

Postburns hair restoration of eyebrow, eyelash, moustache, beard and scalp areas

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Abstract

Background: Burn patients require reconstruction of facial esthetics to return back to social life. Postburn hair restoration improves appearance and quality of life. **Aim:** The current study was aimed to review postburns hair restoration for eyebrow, eyelash, moustache, beard, scalp hair, frontal hairline and side locks over past 5 years in 86 cases with a 9 months to 5 years follow-up. **Materials and Methods:** For a regular hair transplant surgeon, follicular unit extraction using 0.9 mm motorized punches is the preferred technique. For occasional hair transplant surgery, follicular unit transplant strip and suturing is the recommended, where follicles are dissected from a 1.2 cm wide × 6-15 cm scalp strip harvested at the level of the occipital protuberance. Each follicular unit serves as a skin micro graft placed 2-4 mm apart. Patients require 2-3 sittings spaced 8-10 months apart. **Results:** Hair growth in the postburns hair transplants, is delayed, it begins 5-6 months after the transplant. All the hair grafts do not commence growth together, complete result is seen after 10 months. Patients with eyebrow and mustache restoration are most satisfied. **Conclusion:** Follicular unit micro grafting can be used for restoration of eyebrows, eyelashes, moustache, beard, side burns, hairlines or scalp hair.

Key words:

Beard, eyebrow, eyelash, follicular unit extraction, follicular unit transplant, hair restoration, hair transplant, moustache, postburn scar

INTRODUCTION

Burn patients require reconstruction of facial esthetics to return back to social life. Reconstruction of scalp hair, frontal hairline, eyebrows, eyelash, moustache, side

locks or a beard around the chin, animates the face, adds confidence and breaks the cycle of self-pity, giving a feeling of completeness and camouflage for the scars.^[1] Hair loss in burns could be primarily due to deep burns or from excessive fibrosis, which strangulates the follicles creating cicatricial alopecia. Hair restoration is reserved as the last treatment; after all functional problems have been corrected. The scar must be mature, freely mobile, not stuck to the underlying bone when considered for hair transplant.

Various methods for management of postburn scalp defects

Works of Leedy *et al.*, Denewer *et al.*^[2,3] and our clinical observations have led to guidelines for the

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cover of scalp defects or hair less burn scars on the scalp.

1. Excision and primary closure or scalp reduction, for defects away from the hairline, measuring 15-20% of the scalp with 80-85% normal scalp available for undermining and closure could still leave a hypertrophied scar or cause gradual stretching of the scar.
2. Rotation flap, transposition flap or multiple banana peel flaps can be used for burn scars covering up to 30-40% of the scalp with 60-70% of normal scalp available for planning and movement of the flaps.
3. Tissue expanders can be used for burn scars covering 40-50% of the scalp with at least 50-60% of normal scalp available for expansion.
4. Micro grafting can be used for hair less areas involving 50-60% of the scalp with at least, 50% normal hair, available for donor harvesting. Defects of >60% can be covered using body hair especially beard hair, next best is chest hair. Larger areas can also be managed by creating a natural hair line on the front, followed by a hair piece or wig for the rest of the head.
5. All postburn scars on the scalp, from 15% to 60%, can be easily transplanted with follicular unit micro grafts.

The current study was aimed to review postburns hair restoration over past 5 years in 86 cases with a 9 months to 5 years follow-up.

MATERIALS AND METHODS

Areas of postburn hair restoration carried out in 86 patients over the past 5 years are listed in Table 1.

Preferred technique for hair restoration in postburn scars

Our method of choice is follicular unit extraction (FUE), where natural follicles containing 1, 2 or 3 hair each are individually extracted with a 0.9 mm motorized punch and implanted as hair follicular micro grafts. Other technique recommended for occasional Hair Transplant surgery is follicular unit transplant (FUT), carried out

by excising a strip of the scalp to yield hair follicles. A 1.2 cm wide × 6, 10, 12, 15 cm long strip is harvested from donor dominant scalp at the level of the occipital protuberance. Depth of the strip is restricted to the sub-dermal level. Scalp defect is closed in two layers. The strip is then slivered along the width, into single rows of hair containing 10-12 follicles each. Each of these slivers is dissected to yield natural follicular units having 1, 2 or 3 hair [Figure 1]. These units are the hair grafts, implanted with a pattern, layout and angle to match the hair in the area of restoration.^[4] Each of the follicular unit survives like a micro skin graft.

