Browlift

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Grand Rounds Presentation
January 26, 2010
Introduction

- Predictable changes occur to the face with aging which manifest as skin laxity and variable degrees of wrinkling (rhytids).
  - Decreased collagen synthesis (thinning of papillary dermis)
  - Reduction in elastic fibers
- Photoaging also occurs
  - Dermal atrophy, decreased subdermal fat, and homogenization of collagen fibers
Introduction

- Societal views on aging and beauty have influenced many people to pursue facial rejuvenation.
- This has been in the form of topical creams, medications, chemical peels, dermabrasion, non-ablative laser therapies, botox, injectable fillers, and aesthetic surgery.
Brow lift

- Addresses the upper third of the face
- Was once overlooked in facial rejuvenation surgery
- Can be done in combination with blepharoplasty
- The only way to remove deep forehead rhytids
Outline

- History
- Anatomy
- Assessment
- Techniques
- Complications
- Conclusions
History

• The first brow lift was performed in 1906 by Lexor, but he did not publish anything until 1931
• 1919 Passot uses elliptical incisions to elevate brow and decrease crow’s feet.
• 1926 Hunt describes the coronal incision
• Over the next 30 years multiple variations, and even intentional damage to temporal branch were advocated
History

- Modern brow lift principles described by Vinas in 1965
  - Inelastic aponeurotic-muscle layer adheres to the skin and does not permit free movement of it.
  - There are adhesions that prevent the soft tissues of the supraorbital region from moving. These must be released for a more permanent lift.
  - Transient and permanent wrinkles.
History

- Regnault 1971 described changing from subgaleal dissection to subcutaneous dissection to preserve the supratrochlear and supraorbital NVB.
- Many modifications to Vinas procedure ensued until 1992 when endoscopic brow lift was described by Core, Vasconez, and Isse.
Forehead Anatomy

- Skin
- Subcutaneous tissue
- Galea Aponeurosis
- Loose areolar tissue
- Pericranium
Blood Supply

- External carotid via Superficial temporal artery
  - zygomaticotemporal
- Internal carotid via Ophthalmic artery
  - Supraorbital – 2.5 cm lateral to the midline
  - Supratrochlear - medial to the supraorbital
Innervation

- **Sensory nerve supply via:**
  - supraorbital and supratrochlear branches of V1 provide central sensation
  - Lacrimal (V1), zygomaticofacial (V2) and auriculotemporal (V3) provide lateral sensation

- **Facial nerve**
  - Arises from point 1.5 cm below the EAC
  - Courses about 1 cm lateral to the lateral brow and becomes superficial as it courses over zygoma
Musculature

- Frontalis – deep horizontal rhytids
- Procerus – transverse glabellar rhytids
- Corrugator supercilii – vertical and oblique glabellar rhytids
- Obicularis oculi – crow’s feet
Pathophysiology of aging

- The brow ages in its own unique fashion
- With decreased elasticity, the forehead, temple and glabellar skin descend.
- The brow descends below the supraorbital rim, and gravity may cause temporal hooding.
- Supratarsal crease disappears under the ptotic upper eyelid skin
- Rhytids develop from repeated contraction of brow/forehead musculature
Pathophysiology of aging

- Structures that contribute to aging
  - Temporoparietal fascia
  - Zone of adhesion
  - Orbital ligament
  - Frontalis muscle
  - Supraorbital nerve
  - Supratrochlear nerve
  - Galeal fat pad
Patient Selection

- Patient’s need to be educated on the procedure, and realistic outcomes following surgery.
- Age, gender, race, body habitus, and personality all need to be considered when offering brow lift.
Facial analysis

- Evaluate the entire face
- Vertical fifths
- Horizontal thirds
- Patient should be seated and in facial repose
- Photographic documentation
Facial Analysis

A

- Trichion
- Glabella
- Nasion
- Radix
- Rhinion
- Supratip
- Tip
- Subnasale
- Labrale superius
- Stomion
- Labrale inferius
- Menton

