The Case for Open Forehead Rejuvenation

A Review of 1004 Procedures

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Objective: To review the role of open forehead procedures in upper-face rejuvenation.

Methods: The clinical records of consecutive patients undergoing a coronal or trichophytic brow-lift from July 1, 1993, to June 30, 2005, were reviewed. Patient demographics and complication rates were tabulated and compared with published rates for endoscopic brow-lifts. Patient questionnaires were sent to correlate subjective outcome measures with objective clinical record data. To obtain population-based perceptions, 200 women aged 30 to 70 years were surveyed at a local mall.

Results: A total of 628 coronal and 376 trichophytic forehead-lifts were performed for which there were clinical records. There were 6 revisions (0.57%), no hematomas, 12 cases of permanent numbness (1.20%), 7 cases of permanent alopecia (0.70%), and no cases of permanent frontal branch weakness. The adjusted response rate for the questionnaire was 64.0% (416 of 650).

Conclusions: Open procedures in this series had a complication rate equal to or lower than published rates in endoscopic brow-lift series. Open brow-lift procedures are an effective means of upper-face rejuvenation and, when performed correctly, demonstrate high rates of patient satisfaction.

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In 1926, Hunt described raising the eyebrows by using coronal, anterior hairline, and direct approaches. Since then, the results from open brow-lifting procedures (coronal and trichophytic [the latter also known as the high brow-lift]) have been the criterion standard for upper facial rejuvenation. After more than 75 years they are still cited as the simplest, most dependable way to treat the patient with marked brow ptosis and excessive forehead rhytids regardless of the forehead height. In the right hands, open approaches require little special equipment, have extremely low complication rates, and provide excellent versatility and longevity.

Critics of the procedures have cited long scars, potential for persistent scalp numbness, and alopecia as the main drawbacks. Because of these potential risks, surgeons looked to minimally invasive techniques as a possible answer. During the 1970s and 1980s, innovations in endoscopic approaches revolutionized orthopedics, general surgery, and gynecology. In the wake of this success, virtually every specialty saw potential for endoscopic application to their particular fields. In 1992, Core et al, Vasconez, and Isse introduced the use of endoscopic equipment to brow lifting. Surgeons adopting this approach cited less morbidity and better patient acceptance as the major reasons for switching. Results in the first 10 years were good, but early published series suggested a steep learning curve and early recurrence of ptosis, leading to a shift back to open approaches for many surgeons. However, recent advancements in methods of fixation have led to more enduring results and ultimately better patient and surgeon acceptance of the technique.

At present, the endoscopic forehead-lift and its variations have become accepted surgical techniques and for some surgeons are the procedures of choice for upper face rejuvenation.

With more surgeons adopting the endoscopic techniques at large training facilities and the equipment industry growing in parallel, younger surgeons are less familiar with the simpler open techniques. As with any technique with which one is unfamiliar, certain stereotypes come to replace first-hand knowledge and experience. It is now fairly common to see...
quoted in the literature as fact the idea that the open techniques are “fraught with difficulties” such as poor patient acceptance and satisfaction and high morbidity. In reality, most surgeons comfortable with the open techniques find patient satisfaction and complication rates comparable to or better than those of endoscopic series. With this in mind, the purpose of this study was 3-fold.

First, we reviewed a large series of open approaches and techniques were reviewed as well. The second aspect was a comparison rates. The coronal and trichophytic techniques find patient satisfaction and complication rates comparable to or better than those of endoscopic series. The third part of the study looked at the role of “description bias” in patient perceptions of complications and overall satisfaction with the open procedure outcomes. The third part of the study looked at the role of “description bias” in patient perceptions of complications and overall satisfaction with the open procedure outcomes. The third part of the study looked at the role of “description bias” in patient perceptions of complications and overall satisfaction with the open procedure outcomes.

Figure 1. One-page questionnaire sent to patients who underwent open forehead procedures from 1993 to 2005.

