

Endoscopic Forehead Lift: Screws and Temporal Fasciae Sutures, Versus Concentric Double Cable Fixation in Suspension of the Forehead*

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ABSTRACT

Fixation of the elevated eyebrow is an important final step in endoscopic forehead lifting. The most common methods of fixation include temporal fasciae sutures for the tail of the eyebrow, and miniscrews for the body of the eyebrow. An alternative method of fixation is presented in this study. The concentric cables fixation elevates both the tail and the body of the eyebrow. Twenty one cases were included in the current study. They were divided into two groups: Group A cases were fixed by the traditional methods; while in group B cases, the concentric cables were used to suspend the forehead. Comparable stability over six months period was shown using both techniques. Elevation of the tail of the eyebrow using the traditional method was 6.5mm. The concentric cables led to 6.4mm elevation. The body of the eyebrow was elevated by 6.3mm and 4.9mm using traditional and concentric cables respectively. Fewer complications were noted for the concentric cables when compared with the traditional methods of fixation.

INTRODUCTION

Since its popularization in the mid-1990's by the pioneering works of Isse and Ramirez, endoscopic forehead lift has established its place in the field of facial rejuvenation [1,2]. In a survey of different forehead lifts procedures used by plastic surgeons in 2001, Elkwood et al., documented that an increasing number of surgeons are using this technique compared to the traditional forehead (coronal) lift [3]. The advantages of the technique include: Avoiding a long scar, less alopecia, no sacrifice of hair-bearing scalp and, a better control of the muscle imbalance between elevators and depressors of the brow [4].

The classical steps of an endoscopic forehead lift include: Small incisions, tissue dissection and modifications (release and myotomies) and, fixation

of the elevated forehead. Fixation is performed in two areas: Laterally to elevate the tail of the eyebrow and, medially to elevate its body. The lateral eyebrow is elevated and fixed by suturing the superficial temporal fascia (of the lower incision), to the deep temporal fascia in an elevated position [5,6,7]. There exists several techniques to fix the elevated body of the eyebrow. They include: Sutures in subperiosteal tunnels to the occipital scalp, sutures in cortical tunnels, and a recently-introduced bioabsorbable device called endotine [8,9]. However, the most commonly-used technique is suturing the lower and of the incision to a cortical miniscrew that is fixed to the frontal bone [6,7].

Temporal fasciae sutures commonly resulted in a visible depression at the suture site with a high incidence of stitch infection. For that reason, Isse in 1999 introduced the cable fixation to simultaneously elevate the tails of both eyebrows [10]. A 3-0 Nylon suture was sutured to the upper ends of both temple incisions and as it was tightened, the tails of both eyebrows were pulled to an elevated position. Elevating the body of the brow-by fixing the forehead to cortical screws-was accompanied by some side effects. The idea of having a screw attached to the skull was sometimes not accepted by cosmetic patients. The screws were occasionally felt under the scalp, and infection with extrusion of the screw occasionally occurred. Removing the screws under local anaesthesia is commonly performed. Concerns about penetration of the inner table of the frontal bone were also raised [7,8,9]. An alternative method to elevate the body of the eyebrow was introduced in the current study. A second cable suture that attached to the upper ends of the lateral forehead incisions was applied. As the suture was tightened, the bodies of both eyebrows were simultaneously elevated.

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The combination of the two cables previously described was called "concentric cables". In the current study, the concentric cables were compared to the traditional temporal fasciae suture and miniscrews fixation, concerning the effectiveness and the stability of the eyebrow elevation as well as the rate of complications.

PATIENTS AND METHODS

The study included 21 patients suffering from signs of aging of the upper face treated in the period from August 2004 till May 2007. They were all females with age ranging from 34-57 years (mean 47 years). All patients were medically free from any systemic disease, had no previous rejuvenation procedures done to their faces and, had no major asymmetry concerning the position of their eyebrows. The glide test as described by Sasaki in 1996 was used to select those patients who will benefit from the procedure [11]. The test consists of passive elevation of the eyebrow and measuring its excursion. All patients included in the study had at least 12mm glide in both parts (the central and the lateral) of the eyebrow.

