar lines [9]. Resection and cauterization of the corrugators muscles can result in slight widening of the medial brows, which is desirable in some cases.

Midface

For the midface, our technique employs a subperiosteal release of the midface from the infraorbital rim to the inferior aspect of the maxilla and laterally over the entire zygomatic arch to the angle beneath the masseter aponeurosis [8]. There are several benefits to dissection of the midface in the subperiosteal plane: it can be elevated quickly and efficiently with minimal bleeding, and it is a safe plane for dissection with respect to the facial nerve [6].

Following complete elevation of the forehead and superior orbital rim, the dissection proceeds inferiorly with the lighted Aufricht retractor to optimize visualization and provide tension in the fascial planes [9]. We continue dissection inferiorly to the superior aspect of the zygomatic arch over deep layer of temporalis fascia deep to intermediate fat pad. This depth of dissection is carried anteriorly where the frontal branch of the facial nerve is protected by a layer of fascia and the intermediate fat pad [7]. As the plane of dissection from the superior and inferior pockets are connected on top of the deep temporalis fascia, several bridging veins are encountered which can be carefully cauterized with bipolar cautery close to the deep temporal fascia. The sentinel vein is encountered where Pitanguy's line crosses over the lateral orbital rim. This vein should be carefully preserved to protect the frontal branch and serve as a landmark for its. Sabini et al. performed a cadaver study that identified a series of bridging vessels crossing from the deep temporal fascia to the superficial temporal fascia. Among these is the sentinel vein, which enters the superficial temporal fascia within 2 mm of the frontal branch of the facial nerve [12] (Fig. 30.4).

While some surgeons prefer to dissect in the intermediate fat pad, we prefer to be deep to it on top of deep layer of deep temporal fascia as it provides the frontal branch of the facial nerve an extra layer of protection from traction and thermal injury during dissection [7, 8]. In this region care must also be taken to stay on top of the deep temporalis fascia. Penetration through the deep temporal fascia can lead to exposure the infratemporal fat pad. Even minimal trauma in this region can result in temporal wasting postoperatively [9].

Once the superior edge of zygomatic arch is reached, the periosteum of the zygomatic arch is entered anteriorly to ensure safety of frontal nerve [8]. A downcurved dissector is used to incise the periosteum over the arch exposing the periosteum over the entire superior aspect of the zygomatic arch [7, 9]. Posteriorly, the subperiosteal dissection is carried to within 1 cm anterior to the external auditory canal [9]. The masseteric aponeurosis attachments to the inferior aspect of the zygomatic arch are released with blunt dissection [7]. The endoforehead Arcus Marginalis Dissector #6 is used to release the periosteum over the anterior face of the zygoma. The zygomaticofacial foramen may be encountered, and the neurovascular structures should be kept intact if possible. This is an important landmark for suspension of the midface [9]. However, there is generally little consequence to this as bleeding is minimal and stops with packing pressure, and temporary postoperative numbness in the area usually resolves (Fig. 30.5).

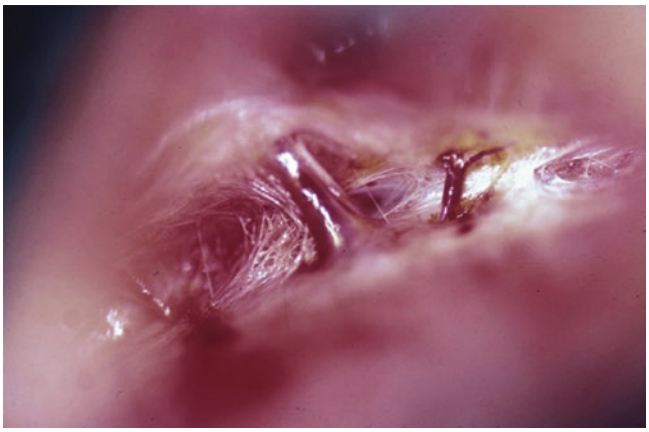

Fig. 30.4 The endoscopic surgical view of the sentinel vein

Subperiosteal dissection continues anteriorly and inferiorly along temporal line to orbital rim maintaining a 1 cm cuff of attached periosteum around the lateral cantus to avoid postoperative distortion of the eye [7–9]. "Dissection continues anteromedially over the anterior wall of the maxilla with a superior sweeping motion of the finger" [9].