1. I underwent a (circle one): “HIGH” brows-lift (incision at the hairline) (incision further back in hair)
   CORONAL        brow-lift
   (incision at the hairline)

2. My scar is (circle one): *UNACCEPTABLE
   *ACCEPTABLE
   *EXCELLENT

3. In the 2 wk after my surgery, my pain from my forehead was, in general (circle one number):
   1 2 3 4 5 6 7 8 9 10
   NONE MODERATE SEVERE

4. In the 2 wk after my surgery, I had severe eye irritation requiring drops (circle one) (please indicate if you underwent eyelid surgery at the same time)
   YES NO
   [Eyelid Surgery: yes no ]

5. I had all of the feeling back in my forehead in (circle one):
   2 mo 4 mo 6 mo 8 mo
   NEVER (I still have areas of numbness)

6. I still have noticeable patches of hair loss around my incision line (circle one):
   YES NO

7. After surgery I had weakness of one or both eyebrows that persists even now:
   YES NO

8. Overall, I am satisfied with my outcome:
   YES NO

9. I would recommend this procedure to a friend:
   YES NO

10. Knowing what I know now, I would undergo this procedure again:
    YES NO

Please place this form into the envelope provided and mail back to the Hedgewood Surgical Center as soon as possible. Thank you for your help!

**METHODS**

**CHART REVIEW**

The anesthesia records for all open forehead cases performed by one of us (C.M.J.) at the Hedgewood Surgical Center in New Orleans, Louisiana, from June 1, 1993, to May 31, 2005, were reviewed. A review of the patients’ clinical records was then conducted. Data regarding patient age, sex, type of brow-lift procedure (coronal vs trichophytic), complications, and need for revision were collected and examined.

**QUESTIONNAIRE**

A 1-page confidential questionnaire (figure 1) was mailed to all patients identified as having a clinical record. The mailing included a cover letter that explained the purpose of the study to the patients and provided simple instructions on how to complete the form. The aim of the questionnaire was to gauge patient satisfaction with regard to common complications and overall outcome.

**SURVEY**

The survey we conducted was judgmental, and volunteers were drawn from a selected group of individuals designed to resemble the patients seen at an average facial plastic surgery clinic. A single table was set up at a local upscale mall on 2 separate occasions (designated table A and table B). Each table had a different survey to hand out, but the personnel administering the survey were blinded to the content of each survey to minimize observer/interviewer bias. Respondents were white women aged 30 to 70 years (mean age, 50 years; range, 36-63 years) with annual household incomes greater than $50 000. Subjects who had undergone an upper facial rejuvenation procedure or a consultation for such a procedure were excluded to avoid contamination by previous opinion bias. Health care workers were also to be excluded, but none was encountered. The survey administered consisted of a single weighted-choice scenario in which the respondent was asked to read 2 carefully prepared, intentionally biased descriptions of upper-face rejuvenation procedures and then asked, on the basis of the 2 descriptions, to choose which they would rather undergo. The choices were “Number 1,” “Number 2,” and “I don’t know,” designated as 1, 2, or 3. Table A administered surveys with descriptions that obviously favored the endoscopic approach to brow-lift (figure 2). Table B administered surveys favoring the open approach (figure 3). Procedural descriptions used at tables A and B were taken from commonly used explanations provided on a host of readily accessible plastic surgery Web sites found by searching for forehead-lift. In each case, no erroneous information was used. At each table, interviewers were instructed to enroll and administer the survey to the first (consecutive) 100 individuals who met the criteria. The data from both tables were compiled and analyzed by the χ2 test on SPSS statistical software (SPSS Inc, Chicago, Illinois).

**SURGICAL PROCEDURES**

Both the coronal and trichophytic approaches have been described in detail elsewhere, but important aspects of the 2 approaches are reviewed as follows. All procedures are conducted with the patient under general anesthesia. The decision to use the coronal or trichophytic approach depends on the height and shape of the forehead. Patients with high or curved foreheads generally undergo the trichophytic approach, whereas the coronal approach is used on lower, straighter foreheads. The key to success in both approaches lies in attention to detail when incising the scalp, gentle tissue handling, and meticulous closure. In the trichophytic approach, the incision is placed in the gradual transition zone between the thick hair of the scalp and the thin wisps of hair at the anterior hairline. A short row of these anterior hairs is trimmed with scissors, and the lateral extensions enter the coronal plane for 4 to 5 cm bilaterally and are shaved. The incision must be situated far enough into the temporal area to allow an appropriate arc of rotation.
to turn down the scalp flap while not extending so far laterally that it disturbs the temporal hairline. Along the anterior hairline, the surgeon should follow the subtle wavy pattern of the normal hairline.

