1. (DL) What is the normal or ideal position for the female eyebrow? The male eyebrow?

As you may imagine, descriptions of ideal eyebrow shape and position vary, and are influenced by many factors, including age, sex, culture, ethnicity and trends. The following summarizes the most commonly asserted ideals.

The eyebrow should follow a smooth and gently curving arc. The brow should begin medially with a slight cubelike configuration and gradually taper toward its lateral end. Position of the female brow is well above the supraorbital rim (Ellenbogen states this distance should be one cm), whereas the male brow position is at or close to the supraorbital rim. The medial edge of the eyebrow lies on the same vertical plane as the lateralmost portion of the nasal ala (A-B) and approximately 10mm above the medial canthus. The brow ends laterally at an oblique line drawn from the most lateral point of the ala through the lateral canthus (A-C). The medial and lateral ends of the brow lie at approximately the same horizontal level (B-C). In women, the highest point of the eyebrow arc is at a line drawn tangentially from the lateral limbus (D-E). However, this ideal eyebrow position can vary.

Question 2: (DJ) Which muscles are responsible for the transverse and vertical glabellar creases? What about the deep transverse forehead lines?

There are four muscles in the eyebrow:

A. **Frontalis** – paired subcutaneous muscle that inserts into the skin of the eyebrow. It is a continuation of the galea aponeurotica from the coronal suture downward and inserts into the dermis at the level of the supraorbital ridge. Terminates at the conjoined tendon laterally. **FRONTALIS → RESPONSIBLE FOR HORIZONTAL FOREHEAD RHYTIDS**

B. **Procerus** – inferonasal extension of the frontalis. Originates on the caudal aspect of the nasal bones and cephalic upper lateral cartilages. Inserts onto medial belly of frontalis muscle and the dermis between the eyebrows. Action produces inferior brow displacement. **PROCERUS → RESPONSIBLE FOR HORIZONTAL GLABELLAR RHYTIDS**

C. **Corrugator supercilii** – originates from the nasal process of the frontal bone near the superomedial orbital rim and inserts into the dermis at the middle third of the eyebrow. Action produces inferior and medial forehead and brow movement. **CORRUGATOR SUPERCILII → RESPONSIBLE FOR VERTICAL GLABELLAR RHYTIDS**

D. **Orbicularis oculi** – arises from the nasal part of the frontal bone, from the frontal process of the maxilla, and from the anterior surface of the medial palpebral ligament. Inserts into the lateral palpebral raphé. Action is to close the eyelid.

3. (AH) Where in the world is the frontal branch of the facial nerve? Any tips on avoiding this structure during brow lift surgery?

The frontal (temporal) branch of the facial nerve innervates the auricularis anterior, auricularis superior, occipitofrontalis, orbicularis oculi, and corrugator muscles. The frontal branch exits the parotid gland below the zygomatic arch and crosses the arch on the undersurface of the SMAS. It enters the forehead within 2 cm of the lateral orbital rim and travels just under the temporoparietal fascia to enter the frontalis muscle laterally.

In a brow lift, the temporal incisions are extended to the level of the deep temporal fascia. A blunt elevator is used to dissect superficial to the deep temporal fascia inferiorly until the sentinel vein, a branch of the zygomaticotemporal vein, is identified. The vein is a reliable marker for the frontal branch of the facial nerve, which lies superficial to the dissection on the undersurface of the temporoparietal fascia. If the vein is spared, the dissection is then continued medial and inferior to the vein. If cauterized, bipolar forceps are placed at the base of the sentinel vein to prevent thermal injury to the frontal branch of the facial nerve. Injury to the frontal branch results in the inability to raise the brow on the ipsilateral side.
4. (KY) Botulinum toxin. What is it, how does it work, and its role in cosmetic surgery?

Botulinum toxin is produced by the bacteria Clostridium botulinum. It is a neurotoxin that in large quantities can cause the disease botulism, which results in flaccid paralysis of the whole body.

“Botox” is a formulation of the neuromuscular blocking agent botulinum toxin type A (BTX-A). Its mechanism of action is the inhibition of acetylcholine release at the presynaptic neuromuscular junctions, thus causing transient paralysis of muscle.

Botox produces a transient (3 to 6 month), dose-dependent, localized muscle weakness, with peak effect of improvement seen in 30 days post-injection. Botox diminishes the appearance of lines caused by facial animation, such as those of glabellar brown lines (“brow furrows”), or hyperactive corrugators or procerus.

Botox may also be used synergistically with the surgical brow depressor musculature release in an effort to weaken the inferior vector forces and promote the maintenance of the newly elevated brow. Two weeks prior to surgery, patients are injected with Botox to block the depressor function of the corrugators, procerus, depressor supercilii (medial brow depressors), and lateral supraorbital orbicularis oculi muscles (lateral brow depressor). Usually 18 units are injected into the medial depressors and 4 units are injected into the lateral depressor muscle.