Fig. 30.5 A 45-year-old woman who underwent endoscopic forehead lift, transtemporal midface lift, upper and lower blepharoplasty, and facelift. Note significant improvement in midface volume and suspension

A finger is kept on the orbital rim as subperiosteal elevation is performed to protect the globe [7]. A thumb positioned over the infraorbital notch protects the neurovascular bundle. This continues toward the nose and ends at the pyriform aperture releasing all the tissue inferior to the infraorbital nerve taking care to avoid entering the oral mucosa [9].

A lateral pocket is made as the dissection proceeds inferiorly. Using the lighted Aufricht retractor, the tendinous attachments at the lateral aspect of the maxilla are lysed with the endoforehead Arcus Marginalis Dissector [8, 9]. The masseteric tendon is cut with a downward motion inferior to the inferior aspect of the zygomatic arch [8, 9]. The dissection continues inferiorly below the masseteric aponeurosis on top of the belly of the masseter muscle until reaching a position 1 cm superior to the gonial angle [8, 9]. The medial subperiosteal midface dissection pocket is connected to the lateral masseteric aponeurosis pocket with a sweeping finger dissection which is also used to confirm adequate release of midfacial tissues [9]. At this point a complete midface release is achieved. Once this point is reached, a complete release of the midfacial tissues is accomplished ensuring free mobility of the midface, malar fat pad, and SOOF [8, 9].

Lower Blepharoplasty

If fat excision is necessary to create an aesthetic lower eyelid contour, this should be performed transconjunctivally prior to suspension of the midface as the tension created from the suspension sutures will hinder access to the conjunctiva. If necessary, transconjunctival lower eyelid blepharoplasty should be performed at this point prior to suture fixation of the midface periosteum [7]. Fat removal or cauterization should be conservative [9]. Lower eyelid excess skin is addressed after midface suspension with a skin pinch excision [7].

Suture Fixation Midface and Temple

After complete subperiosteal elevation of the forehead and midface, a 10 French Jackson Pratt drain is placed through the hair bearing skin above the ear and tunneled subperiosteally across the supraorbital region with the tip of the drain beneath the contralateral brow. Care should be taken to avoid passing the trocar through the superficial temporal vessels during placement [7, 9].

A total of five sutures are used to suspend the midface and temple. We prefer using 0-Vicryl on UR6 needle (Ethicon, Sommerville, NJ) for these sutures as the curvature of the UR6 needle is particularly suitable for placement of the deeper midfacial sutures. Under direct visualization with the lighted Aufricht retractor, a 0-Vicryl is passed through periosteum just lateral to zygomaticofacial foramen back to temporalis fascia [7]. This stitch should exert a superior and slightly lateral vector of pull on the midfacial tissues attached to the periosteum including the malar fat pad and the SOOF [6, 9]. A second suture is placed proximal/superior to the frontal branch of the facial nerve just posterior to Pitanguy's line and is secured to the temporalis fascia superolaterally [6, 9]. Three additional sutures are placed in the superficial temporal fascia or galea layer of anterior skin edge and secured to the deep temporalis fascia [9]. These three sutures should suspend the skin posterior superiorly in the region of the temporal line [9]. By suspending the soft tissues around the temples, this prevents an unnatural appearing bunching of tissue in the temporal area.