Method of placement of grafts

Hair grafts can be loaded into the needle tip of an implanter device and pushed in place with a plunger.^[5] OR hair follicle micro grafts can be implanted using premade slits with special chisel blades, in to which the grafts are placed. OR simultaneous hypodermic needle punctures are made with the left hand, and grafts placed immediately in the needle tracks with a forceps in the right hand, this is called "Stick and Place".^[6] We prefer stick and place, using 20G and 19G hypodermic needles with minimum injury to the recipient skin. The angle of the needle controls



Figure 1: Dissection to prepare follicular unit grafts

Table 1: Requests for hair restoration in burns

Area requested	Number of cases	Number of sittings required			Average number of grafts per patient
		One sitting (%)	Two sittings (%)	Three sittings (%)	
Eyebrow unilateral	27	8	19	None	110
Eyebrow bilateral	12	None	10	2	240
Eyelashes	7	None	7	None	30
Temporal angle and side locks	6	None	4	2	550
Scalp areas	15	None	8	7	1200
Moustache	6	None	5	1	210
Beard areas	4	None	4	None	300
Frontal hairline	9	None	9	None	900
Total	86	8=9	66=77	12=14	
Follow-up			9 months-5 years		

direction, depth and layout of the hair. The needle track must reach a vascular layer and show punctuate bleeding through the site. Scar skin should have elasticity to hold the graft or else it can be cored out with an FUE punch to accommodate the graft without pressure [Figure 2].

Observations and special care in postburns scar

Highest demanded in postburn hair restoration was seen to be for eyebrows, scalp areas, frontal hair line, mustache and temporal angle with side locks. Lowest request was for the beard area and eyelash restoration, which was done in select few cases. In postburn scars the spacing of the hair grafts needs to be at 2-4 mm apart to ensure good graft survival.

A result of single sitting 1500 grafts FUT for childhood burns in an 18-year-old is seen in Figure 3a and b, 10 months after the transplant. In this photograph you can observe that grafts along the hairline and close to normal skin receive better perfusion, these are placed at 1.5-2 mm and as we proceed further into the burn area the placing has been increased to 2-4 mm toward the center of the postburn scar. Same can also be appreciated in the result; showing better growth of the grafts closer to normally perfused facial skin.

Observation of distortion angle of hair grafts

Grafts placed in the postburn scars often appear wavy and distorted when the growth begins. The distortion can be seen in a case of acid burns [Figure 4a and b] having restoration of side locks. Grafts were placed at 3 mm spacing, directed downwards, but the growth appears distorted.

RESULTS

The hair growth from implanted grafts in burn areas is delayed. All the hair grafts do not commence growth together, 30-40% grafts grow at 5-6 months, another 40% grow in 7-8 months and the last 10% grow at 8-10 months. We should be patient to wait and give time. The complete result is seen only 10 months after the hair transplant.

In spite of waiting for the scar to be mature and taking care of all steps in the surgery, there was a 5-12% loss of grafts or failure of the grafts to grow.

Patients with eyebrow and mustache restoration are most satisfied. Often it not only creates an aesthetic landmark, but also covers an uneven scar delivering double benefit. Eyebrow restoration is most critical to keep the angle flush to the skin. Eyebrows placed at the slightest elevated angle grow out like canopies and look unacceptable. Mustache grafts also should match any residual partly growing hair and remain flush to the skin.

Patients are usually counseled for 2-3 sittings. In our review, only 9% patients could be corrected in one sitting. Majority of the postburn hair transplants, 77% required



Figure 2: (a) Childhood burns scar in an 18-year-old male. (b) Result after 10 months 1500 grafts follicular unit transplant, single sitting



Figure 3: Limited beard restoration around the chin and moustache by creating tracks with 1.2 mm punches

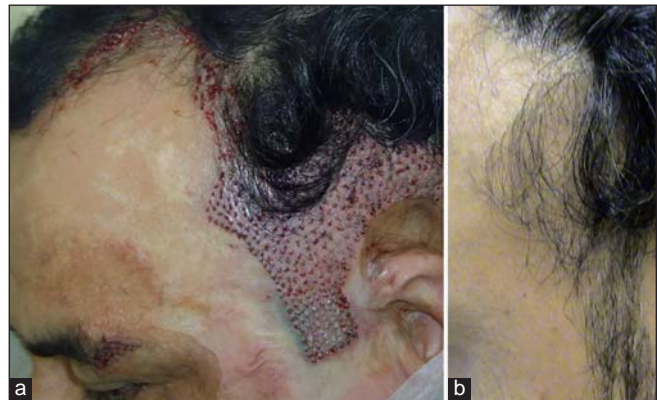


Figure 4: (a) Grafts placed for restoration of temporal angle and side locks. (b) Distortion of direction due to scarring

two sittings [Table 1] and 14% required three sittings for satisfactory restoration. The scar skin was noted to show improved texture and thickness after the first sitting and results of the second sitting were better. Scalp hair grafts grow faster than facial hair and need to be trimmed regularly.

DISCUSSION

Advantages of the surgical technique

The FUE individual extraction technique avoids linear scar and suturing over the donor area. With FUE, grafts can

be harvested from a wide area, all over the scalp, even if the usual occipital donor area is affected by burns. If you are short of scalp donor area, the donor source can be extended to use of body hair extraction. FUE does not require a team of assistants to sliver and dissect the grafts. With FUE, you can select single hair, for eyebrows, eyelashes or 2 and 3 hair units for other areas.^[7] However, FUE requires training and development of skills. For an occasional hair transplant requirement, the hair follicles can be best harvested as a strip from the scalp. Restricting the thickness of the strip to the sub-dermal level preserves lymphatics, veins, nerve endings, avoids neuromas, numbness, ensure faster healing. Two layered closure ensures a thin cosmetic scar.

