

TITLE: Browlift

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INTRODUCTION

Facial rejuvenation has become an integral part of today's society because both sexes are constantly bombarded with images that are considered beautiful. Facial rejuvenation can be accomplished by surgical and non-surgical means. Products such as facial rejuvenation creams, vitamins, supplements, herbal remedies, facials, dermabrasion, botox, injectable fillers, and non-ablative laser resurfacing have been marketed for reducing rhytids. But for those with deep rhytids, only surgical procedures can adequately improve their wrinkles. When performing surgical procedures, the face must be divided into brow and forehead, the midface, and the lower face. The brow and forehead may have prominent ptosis with resultant deep rhytids and crow's feet. This may communicate the emotions of sadness, tiredness, or anger even when these are not the true emotion. In addition with significant brow ptosis and lateral hooding, there can be visual field defects. The first surgeries to address the forehead and brow were described in 1919 by Passot, and there have been many modifications and new techniques developed over the past 90 years. Now there are multiple procedures that can be performed in a variety of patients with minimal morbidity.

ANATOMY

There are five layers of tissue in the forehead before reaching the calvarium. They are easily remembered by the mnemonic "scalp". The skin is most superficial, followed by the subcutaneous tissue, epicranial aponeurosis (galea and frontalis), loose areolar tissue, and then pericranium. The musculature includes one elevator, and three depressors. The frontalis muscle elevates the brow, it originates at the galea aponeurotica, and inserts into the supraorbital dermis. It interdigitates with the obicularis oculi laterally, the procerus medially, and the corrugators in its intermediate portion. The obicularis oculi closes the eye, and depresses the brow. The corrugators supercillii arises from the supraorbital ridge of the frontal bone, deep to the frontalis

muscle, and it pulls the brow medially and inferiorly. The procerus inserts on the lateral nasal bone, nasal cartilage, and skin between the eyebrows. It depresses the medial brow, and elevates the root of the nose. The vascular supply is from both the internal and external carotids. The supratrochlear and supraorbital arteries originate from the ophthalmic branch of the internal carotid and they supply the mid-portion of the forehead. While the superficial temporal and zygomaticotemporal, branch of the superficial temporal, arteries arise from the external carotid and supply the lateral forehead. Sensory innervation is provided from all three branches of the trigeminal nerve. The central forehead is supplied by the supratrochlear and supraorbital nerves, which are branches of V1. The lateral forehead is supplied by the lacrimal (V1), zygomaticofacial (V2), and the auriculotemporal (V3). Motor supply is from facial nerve on the undersurface of each muscle. The facial nerve exits the tympanomastoid foramen about 1.5 cm inferior to the external auditory canal. The temporal branch runs obliquely across the zygoma, and about 1 cm lateral to the lateral brow. In the temporal region, the nerve is fairly superficial and resides in the temporoparietal fascia. Dissection on the deep temporalis fascia avoids damage to the nerve.

PATHOPHYSIOLOGY

With aging, predictable changes in the skin occur. There is decreased collagen synthesis by fibrocytes in the dermal layer resulting in thinning of the papillary dermis. The amount and quality of elastin in the skin decreases resulting in increased laxity of the skin. Sun exposure contributes to photoaging which results in dermal atrophy, subdermal fat loss, loss of elastic fibers, and homogenization of collagen fibers. The effects of gravity and the decreased elasticity of the skin cause ptosis of the brow and upper eyelid skin. The repeated contraction of brow muscles to counteract these forces, leads to the formation of rhytids, dermatochalasis, and lateral hooding. The frontalis muscle contributes to the deep, prominent horizontal wrinkles of the forehead. The obicularis oculi contributes to the lateral rhytids (crow's feet). The corrugator supercilii contributes to the vertical and oblique glabellar wrinkles. The procerus gives rise to the transverse nasal rhytids.

INDICATIONS, PATIENT SELECTION, AND PREOPERATIVE ASSESSMENT

Indications

The brow lift is appropriate for anyone with deep rhytids that desires facial rejuvenation. There are also some people who have such severe lateral hooding, that they develop visual field defects. Brow lift in the temporal region can improve this problem. Brow asymmetry resulting from nerve paralysis or trauma can also be addressed with brow lift.

