

## The Evolution Of Subcutaneous Brow Lift: A Comparative Analysis Of Outcomes And Complications

## Subkütan Kaş Kaldırma Cerrahisinin Evrimi: Sonuçların Ve Komplikasyonların Karşılaştırmalı Analizi

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## ABSTRACT

**AIM:** This study aims to analyze and compare the results of three different subcutaneous brow lift techniques: Fogli temporal lift, pretrichial brow lift, and gliding brow lift.

**MATERIAL AND METHOD :** Thirty-three female patients underwent brow lift surgery between July 2022 and September 2021. Initially, eighteen consecutive patients were operated with either the temporal lift technique or pretrichial brow lift technique based on their forehead length. Then, fifteen consecutive patients underwent the gliding brow lift surgery regardless of their forehead length. Age, type of anesthesia, other accompanying surgical procedures, and postoperative complications including presthesia in the scalp, incisional postoperative healing problems, unfavorable incisional scarring, non-incisional healing problems, hypopigmentation, hyperpigmentation, neuropraxia of the frontal branch, recurrence, and hematoma were analyzed based on the type of the brow lift technique retrospectively.

**RESULTS:** The average follow-up period was 13.6 months (range, 9-21 months). In the gliding brow lift, the most common complications were transient scalp paresthesia (47%), non-incisional healing problems (27%), and small areas of hypopigmentation in the forehead skin (20%). The most common complications of the temporal lift were the unfavorable incisional scarring (85%) and transient (77%) or permanent (31%) paresthesia in the scalp. The rate of postoperative small incisional problems (80%) and scarring (60%) were high in the pretrichial subcutaneous brow lift. None of the patients required a revision surgery or had a permanent frontal branch injury.

**CONCLUSION:** There has been a trend toward the minimally invasive techniques in periorbital rejuvenation. The ideal technique should have minimal morbidity and provide long-lasting effects. This study demonstrates that the gliding brow lift technique is a promising and minimally invasive technique with pleasing outcomes in brow rejuvenation.

**Keywords:** Browlift, Fogli, hairline, periorbital, pretrichial, temporal lift

## ÖZET

**AMAÇ:** Bu çalışma, üç farklı subkütan kaş kaldırma tekniğinin sonuçlarını analiz ederek karşılaştırmayı amaçlamaktadır: Fogli temporal germe, saç önü (pretrichial) kaş kaldırma ve gliding kaş kaldırma.

**GEREÇ VE YÖNTEM:** Otuz üç kadın hastaya kaş kaldırma ameliyatı gerçekleştirildi. Başlangıçta ardışık on sekiz hastaya alın uzunluklarına göre ya temporal germe ya da saç önü kaş kaldırma ameliyatı yapıldı. Ardından, alın uzunluğuna bakılmaksızın ardışık on beş hastaya gliding kaş kaldırma ameliyatı gerçekleştirildi. Kaş kaldırma tekniğinin türüne göre skalpte parestezi, insizyonel iyileşme sorunları, belirgin insizyon skarı, insizyon dışı iyileşme sorunları, hipopigmentasyon, hiperpigmentasyon, frontal dal nöropraksisi, nöks ve hematoma retrospektif olarak incelendi.

**BULGULAR:** Ortalama takip süresi 13,6 ay (9-21 ay) idi. Gliding kaş kaldırmada en sık görülen komplikasyonlar skalpte geçici parestezi (%47), insizyon dışı iyileşme sorunları (%27) ve alında küçük hipopigmentasyon alanları (%20) idi. Temporal germenin en sık görülen komplikasyonları skalpte belirgin insizyonel skar (%85) ve geçici (%77) ya da kalıcı (%31) parestezi idi. Saç önü subkütan kaş kaldırmada insizyonda küçük iyileşme sorunları (%80) ve belirgin skar (%60) oranı yüksekti. Hiçbir hasta revizyon cerrahisi geçirmede. Hiçbir hastada kalıcı frontal dal hasarı görülmedi.

**SONUÇ:** Periorbital gençleştirmede minimal invaziv tekniklere doğru bir eğilim olmaktadır. İdeal teknik minimal morbiditeye sahip olmalı ve uzun süreli etkiler sağlamalıdır. Bu çalışma, gliding kaş kaldırma tekniğinin, kaş gençleştirmede minimal invaziv nitelikte ve memnuniyet verici sonuçlarıyla umut vadeden bir teknik olduğunu göstermektedir.

