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Anatomical Restoration Surgery of the Eyebrow in Asian

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Abstract

Objective: **Eyebrow transplantation is not a commonly performed procedure compared to hair transplantation on the scalp. The knowledge of anatomy and hair direction is essential in achieving satisfactory results.**

Patients and Methods: **Twenty men and 13 women were randomly examined to determine the position of the medial and lateral brow, the width, the length, and its axis. Based on the data of anatomy so obtained, eyebrows design and surgical technique of transplant with single hair graft were performed under local anesthesia in 51 patients for the thinning and cicatricial alopecia of the eyebrows.**

Results: **Majority of the patients were very pleased with the immediate postoperative outcome since we kept the newly grafted hair long in contrast to the short scalp hair. Majority of the hair continue to grow and need trimming once a week.**

Conclusion: **Eyebrow transplantation is performed to improve patient's appearance and self-esteem. Knowledge of the anatomy of the brow is essential especially in the case of total burn to the eyebrow with no hair left for landmark other than the scar. Hair direction and angle of insertion are also critical to achieve good cosmetic results. A few sessions may be needed to add density.**

It is generally accepted that eyebrows that are dense, wide, and dark in color make the face look charming and attractive in men.

The shape of the eyebrow in Asian men and women are not much different. Men appear to have wider eyebrows than women. In fact most women shave the lower portion of their eyebrows to make them narrow and appear more aesthetically pleasing. In Chinese and Japanese culture, bushy eyebrows are believed to be a sign of strength, power, prosperity and charm.

Eyebrow transplantation is performed to improve the patient's appearance and self-esteem.[1] The patients seek eyebrow transplantation mainly for the following reasons:[2]

1. Having normal appearing eyebrow but want to have with darker color.
2. Having uneven eyebrow from lack of lateral third or medial portion of the brow.
3. Having scars resulting from tattoo removal with laser or acid, traumatic scar from burn injuries, eyebrow laceration and healed with detectable line across the brow, and scar from direct browlift.
4. Having congenital absent of eyebrow.
5. Having leprosy.

Patients and Methods

This study was conducted in two parts. The first part involved the study of anatomical consideration of the eyebrow. The second part was the restoration of eyebrow based upon such anatomical consideration.

Anatomical Consideration of the Eyebrow in Asian

The eyebrows of 20 men and 13 women were randomly studied for the shape, highest point, and level of both ends of eyebrows in relation to the medial canthus and the orbital rim. The length, width, and

distance between the medial brows were measured.

Anatomical Restoration of the Eyebrow

A total of 51 patients underwent eyebrow restoration. Forty two patients were for thinning eyebrows and 9 patients were for cicatricial alopecia (Table 1). There were 35 males and 16 females with age ranged from 14 to 77 year-old (Figure 1).

Surgical Technique

The donor site is selected to match the caliber of the existing brow. Recently, the author used microcaliper to measure the diameter of the brow and then the hair at different parts of the scalp in the same fashion till the size matched or was close to the desire dimensions. The number of grafts used depends on the size and nature of the intended reconstruction of the brow. On the average 100 to 200 single hair are transplanted on each side, and the patients usually require two to three sessions to achieve good density. Too dense packing transplant to be completed in one session are technically difficult when transplanting in very acute angle.

The donor hairs are trimmed to one cm long. The ellipse is marked and hairs are harvested by dissection.[3] On the average, two to three centimeters in length by 0.8 centimeter in width is sufficient. The donor wound is closed in single layer with deep dermal bite. The single hair graft is carefully dissected under the microscope. They are skinny trimmed to accommodate 21 G needle for easy insertion and dense packing. The deeper portions are not transected as originally described by Dr. Jung Chul Kim.

The brow is cleaned with betadine, 2% Lidocaine with epinephrine is injected intradermally with minimal amount in the subcutaneous tissue for vasoconstrictive effect and to diminish the bruise seen in the post-operative period. No tumescent fluid is used in this region. Puncture wounds can be made with 19G solid-core needle, but it is rarely used today. It is preferable to use 21G solid-core needle by simultaneously stick and place or stick and stay as a dilator for easy insertion and angle control but the process may be more time consuming.

