

Eyebrow Asymmetry: Ways of Correction

Wolfgang Mühlbauer, M.D. and Charlotte Holm, M.D.

Department of Plastic and Reconstructive Surgery, Hand Surgery, Burn Center Krankenhaus München-Bogenhausen, Academic Teaching Hospital, Technical University Munich, Engelschalkingerstrasse 77, 81925 München, Germany

Abstract. Occasionally a patient asks for correction of his asymmetric eyelids. In many instances, however, a careful analysis reveals that the actual cause is an asymmetry of the eyebrows. Generally, asymmetric eyebrows are due to excessive muscle dynamics (i.e., a hyperkinesia of the frontalis or the depressor supercillii muscles). Therefore, the asymmetry will not be corrected by an asymmetric blepharoplasty, which will instead disclose the preexisting asymmetry, much to the concern of the patient. Management of the asymmetric brow is demanding and requires a preoperative problem-oriented and detailed analysis of the individual patient to achieve satisfactory results. We present 10-years' experience using a problem-specific approach. This included intramuscular botulinum toxin A injection, superselective neurotomy, endoscopic browlift and traditional procedures such as the coronal and direct browlift. Indication, patient selection, results, and complications are discussed.

Key words: Asymmetric eyebrows—Frontalis hyperkinesia—Depressor supercillii muscle hyperkinesia—Botulinum toxin A injection—Selective neurotomy—Endoscopic browlift

Certain patients visit the plastic surgeon asking for correction of their asymmetrical eyelids. In many instances, however, a careful analysis reveals that an asymmetry of the eyebrows is the actual cause of the asymmetrical eyelids. Most patients are unaware of this phenomenon, and even the plastic surgeon tends to overlook it. This

article addresses the problems associated with the surgical treatment of the patient with asymmetric eyebrows. Only aesthetic indications for correction have been selected without dealing with causes like facial palsy or trauma.

Eyelid asymmetry caused by asymmetrical eyebrows is not going to be corrected satisfactorily with an asymmetric blepharoplasty; most likely the asymmetry of the eyelids will become more obvious postoperatively, much to the concern of the patient. Some forms of asymmetry are camouflaged by a pronounced blepharochalasis. A well-performed symmetrical blepharoplasty will disclose the preexisting asymmetry. The patient is likely to blame the surgeon for having performed an asymmetrical job. Plastic surgeons should, therefore, pay attention to this phenomenon to avoid mutual dissatisfaction.

What are the causes for the asymmetry of the eyebrows? A number of people develop mimetic brow asymmetry with one side riding higher than the other. Over a period of time, this habitually raised eyebrow may lead to unilateral hyperkinesia of one frontalis muscle. Patients are unable to relax the frontalis muscle voluntarily during daytime. Mimetic hyperactivity or emotional stress may accentuate the asymmetry. There is even a strong family history with brow asymmetry, developing as early as childhood or adolescence. The muscular hyperkinesia may well be documented with electromyography.

In rare instances, hyperactivity of one depressor supercillii muscle supposedly is capable of pulling the medial portion of the eyebrow down, also resulting in asymmetry [3].

The senior author became aware of this problem, when he was confronted with the above-mentioned complaints of a patient postoperatively after having overlooked this phenomenon. Over the years, we have seen a substantial number of patients with asymmetrical eyebrows unrelated to trauma or disease. We would like to report on our

Correspondence to: Prof. Dr. med. Wolfgang Mühlbauer, Department of Plastic Surgery, Krankenhaus München Bogenhausen, Engelschalkingerstrasse 77, 81925 München. Tel: +49 89 92702030; Fax: +49 89 92702036; e-mail: wmuhlbauer@t-online.de.



Fig. 1. (A, B) Patient with recurrent blepharochalasis before and 1 year after secondary upper blepharoplasty. The preexisting eyebrow asymmetry had been overlooked and became more pronounced after surgery.

experiences and the various methods of correction (Fig. 1A, B).

