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Long-Term Evaluation of Endoscopic and Pretrichial Open Forehead Lifts: A Morphometric Analysis

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Background: The aim of this study was to evaluate and compare the long-term (average, 6 years; range, 3 to 11 years) follow-up results of both the endoscopic and pretrichial open forehead lift. Both the amount of eyebrow elevation and patient satisfaction (FACE-Q questionnaires) were analyzed.

Methods: Preoperative and postoperative eyebrow positions of 65 patients were measured. Both eyebrow sides were measured at three different points. Thirty-two patients completed the FACE-Q questionnaires (10 domains, Dutch translation).

Results: Both the endoscopic and the pretrichial open forehead lift raised the eyebrow significantly at all measured points for each eye. This elevation effect was maintained significantly after long-term evaluation (average, 6 years; range 3 to 11 years), with no significant difference reported between techniques. After both procedures, patients were satisfied or strongly satisfied according to the FACE-Q questionnaires.

Conclusion: Both the endoscopic forehead lift and the pretrichial open forehead lift raise the eyebrow significantly, and both have a long-term effect with either satisfied or strongly satisfied patients, as evaluated according to the FACE-Q questionnaire. (*Plast. Reconstr. Surg.* 150: 289, 2022.)

CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, III.

The periorbital region is of crucial importance for the perception of facial beauty.^{1,2} Aging of this region will manifest itself by a less smooth skin structure, an increased visibility of rhytides (forehead, glabellar, and lateral canthal rhytides), volume loss, and drooping of the eyebrows (eyebrow ptosis). In particular, the latter mentioned aspect, the eyebrow position, has proven to have a significant impact on our perception of facial aging and beauty.¹

For that reason, various methods of eyebrow elevation have been developed and described: on the one hand, there are so-called open procedures (including the direct eyebrow lift, the midforehead lift, the Fogli lift, the pretrichial coronal lift, and the posttrichial coronal lift); on the other hand, there are closed procedures (endoscopic forehead lift and thread lifts).³ In the late 1990s, the endoscopic forehead lift largely

replaced the open procedures and became the procedure of choice for many facial plastic surgeons.⁴ Thereafter, a significant drop arose in the popularity of this procedure for various reasons.⁵ Nevertheless, the aforementioned authors believe that there is still a prominent place for the endoscopic forehead lift to correct brow ptosis. Only in the case of a relative high forehead is an open forehead lift procedure preferable to lower the height of the forehead.

Unfortunately, only a limited number of studies have evaluated the long-term effect of the endoscopic forehead lift.⁶ There are no long-term evaluations available for the open procedure in the English language literature. Therefore, the aim of this study was to evaluate and compare our long-term follow-up results of both the endoscopic forehead lift and the pretrichial open forehead

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lift.⁷⁻⁹ Both eyebrow elevation and positions and patient-reported outcome measures according to FACE-Q questionnaires were analyzed.¹⁰⁻¹³

PATIENTS AND METHODS

Preoperative and postoperative images of 128 patients who underwent either an endoscopic forehead lift or a pretrichial open forehead lift between 2003 and 2010 at the University Medical Centre of Groningen, Medical Centre of Leeuwarden, and Bey Bergman Clinics Heerenveen were retrospectively obtained from the electronic patient-record data. All patients evaluated had given written permission to be used in this evaluation study and were also willing to participate in a clinical long-term follow-up evaluation. Patients with incomplete photographic documentation, patients who did not complete the follow-up period, and those patients who had undergone additional procedures before the forehead lift (which theoretically could interfere with the results of the forehead lift) were excluded. However, patients who had undergone an upper blepharoplasty afterward were included (five patients had undergone upper blepharoplasty 1 to 9 years postoperatively). As a result, only 65 of the 128 patients could be included. Of this series, 32 patients completed the (Dutch translation) FACE-Q questionnaires.