The eyebrow is divided into three portions, to help determine how many sticks are to be made in each segment for uniform density and symmetry. When the needles are inserted or the puncture wounds are made, the direction in the medial third will be parallel to the brow axis instead of upward as in the normal anatomy. For the other two segments, the plan is to have hairs converge to each other. The needles are inserted in an acute angle to almost flat. The medial and mid portion are transplanted in more dense pack and wider. The lower lateral portion is feathered at the base and dense on the top. The patient is allowed to look in the mirror upon completion to see if adjustment is needed.

Post Operative Care

Both dry and moist dressings had been used without any difference in hair growth in the past. Currently, moist dressing with non-adhesive Telfa® application is used and the dressing is taped as flat as possible for ten days. This may help to control the hair angle flat to the skin during the healing process.

Table 1 Sex and reasons for eyebrow transplantation in 51 patients.

	Number of Patient	Total
Sex		51
Male	35	
Female	16	
Reason		51
Thinning Eyebrow	42	
Cicatricial Alopecia of the Eyebrow	9	

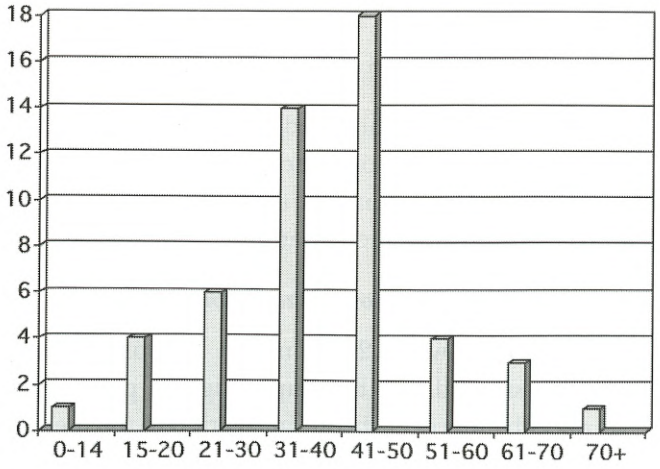

Fig. 1 Age range of 51 patients underwent eyebrow transplantation.

Bruise and swelling usually last for 3 to 4 days. Most of the eyebrow transplants do not shed and continued to grow in contrast to the scalp hairs and need trimming once a week.

Patients are routinely appointed to return in six months for consideration of second session if more density is needed.

Results

Anatomical Consideration of the Eyebrow in Asian

The average distance between the medial brows was 2.3 cm in both men and women. The average length of the eyebrow in men and women were 5.6 and 5.0 cm respectively. The maximum eyebrow width was 1.5 cm in men and 1.3 cm in women. The medial and distal ends were essentially in the same horizontal line except in younger individuals where the lateral end was slightly higher. With aging, the entire brow descends downward and the lateral segment is generally lower than the medial end. The end of the medial brow measured 6 mm in men and 5 mm in women and located just below the orbital rim medial to the medial canthus. The highest point of the brow which appeared like the top of the roof was one centimeter above the orbital rim in between the lateral limbus and the lateral canthus. The tail of the brow situated lateral to the supero-lateral orbital rim in the same horizontal plane as the medial brow (Figure 2). In short, the entire brow in Asian is above the rim in contrast with Caucasian where the entire brow is located just below the orbital rim.

The shape of the brow appears like the sword with the linear base. The upper part of the brow is bowed with pointed tail. At its most medial end, the hairs are of small caliber, lighter in color and point upward for half centimeter then point upward and laterally with increase in caliber. Once approaching the mid portion, the hairs in the upper and lower portion are converged toward the tail till the end.

The hair exits in more acute angle but not flat as one would expect from illusion since the caliber are small, short and the ends are pointed (Figure 2). In the majority, central convergence begins at the medial limbus. The brow in the middle third is wider and denser, once approaching the tail the calibers are smaller and less dense. With age, the lateral segment is also less pronounced.

Anatomical Restoration of the Eyebrow

Forty nine out of 51 patients (96.08%) were satisfied and happy with two sessions for adequate density. For traumatic laceration of the brow, only one session of dense packing was needed. The results of some representative cases are presented in Figures 3-10.