Patient Selection

As with any cosmetic procedure, patient expectations and motivation for surgery need to be assessed prior to performing surgery. These surgeries will make the patient look younger, but aging continues. They need to know the specific complications for each procedure, the preoperative, operative, and postoperative course, and their comfort level with the resultant scars for the procedure they choose. The ideal candidate is in good mental and physical health without systemic disease existing in an uncontrolled state. Preoperative assessment is not complete until

a full history and physical exam has been performed, as well as, adequate facial analysis with photographs.

Facial analysis

It is important to assess the patient while seated and in facial repose (relaxation) in the Frankfurt horizontal plane. The face should be analyzed in terms of width and length. The width should be five equal parts that are equal to the width of one eye. The nasal base width should be equal to the intercanthal distance. The facial length should be divided into thirds. The hairline (trichion) to the glabella represents the upper third, glabella to nasal tip is the middle third, and from the nasal tip to the menton represents the lower third. With aging, there are predictable changes to each third of the face.

Assessment of the upper third begins with determining its relationship to the middle and lower third. After that, the position of the hairline, the quality and thickness the hair, and presence of alopecia are all important for choice of surgical procedure. The presence and severity of rhytids, as well as their position are important because this will determine the extent of dissection necessary to achieve a good surgical outcome.

Brow aesthetics includes the shape, symmetry, position and mobility. The ideal shape for men and women varies. For men, the brow should be position at or near the supraorbital rim, while women need a brow superior to the supraorbital rim, with a higher arch. The brow should be club shaped, and begin at a line drawn from the alar facial crease to the medial canthus. It should end at an oblique line from the alar facial crease to the lateral canthus. The highest portion of the brow should be located at the lateral limbus of the iris. The average height of the female brow (eyebrow to hairline) should be between 5 and 6 cm, while the optimal male height varies and depends on other facial characteristics.

In addition to brow aesthetics, dermatochalasis and temporal hooding should be assessed to determine if blepharoplasty will be performed concurrently. Any ocular problems such as lagophthalmus, or dry eye should be ascertained prior to surgery, but are not contraindications to surgery. These patients may require eye drops, or taping of the eye at night during the immediate postoperative period. The patient's skin type is important for wound healing, and scar camouflage. Fair and thin-skinned patients usually heal with more ideal scars, and those with skin laxity usually have finer scars than those who do not.

Photo documentation is very important, and most Facial Plastic Surgeons have a photography suite in their office. This allows them to show photographs of other patients that have undergone the proposed procedure. Also, they may use computer software that allows them to show the patient the expected postoperative result. This also helps with preoperative planning so the surgeon has an idea of the appropriate amount of lift that can be provided.

Surgical Goals

The surgeon and the patient need to have the same surgical goals. Each procedure has its advantages and shortcomings. Information regarding this should be relayed to the patient so they can make an informed decision on which procedure they want to undergo. Most of the procedures address the horizontal rhytids to some degree. In addition to the prominent

horizontal wrinkles, surgery should elevate the ptotic brow, reduce the amount of lateral hooding, elevate the lateral canthus if necessary, reduce nasoglabellar rhytids, reduce crow's feet, and correct brow asymmetry. If there is significant dermatochalasis, then blepharoplasty may be performed after performing brow lift.

PROCEDURES

Coronal Lift

This procedure offers great exposure and can address most problematic areas of the upper face. The forehead muscles are very well exposed and myotomies can be performed precisely and with ease. It is very useful in patients with low or normal hairline, which have extensive brow ptosis and prominent rhytids. The procedure can be performed under local anesthesia with intravenous sedation, or with a general anesthetic.