Material and Methods

Over a period of 10 years, 25 patients were treated for eyebrow asymmetry by the senior author. The modalities of treatment included: injection of botulinum toxin A (5 patients), neurotomy of the VIIth cranial nerve (7 patients), coronal brow lift (3 patients), and endoscopic brow lift (10 patients).

Injection of Botulinum Toxin A

Botulinum toxin A is a very powerful neurotoxin blocking the motor endplate of muscle fibers (Fig. 2A–C). It has been used for some time already to alleviate muscle spasm, for instance in facial palsy, torticollis, etc. More recently, botulinum toxin A has been injected into hyperactive mimetic muscles in an attempt to smooth facial creases as an alternative to collagen or fat injections.

With the same rationale, botulinum toxin A may be injected into the hyperkinetic side of the frontalis muscle at multiple sites between the hairline and the raised eye-

brow. The recommended dose is 80–120 international units per session. This modality of treatment is simple without surgery and is, therefore, attractive to patients who are used to collagen or fat injections. In contrast to injecting botulinum toxin bilaterally, it is rather difficult to find the exact dosage to correct unilateral asymmetry, because the full effect of the partial paralysis of the muscle fibers takes 12–24 hours to develop. Additional injections of small doses may be necessary during the following days to achieve a good result. Unfortunately, the effect will last only between 3 and 4 months; however, the procedure may be repeated several times with some hope of gradual degeneration of a number of motor endplates and consequent atrophy of the muscle fibers, respectively, thus achieving good permanent eyebrow symmetry without unilateral paralysis.

Superselective Neurotomy: Mimetic Modulation

A high-riding eyebrow may be lowered to the level of the normal side through a superselective neurotomy of one or two of the final branches of the ramus temperofrontalis of the facial nerve on the affected side (Fig. 3A, B). With the help of a percutaneous nerve stimulator, two or three end branches of the facial nerve to the frontalis muscle are picked up and their course marked on the skin of the forehead. One or two of these branches are blocked using a local anesthetic in the temporal area to evaluate the effect before these nerve fibers are resected and coagulated. The coagulation may be performed through stab incisions or even percutaneously with a special apparatus, presently on trial by the authors [2].

Open, Coronal Browlift

A positional asymmetry associated with ptosis of the eyebrow as a result of the aging process is still a good indication for correction with the open coronal technique, where the surplus of skin may be excised accordingly (Fig. 4A, B). The open approach with its panorama view of the rear of the frontal flap has the additional advantage of facilitating direct myectomies of the corrugator, procerus, depressor, and frontalis muscles in order to modulate their muscular activities and erase any hyperkinetic furrows of the forehead. In rare cases of hyperkinesia of the depressor supercillii being the major cause of unilateral eyebrow depression, this muscle should be addressed specifically. A symmetrical blepharoplasty may be added, if necessary.

Endoscopic Browlift

Younger individuals with positional eyebrow asymmetry and mild to moderate ptosis are candidates for an endoscopic browlift (Fig. 5A, B). The disinsertion of the frontalis muscle at the supraorbital rim not only raises the eyebrows, but corrects the asymmetry simultaneously, most of the time without the need for asymmetrical elevation of the forehead. Excess skin is dissipated toward the parietal and occipital scalp. In many instances, a blepharoplasty becomes thereby unnecessary [5].



Fig. 2. (A) Patient with pronounced eyebrow asymmetry as a result of unilateral right-sided hyperkinesia of the frontalis muscle. (B) Botulinum toxin A injection into the right frontalis muscle. (C) Patient 6 weeks after injection with symmetrical eyebrow.