The coronal incision is made in a longhorn shape and the entire strip is shaved. The strip should be at least 5 to 6 cm behind the patient's hairline. In both cases, the surgeon decides on the amount of skin to be excised at the beginning of the procedure and marks it accordingly. This is accomplished by assessing the positional change of the patient's brow while the patient was asleep on the table, combined with the surgeon's operative experience. Generally, this amounts to a 1- to 2-cm excision of scalp to obtain the desired effect. Once the incisions are drawn, local anesthetic (an equal mixture of lidocaine, 0.5%, with 1:100,000 epinephrine and bupivacaine hydrochloride, 0.5%, with 1:200,000 epinephrine) is injected along the incision lines and in the subgaleal plane of dissection. The supraorbital and supratrochlear nerves are also blocked, and the corrugator and procerus muscles are injected to assist with anesthesia and hemostasis during their dissection. The patient is then prepared and draped in a sterile fashion.

The beveling of the brow-lift incisions is the true key to their postoperative camouflage. All incisions are made with a No. 10 Bard Parker blade to the level of the galea. In the coronal brow-lift, the bevel is parallel to the axis of the hair follicles throughout the length of the incision. This minimizes the loss of hair follicles and provides for an incision that is completely surrounded by patient hair. The trichophytic incision involves 3 distinct regions of beveling. This feature, combined with the wavy pattern of the incision, creates the most natural hairline. The lateral aspect of the incision is similar to the coronal incision with parallel beveling for follicle preservation.

Once the incisions have been made, the incised portion of redundant scalp is removed. Careful hemostasis is obtained by means of the electrocautery device. The surgeon is careful to cauterize only at the level of the galea to minimize direct damage to the follicles. Regardless of the incision, the scalp is then elevated in the "sliding plane" just deep to the galea. At the superior orbital rim, the supraorbital neurovascular bundle is identified and preserved. The nerves are located by palpation or by following the plexus of small vessels that lead to the main neurovascular bundle along the pericranium. It is important to remain in the correct plane of dissection laterally to protect the frontal branch of the facial nerve. After the entire flap has been raised over the orbital rim and into the superior aspect of the orbit, the glabellar musculature is addressed. The medial 2 cm of corrugator is dissected free from the surrounding soft tissue. Every attempt is made to identify and preserve the branches of the supratrochlear nerve that course through the substance of the corrugator. At the level of its bony attachment, the entire corrugator is grasped and removed from the bone with bipolar cautery. The goal is to completely remove a strip of muscle and separate the cut end from the bony point of attachment. The procerus muscle is then treated by simple myotomy, as is the medial frontalis aponoeurosis at the level of the most prominent rhytid. This flattens out the overlying rhytids while preserving the natural dynamic motion of the lateral brow. At the end of the procedure, a single small, round drain is placed and a meticulous closure is performed.

RESULTS

CHART REVIEW

According to anesthesia records, a total of 1052 open forehead procedures were performed, 660 coronal and 392 trichophytic. Clinical records were available on 1004 total procedures, 628 coronal and 376 trichophytic. The average and median ages were 54.2 and 53.0 years, respectively. The youngest patient was 36 years old and the old-

Figure 2. The version of the weighted-choice survey presented at table A, clearly favoring the endoscopic approach. Subjects were asked to choose between the 2 procedures by answering "Number 1," "Number 2," or "I don’t know." The answers were recorded on a separate sheet and placed in an envelope with the observers blinded.

Figure 3. The version of the weighted-choice survey presented at table B, clearly favoring the open approach. Subjects were asked to choose between the 2 procedures by answering "Number 1," "Number 2," or "I don’t know." The answers were recorded on a separate sheet and placed in an envelope with the observers blinded.
the results to be excellent. Temporary postoperative eye irritation requiring the use of drops was reported in 41 patients (9.9%). Approximately 1% of the respondents (4 of 416) reported alopecia that was persistent. Postoperative pain responses and incidence of persistent numbness are shown in Figure 4 and Figure 5, respectively. Responses on overall satisfaction indicators were as follows: “Overall, I am satisfied with my outcome,” 414 of 416 (99.5%); “I would recommend this procedure to a friend,” 410 (98.6%); and “Knowing what I know now, I would undergo this procedure again,” 408 (98.1%).

SURVEY

On the survey with the weighted questions, subjects overwhelmingly chose the scenario that was favorably presented ($\chi^2=9.44 \times 10^{-9}$). The responses were as follows: for table A, 82% selected the favorably weighted scenario, 1% selected the unfavorably weighted scenario, and 17% selected “I don’t know.” For table B, the corresponding percentages were 89%, 2%, and 9%.