After appropriate infiltration of local anesthetic, a curvilinear incision that is 4-6 cm posterior to the anterior hairline is marked. The incision is beveled following the hair shafts down through the galea. Dissection is carried out in a subgaleal, supraperiosteal plane down to about 1 cm superior to the supraorbital rim. Laterally, the dissection is immediately on the deep temporalis fascia down to the level of the zygoma to avoid damage to the temporal branch of the facial nerve. The supraorbital and supraorbital neurovascular bundles are preserved, and the corrugators are dissected away from them. The procerus muscle may be incised or completely excised, while the frontalis and galea may be incised to release prominent rhytids. Care should be taken to not excise the frontalis lateral to the lateral canthus because the temporal branch of the facial nerve may be injured. The flap is then pulled superiorly and posteriorly in the midline, and superior and laterally in the temporal portion. Approximately 2 to 4 cm of redundant skin and soft tissue may be excised. There should be a minimal amount of overcorrection, which will resolve over a three week period. A suction drain should be placed, followed by meticulous closure of the galea, and staple closure of the skin. Antibiotic ointment and a light dressing are placed. If there is any lagophthalmos, then ophthalmic drops and ointment may need to be prescribed to avoid corneal injury. The suction drain and dressing is removed on postoperative day one, while the staples are removed on day seven and nine.

Advantages of this procedure include no visible scar, it can precisely address different muscle groups, and there is excellent exposure. Disadvantages include scalp hypesthesia, it will elevate the hairline, and it is an extensive procedure with the potential for more blood loss than other procedures.

High Forehead Lifts

These are modifications to the coronal lift, and they place the incision either a few millimeters anterior to the hairline (pretrichial), or a few millimeters posterior to the hairline (trichophytic). They are useful for women with a high hairline, or increased vertical length to the forehead. The remaining dissection is similar to the coronal lift. Meticulous closure is necessary to have a thin scar.

Advantages of this procedure include excellent exposure, as it can precisely address different muscle groups, and it does not alter the hairline. Disadvantages include potentially

visible scar requiring camouflage (make-up, wearing hair forward in women, hair transplantation in men), and permanent scalp hypesthesia.

Midforehead Lift

Yet another modification to the coronal lift, this technique involves making an incision in a prominent, central midforehead crease. Appropriate for males with prominent horizontal rhytids, and alopecia or receding hairline. Dissection is in a subcutaneous rather than subgaleal plane to preserve sensation to the scalp. As dissection approaches the orbit, subgaleal dissection is carried out medially to address the medial portion of the frontalis muscle, corrugators, and procerus muscles. Redundant skin is excised, and the flap is secured with a superior vector of pull.

Advantages of this procedure include precise brow elevation, less extensive dissection, scalp sensation remains intact, and it does not alter the hairline. Disadvantages include a visible scar, and it is difficult to achieve lateral elevation.

Direct Brow Lift

This is rarely used, but good for elderly with co morbidities that preclude longer duration procedures and for those with brow asymmetry. It is relatively contraindicated in those with light colored eyebrows and patients with history of poor scarring. The inferior incision is made in the superior brow line with care not to extend medial to the medial portion of the brow. Laterally, the incision can be extended in a gentle curve lateral to the lateral eyebrow. The superior incision arcs, with the superior extent between the lateral limbus and lateral canthus. The skin is removed, while the superior edge of the obicularis is freed and sutured to the periosteum above the supraorbital rim.

Advantages include a short, simple procedure with minimal blood loss, and good control of brow position and shape. Disadvantages include visible scar, and inability to manipulate the lateral rhytids.

Browpexy

This procedure is performed via an upper blepharoplasty incision and can treat mild brow ptosis. Elevation is performed in a submuscular, post obicularis fascial plane towards the brow. Elevation is continued 1-1.5 cm above the supraorbital rim. One to three permanent sutures are placed transcutaneously through the lower brow hairs. The suture is then tacked to the periosteum, and passed through the sub-brow muscular tissue at the position of the original transcutaneous suture. The suture is pulled through the skin, and the suture is tied, lifting the brow.

The advantage of this procedure is that it uses a pre-existing incision. Disadvantages include prolonged eyelid edema, possible brow asymmetry, and possible unsatisfactory appearance.

Endoscopic Brow Lift

This procedure was first described in 1992 by Core, and since that time, the equipment and number of surgeons performing this procedure have increased significantly. This is a minimally invasive way of performing brow lift, with long-standing results similar to the open procedures.