Complications

Improper hair direction was the most common complaint encountered. Asymmetrical appearance of

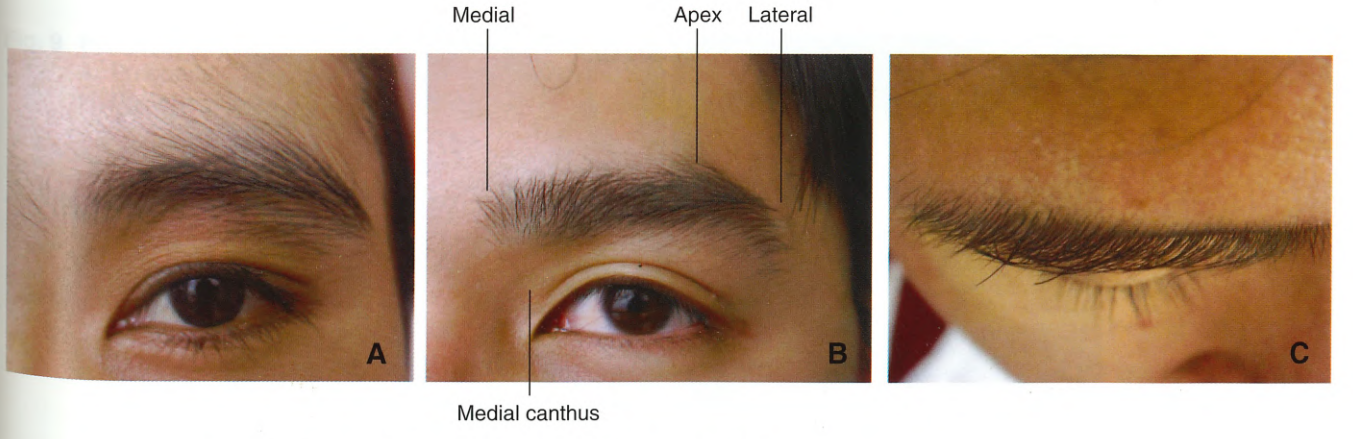

Fig. 2 Photographs showing the eyebrows in Asian.
A. Normal anatomy in female.
B. Normal anatomy in male.
C. The eyebrow hairs that exit from the skin are not flat as one would expect.

Fig. 3 Photographs showing eyebrow restoration in a 40-yr-old male who had removal of nasal implant, hair transplantation (1,776 mini and micro graft) and 710 single hair eyebrow transplantation performed in three sessions (200, 60, and 95 single hair respectively to each brow).
A. Preoperative appearance.
B. Postoperative results.

the brows occurred in only one patient. Two patients, brother and sister, who were transplanted with flat angle insertion developed folliculitis but gradually responded to antibiotic ointment and warm compress. They failed to return for further follow-up and, upon phone contact, showed no interest for more session in fear of recurrent infection.

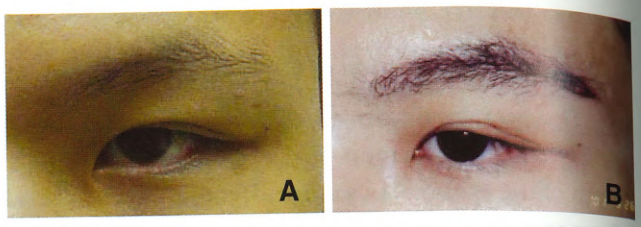

Fig. 4 Photographs showing eyebrow restoration in 23-yr-old male who had 468 single hair grafts to both brows performed in two sessions.
A. Preoperative appearance.
B. Postoperative results.