All patients were subjected to endoscopic forehead lift, the functional forehead lift [1] with either general anesthesia or local anesthesia with sedation. Five incisions (one central forehead, two lateral forehead and, two temple incisions) were used to perform the procedure. The sites of the incisions as well as the extent of dissections were meticulously planned to ensure symmetry. Release of the temporal crest and the periosteum at the supraorbital margin was done in all cases. Orbicularis oculi myotomy (orbital part) was also routinely performed lateral to the supraorbital nerve.

Patients were divided into two groups. Group A included 10 cases where fixation was done using temporal fasciae sutures and miniscrews. In Group B, 11 cases were suspended by the concentric cables. In Group A, the superficial temporal fascia of the lower part of the temple incision was sutured to the deep temporal fascia at a higher position using 3-0 Vicryl sutures. The site of the deep temporal fascia suture was measured from a registration cut done at the time of performing the temple incision to ensure symmetry. Similar registration drill was done in the frontal bone at the inferior end of the lateral forehead incision. The cortical miniscrew (titanium, 2mm in diameter, 5mm in length) was fixed to the frontal bone at a measured distance superior to registration drill. The periosteum of the inferior end of the lateral

forehead incision was sutured to the miniscrew by a 3-0 Prolene suture. The average superior anchoring of the temporal fascia was 1.5-2cm, while that of the forehead was 1-1.5cm.

The concentric cables used in group B were performed by 2-0 Prolene sutures (Fig. 1). The first cable was passed in the superficial temporal fascia at the superior end of the temple incision on one side. The suture and the needle was then pulled from under the dissected temple and forehead to appear on the opposite temple incision. It was then anchored the superficial temporal fascia at the upper end of the incision. The suture was then retrieved from the central forehead incision where tightening the knot was performed till the desired elevation of the tails of both eyebrows was achieved. The knot was then secured. Both ends of the superficial temporal fasciae at each temple incision were repaired by a single 3-0 Vicryl suture. The second cable was applied in a similar fashion grasping the periosteum at the inferior end of both lateral forehead incisions. The knot was also tightened at the central incision site after the desired elevation of the body of the eyebrows occurred. Additional cosmetic procedures including blepharoplasty and rhinoplasty were performed as needed in each case.

To evaluate the results of both groups, two points were studied: The stability of the elevation of the eyebrow over time and the rate of complications. To test the stability of the elevation of the eyebrow, two measurements (Fig. 2) were taken from each side preoperatively and, at one, three and six months postoperatively. The first measurement was the distance between the lateral canthus and the tip of the tail of the natural eyebrow (X distance). The X distance reflects the elevation of the tail of the eyebrow. The Y distance was a measurement taken between the center of the pupil and the lower border of the eyebrow (in the same vertical) plane, reflecting the elevation of the body of the eyebrow. Complications including suture infection, extrusion, skin dimples and scar widening were documented over the 6 months period of the study.

RESULTS

General anaesthesia was used in 7 cases while local anaesthesia with sedation was applied for the remaining 14 cases. Both methods of fixation (screws and cables) were performed in the same time frame and no difficulty was encountered in either technique. Additional procedure included:

Upper blepharoplasty in 3 cases, lower blepharoplasty in 5 cases, combined upper and lower blepharoplasty in one case and, rhinoplasty in one case.

The results of the elevation of the eyebrows in all the cases of the study are shown in Table (1). The mean elevation of the tail of the eyebrow were calculated by the differences in the X distances measured preoperatively and at 1,3, and 6 months postoperatively. For the cases of group A, the numerical values were 7.4, 7 and 6.5mm respectively. Those of group B were 7.5, 6.7 and 6.4mm. The mean elevation of the body of the eyebrow was similarly calculated by the differences in the Y distances measured throughout the study. These values were 6.9, 6.5 and 6.3mm for group A, while group B had 6, 5.6 and 4.9mm of elevation.