Local is infiltrated at the proposed incision sites, for supratrochlear/supraorbital nerve blocks, and direct injection into the procerus and corrugators supercilii. There is one midline incision 2 cm posterior to the hairline and 1 cm in length. There are 2 temporal incisions, which are 2 cm posterior to the temporal hairline and 3 cm in length. If a fixation system is to be used, then two paramedian incisions may also be required.

The initial dissection is performed without the use of the endoscope. Midline dissection begins in the subperiosteal plane down to approximately 1 cm above the brow. Temporal dissection is performed on the deep temporalis fascia with a blunt elevator to avoid injury to the facial nerve. Dissection continues to the sentinel vein then the endoscope is used for the remaining dissection.

Facelift scissors are used to sever the temporal conjoint fascia, connecting the midline dissection with the temporal dissection. Dissection proceeds inferiorly toward the orbital rim under endoscopic visualization. The conjoint tendon (supraorbital rim fascial thickening) is sharply incised, releasing the brow. Temporal dissection proceeds in an inferomedial plane from the sentinel vein. Periosteum over the malar eminence and superolateral orbital rim are released. This continues medially with care to preserve the supraorbital neurovascular bundle. The brow depressors are then incised or removed. Brow fixation is achieved by securing the superficial temporal fascia medially, to the deep temporal fascia in a superolateral vector. Various screws, biological glue, and suture techniques have been used for fixation. There should be overcorrection, which generally corrects itself after three weeks. A small drain may be placed for 24 hours, and the surgical incisions are closed with staples.

Advantages include minimal blood loss, and this is less invasive than traditional open procedures. Disadvantages are the highly specialized equipment necessary to perform the procedure, the high learning curve, and problems with fixation. In addition to this, the degree of elevation of the brow and lateral brow may not be as much as with open procedures.

POSTOPERATIVE CARE AND COMPLICATIONS

Postoperative Care

For most of the procedures, the postoperative care is the same. The incisions are dressed with antibiotic ointment, and possibly a light, cotton dressing. A small drain may be left in place for the open procedures, and the endoscopic brow lift. Patients may experience headaches, and a minimal amount of pain at the incision sites. They can begin gentle shampooing after 48 hours, with hair being blow-dried on the cool setting. They should sleep in an upright or semi-upright position for four days postoperatively. Staples are removed after days seven and nine. They may return to normal activity after three weeks.

Complications

Complications in brow lifts are rare, with many of these being only temporary. During the preoperative appointment, it is imperative that the patient is educated on the likely complications for their chosen procedure. Hematomas develop if hemostasis is not achieved. Large hematomas can develop and jeopardize vascular supply to the flap causing flap necrosis. If a scalp hematoma forms and continues to expand, the wound must be opened and the bleeding vessel cauterized.

Alopecia can occur in the endoscopic, coronal, and high forehead lift procedures. Tension along incisions lines or around screw fixation, or overzealous cautery near the hair follicles are the cause for this complication. In most cases, this is temporary, but there can be permanent alopecia if dissection occurs in the wrong plane.

Scarring can occur in the high forehead lifts, the midbrow lift, and the direct brow lift. Depressed scars occur when there is poor wound closure and lack of eversion of the wound edges. These scars can be addressed as early as 6 to 8 weeks postoperatively with dermabrasion.

Nerve injury can be either sensory or motor. Sensory injuries usually are temporary, and are more common in the open techniques, or when subcutaneous dissection is performed. Injury to the facial nerve can be from stretching, transection, or thermal injury. Knowledge of the course of the temporal branch of the facial nerve is important to avoid injuries.

CONCLUSION

Aesthetic surgery of the face involves addressing the aging process in the upper third, middle third and lower third of the face. Addressing the middle third can help with the tired, sad, or angry look, which may not be the person's true personality. Choosing the correct surgery for each patient requires thorough knowledge of the advantages and disadvantages of each procedure. This allows the surgeon and patient to choose the correct procedure that will address all of the patient's problem areas. To avoid pitfalls during surgery, knowledge of the course of the arteries and nerves in the forehead and brow are crucial. Brow lifting techniques address the deep rhytids of the forehead, the transverse and vertical nasoglabellar wrinkles, and can elevate lateral hooding to alleviate visual field defects.

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