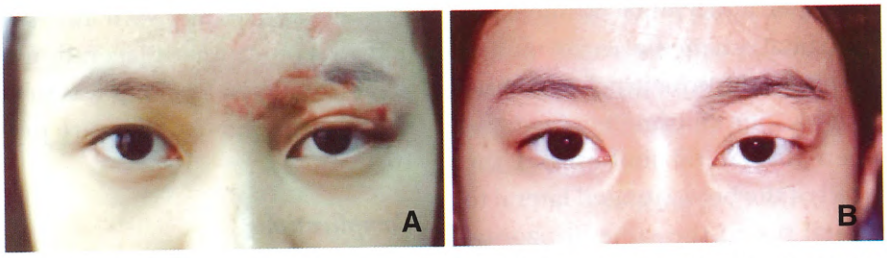

Fig. 5 Photographs showing skin graft transplantation to the left eyebrow from motor vehicle accident.
A. Preoperative appearance.
B. Postoperative results at one year after transplant.

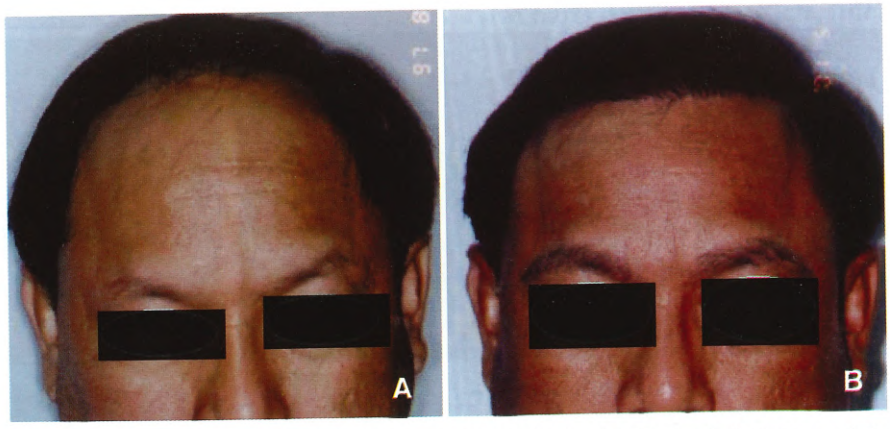

Fig. 6 Photographs showing eyebrow restoration in 43-yr-old male who had 150 single hair to each brow performed in one session.
A. Preoperative appearance.
B. Postoperative results at four years after transplant.

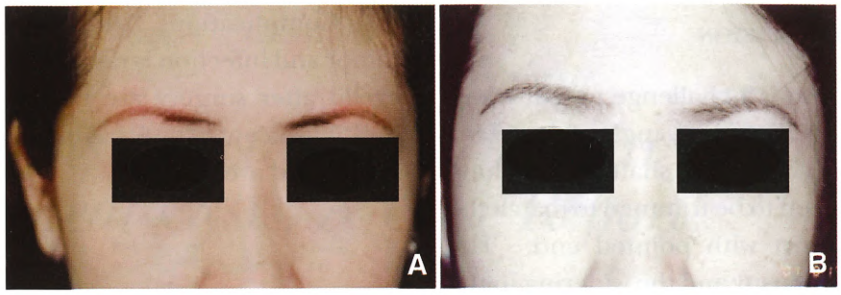

Fig. 7 Photographs showing eyebrow restoration in 37-yr-old female who had scar from tattoo removal at the mid and lateral third of the eyebrow.
A. Preoperative appearance.
B. Postoperative results after two sessions of hair transplantation.

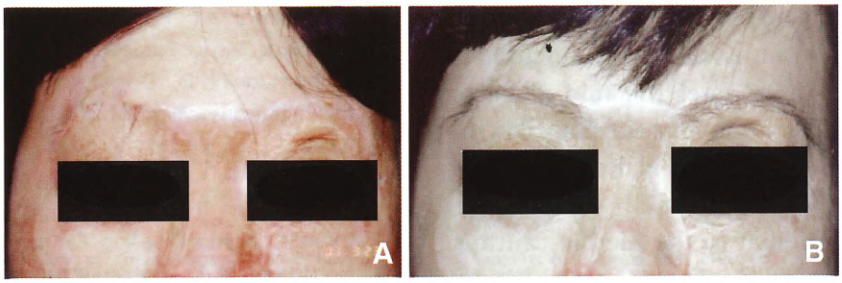

Fig. 8 Photographs showing eyebrow restoration in 30-yr-old female who had partial thickness skin graft to the face and scalp from burn injury one year ago.
A. Preoperative appearance.
B. Postoperative results 127 days after a 100 single hair graft to each brow.