Operative Procedures

The goal of the operation (for both endoscopic forehead lift and pretrichial open forehead lift) is to elevate the eyebrow, to restore or maintain the male or female shape of the eyebrows. After general anesthesia, the hair is fully soaked with a liquid soap solution: this makes surgery in this area very comfortable without having to lose any springy hair around the wounds. Then, after disinfection of the surgical area, the entire forehead is infiltrated with so-called jungle juice, a mixture of 100 cc of saline solution with 20 cc of lidocaine 1% and 0.2 cc of epinephrine. The entire solution is mostly used and infiltrated in the forehead area. [See [Video 1 \(online\)](#), which demonstrates the operative procedure of an endoscopic forehead lift. See [Video 2 \(online\)](#), which demonstrates the operative procedure of a pretrichial open forehead lift.] After infiltration, we wait 5 to 10 minutes for the “adrenaline effect.”

Endoscopic Forehead Lift

Five incisions are made in the hairline with a no. 15 scalpel blade: a central incision (12 to 15 mm), bilateral incisions at the level of the lateral

canthus (12 to 15 mm), and a temporal incision (a small T-incision). The central and lateral incisions are down to the bottom (periost), and the temporal incision is through the superficial temporal fascia ([Fig. 1](#)) [[see Video 1 \(online\)](#)]. Then, through the temporal incision, easy blunt dissection is performed between the superficial and deep temporal fascia with scissors. Next, through the central and lateral incisions, blind dissection of the entire forehead is performed subperiosteally down to 2 cm above the supraorbital rim, lateral to the transition zone, and cranial down to at least 10 cm of the skull with a sharp elevator, spatula 12 × 12 mm, and a working length of 15 cm. After this, blind transection is performed with this elevator from the lateral space between the superficial and deep temporal fascia to the central subperiosteal space at 3 cm above the lateral orbital rim, and with a sweep in the cranial direction, the entire transition zone is blindly released. All these procedures take approximately 10 minutes at most for the senior author (B.v.d.L.). Then, starting mostly first at the right site, the endoscope is introduced through the right lateral incision and the dissector through the temporal incision and now further dissection is performed with direct vision: release of the remaining part of the transition zone and the orbital retaining ligament, and the sentinel vein is spared. Subsequently the entire forehead is released under the vision of the endoscope, the periost is released at the level of the orbital rim, and the supratrochlear and supraorbital nerves are spared. The corrugator muscles are not resected, not even partially because, in the long run, this leads to overelevation of the central part of the eyebrow. After full release, the forehead can be easily elevated in such a position that the desired eyebrow shape is achieved: the forehead is then fixed through all layers by placing a screw in the skull at the cranial end of the elevated lateral incisions—a 16-mm-long self-tapping screw, 2 mm in diameter, placed in a hole drilled with a 1.7-mm diameter drill into the calvaria with a 4-mm stop. In general, the elevation at the lateral incision is between 12 and 17 mm at least, centrally less. In case of a female patient, an arched eyebrow shape is the ultimate goal; in case of a male patient, a rather straight eyebrow with a screw placed centrally. An Ethilon 3-0 (Ethicon, Inc., Somerville, N.J.) suture is placed through the incision and knotted around the screw. This suture secures the fixation of the soft tissues. Then, Tisseel (Baxter BV, Utrecht, The Netherlands) is applied through a metal connector into the subperiosteal space, especially in the