B

- Trichion
- Glabella
- Nasion
- Rhinion
- Supratip
- Tip
- Subnasale
- Labrale superius
- Stomion
- Labrale inferius
- Menton
- Menton
- Cervical point

1/5 1/5 1/5 1/5 1/5
Facial Thirds

- Trichion
- 1/3
- Glabella
- 1/3
- Subnasale
- 1/3
- Menton
Assessment of Upper Third

- Position of hair line (frontal and temporal)
- Quality of hair
- Forehead height relative to facial proportions
- Rhytids
- Eyebrow aesthetics (shape, symmetry, position, mobility)
- Degree of dermatochalasis
- Skin type
- Previous eyelid surgery
- Presence of lagophthalmos
- History of ocular disease or dry eyes
- Bone contour
- Lateral canthus position
- Scalp mobility
Brow Shape

- Medial brow is club shaped and begins at a vertical line connecting the medial canthus and alar crease
- Lateral brow should end at an oblique line drawn from alar-facial junction to the lateral canthus
- The location of maximal brow arch should lie at the lateral limbus of the iris
- Male
  - Located directly over the supraorbital rim, or slightly below
- Female
  - Above the supraorbital rim
Surgical Goals

- Elevation of ptotic brow
- Reduction of lateral hooding and ptotic brow
- Elevation of lateral canthus if needed
- Reduction of glabellar and corrugator rhytids
- Reduction of crow’s feet
- Correction of brow asymmetry
- Brow lift should be performed before blephoraplasty.
Surgical Techniques

- Coronal
- High forehead lift
  - Pretrichial/trichophytic
- Midforehead lift
- Direct brow lift
- Browpexy
- Endoscopic brow lift
Coronal

- Offers excellent exposure, and predictable results
- 4-6 cm posterior and parallel to hairline, through the galea.
- Bevel incision parallel to hair shafts to minimize loss
- Subgaleal, supraperiosteal elevation to supraorbital rim.
- Laterally, immediately on the deep temporalis fascia to protect the frontal branch of CN VII (course in temporoparietal fascia).
- Corrugators and procerus may be excised.
- 2-4 cm of skin/soft tissue is removed, and the skin is pulled posteriorly and superiorly.
- The incisions are then closed
Coronal

- **Advantages**
  - No visible scar (do not use in bald male)
  - Precisely address different muscle groups
  - Excellent exposure

- **Disadvantages**
  - Most extensive procedure
  - Elevates hairline
  - Scalp hypesthesia
Coronal Complications

- Hematoma in 4%
  - usually branch of superficial temporal artery
- Transient hypesthesia up to 33% with 0.07% with permanent hypesthesia
- Transient pruritis up to 18%
- Alopecia in 4%, transient in up to 33%. Usually resolves in 3-5 months. Results from increased tension on closure, or cautery to hair follicles
High Forehead lift

- Pretrichial (just inferior to the hairline), or trichophytic (2mm posterior to the hairline)
- Subgaleal dissection similar to coronal lift
- Advantages
  - Excellent exposure
  - Does not alter hairline (good choice for those with high hairline)
- Disadvantages
  - Potentially visible scar
  - Scalp hypesthesia
Complications

- Minimal postoperative brow lifting may limit efficacy
- Small percentage with visible scar or hypertrophic scar which may need scar revision
- Alopecia – related to excessive skin tension with closure
- Risk of hematoma similar to coronal lift
- Less chance for facial nerve injury, but chance of neuropraxia from stretching.
  - May cause 1-3 month paralysis
Midforehead Lift

- Incision in midforehead rhytid. Supragaleal plane, then transition to subgaleal plane as you approach the supraorbital rim.
- Preserves sensation
- Appropriate for males with prominent wrinkles, receding hairline, or very thin hair
- Advantages
  - Less extensive procedure
  - does not increase hairline
  - Precise brow elevation
- Disadvantages
  - Visible scar, difficult to achieve lateral elevation
Direct Brow lift

- Rarely used, but good for elderly patients that can’t tolerate longer procedure, and for those with significant brow asymmetry
- Two wedges of skin and soft tissue are excised, with the lower incision just above the brow.