No major complications were detected in any of the cases in the current study. Minor complications of group A cases were documented. Stich infections occurred in 4 incision sites at the temple. The condition resolved by topical antibiotics. Depression at the sites of the temple incisions occurred in all cases. It improved by the end of

the 6 months period, but remained noticeable in 5 cases. Infection and exposure of the miniscrew occurred in one site. The screw was removed under local anaesthesia and the wound healed spontaneously, however a small area (3mm) of alopecia was present at the end of the follow-up period. Two patients requested the removal of their screws due to the fact that they could feel the screws under the scalp. The screws were removed under local anaesthesia with no affection of the scar quality. In group B cases, no suture infection or extrusion was detected. The temple incision's scar quality was generally better (thinner) than those of group A. A sizable dimple was seen at the upper end of the temple incisions as the first cable was tightened. This reflected the amount of tissue laxity posterior to the lifted temple. When the second cable was applied, this dimple was reduced as the tissues were gathered more medially between the two lateral forehead incisions. A mild elevation of the scalp tissue occurred between the two lateral forehead incisions reflecting the elevation of the forehead. These previously described dimples and tissue-unevenness were reduced at one month, and were totally absent at 3 months postoperatively.

Table (1): Mean distances in mm (right side + left side divided by 2) for cases of group A (1-10) and group B (1-21).

Case	Age (years)	Preoperative		1 month		3 months		6 months	
		X	Y	X	Y	X	Y	X	Y
1	42	18	20	24.5	28	23	26.5	25	27
2	40	19.5	21.5	25.5	26	25	26.5	24.5	26
3	37	15	17	22	24.5	21.5	23.5	22.5	23
4	46	16.5	14.5	25	22	24.5	21	23	21
5	52	16	15	23	21.5	23	22	21.5	23.5
6	37	15.5	22	21.5	27	21	26	20.5	25
7	55	14	13	23	22	22.5	20.5	22	20
8	51	15.5	16	25	23	25	24	24	23.5
9	62	13.5	15.5	21	22	20	22.5	20	21
10	60	17.5	14	24.5	21	25	20.5	23.5	21
11	47	15	17	21.5	24.5	21.5	23	22	22.5
12	38	14	19.5	25.5	24.5	24	23.5	23	22
13	41	16	18	23	24.5	22	25	22.5	23.5
14	45	14.5	16.5	21	22.5	20	22	19.5	21.5
15	65	16.5	14.5	23.5	21	23	20.5	22.5	20
16	60	14.5	19.5	22	24.5	21.5	23	21	23.5
17	63	16	16	23.5	21.5	22.5	22	22	21
18	55	13.5	13.5	20.5	19	20	19.5	19	18.5
19	46	17.5	15	25	21.5	24	22	23	21.5
20	47	16	18.5	23.5	24.5	22.5	23.5	22.5	22
21	55	15	13	22	19	21	18	21	18

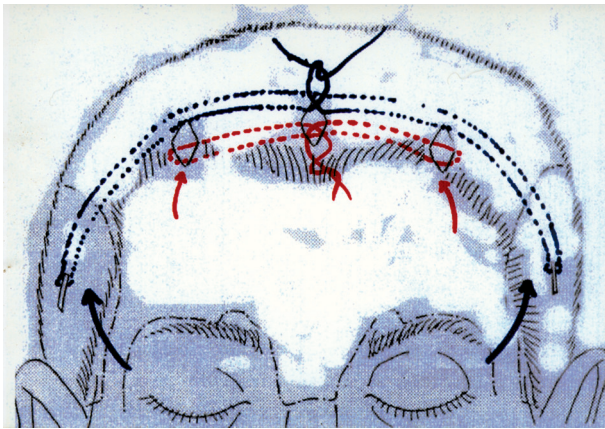


Fig. (1): Concentric cables: The first cable suture (blue) lifts the tail of the eyebrow; while the second cable (red) elevates the body of the eyebrow.