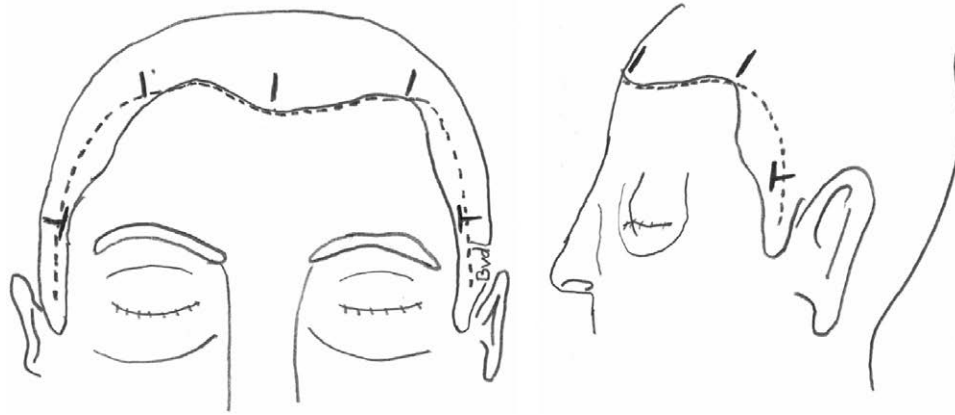


Fig. 1. Operative markings/incisions of an open and endoscopic forehead lift (frontal and lateral views). The *solid lines* central (1 cm), lateral (1 cm), and the T-incision (1 cm length and 1 cm transverse) are the entrance points for the endoscopic forehead lift: central in the middle, lateral in the straight line from the lateral two-thirds of the eyebrow, and temporal in the hair as a small T stab facilitating finding the right plane between the superficial and deep temporal fascia. Screws for temporal fixation of the forehead are mostly only placed in the lateral straight incisions, very occasionally as in the central incision. The incision for the open procedures (*dotted line*) is just an incision bevelled 45 degrees along the frontal hairline and merging into the hair from the “receding hairline” until above the ear.

area of traction between the lateral eyebrow and the inserted screw. All incisions are closed further with Ethilon 4-0. Finally, a self-fixing bandage is applied around the forehead and left in place for 2 days, after which this can be removed, and the hair washed. After 1 week to 10 days, sutures and screws are removed and the remaining opening caused by the screws can heal.

Pretrichial Open Forehead Lift

The incision in front of the hairline is beveled at 45 degrees so that later on, in the healing phase, hair can grow through the scar, which therefore becomes less visible; lateral in the hair, the incision is straight down to the deep temporal fascia (Fig. 1) [see Video 2 (online)]. Centrally, the dissection starts in the subgaleal plane above the periost, and this dissection merges lateral into the plane between the superficial and deep temporal fascia. The entire forehead flap is pulled down and finally, under vision, the flap is dissected until the orbital rim with the result being the release of all the retaining ligaments. The galea fascia is scored, and the corrugator muscles are not resected. Then, the forehead flap is redraped and pulled back; the shape and elevation of the eyebrow is now determined by elevation and fixation after incision of the scalp flap in longitudinal direction at three key points: central for approximately 10 to 15 mm, and lateral at both sites (at level orbital rim) for approximately 20 to 27 mm. Then, the lateral overlapping redundant scalp flap tissue is

excised and fixed in layers: deep, Vicryl 3-0 and 4-0; and skin, Ethilon 4-0. Then, central excision is performed of the redundant hair-bearing scalp skin, again with the tissue cut at 45 degrees beveled. Subsequent closure is performed with Vicryl 4-0 and a running Ethilon 5-0 suture. Finally, a self-fixing bandage is applied around the forehead. This bandage can be removed after 2 days; hair can then be washed. Sutures are removed after 10 days. After an initial period of slight over-correction (2 days; maximum, 3 months) the final position of the eyebrow is established.

Morphometric Evaluation

Photographic documentation was performed by the senior author (B.v.d.L.) using a Canon 5D Mark II camera (Canon, Inc., Tokyo, Japan). Patients were positioned in the natural head position and were asked to close their eyes and slowly open them to avoid involuntary excessive activation of the frontalis muscle and elevation of the eyebrows before the photograph was taken. The photographs were taken during three different periods: preoperatively, up to 7 months postoperatively, and between 3 and 11 years postoperatively. They were analyzed using Screen Caliper (Iconico, Inc., Melville, N.Y.). The eyebrow position was measured at three different points (midpupil and lateral and medial canthus to the upper border of the eyebrow) for both eyes (Fig. 2).

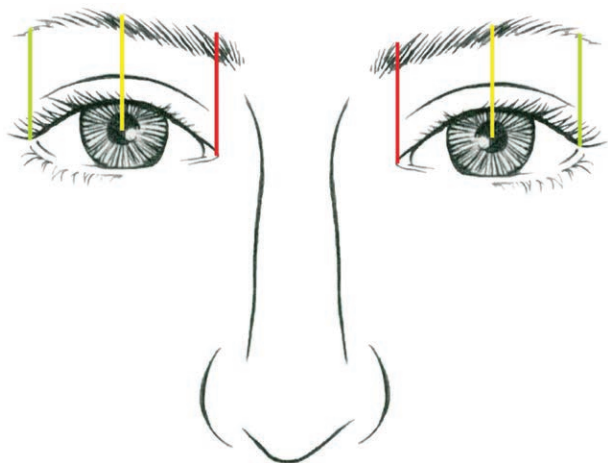


Fig. 2. The eyebrow position is measured at three different points: (1) lateral canthus (green), (2) midpupil (yellow) and (3) medial canthus (red) to the upper border of the eyebrow.