Forehead Fixation

Many have proposed various approaches to fixation of the forehead including permanent micro screws left under the scalp, cortical tunnels to fix galea and pericranium, and temporary fixation screws [7]. We prefer temporary fixation as studies have shown that periosteal reattachment occurs rapidly and permanent fixation is unnecessary. With a preset hand drill guide holes are made toward the superior aspect of the medial incisions and a 14 mm removable screw is secured in place at each drill site. The scalp is retracted superiorly so that the leading edge of the incision rests against the screw and a staple is placed just behind the screw to maintain the forehead scalp in the lifted position hooked behind the screw. This fixation method prevents the forehead flap from gravitating inferiorly [9]. We have found that elevation of the medial endoscopic incision 8 mm from its starting point results in maintenance of preoperative brow height, while elevation of 10–12 mm will result in a 2–4 mm elevation of the brow [8]. In most cases 2–4 mm of elevation is all that is needed to bring the brow back into its ideal position.

Lower Eyelid Skin Pinch Blepharoplasty and Closure

After the midfacial soft tissue is suspended into its new position, there may be noticeable bunching of excess lower eyelid skin that requires a lower eyelid skin pinch to allow better redraping of the lower eyelid skin [9]. The lateral temporal incisions are closed with 5–0 nylon sutures in an interrupted vertical mattress fashion. Additionally if there are any gaps in the medial scalp incisions between the staples and the fixation screws, they are reinforced with 5–0 nylon vertical mattress sutures. The skin pinch incision is closed with 6–0 nylon interrupted sutures laterally and 7–0 silk running locking sutures below the lash margin. Half-inch paper tape is applied across the forehead skin to minimize postoperative edema. Then a light pressure dressing with cotton padding and Kerlix gauze is applied for gentle compression for the first postoperative night [7].

Postoperative Care

The postoperative care routine includes several office visits within the first 1–2 weeks after surgery. On postoperative day 1, the pressure dressing and drain are removed. The patient may experience significant nausea and tightness/headache in the immediate postoperative period. Often this discomfort is significantly relieved once the drain across the forehead is removed and typically resolves by 48 hours [9]. The paper tapes on the forehead are left in place for 1 week. On postoperative day 7, the tape, forehead screws and staples, as well as the temporal sutures are removed. While some authors prefer permanent fixation, we find that it is not necessary. By 1 week the periosteum of the forehead tissues has adhered sufficiently to obviate the need for long-term suspension with screws or other foreign materials. Kim et al. demonstrated in animal studies that by postoperative days 8–12, the shear stiffness and strength approach the preoperative stiffness and strength at the bone periosteum interface [17]. Functionally, stable fixation can be established in even less time. For these reasons, we prefer temporary fixation screws.

Periorbital bruising and edema are expected. Patients are allowed to cover any persistent edema with makeup at 1–2 weeks after surgery.

Patients can also expect mild temporary distortion of the lateral canthus and puckering of the skin above incision [7]. The superior lateral pull of the midface lift creates an unavoidable temporary pulling at the pericanthal skin in the same direction resulting in an elevated appearance of the lateral canthus [9]. Patients often need to be reassured in the postoperative period that this distortion is in fact temporary. By maintaining a 1 cm cuff of periosteal attachment around the lateral canthus attached in the surgical dissection, we ensure return of the lateral canthus position with time [9]. Lateral canthal massage can be performed to relax the pull on the pericanthal skin to help the patient regain their preoperative appearance [9].

Numbness of the forehead is expected as a result of the subperiosteal dissection which may last up to 6–12 months. Reinnervation begins proximally near the supraorbital nerve starting around 4 weeks and continues for up to a year at the occiput [9].

Lessons Learned

Additional Benefits

A number of lessons have been learned in the course of 1200 cases in the experience of the senior author. We have seen several additional benefits with our technique of transtemporal midface lift. One example is the shortened lower eyelid [18] (Fig. 30.6). The lower eyelid aesthetic was better with the combination of transtemporal endoscopic midface with lower blepharoplasty lift than after lower blepharoplasty alone [19]. This was shown by Marotta et al. when they compared two groups, and the lower eyelid height was similar in both groups preoperatively, but postoperatively there was an