5. (DR) What are the indications for a forehead and brow lift?

Goals of rejuvenation surgery of the brow and upper third of face include:

- Elevation of ptotic eyebrows
- Reduction of lateral hooding and redundant upper eyelid skin
- Elevation of lateral canthus, if needed
- Reduction of glabellar and corrugator rhytids
- Reduction of transverse forehead rhytids
- Reduction of lateral canthal “crow’s feet” rhytids
- Correction of eyebrow asymmetry

Selection of a specific procedure is determined by combination of patient’s psychological and anatomic considerations with surgical goals.

Anatomic considerations include:

- Location of frontal and temporal hairline
- Quality of hair: alopecia, thinning, or abundant hair
- Forehead height relative to facial proportions
- Severity of forehead, temporal, and lateral canthal (crow’s feet) rhytids
- Eyebrow aesthetics: shape, symmetry, quality, texture, position, and mobility
- Presence of prominent supraorbital ridge or hollow orbit
- Degree of dermatochalasis: excess skin, tone, lateral canthal hooding, and presence of medial fat pad
- Previous eyelid or eyebrow surgery and scars
- Presence of lagophthalmos (inability to close the upper eyelid completely)
- Scalp mobility
- Lateral canthus position
- Skin elasticity and texture
- History of ocular disease or dry eyes


Since its introduction less than a decade ago, the endoscopic forehead lift has largely taken the place of the classical coronal open brow lift. The endoscope provides 16 times magnification. This allows the identification of even small nerves and vessels. The procedure has a steep learning curve, so experience first must be obtained in the anatomy laboratory before the procedure is introduced into clinical practice.

**COMPLICATIONS**

**Paraesthesia of the Forehead:** While almost every patient will have some degree of temporary paraesthesia of the forehead and scalp, less than 1% have patchy areas of permanent numbness. Approximately 10% of the authors’ patients have multiple small accessory nerves that exit directly from the frontal bone. These cannot be preserved during the surgery, and some degree of numbness is expected until neuritization occurs. No patients have complained of permanent numbness in the forehead region.

**Itching:** Approximately 25% of patients have itching of the forehead and scalp. Many compare this with the sensation of an insect walking across the scalp.
Alopecia: Percutaneous screws at the slit incision line and concomitant stapling for fixation has a 2-10% instance of temporary regional alopecia; this was permanent in 2% of patients. Alopecia seems more common in the frontal than in the temporal areas.

Brow Malposition: Approximately 0.3% of patients have complained of excessive elevation of the brows. 0.8% have reported brow asymmetry, and 0.6% have noted recurrent brow ptosis. This was believed to be caused by inadequate spreading of the periosteum over the lateral brow.

SUMMARY
Endoscopic brow lifting has largely replaced coronal brow lifting (Fig. 12). The results are at least equivalent, if not better, with a greatly decreased incidence of scarring, alopecia, and numbness of the scalp. The technique has a steep learning curve. The equipment needed to perform the surgery is expensive, but the authors believe that a well-trained surgeon using the proper instruments can perform this surgery with minimal trauma and few complications. An update with the advanced techniques described herein is recommended to further decrease the rate of complications and undesirable sequelae.

7. (SR) A 57 year-old woman is scheduled to undergo correction of severe brow ptosis and wrinkling of the forehead and nasal root. She has a high forehead and usually wears her hair pulled back. What incisions and procedures will you perform?

There are 3 major brow lift options: coronal lift, endoscopic lift, and subcutaneous lift.

Coronal: coronal incision from ear to ear. Typically remove about a 1-2 cm strip of your scalp and sew the remaining scalp together. Oldest and most reliable technique in brow lift surgery. Numbness along incision for 6 months, scar is hidden in hairline. Overall, hairline is raised. Better for advanced brow ptosis / horizontal wrinkles.

Endoscopic: 4-6 short 2cm incisions behind your hairline. Through these incisions, use endoscope to visualize lift. Screws are placed to hold tissue in new position. Screws are removed later or absorb. Excess scalp is not removed, just shifted upwards and backwards on skull. No numbness. Greater potential for your forehead and brow to droop after an endoscopic lift, especially if deep creases/severe ptosis. Newer technique, unclear length of effectiveness. Better for moderate brow ptosis / horizontal wrinkles.

Subcutaneous: Least commonly performed. Incision made across forehead, where your hairline begins. Techniques similar to coronal lift and excess skin is removed. Because the incision is in front of the hairline, your hairline will not be moved higher. No numbness. Scar across top of forehead. Better concealed when hair worn forward, so should seriously consider or reconsider coronal or endoscopic brow lift. Do not expect a forehead lift to improve baggy eyelids or crow’s feet.