FACE-Q Questionnaire

The FACE-Q is a patient-reported outcome instrument composed of several independently functioning scales, each developed to measure the outcomes in facial aesthetic surgery. The following FACE-Q scales were completed by the patients:

1. Satisfaction with forehead and eyebrows [six questions were scored from 1 (very dissatisfied) to 4 (very satisfied)].
2. Appraisal of lines: forehead [seven questions were scored from 1 (not at all) to 4 (extremely)].
3. Appraisal of lines: between eyebrows [seven questions were scored from 1 (not at all) to 4 (extremely)].
4. Appraisal of lines: crow's feet [seven questions were scored from 1 (not at all) to 4 (extremely)].
5. Aging appraisal [seven questions were scored from 1 (definitely disagree) to 4 (definitely agree)].
6. Age visual analogue scale [from -15 (I look 15 years younger) to +15 (I look 15 years older)].
7. Satisfaction with outcome [six questions were scored from 1 (definitely disagree) to 4 (definitely agree)].
8. Satisfaction with decision [six questions were scored from 1 (definitely disagree) to 4 (definitely agree)].
9. Psychological function [10 questions were scored from 1 (definitely disagree) to 4 (definitely agree)].

10. Social function [eight questions were scored from 1 (definitely disagree) to 4 (definitely agree)].

All FACE-Q scales ask patients to answer items with their facial appearance in mind. The evaluation of all FACE-Q scales (the sum of scores for each scale) was conducted by means of Rasch scale.¹⁴ Higher FACE-Q scores indicate greater satisfaction (strongly satisfied, 76 to 100; satisfied, 51 to 75; unsatisfied, 26 to 50; and strongly unsatisfied, 1 to 25) for some scales [($n = 1$) satisfaction with forehead, eyebrows; ($n = 7$) satisfaction with outcome; ($n = 8$) satisfaction with decision; ($n = 9$) psychological function, and ($n = 10$) social function]. However, lower FACE-Q scores indicate greater satisfaction (strongly satisfied, 1 to 25; satisfied, 26 to 50; unsatisfied, 51 to 65; and strongly unsatisfied, 76 to 100) for other scales [($n = 2$) appraisal of lines: forehead; ($n = 3$) appraisal of lines: between eyebrows; ($n = 4$) appraisal of lines: crow's feet and ($n = 5$) aging appraisal]. Higher scores on the age visual analogue scale (score from -15 (I look 15 years younger) to +15 (I look 15 years older) give an indication of youthful self-perception.

Complications

Complications were registered for both groups. Side effects included local wound infection and frontal hypoesthesia.

Statistical Analysis

Statistical analysis was carried out using IBM SPSS Version 23 (IBM Corp., Armonk, N.Y.). The Wilcoxon signed rank test (two-sided) was performed 36 times to compare preoperative measured eyebrow distances to both postoperative measured distances (up to 7 months and 3 to 11 years). Bonferroni correction was performed for multiple testing, which yielded an alpha of 0.001 for statistical significance. The Mann-Whitney U test (two-sided) was performed 18 times to compare the measured eyebrow distances for the endoscopic forehead lift group and the pretrichial open forehead lift group. Bonferroni correction for multiple testing yielded an alpha of 0.003 for statistical significance.

