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Eyebrow Restoration with Hair Transplantation

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Original Research Article

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Abstract:

Introduction: Eyebrows are key to facial aesthetics and expression, framing the eyes and contributing to facial harmony. Their importance extends beyond cosmetics, as they anchor muscles involved in facial movement. Eyebrow loss caused by trauma, burn or medical conditions can lead to emotional distress. Hair transplantation, particularly Follicular Unit Extraction (FUE), offers a minimally invasive, effective solution with natural-looking results. This technique involves transplanting individual hair follicles, usually from the scalp, to restore brow shape, density, and symmetry. This article shares our experience with FUE eyebrow restoration in 21 patients, covering technique, management, and outcomes. ***Materials and Methods:*** this study was conducted at cosmetic surgery centre limited. Period was study was from January 2018 to January 2022. Total number of cases done was 21. ***Result:*** Overall results were satisfactory and there were no significant complications. ***Conclusion:*** Excellent result can be obtained eyebrow hair transplant, if patient selection and technical details are properly performed.

Keywords: Eyebrow, transplantation, Follicular unit extraction.

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INTRODUCTION

Eyebrows play a crucial role in facial aesthetics, framing the eyes and contributing to expression, symmetry, and overall facial harmony [1]. Beyond their cosmetic significance, eyebrows are functionally important due to the insertion of several facial muscles such as the frontalis, orbicularis oculi, and corrugator supercilii into the dermis of the brow region, which enables nuanced facial expressions [2].

Eyebrow loss, or madarosis, can occur due to various causes including trauma, burns, over-plucking, alopecia areata, trichotillomania, systemic diseases, or congenital absence [3]. The resulting cosmetic deformity can lead to psychological distress and decreased self-esteem, prompting many individuals to seek reconstructive solutions [4].

Hair transplantation has emerged as a reliable method for eyebrow restoration, with Follicular Unit Extraction (FUE) gaining popularity due to its minimally invasive nature, lower scarring risk, and natural aesthetic results [5]. In this technique, individual follicular units typically harvested from the occipital scalp are transplanted into the eyebrow region, with meticulous attention to the direction, angle, and density of hair growth [6]. Achieving a natural-looking eyebrow typically requires approximately 200–300 grafts per side, depending on individual anatomy and aesthetic goals [7].

Previously hair bearing superficial temporal artery island flap was used for eyebrow restoration, resulting in brush forming eyebrow with undesired growth and misdirection of hair growth. [8] Follicular unit Transplant was used for long time, but donor site scar and morbidity have reduced its implication.[9] Nowadays Follicular unit extraction is the most popular method, with minimal donor site morbidity and scar, faster healing and low downtime.

This article presents our clinical experience with FUE-based eyebrow restoration in 21 patients, discussing surgical technique, patient selection, perioperative care, aesthetic outcomes, and complications.

MATERIALS AND METHODS

This retrospective clinical study was conducted at Cosmetic Surgery Centre Limited over a four-year period, from January 2018 to January 2022. A total of 21 patients underwent eyebrow restoration using follicular unit extraction (FUE) hair transplantation. All procedures were performed by a single experienced surgeon under standardized protocols.

Patients included in this study presented with partial or complete eyebrow loss due to various etiologies, including trauma (e.g., burns), over-plucking, scarring, or congenital thinning. Exclusion criteria included active dermatologic conditions such as alopecia areata or frontal fibrosing alopecia, uncontrolled systemic illness, and unrealistic expectations. Informed consent was obtained from all participants.

PROCEDURE

Preoperative evaluation:

Common indication for eyebrow restoration is cosmetic due to congenital absence, inadequate coverage, normal appearing brow but requiring darker color, scar due to trauma or burn, [Fig1] trichotillomania, frontal fibro sing alopecia, madarosis due to disease like hypothyroidism or Hanson's disease [10] [Table-2].

Post traumatic or post burn eyebrow restoration is done when all functional deformities of the face are corrected and no further operative procedure is required as it may alter eyebrow symmetry and when all the scars are mature. In case of alopecia areata, frontal fibro sing alopecia, scarring alopecia or trichotillomania tissue biopsy is taken to exclude active signs of disease process, which should differ eyebrow restoration. Total number of cases were n-21 of different age group. [Table 1]

Table 1: Total number of cases according to age limit (n-21)

Age group	Number of cases
Below 15 years	Nil
15-25 years	3
25-35 years	6
Above 35 years	12

Pre operative counseling:

The patient is counseled for realistic expectations, second stage of procedure may require to get desired density, even after that may need to use eye pencil to get desired colour and contour. 5-10% hair follicle may be misaligned which will need regular trimming. Growth rate may get synchronized by time according to recipient site [11,12]Acute disease process may destroy grafts. Patient is asked about her expectations, preoperative template prepared and autoclaved for use per operatively.

