Although the first forehead lift was performed by Lexer in 1906, the upper one third of the face was not routinely addressed by facial plastic surgeons until the late 1970’s. Brennan and Pitanguy reported several large series of patients, and noted aging of the forehead brings about many changes, including skin laxity, rhytids and fatty deposits. They noticed ptosis of the lateral eyebrow is seen first, followed by temporal and forehead rhytids. These manifest as lateral brow hooding and crow’s feet, and result in a sad appearance. Vertical and horizontal glabellar rhytids follow, often imparting an angry or mean look (think Sam Donaldson). There is loss of elasticity and subcutaneous tissue as well as bony resorption of the skull. Their conclusions were failure to address the forehead during any rejuvenation process of the face is likely to result in an unsatisfactory cosmetic appearance.

In youth the forehead and brow are without laxity or rhytids. The hairline is irregular and there is no hair loss. The brow is elevated allowing easy visualization of the upper eyelid, and there are no visible fatty deposits. The ideal brow, as described by Brennan, begins medially in women at a vertical line from the ala of the nose. The lateral end terminates at an oblique line drawn through the ala of the nose and extending past the lateral canthus. The medial and lateral ends are on a horizontal line, with the brow arching laterally. The maximal height of the brow should be at the lateral limbus. In men, the brow lies at the supraorbital rim. It does not arch as high as in the female.

Anatomy

The bony anatomy is defined by the supraorbital rims and the frontal bones. In males, the lateral supraorbital rim is more prominent, as is the forehead. In females, prominence of these bones leads to a masculine appearance, and these areas are sometimes addressed during rejuvenation procedures.
The blood supply of the forehead is from branches of both the external and internal carotid arteries. The superficial temporal artery is the terminal branch of the external carotid artery, and the smaller zygomaticotemporal artery often branches from this artery and accompanies portions of the temporal branch of the facial nerve. These vessels provide the lateral forehead. The medial forehead is supplied by the supratrochlear and supraorbital arteries, both branches of the ophthalmic artery, which itself is the first branch of the internal carotid artery.

Sensory innervation of the forehead derives from the three branches of the trigeminal nerve. Medial innervation of the forehead is from the supratrochlear and supraorbital arteries (V1), whereas the lacrimal (V1), zygomaticofacial (V2) and zygomaticotemporal (V3) nerves provide the lateral aspects. The temporal branch of the facial nerve runs 1 cm lateral to the lateral eyebrow, and must be avoided during dissection.

The scalp is composed of five layers, and knowledge of these layers is imperative to understanding forehead rejuvenation. Medial to the epidermis and dermis is the subcutaneous tissue, which itself overlies the galea-enveloped frontalis muscle. Loose areolar tissue underlies the galea ("the subgaleal plane") which overlies the pericranium. The frontalis muscle begins within the galea at approximately the level of the hair. The galea divides into an anterior and posterior portion. Posteriorly, the galea originates from the occiput. There is no bony insertion. It functions in raising the eyebrows and glabella. The posterior galea fans out to insert into the zygomatic arches and continues over the orbits to fuse with the periosteum at which time it continues over the eyes as the orbital septum. The anterior galea interdigitates with the dermis above the orbital rim. Superficial to the orbital septum, particularly laterally, is the orbital fat pad. The orbicularis oculi serve as the sphincter of the eye, and they insert superiorly and medially with the frontalis muscle. The corrugator supercilli originate from the bony glabellar area and extend superiorly laterally to interdigitate with the frontalis and orbicularis. The procerus originates from the nasal bones and alar cartilage and extend superiorly to connect with the frontalis, orbicularis and procerus. The corrugator acts to draw the eyebrows medially, whereas the procerus draws the medial eyebrows inferiorly.

Rhytids result from the combination of aging skin and increasingly active underlying musculature. They are the perpendicular attachment of the dermis to the underlying aponeurosis. In the forehead, the initial lateral brow ptosis is counteracted by increased activity of the frontalis muscle, particularly when looking in the mirror. This is usually a subconscious activity. With time, these initial superficial rhytids become deeper and permanent, even when the muscle is at rest. Common rhytids of the aging forehead include the horizontal rhytids due to the action of the frontalis, the vertical lateral glabellar rhytids due to the corrugator supercilli, and the horizontal glabellar rhytid due to the procerus.

**PREOPERATIVE ASSESSMENT**

The most important preoperative assessment is the goal of the patient. Some request cervicofacial rhytidectomy, not recognizing the contribution of the upper one third of the face. Others request blepharoplasty without recognizing the contribution of the brow. Most people raise their eyebrows subconsciously when looking in the mirror, and fail to accurately assess their own forehead aging. It is therefore vital to have a patient look in the mirror in repose.
Any preoperative assessment of the forehead must include an ophthalmallogic examination, including visual acuities and existing dry eye conditions. Any prior surgery of the eye or forehead must be elicited. A conservative approach must be taken in any patient with a history of blepharoplasty, as lagophthalmos may result.

