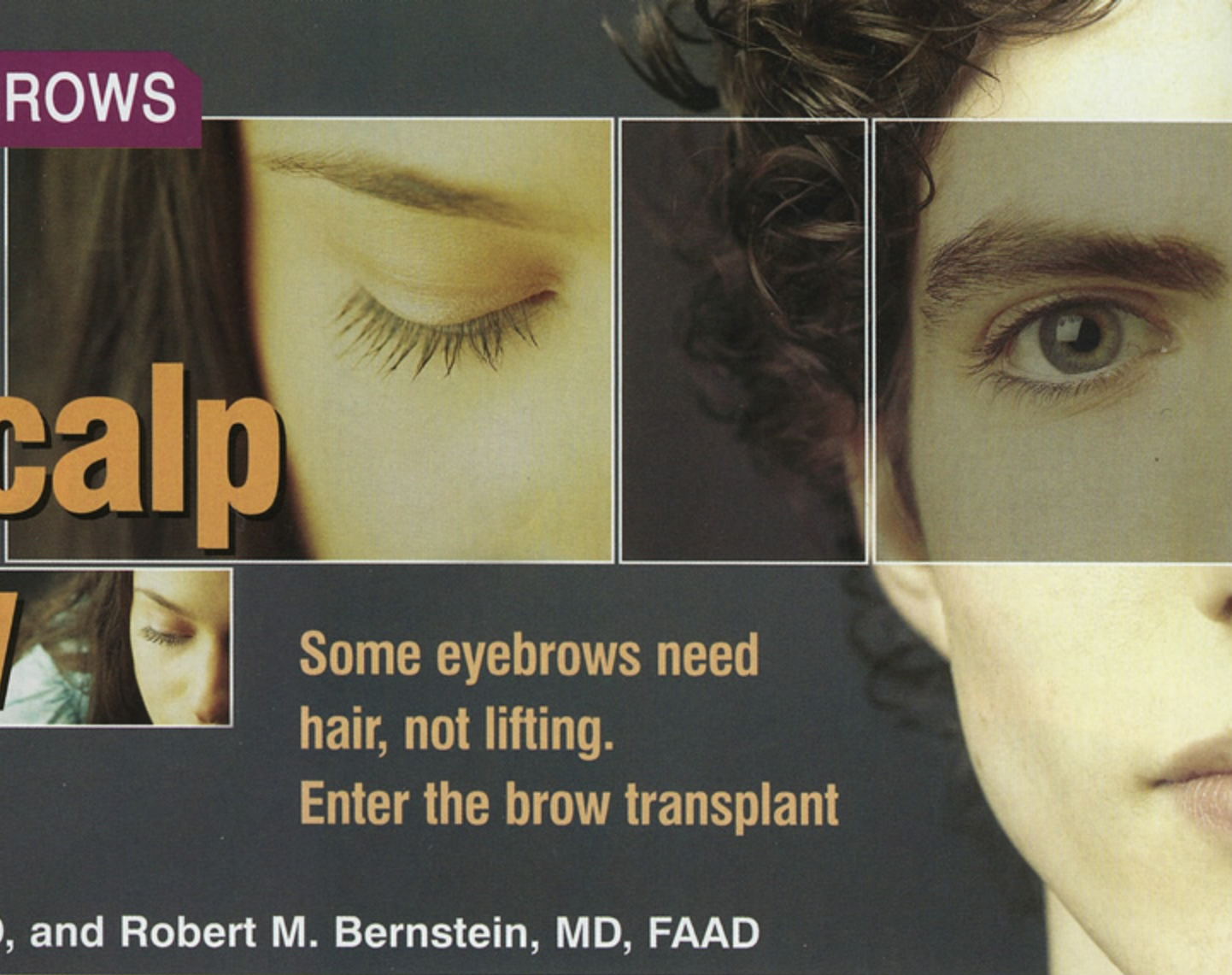


From Scalp to Brow



Some eyebrows need hair, not lifting.
Enter the brow transplant

by William R. Rassman, MD, and Robert M. Bernstein, MD, FAAD

Eyebrows are central to a person's appearance because they frame the eyes and give symmetry to the face. The partial or complete loss of eyebrows can produce a profound change in one's looks and have a devastating effect on the individual's confidence and self-esteem.

Eyebrow reconstruction is based on the technology first reported by Krusis in Germany in 1914 and later by Japanese physicians in the 1930s and 1940s.¹ In 1943, Tamura reported that single-hair grafts should be used for the restoration because they would look the most natural.² More than half a century later, the most advanced type of scalp-hair transplantation uses naturally occurring follicular units containing one to four hairs, but the most refined eyebrow transplantation still uses individual hair follicles.³

Advances in eyebrow restoration lie, therefore, not in using individual hairs—this has been known for a long time—but in adopting techniques used in scalp-hair transplantation that enable the physician to carefully isolate the individual hair follicles from the donor scalp.