Advantages
- Short, simple procedure with minimal blood loss
- Good control of brow position and shape

Disadvantages
- Visible scar
- Unable to manipulate musculature or lateral rhytids
Browpexy

- Performed via upper blepharoplasty incision to treat mild brow ptosis
- Elevate in submuscular, post obicularis fascial plane towards the brow. Elevate 1-1.5 cm above supraorbital rim.
- One to three permanent sutures are placed transcutaneously through the lower brow hairs. The suture is then tacked to the periosteum.
- The suture is then placed in the sub-brow muscular tissue at the position of the original transcutaneous suture. The transcutaneous end is pulled through and the suture is tied to lift the brow
Browpexy

- Advantages – used pre-existing incision
- Disadvantages
  - possible prolonged eyelid edema
  - Possible brow asymmetry
  - Possible unsatisfactory appearance
Complications

- Efficacy limited because decreased amount of lift when compared to other procedures
- Removal of brow fat pad leads to injury to lateral cutaneous nerves (lacrimal, zygomaticofacial, zygomaticotemporal)
- Damage to supraorbital causing central forehead paraesthesia
- Dimpling of the skin
- Ecchymosis and edema to the eye
Endoscopic Brow lift

- 1992 Core and Vasconez first presented endoscopic brow lift
- Various fixation techniques
- Specialized equipment required
- Can be performed in almost every patient desiring brow lift
Endoscopic Brow Lift

- **Incisions**
  - One midline, two temporal, and two paramedian
  - Midline incision is 2 cm posterior to the hairline, and 1 cm in length
  - Temporal incisions are 2 cm posterior to hairline and 3 cm in length

- **Local anesthesia**
  - 15 cc 1% Lidocaine with epinephrine injected into procerus, corrugator, and depressor supercilii, proposed incision sites, and for supraorbital and supratrochlear nerve blocks.
  - 50 cc of solution containing 500cc saline, 0.5 cc of 1:1000 epinephrine, 5 cc sodium bicarbonate, and 25 cc of 2% lidocaine. Used for infiltration primarily in temporal region.
Endoscopic Brow Lift

- Midline dissection is subperiosteal without the use of endoscope, down to 1 cm above the brow.
- Temporal dissection extended down to deep temporalis fascia. Blunt elevator used to dissect over the temporalis fascia until the sentinel vein is encountered.
- The endoscope is used for the remaining portion of the procedure.
Endoscopic Brow Lift

- Facelift scissors are used to sever the temporal conjoint fascia, connecting the midline dissection to the temporal dissection.
- Dissection proceeds inferiorly toward the orbital rim under endoscopic visualization.
- The conjoint tendon (supraorbital rim fascial thickening) is sharply incised.
- 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.
Endoscopic Brow Lift

- Brow depressor muscles 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.
- There should be overcorrection, which corrects itself over three weeks.
- Drain may be placed for 24 hours, and surgical staples are used to close incisions.
- There are several options for bone fixation.
Endoscopic Brow Lift

- Advantages
  - Less invasive
  - Minimal blood loss

- Disadvantages
  - Specialized equipment
  - Higher learning curve
  - Problems with fixation
  - May not be able to achieve same degree of pull as open techniques
Complications

- Hematoma – small percentage
- Infection – 0.3%
- Transient alopecia - 29% with screw fixation, 6% without
- Permanent nerve injury 0.6%
- Hypertrophic scarring
- Paramedian incision depressions with screw fixation
- Periorbital complications up to 20%
  - Lagopthalmos (7%), eye irritation (8%), eyelid asymmetry (8%), and brow malposition (3%)
Postoperative Care

