Eyebrow Peak Position Redefined

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Abstract

Background: The aesthetically appealing eyebrow shape has been defined by its arch, located near the junction between the medial two-thirds and lateral one-third. The position of this arch has been historically described by arbitrary anatomical landmarks that have no logical structural relationship. Moreover, selection of endoscopic brow lift incision sites that define vector of pull and fixation points have been variably described.

Objectives: The authors examine the position of the deep temporal fusion line to determine whether it can act as a more accurate and functional landmark than prior anatomical landmarks for the eyebrow peak position.

Methods: Eyebrows were measured in 50 subjects from the medial aspect of the eyebrow to the a) deep temporal fusion line (ridge), b) eyebrow peak (arch), c) lateral aspect of the brow, and d) lateral limbus. Pearson's correlation, descriptive statistics, and student's *t* test results were obtained.

Results: Eyebrow measurements demonstrated that the deep temporal fusion line is the most precise indicator of brow peak position among all examined landmarks. The Pearson correlation value was strongest between brow peak and deep temporal fusion line ($P = .860$) and a *t* test confirmed this observation with no significant difference between brow peak and deep temporal fusion line. The lateral limbus and medial two-thirds lateral one-third junction more accurately predict brow peak in females, but the deep temporal fusion line is an equally reliable predictor of brow peak for males and females.

Conclusions: These findings suggest that placement of endoscopic brow lift incisions and subsequent fixation points may be best defined along the deep temporal fusion line.

Keywords

deep temporal fusion line, brow peak, anatomical landmark, lateral third, endoscopic brow lift

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Defining eyebrow shape remains a contested subject among experts in the field of aesthetic medicine. Expected location of the brow peak, or superciliare, varies for different models of eyebrow arch position.[1-3] One of the first modern models was presented by Westmore, who stated that a woman's brow peak should lie directly above the lateral limbus, or the boundary between the iris and sclera of the eye.[1,2] Westmore also reported that the medial and lateral brow should begin and end at the same vertical plane as the medial canthus and lateral canthus, respectively. Furthermore, the medial and lateral ends of the brow should lie at approximately the same height. Many subsequent models have followed Westmore's definition of brow shape, making only slight modifications to his criteria.[1-3]

Whitaker et al offered a different brow shape model, which stated that the brow peak should be located at the junction of the medial two-thirds and lateral one-third of the brow rather than at the lateral limbus.[1] Whitaker et al also claimed that the medial aspect of the brow begins just inferior to the brow ridge and the lateral aspect of the brow begins just above the brow ridge. In contrast to Westmore's model, Whitaker et al asserted that the medial and lateral ends of the brow are not at the same height and that their positions depend on the brow ridge rather than the canthi. Some studies show that the placement of brow peak above the lateral limbus is less appealing than the medial two-thirds/lateral one-third placement because it creates an "unnatural, surprised look,"[1-3] in which case the position of the superciliare suggested by Whitaker et al is preferable.

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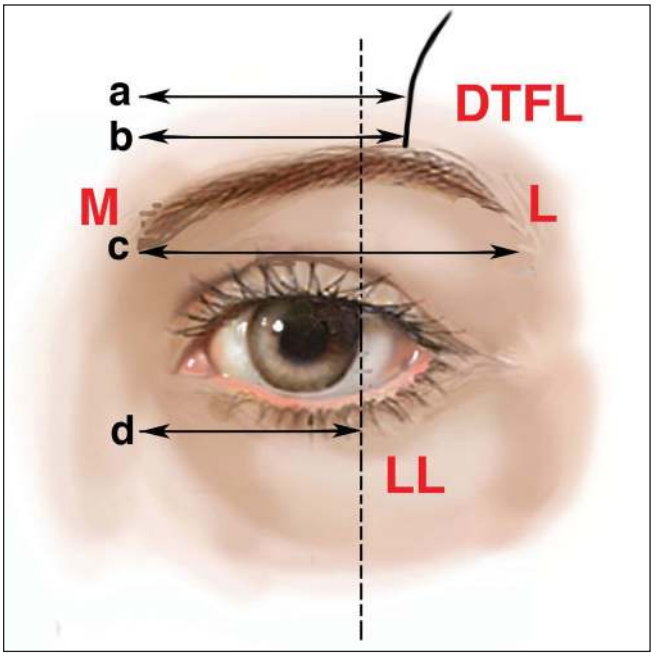