Table 2: Total number of cases according to indications (n-21)

Indications	Number of cases
Traumatic injury	2
Burn scar	2
Aging/Hormone deficiency	17

Anatomy of natural eyebrow:

Eyebrow has three parts[1], most inner part is head about 0.5-0.7cm having fine lighter color hair, central part is body about 2.5cm having coarse, dark colored dense hair and most outer 2cm is tail end, gradually being thin laterally. An ideal brow have ideal mediolateral extent and ideal shape. Medial end of eye brow should start on the same vertical plane of inner canthus and lateral end of ala[2,3]. In case of increased intercanthal distance it should start medial to inner canthus and in case of decreased inter canthal distance, it should start lateral to inner canthus. Lateral end of eyebrow should be at an oblique line extending from the most lateral part of ala passing through lateral canthus. It is believed since past that medial and lateral end of eyebrow should be at the same horizontal plane, although some believes medial end should be slight lower than lateral end. Brow shape may change facial expression, like more elevated medial end look surprised, more elevated lateral end express angriness and more depressed lateral end express sadness[4]. The arch should be at the same vertical plane as the lateral limbus, although recent consensus says to be just medial or lateral to the lateral limbus[5,6]. Eyebrow shape differ in male and female, being more coarse and, dense overly orbital ridge, almost horizontal in male and being just few millimeter above orbital rim, arched at lateral third and more dense medially than lateral in females[7]. The maximum eyebrow width is 1.5cm in men and 1.3cm in women[8]. Eyebrow shape should be individualized according to face shape, more horizontal in long face, more arched in rounded face and arch over jaw line in case of square shape face to get aesthetically pleasant face shape[9].

Hairline Designing:

The procedure began with patient participation in eyebrow design. Patients were asked to draw their desired eyebrow shape, which was then refined by the surgeon using a combination of ideal aesthetic principles and individualized facial characteristics. The finalized shape was recorded using a Telfa pad imprint, which was horizontally reversed to replicate the design on the opposite eyebrow, ensuring symmetry.

Anesthesia:
Due to the complex innervation of the eyebrow region supplied by the supratrochlear, infratrochlear, lacrimal, and zygomaticotemporal nerves a ring block was administered using a mixture of lignocaine, bupivacaine, and adrenaline. Tumescence was avoided, and pressure taping was applied over the upper eyelids to minimize postoperative edema.

Recipient Site Creation
Initial recipient slits were created using 0.7–1.1 mm blades or 18–19 gauge sharp needles, after test follicle extraction. Slits were first made along the marked borders to preserve the eyebrow shape. Specific orientation techniques were followed:

- Vertical direction in the head region
- Horizontal direction in the body region forming a herringbone pattern
- Lateral orientation at the tail, with crisscross hatching at the ends

Sagittal slits were preferred for controlling hair curl, while coronal slits helped in angle adjustment. The desired density was maintained at ≤30 follicular units (FUs)/cm².
Donor Site Selection and Extraction
Donor hair was selected based on caliber, curl, and growth characteristics. Eyebrow hair was compared with various scalp regions to select the best-matching donor area. Preferred donor sites included:

- Occipital scalp
- Pre-auricular region
- Nape of the neck

In male patients, the occipital and pre-auricular areas were preferred due to coarser hair. In female patients, pre-auricular and nape regions were used for finer hair, with counseling provided for those who wear ponytails.

Hair was conservatively trimmed to 3–4 mm to preserve visible curl during implantation. Grafts were extracted using 0.75–0.80 mm sharp FUE punches, with only single-hair FUs harvested to ensure natural appearance. Around 200 FUs per side were typically required, depending on brow size. Extraction was limited to ≤200 FUs per session to reduce out-of-body time.

Implantation Technique:
Implantation followed a "first-out, first-in" principle to minimize follicle ischemia, with grafts preserved in chilled normal saline (4–8°C). A no-touch technique at the follicle root was strictly followed. Each brow was implanted by a single implanter to minimize trauma and ensure consistency.

- Fine hairs were placed along the edges
- Coarse hairs were placed centrally for better aesthetic results

Postoperative Care:

- The recipient site was left uncovered, while the donor area was dressed and dressing removed on postoperative day (POD) 3
- Oral antibiotics, analgesics, and systemic steroids (40–60 mg/day) were prescribed for 3–5 days
- Periorbital swelling resolved within 3–4 days
- Periorbital makeup was allowed from POD 1; eyebrow makeup was permitted after crusting resolved

Transplanted hairs typically underwent anagen effluvium, with regrowth beginning at 3–4 months postoperatively and density improving by 6 months. Touch-up sessions were avoided before 9 months post-surgery. Patients were advised to use styling gel starting at 3 weeks to manage any misdirected growth.

RESULT

The author has done total 21 cases, majority of the cases were above 35 years and indication was aging (Fig 1) or hormone deficiency [Table 1,2]. There were no cases below age of 15 years. Two cases were post burn (Fig 2) and two cases post trauma. Among all cases, one patient (from burn scar group) had partial graft loss and none of the patients required second session.