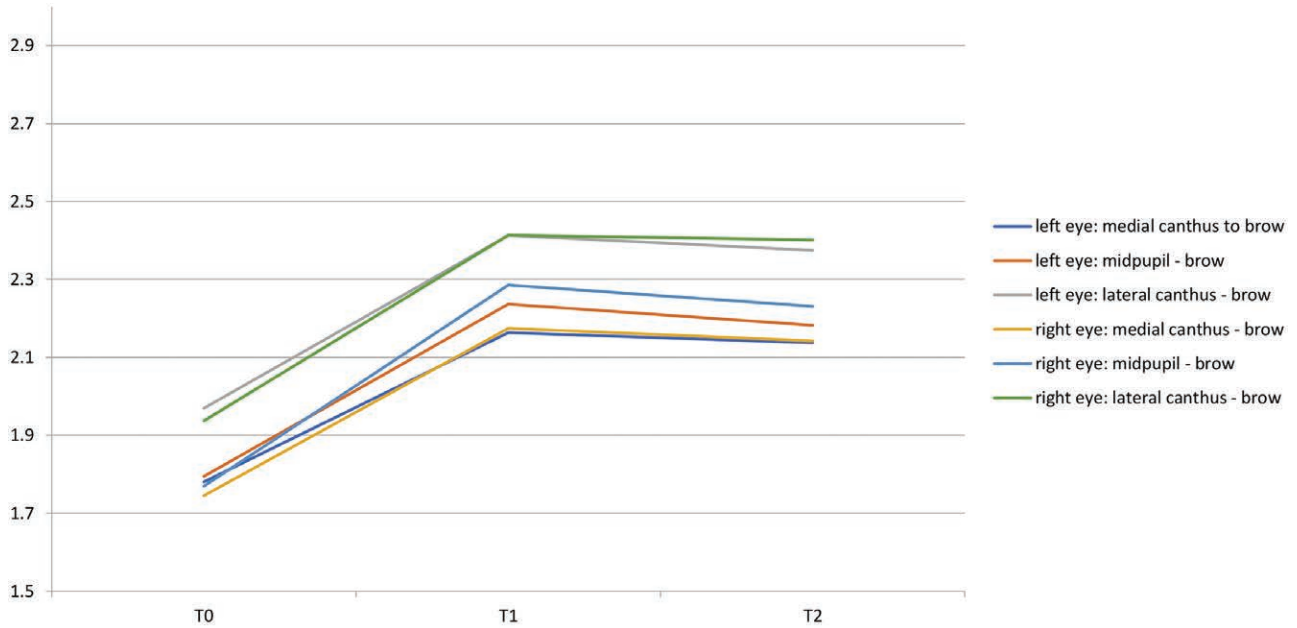
The Mann-Whitney U test (two-sided) was also performed nine times to compare the FACE-Q scales for the endoscopic forehead lift group and the pretrichial open forehead lift group. An alpha of 0.006 was yielded after Bonferroni correction for multiple testing.

RESULTS

Morphometric Evaluation

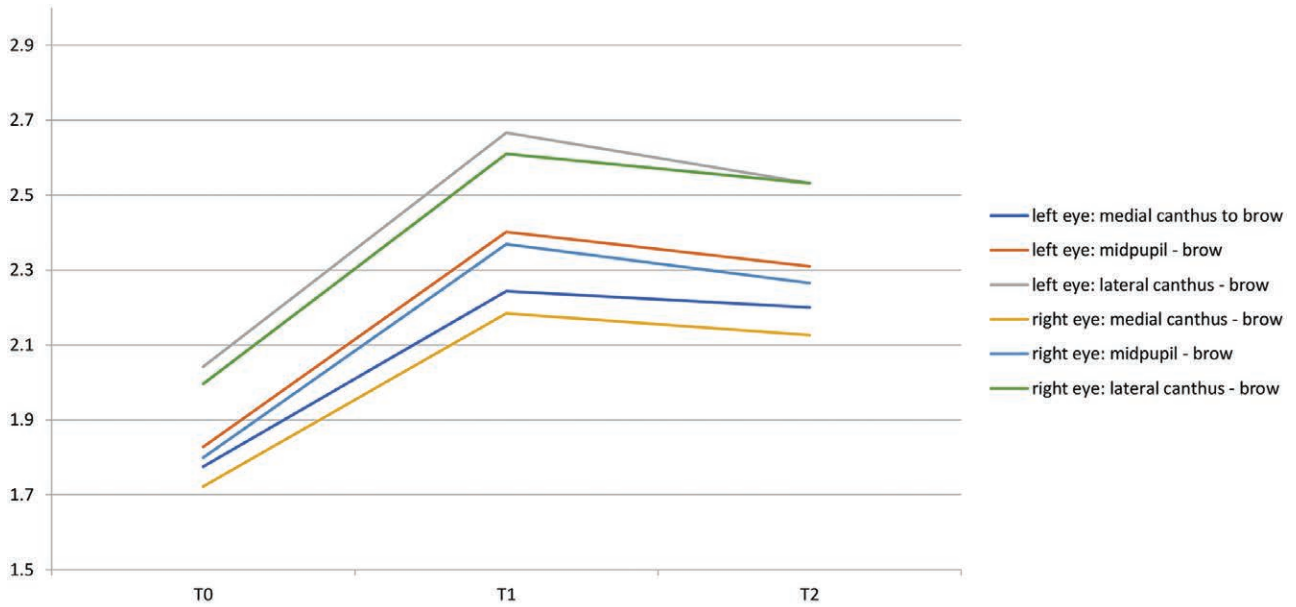
Forty-seven patients who underwent endoscopic forehead lift (28 women and 11 men) and had a mean age of 55 years (range, 35 to 72 years) and 18 patients who underwent pretrichial open forehead lift (14 women and four men) and had a mean age of 58 years (range, 43 to 70 years) were included in this study. This resulted in 94