**Anahtar kelimeler:** cilt altı, Fogli, kaş kaldırma, periorbital, saç çizgisi, temporal germe

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## INTRODUCTION

The knowledge of aging-related changes in the periorbital region and interventions for periorbital rejuvenation is of great importance in plastic surgery. Various brow lift techniques have been debated for decades by plastic surgeons, and the best technique is yet to be determined.<sup>1-8</sup> Each technique has its own advantages and disadvantages.

Recently, a shift towards less invasive techniques has begun in brow lift surgery. Transcoronal brow lift,<sup>2</sup> Fogli temporal lift,<sup>3</sup> pretrichial brow lift,<sup>6</sup> internal browpexy,<sup>9</sup> direct brow lift,<sup>10</sup> endoscopic brow lift,<sup>11</sup> gliding brow lift (GBL),<sup>4</sup> chemical brow lift,<sup>12</sup> and thread lift<sup>13</sup> are popular techniques in brow elevation. The plastic surgeon is responsible for establishing a balance between patients' expectations and surgical techniques. Durability of the brow elevation, postoperative scarring, paresthesia in the scalp, hairline distortion, frontal branch injury, and hematoma are important parameters in deciding the right technique.

Chemical brow lift and thread lift are associated with short-term brow elevation.<sup>12,13</sup> Transcoronal brow lift is an invasive approach and only performed in selected cases due to its long scar and postoperative paresthesia.<sup>2,5</sup> Direct brow lift is reserved for a selected patient group who will not complain about the scar over the brow.<sup>10</sup> However, in most cosmetic cases, patients desire a well-concealed scar. Internal browpexy is a good adjunct in upper blepharoplasty, however it has a moderate effect with restricted brow elevation and causes irregularities over the brow.<sup>14</sup> Endoscopic brow lift is a popular technique due to its less invasive nature. It has a long learning curve and necessitates endoscope. It is not suitable for patients with high hairline, and it suffers from high recurrence rates.<sup>15</sup>

Subcutaneous techniques have been used with high satisfaction rates.<sup>4,6,16</sup> The Fogli temporal lift, pretrichial brow lift, and GBL are different subcutaneous brow lift techniques.<sup>3,4,6</sup> The GBL is a novel technique with a 5-mm incision, and involves the hemostatic net application.<sup>17</sup> This study aims to analyze and compare the results of three different subcutaneous brow lift techniques: Modified Fogli temporal lift, pretrichial brow lift, and GBL.

## MATERIAL AND METHOD

Thirty-three patients underwent brow lift surgery between July 2020 and September 2021. Patients were operated with three different subcutaneous brow lift techniques: GBL, modified Fogli temporal lift, and pretrichial brow lift. Initially, eighteen consecutive patients were operated with either the temporal lift technique or pretrichial brow lift technique based on their forehead length. The pretrichial brow lift was performed in patients with long forehead length, on the other hand, temporal lift was performed in patients who have short to normal forehead length. Then, fifteen consecutive patients underwent the gliding brow lift surgery regardless of their forehead length. Age, type of anesthesia, smoking status, other accompanying surgical procedures, and postoperative complications including paresthesia in the scalp, incisional postoperative healing problems, unfavorable incisional scarring, non-incisional healing problems, hypopigmentation, hyperpigmentation, neuropraxia of the frontal branch, recurrence, and hematoma were analyzed based on the type of the brow lift technique retrospectively. Written informed consent was obtained from all patients for the procedures performed and for the use of their images. The study protocol was approved by the Institutional Review Board of Hacettepe University Faculty of Medicine (approval date and no: 04 Jan 2022, GO: 22/33). This study adhered to the principles of the Declaration of Helsinki.

**Surgical techniques**

The pretrichial brow lift surgery is performed in the subcutaneous plane. A hairline incision parallel to the hair shafts is employed. Excess skin is removed following surgical brow elevation. Special care is taken to close the incision with minimal tension. No drains are used.

The modified Fogli temporal lift incision is placed 3 cm posterior to the hairline to conceal the postoperative scar. Incision is placed in a most appropriate position to give the lateral brow a desired shape. Dissection begins over the deep temporal fascia and periosteum in the subgaleal plane not to injure hair follicles. Then, the dissection plane changes to the subcutaneous plane just anterior to hairline. Excess scalp tissue can be removed after brow elevation, if desired. No drains are used.

The GBL procedure is performed using two special blunt dissectors designed

by the author



Figure 1

which are very similar to the ones designed by Viterbo but have small modifications.<sup>4</sup> A 5-mm hairline incision is made to allow entry of the dissectors. After tumescent infiltration into the subcutaneous plane, the skin is elevated bluntly in the subcutaneous plane, and the brow is elevated. Gliding motion of the brow and lateral forehead skin over the underlying soft tissue is seen while the skin is pulled upwards with two skin hooks. The hemostatic net is applied for four reasons: (1) to elevate the brow, (2) to cause adhesions between the skin flap and underlying tissue, (3) skin adaptation and redistribution in the upper half of the forehead, and (4) hemostasis. No drains are used.