Ptosis

Aging of the forehead results in brow, forehead, glabellar and temple ptosis. Brow ptosis results in lateral eye hooding and must be differentiated from upper eyelid skin redundancy, which is better addressed by blepharoplasty. The patient must be in repose, or an unnatural contraction of the forehead will lead to artificial elevation of the brows. This is particularly important in the younger patient, who usually benefits more from forehead procedures rather than blepharoplasty. Correction of glabellar ptosis improves skin laxity and glabellar rhytids, and often results in an improved nasal appearance by giving the illusion of a rotated tip. Correction of temporal ptosis improves Crow’s feet.

Rhytids

Myoplasty should be performed on forehead musculature resulting in rhytids. Specific muscles to be addressed include the frontalis, the procerus and the corrugator supercilli. Their rhytids correspond to the frontal and glabellar areas. Of note, rhytids are more pronounced the thinner the subcutaneous tissue.

Hairline Patterns

The height of the hairline and extent of alopecia must be addressed to adequately plan browplasty. Patients with low hairlines and no alopecia are excellent candidates for coronal approaches, whereas this approach is contraindicated in patients with high hairlines and marked hair loss. The trichophytic approach may be used in those with high foreheads or in males with minimal hair loss who are willing to undergo hair transplantation. This is also true of women with thinning hair.

The direction of hair growth should also be assessed. Eyebrow hair growing superiorly will be better served by a direct browlift because the scar will be well camouflaged. Forehead hair growing inferiorly will better camouflage a trichophytic scar.

Skin Type

Thin and fair skinned people usually have less conspicuous scars than those with thick skin with numerous sebaceous glands. Older people also have a tendency to form better scars, presumably due to skin laxity with resulting minimal suture tension.

Facial Symmetry

Slight facial asymmetry is partly responsible for the uniqueness of each individual, and these asymmetries should only be corrected if specifically requested by the individual. Gross passive
and dynamic asymmetry, however, should be addressed, as these have a tendency to draw the eye to unfavorable aesthetic qualities.

Coronal approaches are usually unsuccessful in repairing asymmetries of the brow, and this approach should be reserved for symmetrical ptosis and rhytids. Some exceptions can be made when extensive unilateral myoplasty may be performed, but this is rare. Unilateral direct, indirect and midforehead approaches are generally much more successful, and these should be considered the procedures of choice.

**Bony Contour**

Women with excessively prominent supraorbital rims and frontal bossing appear masculinized. They may benefit from a reduction of the orbital rims and frontal bone.

**SURGICAL APPROACHES**

**Direct Browplasty**

The direct browlift was first described by Passot in 1930, but was heavily refined in the 1970’s by Anderson and Goode. An ellipse of skin is removed directly above the eyebrows and orbicularis is suspended from the frontalis fascia or periosteum and the skin primarily closed. Candidates are males with frontal alopecia, people with high hairlines and those with thick eyebrows with hair that grows superiorly. It is particularly useful with ptosis of the lateral two thirds of the brow and minimal forehead and glabellar rhytids. It is the procedure of choice for those with unilateral brow paralysis. Relative contraindications are patients with thick, oily skin and those with a low hairline.

The major disadvantage of the direct browlift is the resulting forehead scar. The scar may require camouflage with cosmetics and require dermabrasion or even revision. Traumatic hairloss of the upper border of the eyebrow sometimes occurs, and this can lead to an unnatural appearance.

Surgical technique requires assessment of the patient in repose while in the sitting position. The eyebrow is lifted to a satisfactory level and this elevation is measured. Two millimeters are added to account for postoperative skin relaxation. An ellipse is drawn on the skin with the widest diameter at the lateral limbus and both the medial and lateral edges tapering to a point. The skin is excised in the subcutaneous plane, superficial to the orbicularis. Three to six permanent sutures are used to attach the orbicularis to the frontalis fascia or the periosteum. The wound is closed in layers. When indicated, a blepharoplasty is then performed with a conservative resection of the skin. Aggressive skin resection may lead to lagophthalmos.

**Midforehead Browlift (Indirect Browplasty)**

The indirect browlift is similar to the direct browlift except the incision is made in a natural forehead crease some distance above the eyebrow. It is particularly useful in males with forehead alopecia and deep forehead rhytids but eyebrow hair which would not conceal a direct browlift scar. The patient must have thin, non-oily skin and must be fully informed of the possible
resultant visible scar. They must also accept a visible healing scar for several months. Of note, the indirect browplasty does not address the glabella.

Advantages of this approach include the ability to conceal the incision in suitable candidates and a relatively predictable and long lasting result.