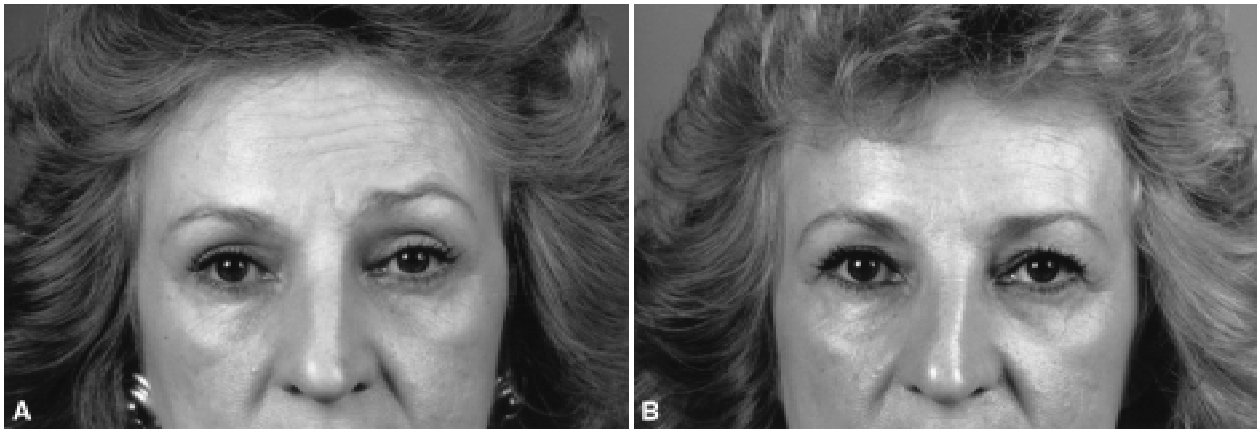


Fig. 3. (A) Patient with eyebrow asymmetry due to mimetic hyperkinesia of the left hemifrontalis muscle. (B) The patient 3 months after superselective neurotomy of two of the final

branches of the ramus temporofrontalis of the facial nerve on the left side. Good symmetry achieved.

Unilateral Eyebrow Elevation

Some patients like their “high browed” side better and ask for elevation of the “normal” side (Fig. 6A–E). The easiest way of correction, of course, is a simple excision of an ellipse of skin above the normal eyebrow. However, the resultant scar is difficult to conceal. Today it is possible to perform unilateral endoscopic brow lift without visible scars. An additional blepharoplasty is necessary only in older patients with pronounced blepharochalasis.

Results

The results of each procedure are demonstrated with a representative case. Pros and cons will be discussed later in the article.

The authors have only recently begun to use *botulinum toxin A injection* for pure aesthetic indications, here for the correction of the asymmetry of the eyebrows. The results were disappointing. In contrast to bilateral injections, it is rather difficult to find the exact dose without over- or undercorrection. The effects of botulinum toxin A last only between 2–6 months with gradual recurrence of the asymmetry. No long-term results of repeated injections are available to the authors. Three out of five patients developed a transient palpebral ptosis as an iatrogenic complication.

The results after *superselective neurotomy* were pleasing and long-lasting. This may well be attributed to the senior author’s long and specific experience with this method in treatment of facial palsy and problem creases of the face [4]. However, one patient developed a tem-