Fig 1: Before and after eyebrow transplant

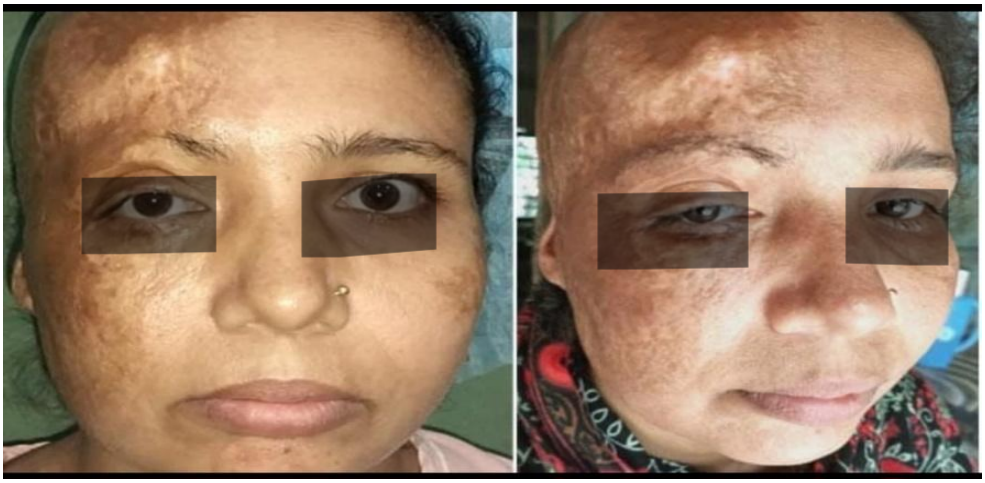

Fig 2: Pre operative and post operative photos after FUE in a burn patient

Complications:
Most common complications are misdirection, hair curl, mismatch of texture and lack of regrowth. [26] Asymmetry is noticed due to contraction of orbicularis or frontalis after anesthesia causing maladjustment of slit creation. We did not see any Infection, folliculitis or scarring in our series [21].

DISCUSSION

Eyebrow restoration via hair transplantation has evolved into a sophisticated and effective procedure, offering both aesthetic and psychological benefits for patients suffering from partial or complete eyebrow loss. Eyebrows play a critical role in facial aesthetics, symmetry, and non-verbal communication, and their absence or thinning can have significant emotional and psychosocial effects (31).

The most commonly employed technique for eyebrow transplantation is Follicular Unit Extraction (FUE), although Follicular Unit Transplantation (FUT) may also be used depending on the surgeon's preference and the patient's needs. FUE offers the advantage of minimal scarring and faster recovery, which is particularly favorable for patients undergoing cosmetic procedures (32). Hair follicles are typically harvested from the occipital scalp due to the similarity in hair caliber and quality. However, scalp hair has a longer anagen phase and may grow longer than natural eyebrow hair, necessitating regular trimming (33).

Achieving natural results requires a deep understanding of eyebrow anatomy and aesthetics. The direction, angle, curl, and density of implanted hairs must replicate natural eyebrow growth patterns. This is particularly challenging because eyebrow hairs grow in divergent and multi-directional patterns, especially in the lateral thirds of the brow (34). Even slight misalignment in graft placement can lead to unnatural outcomes, underscoring the importance of surgical skill and artistic precision.

While outcomes are generally positive, not all grafts survive, and some patients may require secondary sessions to achieve desired density. Reported graft survival rates range from 85% to 95%, depending on surgical technique, graft handling, and postoperative care (35). Complications are rare but may include folliculitis, cyst formation, asymmetry, or poor hair growth.

Patient selection is critical. Candidates with stable alopecia, such as those with over-plucking, scarring alopecia, or trauma-related loss, tend to respond well to the procedure. Conversely, individuals with active inflammatory conditions like frontal fibrosing alopecia (FFA) may experience poor graft survival unless the disease is well-controlled (36).

Adjunctive therapies such as Platelet-Rich Plasma (PRP) are increasingly being explored to enhance graft survival and accelerate healing, though more large-scale, controlled studies are needed to confirm their efficacy in eyebrow transplantation specifically (37).

In conclusion, eyebrow restoration using hair transplantation is a viable, permanent solution for patients seeking natural eyebrow reconstruction. While technically demanding, when performed by experienced surgeons, it offers high satisfaction rates and can significantly improve quality of life. Future innovations such as robotics, stem cell therapy, and enhanced imaging may further refine outcomes and expand indications for this procedure.

CONCLUSION

Eyebrow restoration by Follicular Unit Extraction (FUE) hair transplant, has proven to be a safe, effective, and aesthetically rewarding procedure. It not only restores physical appearance but also significantly improves patient confidence and quality of life.
While the procedure is technically demanding, it offers high satisfaction rates when performed by experienced hands.

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