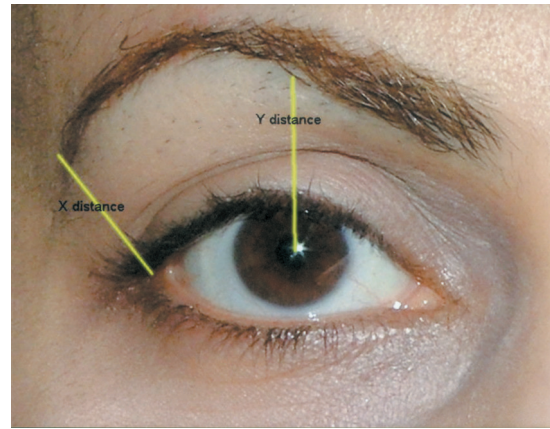


Fig. (2): While the patient is in neutral gaze, the X distance is measured between the lateral canthus and the tip of the tail of the eyebrow. The Y distance is measured between the center of the pupil to the lower border of the eyebrow.



Fig. (3): Case number 2, (A) Preoperative, (B) Postoperative view 6 months after endoscopic forehead lift and suspension by temporal fascia sutures and miniscrews. Elevation achieved was 5mm for the tail of the eyebrow and 4.5mm for the body of the eyebrow. Note the unfolding of the excess skin of the upper eyelids without upper blepharoplasty.



Fig. (4): Case number 19 (A) Preoperative (B) Postoperative view after endoscopic forehead lift with concentric cables fixation and rhinoplasty. She had an elevation of 5.5mm to the tail and 6.5mm to the body of the eyebrow.



Fig. (5): (A) Tissue gathering and dog-ears that occur when a single cable was used to elevate the tail of the eyebrow (B) Better tissue distribution with minimal dimpling when two concentric cables were used.

DISCUSSION

Traditional forehead lift techniques depend upon excising a strip of hair-bearing scalp to lift the eyebrows. The resultant long scar (coronal incision) has its disadvantages including alopecia, itching, loss of sensation posterior to the incision and, receding anterior hairline. In addition, in many of the traditional techniques of forehead lift, the frontalis muscle is cut to improve the forehead wrinkles. This results in weakening of the main eyebrow elevator muscle [3]. Endoscopic techniques on the other hand rely on tissue dissection and release of areas of adherence via small incisions without sacrificing hair-bearing scalp. The forehead depressor muscles (orbicularis, procerus, and depressor supercilli) are weakened by myotomies to allow the frontalis to work unopposed elevating the eyebrows [1,5,8]. In recent years it gained wide popularity and is currently the most commonly-used surgical technique to rejuvenate the upper face [12,13,14].

Suspension of the eyebrow is an important last step in endoscopic forehead lifting techniques. Its role is however variable for different areas of the eyebrow. To elevate the head of the eyebrow, suspension is not needed as the myotomies of the powerful depressors in the glabellar region ensure an adequate elevation. The body of the eyebrow frequently needs suspension till the periosteum adheres to the new elevated position and the frontalis maintains the elevation. In the tail of the eyebrow region, the frontalis does not act effectively. Suspension here is mandatory to lift the lateral forehead [11,14].

Suturing the superficial temporal fascia to the deep temporal fascia in an elevated position is the most commonly-used method to elevate the tail of the eyebrow. It is however accompanied by a permanent depression in this region and frequent stitch infection, as the superficial temporal fasciae of both ends are not repaired. Cable suture as an alternative method to elevate the tail of the eyebrow was developed and frequently used by Isse since 1999 [11]. However, he did not document the long-term efficacy and the side effects of this technique. The cable fixation, used in the current work, showed excellent elevation and stability overtime. It was comparable to the temporal fasciae sutures as shown by the results of the X distances in both groups. Temporal fasciae sutures (group A) had 4 incidences of complications (stitch infection) that were absent in the cases done by the cable sutures (group B). This fact was attributed to the proper repair of the superficial temporal fascia that was possible only in the cases done by the cable sutures. There is however a theoretical disadvantage of the cable suture which is the fact that the elevation is symmetrical. Considerable asymmetry in eyebrow position would not be properly corrected by cable sutures. Such cases would benefit from differential elevation by temporal fasciae sutures.