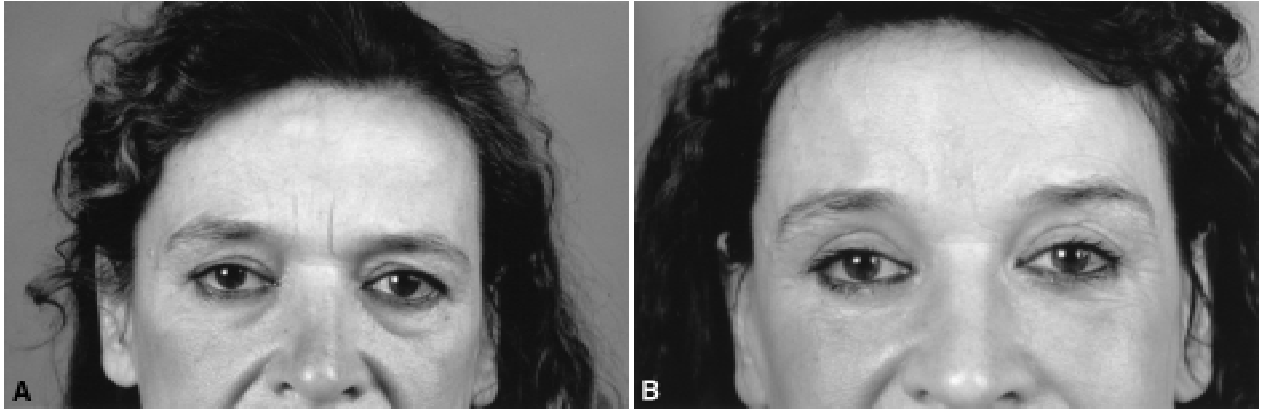


Fig. 4. (A) 55-year-old patient with asymmetrical ptosis of the eyebrows and glabella creases due to hyperkinesia of the corrugator, procerus and depressor supercilii muscles (left side more pronounced than the right side.) (B) The patient 1 year

after coronal browlift with correction of the eyebrow asymmetry and myectomies of the corrugator, procerus and depressor supercilii muscles bilaterally and additional upper and lower blepharoplasties.



Fig. 5. (A) 52-year-old patient with moderate asymmetrical ptosis of the eyebrows as a form of pseudorecurrent upper blepharochalasis. (B) The patient 18 months after bilateral en-

doscopic browlift with correction of the asymmetry without secondary blepharoplasty.

porary paresis of the treated hemi-frontalis muscle with reversion of the eyebrow asymmetry.

The open, *coronal browlift* was a rare indication in cases of asymmetrical ptosis of the eyebrow with additional surplus of skin and pronounced wrinkles. The overall results were excellent and permanent.

The *endoscopic browlift* approach has been used since 1994 with increasing enthusiasm. Exact correction of the asymmetry was possible without interference with the mimetic motion. The possibility of a unilateral endoscopic approach is rather attractive in this respect. The unilateral elevation of a "normal" eyebrow to the level of the hyperkinetically raised eyebrow leads, however, to a moderate degree of recurrence.

Complications

Complications occurred in a total of five patients, and were all mild and/or temporary.

In three out of five of the patients treated with injec-

tion of botulinum toxin A above the hyperkinetic eyebrow, the injection caused a transient palpebral ptosis lasting from 4 weeks to 6 months. The injection was performed concomitantly with a surgical procedure such as blepharoplasty, facelift, etc. This might explain the migration of the toxin into the upper orbit to paralyze also the levator muscle. The case with the longest duration of the ptosis was retrospectively found to have a mild senile palpebral ptosis of the affected side prior to surgery. However, it was concealed by the pronounced blepharochalasis. Nevertheless, the psychological support of the patient was quite demanding until complete recovery.

In one out of seven patients having performed superselective neurotomy, the coagulation of the nerve on the hyperkinetic side led to a, fortunately temporary, unilateral total paralysis of the frontalis muscle with reversion of the eyebrow asymmetry. The location of the neurotomy was apparently somewhat too proximal with thermal damage of an end branch of the ramus fronto-



Fig. 6. (A) Patient in her fifties with mimetically high-riding left eyebrow (from her family photo album). (B) Patient 62 years of age with fixed eyebrow asymmetry due to a left hyperkinetic frontalis muscle. (C) Intraoperative view after unilateral (right side) endoscopic elevation of the “normal” eye-

brow and bilateral upper blepharoplasties. (D) The patient 2 weeks postoperatively. Note the overcorrection of the “normal” eyebrow. (E) The patient 1 year postoperatively with some recurrence of the eyebrow asymmetry due to the persistent hyperkinesia of the left hemifrontalis muscle.

temporalis of the VIIth cranial nerve, causing a temporary neurapraxia of the remaining two rami.

In the one patient with unilateral endoscopic elevation of the “normal” eyebrow, a partial recurrence over a period of 1 year was encountered. The hyperkinesia of the “high browed side” could not completely be equalized by disinsertion of the normal frontalis muscle and elevation of the skin of the forehead. However, the end result was markedly improved compared to the situation before the corrective procedure.