The two sutures placed around the brow were removed 5 days after surgery in all GBL patients. Remaining sutures were removed no later than 48 hours (in average, 36 hours after surgery) in the last 10 cases. At the beginning, the hemostatic net sutures of the forehead were removed 3 days after surgery in the first 5 consecutive GBL patients.

## RESULTS

The average follow-up period was 13.6 months (range, 9–21 months). All patients had some degree of brow ptosis preoperatively. All patients were female. The number of patients operated with the GBL, temporal lift, and pretrichial brow lift was 15, 13, and 5, respectively. The average age of the patients was 42.8 years (range, 28–58 years). 94% of all cases were performed in combination with other procedures. 18% were operated under local anesthesia. Patients' characteristics and intraoperative findings are shown in

Table 1. Patients' characteristics and intraoperative data of the three brow lift techniques.

	Gliding Brow Lift (n=15)	Temporal Lift (n=13)	Pretrichial Brow Lift (n=5)	Total (n=33)
Age (yrs)	41.2	43.8	45.2	42.8
<b>Anesthesia</b>				
General	11	12	4	82%
Local	4	1	1	18%
Smoking	8	7	3	55%
<b>Combination</b>				
None	1	1	-	6%
Facelift	4	3	-	21%
Necklift	3	2	-	15%
Midface lift	1	-	-	3%
Lipofilling	4	2	2	24%
Upper blepharoplasty	11	8	3	67%
Lower blepharoplasty	4	6	2	36%
Rhinoplasty	-	2	-	6%
Lateral canthopexy	13	10	2	76%
Chin implant	2	-	-	6%

Comparison of the techniques

In the GBL technique, the most common complications were transient scalp paresthesia (47%), non-incisional healing problems (27%), and small areas of hypopigmentation in the forehead skin (20%). The blunt dissection resulted in minimal to no bleeding, therefore the electrocautery was not used. The hemostatic net was utilized to prevent hematoma or seroma accumulation postoperatively. The hemostatic net was also used to increase skin adaptation and adherence to the underlying soft tissue, and to elevate the brow

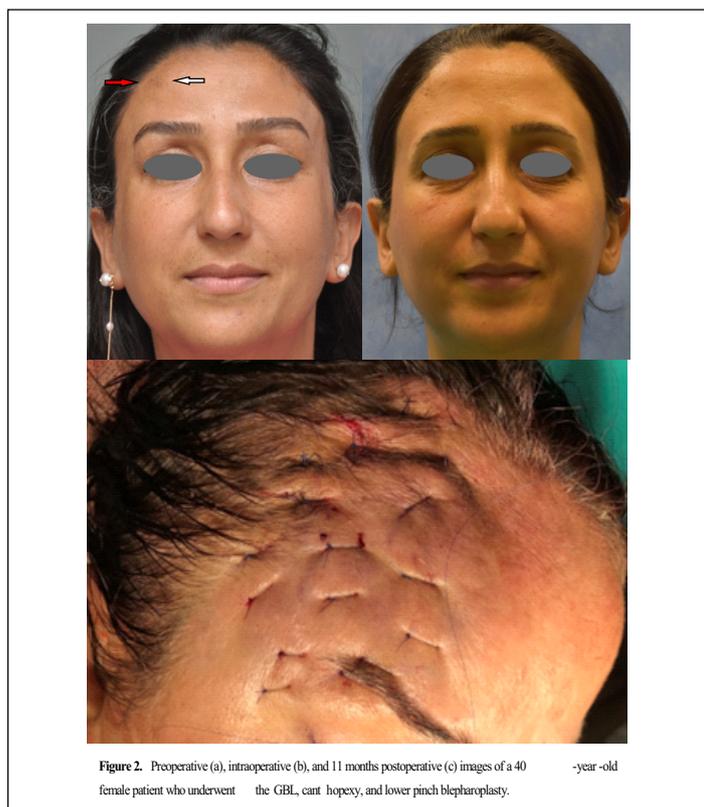


Figure 2

None of the GBL patients had hematoma. In the first 5 GBL patients, forehead sutures were removed 3 days after surgery. However, this resulted in suture-related ischemic problems leading to non-incisional healing problems in three patients, and hypopigmentation in two patients. Therefore, the forehead hemostatic net sutures were removed around 36 hours after surgery to decrease the rate of non-incisional healing problems in the remaining 10 patients. Among these, only 1 patient experienced a hemostatic net related ischemic problem leading to hypopigmentation in a small area. These small hypopigmentations are well tolerated by patients. The two sutures placed around the brow did not cause any ischemic problems even though they were removed 5 days after surgery to increase the adherence. All irregularities caused by the hemostatic net were disappeared until 1 month after surgery.