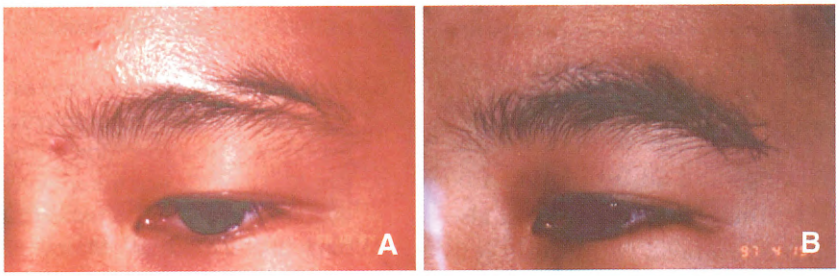

Fig. 9 Photographs showing eyebrow restoration in 15-yr-old boy who had scar from traumatic laceration to left brow 4 yrs ago.
A. Preoperative appearance.
B. Postoperative results at 6 months post op after 80 single hair transplant in one session.

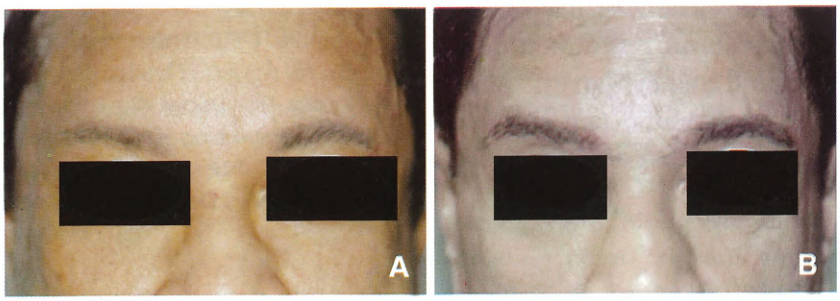

Fig. 10 Photographs showing eyebrow restoration in 60-yr-old male who had tattoo to his eyebrow twenty years ago.
A. Preoperative appearance.
B. Postoperative results at two years after transplant of 200 single hair graft to each brow.

Discussion

Eyebrow restoration is a challenge to hair transplant surgeon due to its direction, angle, convergent and lastly the different size in hair shaft and the long donor scalp hair that need to be trimmed to match the brow hair which is short with pointed end. The esthetic pleasing is the density and the widering in the medial portion that gradually become narrow and dense in the lateral portion in women. However in men uniform thickness and density throughout the brow are of preference.

Eyebrow design is critical in case of full facial burn or absence of brow since there are no anatomical landmarks. The anatomy must be well understood as described earlier. In these cases the mid glabellar point is marked first. The patient must be placed in the sitting position. The second point is the medial end which is below the supero-medial orbital rims approximately 4 mm medial to the medial canthus. The third point is the apex which is one cm above the orbital rim between the lateral limbus and lateral canthus. The last point is the lateral end which is lateral to the rim in the same horizontal plane of the medial brow. These points must be marked simultaneously on both sides to achieve symmetry. The average length is 5.5 cm. The three points are joined, the shape and size of the brow is then drawn as described earlier. In the other categories the designs are straight forward. The patient must assist the surgeon during the markings and adjustment can be made to patients' satisfaction. The patient must also be informed that the aim of eyebrow restoration is to improve his or her appearance and it is impossible to perfectly reproduce a new natural eyebrow.[4]

The use of mini-graft,[5-8] island flap,[8] strip graft and punch graft,[9] for eyebrow reconstruction uniformly yields unnatural appearance. The first few reports using single hair graft for eyebrow restoration came from Japan,[10-12] Germany[13] and later by Marritt.[14] Since the eyebrow is one of the most important cosmetic units on the face, it is imperative that only single hair unit should be used.

Complications from eyebrow restoration are minor and infection is rare. Swelling and bruise of the eyelid after surgery are not common and are self-limiting except in unusual bleeder. Hypertrophic scar and keloid are not seen.

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