examined periorbital regions after an endoscopic forehead lift and 36 periorbital regions after a pretrichial open forehead lift. All procedures were performed by the senior author (B.v.d.L.). Preoperative and postoperative means of measured distances are presented in Figures 3 and 4. The endoscopic forehead lift raised the eyebrow significantly at all measured points for both eyes ($p < 0.001$) (Table 1). The effect of this technique was significantly maintained after the long-term



			T0 mean (SD)	T1 mean (SD)	T2 mean (SD)
Endoscopic Forehead Lift (n=47)	Left eye	Medial canthus	1,78053340 (,290469133)	2,16362358 (,395615247)	2,13717904 (,393743484)
		Midpupil	1,79484425 (,292871491)	2,23665815 (,366615023)	2,18298093 (,366530938)
		Lateral canthus	1,96956886 (,327152904)	2,41299436 (,368937437)	2,37421542 (,391631317)
	Right eye	Medial canthus	1,74519301 (,304459525)	2,17438448 (,396760050)	2,14193122 (,383035064)
		Midpupil	1,76955699 (,275373042)	2,28561718 (,337844088)	2,23164859 (,341750948)
		Lateral canthus	1,93718405 (,319753105)	2,41353125 (,366858923)	2,40184078 (,407857853)

Fig. 3. Endoscopic forehead lift. Distances measured (in centimeters) in the preoperative situation (time 0), up to 7 months postoperatively (time 1) and between 3 and 11 years postoperatively (time 2). T0, time 0; T1, time 1, T2, time 2.



			T0 mean (SD)	T1 mean (SD)	T2 mean (SD)
Pre-trichial	Left eye	Medial canthus	1,77502734 (,374454109)	2,24349832 (,345002205)	2,20076377 (,371143158)
		Midpupil	1,82768013 (,366084237)	2,40137336 (,339668501)	2,30936263 (,349322240)
Lift (n= 18)	Lateral canthus	Left eye	2,04189063 (,421850913)	2,66630607 (,336096418)	2,53152564 (,401365673)
		Right eye	1,72212826 (,458455240)	2,18432507 (,366128622)	2,12600106 (,422245494)
	Midpupil	Right eye	1,79915325 (,465585010)	2,36868063 (,355278999)	2,26540846 (,431217365)
		Left eye	1,99603303 (,484643774)	2,60984606 (,385618772)	2,53193167 (,439296115)

Fig. 4. Pretrichial forehead lift. Distances measured (in centimeters) in the preoperative situation (time 0), up to 7 months postoperatively (time 1), and between 3 and 11 years postoperatively (time 2). T0, time 0; T1, time 1, T2, time 2.

evaluation (3 to 10 years) ($p < 0.001$) (Fig. 5). The pretrichial open forehead lift also raised the eyebrow significantly at all the measured points for both eyes ($p < 0.001$) (Table 1), and this effect was also present after the long-term evaluation (3 to 11 years) ($p < 0.0013$) (Fig. 6).