Elevation and suspension of the body of the eyebrow can be performed by several methods. Sutures in cortical tunnel are difficult to perform and carry the risk of drilling the inner table of the skull. Long sutures over gauze bolts are uncomfortable to patients and carry the risk of pressure ulceration and localized alopecia. Suture around

a miniscrew is the most commonly used method to elevate the body of the eyebrow. The technique is sometimes not tolerated by cosmetic patients and the need to remove the screws under local anesthesia is an additional disadvantage. Extrusion, migration and palpability of the screws when left buried are also viable concerns. The concentric cable introduced in this study offers an alternative method to elevate the body of the eyebrow. Results of the Y distances of group A and B revealed similar efficacy and stability of eyebrow elevation. In group A cases of this study, 3 cases had complications concerning the buried screws that necessitated screws removal (two palpability, one infection and exposure). Group B cases had only temporary dimples at the incision sites that resolved completely by the end of the study period. An additional advantage of the concentric cable was noticed when combined with the first cable. Tissue gathering at the medial end of the temple incision led to marked dimpling when the first cable was used alone (Fig. 5A). The patients usually suffered from a longstanding dog-ear at that site. When the second cable was applied, the tissue excess at the medial end of the temple incisions was distributed more medially and was easy to hide and disappeared totally over an average of three months (Fig. 5B). The theoretical limitation of the concentric cable is also the problem of asymmetric patients that would not be corrected by simultaneously elevating both bodies of the eyebrows.

Conclusion: Concentric cables fixation offers an alternative method to suspend the bodies and the tails of both eyebrows simultaneously with long term stability and fewer complications than the traditional temporal fasciae sutures and miniscrews fixation.

REFERENCES

- 1- Isse N.G.: Endoscopic facial rejuvenation: Endoforehead, the functional lift. *Aesthetic Plast. Surg.*, 18: 21, 1994.
- 2- Ramirez O.M.: The anchor subperiosteal forehead lift. *Plast. Reconstr. Surg.*, 95: 993, 1995.
- 3- Elkwood A., Matarasso A., Rankin M., Elkowitz M. and Godek C.P.: National plastic surgery survey: Brow lifting techniques and complications. *Plast. Reconstr. Surg.*, 108: 2143, 2001.
- 4- Paul M.: The evolution of the brow lift in aesthetic plastic surgery. *Plast. Reconstr. Surg.*, 108: 1409, 2001.
- 5- Isse N.G.: Endoscopic facial rejuvenation. *Clin. Plast. Surg.*, 24: 213, 1997.
- 6- Daniel R.K.: Endoforehead: Subperiosteal Approach. In O.M. Ramirez and R.K. Daniel (Eds.), *Endoscopic Plastic Surgery*. New York: Springer-Verlag, pp 46-68, 1995.
- 7- Daniel R. and Tirkanits B.: Endoscopic forehead lift: An operative technique. *Plast. Reconstr. Surg.*, 98: 1148, 1996.
- 8- Guyuron B. and Michelow B.J.: Refinements in endoscopic forehead rejuvenation. *Plast. Reconstr. Surg.*, 100: 154, 1997.
- 9- Horn C. and Thomas R.J.: Subgaleal endoscopic browlift with absorbable fixation. *Facial Plast. Surg. Clin. North Am.*, 14: 175, 2006.
- 10- Isse N.G.: Personal communication. Second European EPSES Program (Endoscopic Plastic Surgical Educational Seminars), Marbella (Spain), June, 2004.
- 11- Sasaki G.H.: Endoscopic forehead and periorbital lift procedures. In G.H. Sasaki (Eds.), *Endoscopic, aesthetic and reconstructive surgery*. Philadelphia: Lippincott-Raven, pp 45-79, 1996.
- 12- Perkins S.W. and Batniji R.K.: Trichophytic endoscopic forehead lifting in high hairline patients. *Facial Plast. Surg. Clin. North Am.*, 14: 185, 2006.
- 13- Chadwell J.B. and Mangat D.S.: The endoscopic forehead-lift. *Facial Plast. Surg. Clin. North Am.*, 14: 195, 2006.
- 14- Nassif P.S.: Endoscopic brow-lifting with deep temporal fixation only (DTFO). *Facial Plast. Surg. Clin. North Am.*, 14: 203, 2006.