Fig. 30.6 A 48-year-old woman who underwent endoscopic forehead lift, transtemporal midface lift, and lower blepharoplasty. Note the periocular improvement and the appearance of shortened vertical height of the lower eyelids

average of 5.1 mm reduction in lower eyelid height with midface compared to 0 mm reduction with lower blepharoplasty alone including patients who underwent transconjunctival and skin pinch as well as those who underwent skin muscle flap methods [19]. In addition to reducing the vertical height of the lower eyelid, this technique also resulted in reduction of infraorbital hollowing and improved the double contour deformity more effectively than by lower eyelid blepharoplasty alone. This improvement was achieved by padding the infraorbital rim and excising pseudoherniated orbital fat transconjunctivally [19]. Also because of the vertical vector of lift, the ptotic midfacial soft tissues exert less downward stretch on the lower eyelid skin allowing for more aggressive skin resection with the lower blepharoplasty (up to 7 mm) [19].

Another benefit of transtemporal midface lifting is the increased tension of the lower eyelid [20]. This increased tension is long lasting – at least 12 months – and can help to combat lower eyelid laxity and avoid ectropion [20]. Scleral show can result from excessive excision from lower eyelid blepharoplasty. Midface suspension can raise the lower eyelid position and reduce sclera show from previous blepharoplasty and prevent scleral show when combined with lower blepharoplasty [7]. However, this increased lower eyelid tightness can also cause patients to experience postoperative dry eye. This may occur as a result of tension across the lower eyelid resulting in inadequate circulation of tear film [9].

By combining the midface lift with a temporal lift, we are able to avoid bunching of the temporal skin after lifting the midface [6] as can sometimes be seen with elevation of the midfacial soft tissues through other approaches (Fig. 30.7).

The vertical vector of pull on the midfacial tissues has several specific and unique benefits. It has a favorable effect on nasolabial fold. In a comparison with deep plane facelift, the transtemporal zygomaticofacial sutures result in more improvement than deep plane face lift on the nasolabial fold [18]. This is presumably because of the vertical rather than lateral vector of tension of the midfacial suspension sutures. Festoons and malar mounds are improved by vertical subperiosteal midface lift [14].

Although it was initially not expected when this technique first came into use, there is improvement in the appearance of the lower third of the face after transtemporal midface

Fig. 30.7 A 48-year-old woman who underwent endoscopic forehead lift, transtemporal midface lift, and upper and lower blepharoplasty

Fig. 30.8 A 42-year-old woman who underwent endoscopic forehead lift, midface lift, and upper and lower blepharoplasty. This patient did not have a lower facelift. Note pre- and postoperative photos demonstrate improvement in lower face jawline and jowling as a result of midface lift

lifting even with any direct surgical intervention on the lower face. The zygomatic periosteal suture typically imparts a 1–1.5 cm elevation of the skin overlying the angle of the mandible resulting in a significant improvement in jowling and rejuvenation for the lower face [21] (Fig. 30.8).

Another important lesson in midfacial rejuvenation is identifying preoperative overall volume deficit. While lifting the midfacial soft tissues can restore some of the volume loss due to midfacial descent, it may not be sufficient to restore a youthful appearance. It is said that the maxilla recedes 1.5 cm as we age. Midfacial resuspension may not be sufficient to compensate for this process, and additional valorization may be necessary such as fat injection or facial fillers.

Pitfalls/Complications

A number of lessons regarding postoperative complications and inconvenient consequences have been learned as well. Patients may experience masticatory tenderness as a result of the suspension sutures in the deep temporalis fascia and dissection over the masticator aponeurosis. This can be treated with muscle relaxants in the first week and NSAIDS thereafter [9]. This is expected to resolve within 2–8 weeks [7].

Chemosis is also relatively common postoperatively occurring in about 30% of patients [9]. Blurry vision and a change in refraction may occur if chemosis is present and usually resolves in 3–6 weeks [9]. If chemosis occurs, a regimen of hypertonic saline and prednisolone eye drops is initiated. Some patients may also experience photosensitivity and dry eye; these symptoms usually resolve within 3–6 weeks as well.