The most common complication of the Fogli temporal lift was the unfavorable incisional scarring (85%). Although the incision is placed in the hair-bearing-scalp, they tend to widen over time

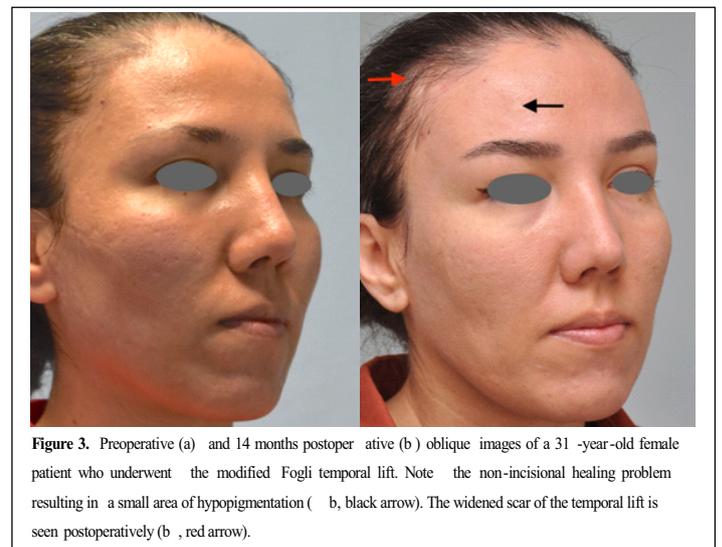


Figure 3

None of these patients underwent a scar revision surgery. Transient (77%) or permanent (31%) paresthesia in the scalp was also another common complication of this technique because the incision reaches the deep temporal fascia and transects all neurovascular structures located in the subcutaneous level.

It should be noted that the subcutaneous brow lift techniques can also eliminate or decrease forehead wrinkles, which can be considered as a secondary beneficial effect of these techniques



Figure 4



Figure 5. Preoperative (a), two weeks postoperative (b), and 16 months postoperative (c) images of a 46-year-old female patient who has a long forehead length underwent the pretrichial brow lift, lower pinch blepharoplasty, and lipofilling. Bilateral incisional healing problems are seen two weeks after the surgery (b). Although care was taken to minimize tension on the incision, the rate of postoperative small incisional problems (80%) and scarring (60%) were high in the pretrichial subcutaneous brow lift

Subcutaneous sharp dissection causes bleeding which necessitates the use of electrocautery in the pretrichial brow lift and temporal lift cases. This increases the risk of non-incisional healing problems and neuropraxia of the frontal branch. There were no permanent frontal branch injury cases in this study. One patient operated with the temporal lift technique underwent hematoma drainage under local anesthesia. Details of the postoperative complications are listed in

Table 2. Postoperative complications.

Complications	Gliding Brow Lift (n=15)	Temporal Lift (n=13)	Pretrichial Brow Lift (n=5)
<b>Paresthesia</b>			
Transient (mos)	7	10	2
Permanent	-	4	-
<b>Incisional postoperative healing problems</b>	1	3	4
<b>Unfavorable incisional scarring</b>	1	11	3
<b>Non-incisional healing problems</b>	4	2	1
<b>Hypopigmentation</b>	3	1	2
<b>Hyperpigmentation</b>	1	-	-
<b>Frontal branch neuropraxia</b>	-	1	-
<b>Recurrence</b>	-	-	-
<b>Hematoma</b>	-	1	-

## DISCUSSION

Brow lift procedures have evolved from the most invasive technique, such as a transcoronal brow lift, to a minimally invasive approach, such as a GBL, over the past century.<sup>2,4</sup> Currently, there is no consensus on which brow lift technique is the most durable and safe. As we learn more about the anatomy, and see long-term results of each technique, we can refine our techniques to reach the best outcome. In this study, evolution of the author's brow lift technique has been demonstrated by comparing the results of the three different techniques.

It is of utmost importance to understand the ideal brow shape. There are two important principles in female brow rejuvenation: (1) The lateral end of the brow should be located slightly higher than the medial end, and (2) The brow peak should be located between medial two-thirds and lateral one-third.<sup>18,19</sup> On the other hand, to reach these goals, we need to use the best technique that has long-lasting results, and causes minimal scars, zero to minimal paresthesia, and minimal postoperative complications.