Figure 1. The four measurements taken from the eyebrow of each patient are shown. Line *a* measures distance from the medial edge (M) of the brow to the deep temporal fusion line (DTFL). Line *b* measures from the medial edge of the brow to the brow peak. Line *c* measures from the medial to lateral edge (L) of the brow. Line *d* measures from the medial edge of the brow to the lateral limbus (LL). The vertical dotted line represents the lateral limbus, or the boundary between the iris and sclera of the eye.

A large setback in determining brow shape is the reflection of fashion trends in the analysis of brow peak position. Feser et al[2] demonstrated that female preferences for eyebrow position and shape depend on the age of the subject. Therefore, allowing aesthetic opinions from a particular cohort to determine brow peak only yields a temporary or subjective definition of brow shape. Furthermore, defining brow shape based on transitory perceptions of beauty has obscured the importance of identifying an anatomical structure that logically explains the development of brow peak position. With the rising popularity of endoscopic brow lifts, adequate knowledge of eyebrow anatomy becomes increasingly essential for the selection of proper incision and fixation points.[4-12] In addition, defining brow shape based on more empirical evidence will enable physicians to evaluate the surgical outcome of brow lifts with greater consistency.

The relationship between age and anatomy is also important because there is an observable change in eyebrow structure from childhood to adulthood. Infants and young children tend to have rounded brows that lack a peak region, whereas adults have a noticeable peak with varying heights for different individuals. This developmental change could result from the presence of additional structural support at the brow peak region. We believe that the ligament at the deep temporal fusion line secures the brow at the future peak position, whereas the rest of the brow falls in height due to gravity. This study aims to verify the relationship between the deep temporal fusion line and brow peak position in order to support our observation of brow development. Because the lateral limbus and the medial two-thirds/lateral one-third junction of the brow are frequently employed as anatomical landmarks in determining brow peak position, we also compare the location of these landmarks with brow peak.

Table 1. Mean and Standard Deviation Values for Different Measurements and Gender Groups

	Mean ± Standard Deviation, cm		
Measurement	Male	Female	Male and Female
A (medial to ridge)	3.72 ± 0.40	3.44 ± 0.38	3.58 ± 0.41
B (medial to peak)	3.63 ± 0.40	3.29 ± 0.38	3.46 ± 0.42
C (medial to lateral one third)	3.85 ± 0.33[B]	3.50 ± 0.43	3.65 ± 0.36
D (medial to lateral limbus)	3.12 ± 0.40[A]	3.01 ± 0.44[A]	3.07 ± 0.42

Refer to Figure 1 for additional measurement description.
[A]Significantly different from medial to peak measurements (*t* test, $P < .0001$).
[B]Significantly different from medial to peak measurements (*t* test, $P < .001$).

METHODS

Fifty Caucasian patients between the ages of 30 and 62 were recruited from Springfield, Illinois. Male and female patients were represented equally. Patients were excluded if they had ever received a brow lift or if their eyebrows had been tweezed or waxed within 30 days. Four different measurements of the eyebrow were taken. The distance from the medial aspect of the eyebrow to each of the following points was measured to evaluate eyebrow shape: (a) the deep temporal fusion line or ridge, (b) the peak or arch, (c) the lateral aspect of the brow, and (d) the lateral limbus (Figure 1). The medial two-thirds/lateral one-third junction values were calculated from measurement of the medial to lateral edge of the brow. The senior author (AM) measured the distances once for each patient with a caliper. He measured the deep temporal fusion line at its inferiormost aspect and at the junction with the orbital rim. The deep temporal fusion line was identified by the groove that can be felt along the junction of the temporal bone with the frontal and parietal bone. Both measured and calculated data were compared to determine relationships between the eyebrow peak, lateral limbus, medial two-thirds/lateral one-third junction, and the deep temporal fusion line. Pearson's correlation, descriptive statistics, and *t* test results were obtained with SPSS statistical analysis software (SPSS, Inc., an IBM Company, Chicago, Illinois).