The specific technique is called stereo-microscopic dissection. It enables the surgeon to generate a hair follicle that contains all of the essential anatomic structures for maximum survival and growth, and one that is devoid of the excess tissue that makes traditional grafts too cumbersome for the nuanced restoration of the eyebrows.⁴

A carefully dissected single-hair micrograft, trimmed of excess epidermis, dermis, and fat, has the flexibility to be inserted into the tiny opening made with a fine hypodermic needle and placed at an angle almost flush with the skin—two techniques that are essential for the most natural restoration. The tiny recipient sites allow the grafts to be placed very close together.

However, when closely placed grafts are angled so acutely, the base of one follicle literally lies under the shaft of the next, so that any extra volume in the graft can make the brow unnaturally lumpy. The slender, microscopically dissected grafts have no volume other than the functional follicle, so they are perfectly suited for this closely spaced acute-angle graft placement.

The Hair Cycle

The normal hair cycle varies from months to years, depending on where in the body the hair is located. Each hair-regeneration cycle has a growth phase called anagen and a resting phase called telogen. The anagen phase of scalp hair ranges from 3 to 6 years, whereas the anagen phase of eyebrow hair is significantly shorter.

The growth rate of scalp hairs ranges from 0.30 to 0.41 mm per day (about 0.5 inch per month), but the growth rate of eyebrow hair is half of that.

When scalp hair is transplanted to the eyebrow, it soon grows to an aesthetically unacceptable length. This necessitates frequent trimming of the eyebrows, which can be a mild nuisance. Trimming results in a cut end that is less elegant than the finely pointed tip of an uncut hair, so eyebrow hair should be cut on an angle to replicate nature's work.

Over time, the transplanted hair will assume some of the characteristics of the transplant site, and the growth rate of the transplanted hair will decrease gradually. It is not known whether transplanted follicles will eventually assume the full characteristics of the surrounding eyebrow hair, but work by Hwang et al suggests that influences of the recipient site are more significant than had been previously thought.⁵

Indications for Reconstruction

A variety of conditions can result in the loss or alteration of the eyebrows. Probably the most common condition is self-induced: repeated plucking of the eyebrows for aesthetic reasons, or less often a symptom of an obsessive-compulsive disorder (OCD) called trichotillomania. People with this disorder who pluck hair should not have brow transplants without addressing the OCD first; transplantation results will disappear as the patient returns to old habits.

Other forms of physical trauma that may result in eyebrow loss include automobile accidents, burn injuries, defects remaining from surgical procedures, and radio- and chemotherapy. Burns or trauma may result in the formation of scar tissue that initially precludes hair transplantation. In these cases, reconstructive surgery may be necessary before the hair transplant can be performed. Thickened scars may respond to injections of corticosteroids; after thinning, they may readily support the growth of transplanted hair.

Women who consider their eyebrows too thin occasionally have them tattooed, but this almost invariably looks unnatural. The situation worsens as the pigment is engulfed by macrophages and is brought deeper into the dermis, causing the black-brown color to take on a bluish hue. The pigment can be successfully removed with lasers, but this causes the once-thin eyebrows to become totally devoid of hair.

A common dermatologic condition that may cause eyebrow (and eyelash) loss is alopecia areata. This is a genetic autoimmune



Figure 1: A. This man looks natural and handsome with his original thick and full eyebrows. B. With "female" eyebrows, he loses his masculinity. C. The woman looks natural and beautiful with her original thin and shaped eyebrows. D. With "male" eyebrows, she loses her femininity. These photos have been altered for the purpose of illustration.

condition that manifests with the sudden onset of discrete round patches of hair loss with normal underlying skin. It can be treated with injections of cortisone, but it tends to recur.

Systemic diseases and congenital abnormalities are also associated with the loss or absence of eyebrows, eyelashes, or both. In some patients, the disappearance of eyebrows with age is normal and results from the progressive thinning (miniaturization) of the hair until it is barely noticeable.

For any restoration procedure to be successful, the physician must be certain that the underlying condition that caused the hair loss in the first place has been corrected. Once the hair loss is stable, hair restoration may be contemplated.

The Design

People who seek eyebrow restoration generally have particular desires, goals, and prejudices regarding their ideal eyebrow shape. Creating natural-looking eyebrows can be a difficult task because of the differences between a patient's expectations and normal eyebrow design.