Surgical technique is similar to direct browplasty except the inferior aspect of the incision is a natural rhytid and the superior incision extends onto the forehead. The inferior aspect of the incision is dissected in the subcutaneous plane until the orbicularis is fully in view. Dissection in this plane prevents damage to the neurovascular bundle. The muscle is then suspended as in a direct browplasty.

**Browpexy**

The browpexy is performed through an infrabrow incision, usually in conjunction with a blepharoplasty. It is useful to address lateral eye fullness, supraorbital bony prominence and mild brow ptosis. The procedure is primarily used in younger patients who do not have significant forehead rhytids. It is not useful in patients with significant brow ptosis or in addressing the forehead.

Advantages of the procedure include excellent cosmesis, as the incision is the same as used for blepharoplasty. It also allows elevation of the minimally ptotic brow through a less invasive procedure than other forehead approaches.

The surgical technique begins by identifying the supraorbital nerves and vessels and placement of the upper eyelid incision so as not to damage these structures. Dissection is carried superiorly 1 to 1.5 cm in the suborbicularis plane. The orbicularis is then suspended to the periosteum as needed.

**Midforehead Rhytidectomy**

The midforehead browplasty was first described by Johnson and Waldman in 1983. It is essentially an extension of the indirect browplasty made by connecting the two supraorbital incisions. This extension allows the glabella to be addressed and an extensive myoplasty to be performed. It thus is superior in eliminating forehead rhytids. It is most useful in males with forehead alopecia and deep forehead rhytids, although it is sometimes used in females in whom the coronal lift is contraindicated. As with the indirect browlift, the patient must be made aware of the possibility of a visible forehead scar and must accept a visible incision in the forehead during the healing process.

Contraindications to midforehead browplasty are thick, oily skin and the inability of the patient to accept a forehead scar. This procedure is inadvisable in the patient with ptosis of the eyebrow and glabella but no forehead rhytids.

The surgical technique begins with an incision in a deep forehead rhytid through the subcutaneous plane. The subcutaneous plane is dissected to the orbital rims, at which time
extensive myoplasty of the corrugator, procerus and frontalis may be performed. Care is taken to avoid the supraorbital vessels. The orbicularis is suspended to the frontalis galea or the periosteum, as needed.

**Bicoronal Forehead Lift**

The bicoronal forehead lift is the procedure of choice for the rejuvenation of the upper one third of the face. It is useful for generalized ptosis of the entire forehead and brow as well as rhytids. It is indicated when extensive rhytids and ptosis exist and the patient has a low or normal hair line.

Contraindications and disadvantages of the bicoronal lift are frontal alopecia, a high hairline or asymmetry of the brow. Hyperesthesia posterior to the incision sometimes occurs, and a poorly placed incision can lead to hair loss in the incision line. Extensive undermining can sometimes lead to a hematoma.

Advantages of the bicoronal lift are excellent scar camouflage and exposure of the forehead musculature for myoplasty. Patients with low hairlines have improved appearance, providing an additional benefit to this procedure.

The surgical technique involves an incision parallel to hair follicles from posterior to the helical root extending across the head approximately five centimeters posterior to the hair line and ending on the opposite helical root. The incision is carried through the subgaleal plane and the dissection is carried inferiorly in this plane. As the supraorbital rim is approached the vessels and nerves are identified. Extensive myoplasty of the corrugator, procerus and frontalis may be performed at this time. Care is taken not to transect the procerus or corrugator, as fullness of the glabellar can result. Myoplasty and unipolar cautery are restricted to between the pupils to prevent damage to the temporal branch of the facial nerve. Flap advancement is posterior superior, and the skin is excised with the incision parallel to hair shafts.

**Bilateral Temporal Lift**

The bilateral temporal lift is similar to the bicoronal flap except the incision ends at the midpulvilliary line. This procedure is indicated with lateral brow ptosis and eyelid hooding. It does not allow access to the medial eyebrow or middle forehead musculature. It is indicated in males with alopecia or in those with a high hairline and thick skin, where alternative procedures would not be indicated.

Surgical technique involves dissection in the subgaleal plane to the zygomatic arches and lateral brow. The orbicularis oculi is then suspended to the galeal fascia or periosteum with non absorbable sutures. The amount of redundant skin removed is usually around ten millimeters.

**Pretrichial Forehead Lift**

The pretrichial forehead lift is a modification of the bicoronal flap. The temporal incisions are similar, but the cephalad portion of the incision is brought forward to the anterior hairline, where a W-plasty is usually performed. It is primarily indicated in those with a high forehead but who
require extensive forehead work. An additional advantage is the reduction of excessive forehead height, which is often a marked cosmetic improvement.

The biggest disadvantage of the pretrichial forehead lift is the presence of a scar in the anterior hairline. It is therefore most advantageous in those with thick hair or in those willing to undergo hair transplantation. Hypesthesia is common posterior to the scar, and is often permanent.