Both the endoscopic forehead lift and the pretrichial open forehead lift did raise the eyebrow significantly, and neither one of the techniques was superior with regard to its effect ($p > 0.003$)

(Table 2). Gender did not influence the effect of eyebrow lifting for either the endoscopic forehead lift ($p = 0.043$ to 0.0961) or the pretrichial open forehead lift ($p = 0.079$ to 1.000).

FACE-Q Questionnaires

Thirty-two patients completed the FACE-Q questionnaires (20 patients with an endoscopic forehead lift and 12 patients with a pretrichial open forehead lift). All patients were satisfied

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Table 1. Statistical Significance*

	<i>p</i>		
	Time 0 vs. Time 1	Time 0 vs. Time 2	Time 1 vs. Time 2
Endoscopic forehead lift			
Left eye			
Medial canthus	0.000	0.001	0.310
Midpupil	0.000	0.000	0.090
Lateral canthus	0.000	0.000	0.159
Right eye			
Medial canthus	0.000	0.000	0.271
Midpupil	0.000	0.000	0.108
Lateral canthus	0.000	0.000	0.775
Pretrichial forehead lift			
Left eye			
Medial canthus	0.000	0.001	0.372
Midpupil	0.000	0.000	0.133
Lateral canthus	0.000	0.000	0.039
Right eye			
Medial canthus	0.000	0.000	0.215
Midpupil	0.000	0.000	0.064
Lateral canthus	0.000	0.000	0.170

*Wilcoxon signed rank test.

or strongly satisfied in the endoscopic forehead lift group for all measured FACE-Q scales. They scored themselves 3.8 years younger after the procedure according to the visual age scale. All patients were satisfied or strongly satisfied with all outcomes according to the FACE-Q in the pretrichial open forehead lift group; however, they scored themselves a half year younger after the procedure according to the visual age scale. No significant difference was found between the endoscopic and pretrichial open forehead lift ($p = 0.062$ to 0.948).

Complications

Complications were mostly minor and similar between the two groups: endoscopic forehead lift, 6.4 percent; pretrichial open forehead lift, 16.7 percent. Local wound infection around the stab incisions containing the screws for temporary fixation (4.3 percent) was the most common complication after the endoscopic forehead lift followed by frontal hypoesthesia (2.1 percent). Frontal hypoesthesia (11.1 percent) was the most common complication after the pretrichial open forehead lift, followed by local wound infection/



Fig. 5. Photographs of a patient who underwent an endoscopic forehead lift (and additional upper blepharoplasty after 9 years). (Left) Preoperative situation, (center) postoperative situation, and (right) long-term postoperative situation.

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Fig. 6. Photographs of a patient who underwent a pretrichial forehead lift. (Left) Preoperative situation, (center) postoperative situation, and (right) long-term postoperative situation.

dehiscence, mostly as a result of suture spitting (5.6 percent).

DISCUSSION

This long-term evaluation study clearly demonstrates that both the endoscopic forehead lift and the pretrichial open forehead lift raise the eyebrow significantly and have a long-term effect, with long-lasting satisfied or strongly satisfied patients, as evaluated by the FACE-Q questionnaire. As far as we are aware, this is the first study regarding forehead lifts in the current literature that specifically focuses on and describes patient-reported outcome measures according to FACE-Q questionnaires.

Table 2. Statistical Significance*

	<i>p</i>		
	Time 0	Time 1	Time 2
Endoscopic forehead lift			
Left eye			
Medial canthus	0.671	0.285	0.468
Midpupil	0.758	0.037	0.213
Lateral canthus	0.446	0.011	0.101
Pretrichial forehead lift			
Right eye			
Medial canthus	0.692	0.681	1.000
Midpupil	0.977	0.192	0.676
Lateral canthus	0.747	0.037	0.238

*Mann Whitney *U* test (Wilcoxon rank sum test).