- Incisions are dressed with antibiotic ointment
- May need to place small drain
- Patients may experience headaches and minimal pain
- Gentle shampooing after 48 hours, with hair being blow-dried on cool setting.
- Sleep in upright/semi-upright position for 4 days postoperatively.
- Staples removed in 7 days
- Return to normal activity in 3 weeks
Brow Lift Success

- Requires complete brow release
- Tension free brow fixation
- Fixation until wound healing is maximized
- The patient should have smoother transverse forehead rhytids, glabellar rhytids, and nasal rhytids.
- Resuspension of the ptotic brow, and upper eyelid skin.
Controversies in Brow Lifting

- What procedure to use?
- Do endoscopic procedures have less complications than open procedures?
- When using Endoscopic technique, what is the best method of fixation?
Algorithm

- Endoscopic – High Hairline. No alopecia
- Coronal – limited uses in males, lengthens hairline, treats lateral hooding. No alopecia
- High Forehead – High hairline, preserves hairline. Can be used for lateral hooding
- Midforehead brow lift – corrects brow symmetry, males with prominent rhytids. Treats brow only
- Direct brow lift – patients that can’t tolerate long procedures, treats brow only
- Browpexy – mild brow ptosis
The Case for Open Forehead Rejuvenation

- Cilento and Johnson (2009) retrospective chart review of 1004 consecutive open brow lifts.
- 628 coronal and 376 trichophytic
- 6 revisions (0.57%)
- No hematomas
- 12 cases of permanent numbness (1.20%)
- 7 cases of permanent alopecia (0.7%)
- No permanent frontal branch weakness
The Case for Open Forehead Rejuvenation

- Survey for perception of open versus endoscopic procedures
- White women 30 – 70 years old with annual household incomes greater than 50,000
- No prior facial rejuvenation, or medical experience
- Survey A (weighted to favor endoscopic) and B (weighted towards open approach)
  - The acceptability of forehead procedure based on wording
- Concluded that open approaches can be just as good as endoscopic approaches
Case for Endoscopic

- Minimally invasive
- The same or better results than open procedures
- Continued elevation of brow postoperatively
- De Cordier et al 2002 RCR of 400 brow lifts. 8% performed on patients with previous coronal lift, and 2% needed reoperation
- Complications similar or less than open procedures
Endoscopic vs. Open
(Complications)

- 2001 National Survey
- 6951 brow lifts, 50% open and 50% endoscopic
- Most common complication Alopecia in both groups
- Open 4.02%, endoscopic 2.9%
- Younger surgeons preferred endoscopic, while older surgeons preferred open techniques
# National Plastic Surgery Survey

**TABLE I**
Summary of Reported Complications after Open Brow Lifts and Endoscopic Brow Lifts

<table>
<thead>
<tr>
<th>Complication</th>
<th>Open ($n = 3534$) (%)</th>
<th>Endoscopic ($n = 3417$) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alopecia</td>
<td>4.0</td>
<td>2.9</td>
</tr>
<tr>
<td>Dissatisfaction</td>
<td>0.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Scarring</td>
<td>0.8</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Asymmetry</td>
<td>0.8</td>
<td>1.2</td>
</tr>
<tr>
<td>Sensory loss</td>
<td>0.1</td>
<td>0.6</td>
</tr>
<tr>
<td>Infection</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Lagophthalmus</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Motor deficiency</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Abnormal contour</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Hematoma</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
</tr>
</tbody>
</table>
Fixation in Endoscopic Brow Lift

- Rorich and Beran (1997) reviewed fixation techniques
- **Endogenous**
  - Galea-frontalis-occipitalis release
  - Lateral spanning suspension sutures
  - Bolster fixating sutures
  - Anterior scalp port excision
  - Galea-frontalis advancement
  - Cortical tunnel
  - Tissue adhesives
- **Exogenous**
  - Internal plate or screw fixation
  - External screw fixation
  - Mitek screw
  - K-wire fixation
## Endogenous Techniques