Hematoma is a rare complication after the transtemporal midface lift occurring in 1% or fewer cases. The major reason for this is that the subperiosteal plane is relatively avascular [9]. Potential sources of bleeding include bridging vessels near frontal branch or sentinel vein or the superficial temporal vessels being punctured or traumatized during drain placement. If a hematoma occurs, it may be difficult to identify as a certain amount of swelling is expected and much of the dissection is in the subperiosteal plain, it would be difficult to palpate. A hematoma in the midface can easily be drained transorally through a small mucosal incision.

Postoperative infection is a rare complication after transtemporal midface lift. Serious wound infections leading to abscess formation are exceedingly rare, estimated to occur at a rate of 1/1000 [9]. Although we have not seen any in our experience of over 1200 cases, we have seen stitch abscesses. These can form around a deep buried suture that can be treated with simple incision and drainage and removal of the retained stitch [9, 21].

Facial nerve injury is perhaps the most feared complication of this surgery. However with a thorough understanding of the anatomy and proper technique as detailed above, it is unlikely to be encountered. Temporary neuropraxia in the frontal branch of the facial nerve can occur in around 1% of cases. This is often secondary to traction of nerve or thermal injury form cautery of bridging veins. The temporary asymmetry that results can easily be treated by injecting botulinum toxin in the contralateral (functioning) brow, and most patients recover by 6 months [9]. Permanent frontal nerve injury is much less common. The senior author has only had 1 permanent paresis in 1200 cases in a patient with scarring from previous surgeries in the temporal region [9].

Hair loss may occur near the incision sites despite the surgeon's best effort to preserve hair follicles in incision planning. An estimated 5% of patients experience telogen effluvium or shock loss resulting in a 1 cm region of alopecia around incision sites [9]. Hair growth in this region almost always returns in 3–9 months. Patients should be reassured that hair growth will return in this region.

Irregularity over glabellar area such as localized depressions can occur due to corrugator resection [21]. These irregularities are less likely to occur if the periosteum is fully elevated over the orbital rim from the nasion medially to the arcus marginalis laterally. Another method to minimize these irregularities is by completely resecting the corrugators rather than merely performing a myotomy.

Superior oblique palsy has been described but is also rare and can be avoided with careful dissection technique [21].

Forehead and scalp paresthesias are not a complication but part of the expected postoperative experience. The paresthesias can be particularly distressing to some patients with itching and discomfort that is difficult to relieve. This can be expected to last 2–6 months but in some cases may continue for up to a year. Reinnervation begins at the supraorbital notch and proceeds superiorly reaching the crown by 9–12 months. Patients often need frequent reassurance in this regard.

Finally brow asymmetries can occur that are not due to temporary frontal nerve palsy or irregularities in the subcutaneous soft tissues. In evaluating such asymmetries, one must first carefully and critically study the patient's preoperative photos. Occasionally, there are preexisting asymmetries that the patient did not pay attention to before surgery. For example, a patient may have stronger brow elevation on one side that is long standing. If this asymmetry is identified preoperatively, it can be treated intraoperatively by performing lateral orbicularis oculi myotomy on the more active side [9]. If there were no preexisting asymmetries, a postoperative brow asymmetry may be the result of asymmetric placement of the medial incisions or screw fixation [9].

Summary

Midfacial rejuvenation evolved as the facial plastic surgery community developed a sophisticated understanding of the effects of aging in a three-dimensional perspective of the midface. With the transtemporal midface lift, we are able to reliably provide a lasting resuspension of the brow and restoration of a youthful midfacial appearance by restoring volume of the soft tissues in their original suspended position. With this surgery, several key maneuvers must be accomplished to achieve forehead and midface rejuvenation: (1) a subperiosteal dissection of the scalp to the level of the orbital rims and zygomatic arch, (2) release of the orbital periosteum, (3) selective myectomies of the glabella muscles, (4) subperiosteal dissection of the midface, and (5) suspension and reposition of the malar fat pad, SOOF, and soft tissue overlying the angle of the mandible [8].

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