Eyebrow-lift surgery has a very rich history of technique evolution.¹⁵ The endoscopic eyebrow lifting technique was first introduced by Isse in 1992 and then became very popular in the early 1990s, replacing nearly all the other techniques since its introduction.⁴ Later, the popularity of the endoscopic forehead lift dropped, probably for several reasons: (1) insufficient release of the orbital retaining ligaments, (2) apparently interpreted limited effect (limited raise of the eyebrow and not considering the amount of furrow/wrinkle reduction of the forehead), and (3) insufficient long-term effect in severely frowning patients (who definitely need botulinum toxin, which was not available for that purpose at that time, to reduce the down force of the corrugator muscle and its effect on the eyebrow position).⁵

Clinical Application/Ramification of This Study

Both techniques appear to be equally effective over time, and all patients are and remain either satisfied or strongly satisfied with the results (Figs. 5 and 6). Therefore, we can conclude that the choice to use a specific technique is not dependent on the expected lifting effect but on other aspects, such as having rather minimal scars and maintaining the sensibility of the scalp after an endoscopic forehead lift is performed. Thus, the endoscopic technique has to be the choice

of treatment when treating (balding) men or women with (familial history of) hair loss/alopecia, receding hairline, or loss of hairline because of a smaller scar formation. The only indication for an open procedure is a relative high forehead or receding hairline in women or nonbalding men. In a systematic review, Cho et al. showed that each eyebrow lifting technique has a different complication profile: the highest numbness rate was shown after an open brow lift (5.5 percent), and the highest alopecia rate was shown after the endoscopic brow lift (2.8 percent).¹⁶

The Ideal Eyebrow Position

There is no prototypical face that defines the ideal eyebrow position. Attractive position of the eyebrow is a rather subjective judgment influenced by many factors, and thus it cannot simply be determined by a fixed mathematical formula. In general, a youthful face is characterized by a high-lid cheek junction, a low eyebrow position, and smooth skin. We have shown in a previous study that the most attractive eyebrow position depends on the lid-cheek junction; this principle of balanced beauty around the eyes is called the “oval orbital balance principle.” According to this principle, a face is optimally attractive when the eye is centered in an “oval” defined by the lid-cheek junction and the eyebrow.¹ For a youthful face, this means a combination of a high lid-cheek junction in combination with a low eyebrow position; for an older face, this mostly implicates an often lower lid-cheek junction in combination with a higher eyebrow position. Therefore, it is recommended to take this principle into account when advising patients about facial rejuvenation. It is also important to note that rejuvenation of the midface often is a key milestone in achieving a youthful face, along with reducing or eliminating the bags found under the eyes and increasing the position of the lid-cheek junction. In addition, improving the skin texture further improves the overall appearance.

Strengths and Limitations of This Study

This long-term evaluation study after either an endoscopic forehead lift or a pretrichial open forehead lift is the first morphometric analysis study that combines objective measurements with patient-reported outcome measurements (FACE-Q questionnaires). Previous research with regard to eyebrow lifting was based only on morphometric analysis.^{7–9} Godwin et al. previously demonstrated a discrepancy between patient-reported outcomes (patient satisfaction) and interpretations

by medical professionals, especially regarding long-term outcome.¹⁷ Therefore, it is of crucial importance to evaluate both patient satisfaction in combination with objective measurements, because we as plastic surgeons always tend to use our own judgment of aesthetic outcome.

Performing post hoc Bonferroni correction for multiple testing in our study increased the reliability of our outcome measurements, which most studies do not perform. Performing upper blepharoplasty (in only five of 65 patients) postoperatively after (1 to 9 years) might be a limitation of this study; however, different studies showed that upper blepharoplasty does not change eyebrow height.^{18–21}

Not differentiating our sample size according to age and gender is a limitation of our study. Another limitation is that only 32 patients completed the FACE-Q questionnaires, which decreases reliability of the overall patient-reported outcome measures.

CONCLUSIONS

Both the endoscopic and pretrichial open forehead lifts raise the eyebrow significantly and have a long-lasting effect on the raised eyebrow position (average, 6 years; range, 3 to 11 years). Both procedures have similar good results and similar long-term outcomes. Finally, all patients within both groups were satisfied or strongly satisfied with their appearance after the procedure in the long-term evaluation, as evaluated by means of patient-reported outcome measures (FACE-Q questionnaires).

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PATIENT CONSENT

Patients provided written informed consent for the use of their images.

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