<table>
<thead>
<tr>
<th>Technique</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galea-frontalis-occipitalis release</td>
<td>Simple, easy to dissect</td>
<td>Unpredictable, pain, extensive dissection</td>
<td>Hematoma, unpredictable brow position</td>
</tr>
<tr>
<td>Lateral spanning suspension suture</td>
<td>Precise lateral brow correction</td>
<td>Poor medial brow elevation</td>
<td>Relapse, asymmetry</td>
</tr>
<tr>
<td>External scalp bolster</td>
<td>simple</td>
<td>cumbersome</td>
<td>Alopecia/scalp loss</td>
</tr>
<tr>
<td>Segmental anterior port excision</td>
<td>Remove scalp excess</td>
<td>Longer anterior scalp scars</td>
<td>Alopecia, scar widening</td>
</tr>
<tr>
<td>Galea-frontalis advancement</td>
<td>Simple, reproducible, minimal hairline dissection</td>
<td>Prolonged scalp roll, inadequate lateral brow vector</td>
<td>relapse</td>
</tr>
<tr>
<td>Cortical tunnels</td>
<td>Precise, rigid medial and lateral fixation</td>
<td>Powered instrument may be required</td>
<td>Dural injury</td>
</tr>
<tr>
<td>Tissue adhesive</td>
<td>Easy to use, hemostatic</td>
<td>Expensive</td>
<td>Autologous in US</td>
</tr>
<tr>
<td>Temporal sutures and G-F advancement</td>
<td>Precise medial and lateral correction</td>
<td>Prolonged scalp roll</td>
<td>Relapse (rare)</td>
</tr>
</tbody>
</table>
## Exogenous

<table>
<thead>
<tr>
<th>Technique</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal screw</td>
<td>precise</td>
<td>Power equipment and increased cost</td>
<td>Palpable, dural injury</td>
</tr>
<tr>
<td>External screw</td>
<td>Precise, removable</td>
<td>Power equipment and increased cost</td>
<td>Infection, alopecia, relapse, dural injury</td>
</tr>
<tr>
<td>Mitek anchor</td>
<td>precise</td>
<td>Power equipment and increased cost</td>
<td>Palpable, dural injury</td>
</tr>
<tr>
<td>K-wires</td>
<td>Precise, absorbable</td>
<td>Power equipment and increased cost</td>
<td>Alopecia, prolonged absorption, dural injury</td>
</tr>
<tr>
<td>Endotine</td>
<td>Precise, absorbable</td>
<td>Power equipment and increased cost</td>
<td>Palpable, dural injury, alopecia</td>
</tr>
</tbody>
</table>
Current Practices for Fixation

- Byrne 2007 Endotine fixation
- McKinney and Sweis 2001 tunnel fixation
- Foustanos and Zavrides 2006 soft tissue/periosteal fixation
Conclusions

- The eyebrow is an important aesthetic portion of the upper third of the face.
- With aging, rhytids become prominent and brow ptosis occurs.
- This may cause the person to look angry, tired or sad, even when this does not reflect the person's true emotional state.
Conclusions

- There are many means to alleviate rhytids
- Surgical procedures that address the forehead rhytids, lateral eye rhytids, and nasoglabellar rhytids exist.
- There is no perfect procedure that works for everyone
- Knowledge of the course of the facial nerve, supratrochlear, and supraorbital nerves is also important to decrease postoperative paralysis and numbness
Conclusions

- Long term fixation is one goal if surgery
- Brow lifting slows the process of aging
- Candid discussion with the patient about the risks, benefits, and realistic outcomes to these procedures is paramount
Bibliography

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- Chiu ES, Baker DC. Endoscopic brow lift: a retrospective review of 628 consecutive cases over 5 years. Plast and Reconstr Surg 2003;112:628-33