Eyebrows are as different as faces, so "normal" is a relative and subjective term. Men who are not satisfied with their eyebrow shape often want their eyebrows to have a special character, such as the look of Albert Einstein. Some men think that bushy eyebrows are the most desirable because they represent male virility or "genius."

Women, on the other hand, want delicacy and better-defined shapes. These differences in the preferences of each sex must be understood and incorporated in the design of the restoration from the outset (Figure 1).

When eyebrows are reconstructed to correct deformities, the goal is "normalcy." When the surgery is for aesthetic enhancement only, the surgeon acts like a portrait painter, creating a reality that nature possibly never intended.

Beauty is not just determined by a specific angle or a precise number of grafts. The art of the restoration requires that the surgeon gets "inside the head" of the patient and understands what he or she wants to achieve.

In contrast to balding men, who often cannot remember where their hair was when they were young and who are thus open to any design that will give them hair, the person seeking eyebrow restoration often has very specific ideas in mind. The surgeon's job is to moderate the patient's perspective and make sure that it is reasonable. Mistakes will be in full view and can leave a patient with a problem that may require years of plucking to correct.

Proper angulation is the most important aspect of the restoration. The hair in the upper part of the central edge of the eyebrow usually points upward toward the hairline, whereas the hair on the lateral aspects points horizontally, toward the ears. The hairs in the upper part of the eyebrow should be pointed slightly downward and the lower portion slightly upward, so that they will converge in the middle, forming a slight ridge and resembling the pattern of a feather (Figure 2).⁶

The eyebrow hair must be inserted flat, or it will point forward. The surgeon controls the direction and the distribution as the hair is transplanted into the eyebrow, and fine skills are required to densely pack single hairs into the small needle tracks that create an undetectable wound (Figure 3, page 38).

The Technique

The outline of the restoration should be carefully delineated using a fine surgical marker according to the design agreed upon by the surgeon and patient during the consultation. Markings should also be used to indicate the directional change of the hair from medial to lateral. It is often helpful to make these markings above the brow (outside the area that will be transplanted) so that they are not lost as the transplantation proceeds.

Once the markings are complete, the patient should be given a mirror to verify that this is what had been discussed and that the design is satisfactory. At this point, we find it helpful for the physician to leave the room (another staff member should still be present) to give the patient a few minutes to reflect on the design.

A small amount of anesthetic should first be injected into the supratrochlear and supraorbital notches to create a nerve block that numbs the medial and lateral aspects of the brow.⁷ Local infiltration using a mixture of lidocaine or bupivacaine and epinephrine can further anesthetize the area and provide rigidity to the eyebrows. Tumescence enables the physician to keep the recipient sites more superficial and at a more acute angle while minimizing bleeding. Because of the small volume of fluid needed, a separate tumescent mixture is generally not necessary. Avoid using corticosteroids and other particulate solutions when injecting around the eyes.

Recipient sites should be created using 20–22-gauge needles (or equivalent instruments), depending on the coarseness of the hair. If the patient's scalp hair is very light and fine, two-hair grafts can be

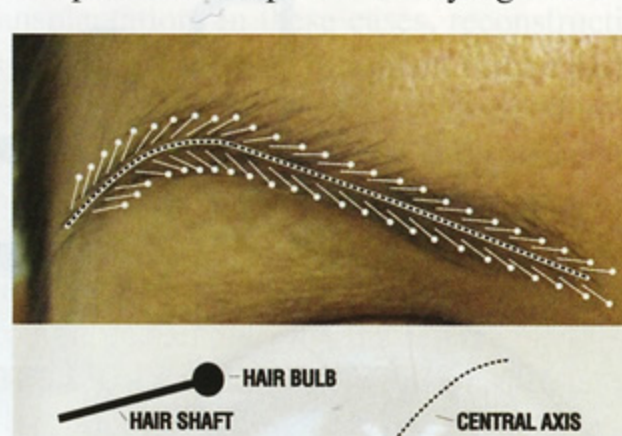


Figure 2: This is not an actual diagram of hair placement, but it shows the angling necessary to form a slight ridge in the pattern of a feather.

used in the central part of the brow to create extra density, but these grafts should not be placed near the edges.

Recipient sites should be created by holding the instrument as flat as possible to the skin surface, because there is always some elevation of the graft in the normal process of

healing. The instrument should be gripped between the thumb and the first and second fingers and held nearly flush to the skin surface.

How Much Hair?

The number of grafts needed for eyebrow restoration can vary from as few as 75 per brow to as many as 350. Men generally require significantly more grafts than women. It is helpful to make the recipient sites first to determine exactly how many hairs need to be harvested. It is important to remember that follicular units will yield two or three grafts on average, depending on the patient's donor density.