The idea of subcutaneous brow lift has been embraced by plastic surgeons as it results in long-lasting results due to the strong attachments caused by fibrosis between the skin flap and underlying soft tissue.<sup>4</sup> Although there was no recurrence in this study, the average follow-up period was 13.6 months (range, 9-21 months). This means some of the patients did not have a long-term follow-up. Another minimally invasive technique is the endoscopic brow lift. This procedure relies on the adhesion between the underlying bone and the repositioned periosteum. However, there are controversial results on the strength of the periosteal readhesion in different experimental studies.<sup>20,21</sup> There is still an ongoing debate on the high recurrence rates of the endoscopic brow lift.<sup>5,15</sup> Another feature of the endoscopic brow lift is the elongation of the forehead as the hairline is pulled backwards.

As the frontal branch of the facial nerve runs under the frontalis muscle and superficial temporal fascia, the subcutaneous brow lift procedures are safe in terms of nerve injury.<sup>22</sup> None of the patients had a permanent frontal branch injury in this study. Furthermore, blunt subcutaneous dissection is an atraumatic technique which minimizes bleeding and obviates the use of electrocautery in the GBL surgery.

Considering the postoperative complications of the three techniques, the Fogli temporal lift has a high risk of postoperative paresthesia and incisional scarring. Despite the incisional closure with minimal tension, this scar tends to widen over time which might be visible although it is located in the hair-bearing-scalp. In the temporal lift, it is safer to place the incision lateral to the temporal crest not to injure the deep branch of supraorbital nerve to prevent scalp paresthesia. However, the location of the incision is determined by the desired postoperative brow shape and patient's anatomy. Some patients' peak of brow is located medial to the crest which requires medial placement of the incision to give the brow a better shape. Those patients have a high risk of postoperative paresthesia if operated with the Fogli temporal lift technique.

The pretrichial brow lift is a relatively easy procedure. Elliptical skin excision is performed. Patients with a short forehead length are not ideal candidates for this technique as it shortens the forehead. Additionally, patients with indistinct and sparse hair should not undergo this technique as the hairline scar will be apparent. In the present study, incisional small healing problems were encountered in patients operated with the pretrichial brow lift technique as the skin flap is thin, and it is impossible to close the incision with no tension.

The GBL is a novel approach in brow rejuvenation. It can be performed under local anesthesia unless it is combined with other procedures. On the other hand, endoscopic brow lift is performed under general anesthesia. In the GBL surgery, only a 5-mm incision is made for the entry of the blunt dissectors on each side. The rate of incisional healing problems is low (7%) as there is only a small incision in the GBL technique. In other subcutaneous techniques, 4-5 cm incisions are used which increases the risk of incisional healing problems and scarring. Moreover, non-incisional healing problems can be seen in these techniques due to sharp dissection and use of electrocautery. In this study, 3 out of 18 patients operated with the Fogli temporal lift and pretrichial brow lift techniques had non-incisional healing problems. These problems can lead to hypopigmentation of the skin in the long-term. Blunt dissection is relatively easy to perform with the blunt dissectors. It is performed rapidly; however, additional time is necessary to apply the hemostatic net for brow elevation and skin adaptation. Theoretically, this technique cannot cause a permanent

paresthesia as the deep branch of the supraorbital artery runs in the subgaleal plane at this region.<sup>23</sup> Blunt dissection minimizes the risk of other neurovascular injury. This technique has no risk of alopecia or forehead lengthening as the hair-bearing skin remains intact. In selected cases, a few entries with the blunt dissector having a straight tip can be performed to distribute the skin if the skin buckling is excessive at the hairline. But, it is not necessary in almost 90% of the cases as the skin can be adapted easily by the net sutures as described by Viterbo et al.<sup>4</sup> The present study showed that the ischemic non-incisional healing problems can be seen if the sutures are removed 3 days after surgery. Although, these small ischemic regions heal well with minimal hypo- or hyper- pigmentations and are well tolerated by patients, removal of the sutures around 36 hours after surgery results in similar outcomes with a lower risk of non-incisional healing and pigmentation problems.

There are several limitations of the present study. First, the study had a limited number of patients. Therefore, statistical analysis of the results could not be performed. Second, this was a retrospective study based on the experience of a single surgeon. Further clinical prospective studies including the procedures other than the subcutaneous techniques should be designed to better analyze the efficacy of the brow lift techniques.

### CONCLUSION

There has been a trend toward the minimally invasive techniques in periorbital rejuvenation. The ideal technique should have a minimal morbidity and long-lasting effects. This study demonstrates that the GBL technique is a promising and minimally invasive technique with pleasing outcomes.

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