COMMENT

For nearly a century, surgeons have recognized the aesthetic value of treating the upper third of the face alone or in combination with lower-face rejuvenation. Pioneers in the field described ellipsing pretrichial skin to help smooth the forehead and soften crow’s-feet. Since that time, numerous approaches have been developed to raise the ptotic brow and smooth the temporal region; these include coronal, trichophytic, midforehead, direct brow, endoscopic, and transblepharoplasty techniques. For most of this time, the coronal and trichophytic approaches have been the criterion standard because of their excellent results and low morbidity. With the introduction of the endoscopic approach in 1992, many surgeons have championed the new approach, and an entire industry has been built on the equipment and various fixation devices necessary to perform the lift. In a recent article by Pedroza et al., the authors reviewed the “latest findings in the constantly changing field of brow and forehead lifting.” They make the assumption that the coronal approach has lost favor because of the lack of recently published articles within the preceding 24 months. The major advantages of endoscopic forehead lifting are now listed as less alopecia, less overall morbidity, and higher patient acceptance and satisfaction. Their review article provides an excellent backdrop for discussing the results of the current study. Although previously published series of open brow-lifts have demonstrated low complication rates, they lacked any real power. The present study represents one of the largest series to date, with objective (clinical record review) complication rates that compare favorably with subjective (patient questionnaire) data in the same study. Moreover, both sets of data reflect equal or, in some cases, lower complication rates than those in published endoscopic series.

Although concordance of 2 separate data sources is comforting, shortcomings of the data need to be highlighted. Clinical record reviews represent physician assessments of

QUESTIONNAIRE

Of a possible 1004 patients with records, only 814 had current addresses. Of these mailings, 164 were returned by the post office as undeliverable (most likely related to Hurricane Katrina in August 2005). Four hundred thirty-two were returned completed and, of these, 16 were rejected because of incomplete adherence to instructions. The overall response rate was 41.43%. However, taking into consideration that 35.26% (354 of 1004) of the patients never received the mailing, the adjusted response rate was 64.0% (416 of 650). No patients questioned found their scar to be unacceptable, 32 (7.7%) found it to be acceptable, and 384 (92.3%) found
patient outcome. One must consider underreporting of complications as a small but real source of error. However, this is no more true for the present study than it is for any other. Also, information collected with an anonymous questionnaire often provides subjective, unconfirmed data, which may lack the validity of data collected as part of a well-designed prospective study. The 2 sets of data taken together, however, offer compelling evidence that open procedures are safe and well accepted by patients. This is in stark contrast to what is sometimes reported in the brow-lift literature. Often one approach’s shortcomings are exaggerated to highlight the benefits of the authors’ approach. We believe that articles advocating one method or approach as “superior” to another are missing the point. There are many forehead rejuvenation techniques available to the facial plastic surgeon. To maximize patient satisfaction, selection of the appropriate technique should be based on a balance between patient characteristics (anatomic and functional), patient desires, and the physician’s abilities. Far too often, surgeons choose sides in what becomes a purely philosophical debate. This brings us to the final aspect of our study, namely, patient acceptance.

Many surgeons, regardless of preferred approach, believe that patient preference drives what we choose to offer surgically. In reality, surgeons will tailor their description of procedures to fit their perception of what will be best for the patient. Often this reflects what the surgeon is comfortable with performing. The survey that we conducted was designed to quantify what amounts to common sense. As surgeons we have a great deal of influence over what is “acceptable” to patients. By changing the tone of our description of 2 procedures, we were able to completely reverse the subjects’ choice of a favored approach. This does not mean that every patient is easily swayed, but it does suggest that the surgeon’s bias during consultation can have a great influence on patient opinion of a particular procedure. Knowing this allows the surgeon more freedom to let objective variables guide technique selection. Thus, in reality, the “best” procedure is the one the surgeon believes will give the best result in his or her experience.

In 2001, a national plastic surgery survey\textsuperscript{20} reported that about half the surgeons who responded to the survey performed open brow-lift procedures and half performed the procedure endoscopically. More current data may show more extensive use of the endoscopic approach, but this is speculation. While the endoscopic brow-lift offers the surgeon another approach to upperface rejuvenation, it does not constitute a paradigm shift. Although an entire industry is being built on the equipment needed to perform endoscopic cosmetic surgery, surgeons should guard against the tail wagging the dog. Just because something is new does not necessarily make it better. Many combination procedures (ie, open trichophytic-endoscopic) are being developed that deal with shortcomings of endoscopic surgery, such as brow-lifting in patients with long foreheads. Ideally a surgeon should be comfortable with a host of procedures and be able to offer patients the type of procedure that is most comfortable for both of them.

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REFERENCES