Discussion

The injection of botulinum toxin A into the hyperkinetic side of the frontalis muscle appears to be a simple and effective method to correct unilateral dystopia of one eyebrow. As the toxin is rather expensive, one may use

it for multiple locations or schedule several patients at the same time to make full use of the rapidly degradable substance. Unfortunately, the effect is a temporary one, lasting somewhere between 2 and 6 months. Although the injection may be repeated for a number of times, the effect may range from a total muscle paralysis to a gradual recovery with oscillating eyebrow asymmetry as a consequence. It is postulated that repeated injections eventually lead to fibrosis of the motor endplates and atrophy of the muscle fibers with permanent weakening of the muscle action for a lasting result. In the correction of eyebrow asymmetry it is rather difficult to titrate the necessary dosage for the desired normalization of the hyperkinesia of the frontalis muscle without exceeding the required dose and ending up with a reversed asymmetry. The senior author experienced three cases of very annoying, iatrogenic palpebral ptosis as a complication of injecting botulinum toxin A intramuscularly above the

eyebrow. To explain this phenomenon we assumed that the migration of the toxin into the orbit was facilitated by concomitant surgical procedures such as upper eyelid blepharoplasty and facelift. However, it is suggested that these complications can be avoided and the proper dosage for each individual patient defined more properly with more experience [1].

The rather sophisticated superselective neurotomy of the affected side is capable of weakening the hyperactive frontalis to normal levels under good direct control with the patient's cooperation under local anesthesia. The experience of the senior author over a decade has been encouraging, and good permanent results are possible as shown in a previous publication on mimetic modulation [4]. In most instances a permanent symmetry may be achieved with normalized mimetic activity of the previously hyperkinetic frontalis muscle. This procedure, being minimally invasive and already well established for the correction of the hyperkinetic side in unilateral facial palsy, was however only reluctantly accepted by patients as well as surgeons. The irreversible damage to one of the branches of the facial nerve appeared to be far too aggressive to the patients, if the indication for surgery was only an aesthetic one.

In the era of the endoscope, it is difficult to encourage the more invasive, open, coronal approach to the patients. Nevertheless, this procedure still has an indication in positional asymmetry associated with ptosis of the eyebrow as a result of the aging process. The surplus of skin may be excised as needed and the open approach with a panorama view of the rear of the frontal flap has the additional advantage of exposing the corrugators, the procerus and the depressor supercillii muscles, making a subtotal myectomy of these muscles much easier. Thus, muscular hyperactivities can be modulated under direct vision, and any hyperkinetic furrows of the forehead may be erased. An eventual low positioned hairline may be elevated to a normal position. A symmetrical blepharoplasty is added, when necessary. The disadvantages of the coronal scalp incision include frontoparietal scalp numbness, alopecia, and temporal or permanent paresthesias.

The results have been long-lasting and reliable in our experience, however. The elegant endoscopic browlift is ideal for younger individuals with elastic skin and also for patients with pseudorecurrence of upper lid chalasis, when in fact the eyebrows have been drooping over the

years. It is more appropriate to raise the ptotic eyebrows together with a correction of the asymmetry than to shorten the upper lids for a second time. Although no long-term results can be evaluated at this stage, the intermediate (up to 4 years) results appear to remain sufficiently stable.

Regarding the elevation of normally positioned eyebrows, the unilateral elevation appears rather simple and elegant using the modern endoscopic technique. Yet it is an illogical approach to elevate the "normal" eyebrow to the level of the hyperkinetic one, the position of which is preferred by some patients. The dynamic hyperkinesia of the affected side is going to override the normal side in the long run, even when the latter one has been overcorrected. From our disappointing experience, therefore, we recommend some form of compromise in these cases (i.e., maximal elevation of the normal side combined with some weakening of the hyperactive frontalis muscle for a better permanent result).

The transpalpebral browlift through an upper blepharoplasty approach appears to be another alternative [2,6]. The authors do not have personal experiences with this technique.

In conclusion, we have tried to direct the attention of plastic surgeons toward the intriguing phenomenon of eyebrow asymmetry and presented various ways of correction, selected and applied after careful analysis of each individual patient's problem.

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