If the donor hair is obtained from a strip, then 1 cm² of tissue should be excised for every 200 grafts required. (This is based on an average of 100 follicular units/cm², or 230 hairs/cm².) If hair is obtained via follicular-unit extraction, then the staff should dissect the grafts into individual hairs as they are removed from the scalp so that the surgeon can determine exactly how many are needed.⁸

In women, the finer hair in the area over the ears should generally be used. In men with fine hair and coarse eyebrows, the area adjacent to the occipital protuberance is usually the coarsest hair on the scalp and may be the best match.

The grafts should be inserted using fine jeweler's forceps under loupe magnification. The hair must be literally stuffed—rather than inserted—into the sites, because the site is too small to accommodate both the graft and the forceps.

No dressing is required postoperatively. The patient is instructed to sleep with his or her head elevated. The following morning, the patient should gently irrigate the transplanted area to remove any dried crusts. This should be done in the shower at least three times the day following surgery and twice daily for 1 week. After each shower, an antibiotic ointment should be applied to the brow to help soften any crusts so that they can be more easily removed with the next washing.

The surgery often causes bruising that may take 1 week or more to subside. Bruising is usually most apparent in older patients whose skin has significant sun damage.

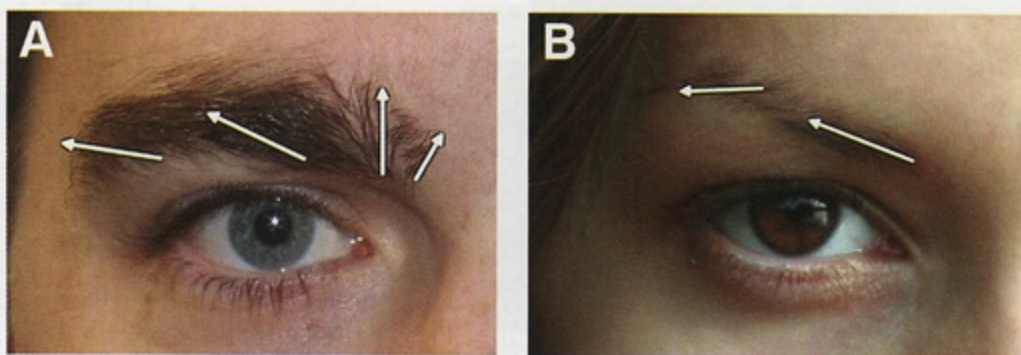


Figure 3: A. In the male eyebrow, the natural direction of the hair takes four angles, from right to left: 45°, 90°, 150°, and 170°. B. In the female eyebrow, the groomed and shaped direction has only two angles: 150° and 190°.

As the transplanted hairs grow, they will require occasional trimming. The hairs have a tendency to be unruly, particularly when they first start to grow; so using a gel or wax will help keep them flat. As mentioned above, the hair growth will tend to slow down over time and the hair will begin to assume some of the characteristics of the surrounding hair as it is influenced by the recipient site.

Patients should understand that two or more sessions may be required to achieve the desired look. Sessions are best spaced a minimum of 8 months apart so that the surgeon has the benefit of seeing the first-session transplants grow in before planning the second.

Challenges of Eyebrow Transplants

When eyebrows receive transplanted scalp hair, they invariably retain some of the donor-area hair characteristics of shape, shaft thickness, and growth rate. If a person has coarse hair and fine eyebrows, a transplant from the scalp may not be a good match, particularly for a woman who requires a delicate new transplanted eye-

brow. It is possible to decrease the diameter of the hair shaft by trimming all or part of the bulb, but this may produce an irregularly shaped hair.

African-American coarse, kinky hair may not provide the directional control needed for an eyebrow transplant. As a result, some African-Americans may not be good candidates for an eyebrow hair transplant. However, with newer techniques, it is now possible to place hair so that its curvature is oriented in the appropriate direction.⁹

As part of the normal healing process, wounds tend to contract. Consequently, the cylindrical defect created by the transplanted hair will tend to contract and orient itself more vertically. This will tend to lift the hair slightly away from the skin, giving the brow a bushier, more unruly appearance. Creating the recipient sites at a very acute angle can partially compensate for this, but some elevation may still occur.

Wrapping Up

Eyebrow transplantation is a safe outpatient procedure that can significantly enhance a patient's appearance. It is particularly helpful for individuals who have defective eyebrows caused by disease, accidents, or repeated plucking.

Eyebrow restoration is a nuanced procedure that demands technical skills and artistic knowledge beyond that required for treating a balding scalp. Physicians who have the aesthetic inclination and are willing to take the time to develop the special skills necessary for this procedure will find that eyebrow restoration can significantly improve the appearance of selected patients. **PSP**

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