**Trichophytic Forehead Lift**

The trichophytic forehead lift is a modification of the pretrichial forehead lift. The anterior incision is placed just posterior to the hairline in an irregular manner, and the incision is beveled anteriorly in the dermis. The hair shafts are therefore transected, but the follicles remain intact. Hair therefore grows through the incision, camouflaging the scar. The indications are the same as for the pretrichial forehead lift, namely those with high foreheads and those willing to undergo hair transplantation.

The major advantages of this procedure are markedly improved scar camouflaging and the ability to perform extensive myoplasty. The height of the forehead is also reduced. Most patients can wear their hair back and not worry about scar exposure.

The surgical incision is irregular and just posterior to the hairline. It begins parallel to the hair follicles, but once to the dermis is beveled anteriorly until the subgaleal plane is reached. After necessary myoplasty and browplasty, the redundant skin is removed in a likewise beveled manner and meticulously reapproximated.

**Endoscopic Forehead Lift**

The endoscopic forehead lift is useful for fair, thin skinned people with glabellar rhytids, minimal brow ptosis and minimal forehead rhytids. Other indications are identical to the bicoronal approach, although more extensive myoplasty and suspension of ptotic areas are possible with the bicoronal approach.

Advantages of the endoscopic forehead lift are smaller incisions and decreased incidence of sensory neuropathy and bleeding. The recovery period is also faster.

Disadvantages of the procedure are increased operative time, the requirement for more extensive training, the need for external fixation and unknown long term results. As with the bicoronal approach, contraindications include those with high hairlines and those with alopecia. As this is a subperiosteal approach, an additional and unique contraindication is Asians and American Indians, who have extensive subperiosteal bony attachments.

The surgical approach is through five incisions located one to two centimeters behind the hairline. There is a midline and two paramedian incisions, along with two lateral temporal incisions, along the exact location and number of incisions varies. The incisions are carried to the cranium and the subperiosteal plane is elevated under direct endoscopic visualization to a level two centimeters superior to the supraorbital rim. Transverse incisions are made in the periosteum.
after visualization of the supraorbital vessels, and this flap is used to elevate the forehead skin. The corrugator and procerus muscles are visualized and myoplasty may be performed. Y to V advancement flaps in the initial incisions can be used to excise skin. The periosteum is usually suspended from plates and the incisions closed.

**COMPLICATIONS**

**Bleeding**

Meticulous hemostasis is vital to the success of surgical rejuvenation of the forehead. The superficial temporal artery, the supratrochlear arteries and the zygomaticotemporal arteries are common named vessels responsible for postoperative bleeding. Hematomas form seldom in direct browplasty and midforehead browplasties, but are more common in the bicoronal flaps. Should one develop under the forehead flap, elevation of the flap with control of bleeding is required. Suction drains are placed. Smaller hematomas can be managed with incision and drainage followed by pressure dressings.

**Hypesthesia**

Hypesthesia and occasionally hyperesthesia are common following forehead rejuvenation procedures. The posterior aspect of the bicoronal and trichophytic flaps can develop permanent loss of sensation, but this is rarely of concern to patients. Browplasty results in temporary hypesthesia of several months duration.

**Facial Nerve Injury**

The frontal branch of the facial nerve runs from the pes anserinus to the frontalis, and is usually located 1 cm lateral to the lateral canthus. It is at risk during elevation of the forehead flap and during myoplasty. To avoid injuring the nerve, myoplasty should be limited to between the pupils.

**Lagopthalmos**

Lagopthalmos is rare when browplasty alone is performed. A concurrent or prior blepharoplasty, however, significantly increases this risk. If a blepharoplasty is to be performed, it should always follow any forehead procedure, and excision of skin should be conservative. In most cases, mild lagophthalmos resolves with conservative therapy, including massages and ophthalmic ointment to prevent corneal abrasions. If necessary, upper eyelid skin may be stored and reused for up to three weeks.

**Alopecia**

Hair loss due to follicle shock is rare, and is usually seen in cases of prior alopecia. It is most likely to occur during revision procedures, when a secondary incision is made posterior to the initial incision. This may lead to hair loss between incisions.
SURGICAL ALTERNATIVES

Sun exposure is believed to cause photodamage of the skin and accentuate rhytids. It also leads to increased squinting and worsening of glabellar creases. Cosmetics can be used to camouflage some rhytids, particularly if minor. Those minor rhytids may respond to retinoids or, deeper, chemical peels. Those with high foreheads and deep rhytids can style their hair to help camouflage these areas.

Temporary improvement of rhytids can be accomplished with minor interventions, including collagen injection and botulinum toxin. Botulinum toxin works by paralyzing the facial musculature. Of note, it may contribute to increased ptosis.

References