RESULTS

Mean values showed that the distance from the medial edge of the brow to the peak was nearest to the distance from the medial edge of the brow to the deep temporal fusion line, among all measurements. Mean distance was highest from the medial edge of the brow to the lateral one third (3.65 ± 0.36), followed by the distance from the medial edge of the brow to the ridge (3.58 ± 0.41), the medial edge of the brow to the peak (3.46 ± 0.42), and the medial edge of the brow to the lateral limbus (3.07 ± 0.42), in that order. The above statistics were calculated from a sample of males and females combined. Measurements were slightly higher for male participants, but the data trend was similar for both sexes (Table 1).

Correlation analysis revealed that the deep temporal fusion line was the best predictor of brow peak location. Brow peak and deep temporal fusion line measurements had the strongest Pearson correlation value among all groups (0.860). The medial two-thirds/lateral one-third junction of the brow had the second strongest Pearson correlation with brow peak (0.737). The lateral limbus had the weakest Pearson correlation with brow peak (0.561). All correlations were significant at the .0001 level.

We performed *t* tests on male and female patients separately and the significance level was set at $P < .0001$. A significant difference was found between the lateral limbus and brow peak for men and women. There was no significant difference between the deep temporal fusion line and brow peak for men and women. There was also no significant difference between the medial two-thirds/lateral one-third junction and brow peak for men and women.

Additional gender differences were observed in the data. The peak and medial-lateral junction measurements were significantly different at the 0.001 level for men but strongly insignificant for women. Furthermore, all mean values were larger for men. However, data patterns were mostly similar between men and women.

DISCUSSION

Brow lifts are popular in both reconstructive and cosmetic surgery because the forehead and brow play a major role in maintaining adequate vision and providing an aesthetic appearance to the face.[3-17] Although endoscopic brow lifts have demonstrated remarkable success, insufficient knowledge of eyebrow anatomy creates variable incision and fixation sites.[4-12] The absence of a standardized brow lift procedure presumably stems from the reliance on subjective brow shape models. Examining the aesthetic appearance of different brow peak positions is an important factor in determining incision and fixation sites for endoscopic brow lifts, but the functional position of brow peak should also be considered.

Our findings show that brow peak position is best predicted by the deep temporal fusion line. The Pearson correlation value for brow peak and deep temporal fusion line was 0.860, and a *t* test confirmed this observation, with no significant difference between brow peak and the deep temporal fusion line. It is likely that the orbital ligament at the deep temporal fusion line is the source of structural support for brow peak development. Therefore, it would be wise to define incision sites and fixation points in the scalp along the deep temporal fusion line when performing endoscopic brow lifts.

The temporal fusion line begins at the lateral aspect of the orbital rim and ascends, veering laterally along the junction of the temporal bone with the frontal and parietal bone. The supraorbital nerve, which usually exits at a groove along the supramedial orbital rim called the supraorbital notch, is situated medial to the deep temporal fusion line.[18] Therefore, fixing endoscopic brow lifts along the deep temporal fusion line would be a safe method for avoiding injury to the supraorbital nerve.

Stephan[19] aimed to verify (or disprove) the assumption that the superciliare lies directly above the lateral limbus. He found that the lateral limbus did not accurately predict brow peak, especially for men. Our *t* test of brow peak and lateral limbus in men was significantly different at the .0001 level. For women, the *t* test of brow peak and lateral limbus had a lower level of significance ($P < .001$). Therefore, our study supports the finding that the superciliare does not lie directly above the lateral limbus and that the difference between the two structures is greater for men.

Our results also show that the medial two-thirds/lateral one-third junction is a strong predictor of brow peak for women but is a less reliable predictor of brow peak for men. However, the deep temporal fusion line is an equally strong predictor of brow peak for both men and women. Therefore, a standard brow lift procedure that utilizes the deep temporal fusion line in determining incision and fixation points can be implemented for a larger number of patients, given that the functional position of brow peak is desired. The deep temporal fusion line not only corresponds with brow peak position more closely than previously described anatomical landmarks but also provides a logical explanation for the development of brow shape. Further experimentation is required to evaluate the aesthetic value of placing brow peak along the deep temporal fusion line.

Disclosures

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