Technique of implantation

Implanters can bypass the skill for graft placement. Use of implanters is recommended for surgeons who do not do regular hair transplants. Implanters can achieve depth of placing, control the angle, layout, direction and density of the grafts as is aimed with skillful Stick and Place technique to match the natural hair pattern in the area of restoration. Premade slits with a 1 mm chisel blade^[8] or premade tracks with 18G - 19G hypodermic needle allow the use of assistants to later, place the grafts in these tracks. In any technique for eyebrow, mustache, beard, eyelashes it is essential to place the grafts flush to the skin [Figure 5]. An assistant should stretch and stabilize the skin for easy placement of the grafts.

Spacing between the grafts

In routine hair transplants done for patterned baldness, the micro grafts are placed 1-1.5 mm apart. However, in postburn scars it is observed that close placed grafts may not take well due to reduced perfusion. In postburn scars, the grafts have to be spaced at 2-4 mm, which ensures over 90% graft survival. Further sittings will be required to ensure good density and coverage.

Depth of implantation

In burn scars, we should create skin tracts reaching to deeper vascular layer showing punctuate bleeding from



Figure 5: Eyebrow graft placement flush to the skin

the needle pricks, which ensures placement of grafts in contact with a vascular perfused layer ensuring better survival. Needle tracks should show some elasticity and recoil to hold the grafts. Nonelastic, thick, dense, white scars can be cored out with 1.2 mm FUE punch to extract the scar and create tracks to accommodate the new grafts [Figure 2].

Delayed hair growth in burns

Normal transplants begin hair growth within 3-4 months. Whereas, in burn scars you have to wait patiently, due to poor circulation. Distortion of angle and wavy growth appears with grafts implanted in postburn scars. This is due to the fibrosis in the bed and adherence between the tissue layers. The distortion will be less pronounced in the subsequent hair cycles the hair will set better gradually in the next 8-10 months. Initially, the hair growing out is being squeezed through the scar. Thus it tends to become wavy, gradually in the next 4 months as it continues to grow longer it may become better. Coconut oil or Vaseline can be used to groom the hair and rub it down to grow along the required direction.

Poor growth and failure of graft growth

Failure of 5-7% growth of grafts can be attributed to poor blood perfusion, compression of the grafts in the scar tissue, deep dermal scarring and too much handling or repetitive attempts of graft insertion and implantation in the nonelastic scarred skin. This can be countered by premaking the slits or needle tracks and extracting scar tissue with a FUE punch to facilitate graft placement. The loss of grafts and failure to grow improves with experience.

Number of sittings and spacing between two sittings

The 9% patient requiring one sitting were cases of partial loss of eyebrows. Majority patients required second sitting due to grafts being implanted 2-4 mm apart, a second sitting is thus required for adding density. The sittings are planned 8-10 months apart to allow time for the growth of previously placed grafts and to permit replacement of the nongrowing grafts during the second sitting. Most of the scalp areas require three sittings as patients desire good density to be added, especially if there are adjacent areas of normal hair or a presentable landmark, which was the desire to be matched. During the second sitting, the scar is seen to have improved texture and thickness due to the introduction of new stem cell reserve from the implanted follicles. Therefore results of subsequent sitting are better.

Eyebrow restoration

Since eyebrow restoration is the highest demanded hair transplant in postburn scars, let us consider more details. Eyebrow reconstruction has been attempted with the use

of strip grafts and temporal artery based flaps. These have resulted in fibrosis, change in the direction of hair growth, scarred borders around the eyebrow, too thin or too robust hair growth and unnatural appearance. A good eyebrow should recreate natural curve, characters and pattern.

Characteristics of a natural brow

Medially the eyebrow begins below the orbital margin, in line with the medial canthus. It gradually climbs up and arches in the middle third to reach its highest level above the orbital rim, then thins out and slopes along the orbital rim, in the lateral third, to the level of the lateral canthus [Figure 6].^[5]

There are two types of eyebrow hair patterns

Triple pattern brow

Medial hair growing medially or vertical,^[6] hair in the middle third grow vertically upwards and outwards, while the lateral third hair grow downwards and outwards [Figure 5]. The brow is thickest medially. It is the most difficult to match. The best strategy is to implant all the grafts facing downwards and laterally within the shape of the brow.



Figure 6: Natural layout and eyebrow pattern

Double row crisscross brow

Having hair in the upper and lower halves growing crisscross toward each other. The brow is thickest medially and tapers laterally.^[6]

Pattern and shape of the opposite brow or old photograph can serve as a guide.^[5] A single eyebrow may require 70-130 single hair grafts placed in 3-5 rows. Brow slanting downwards gives elderly look. Brow placed higher gives a surprised look. Females brows should be created thinner, the patients may like to draw the eyebrow for you. The female eyebrow begins slightly away from the medial canthus, is thinner and more 'C' shaped with maximum curvature at the lateral border of the limbus.^[5] The results seen in Figure 7a and b show the layout of grafts and 'C' shaped eyebrow planned in a postburn mature scar. In females beware, transplanted brow has thicker follicles that are difficult to reshape with threading or plucking.

Difficulties in eyelash restoration

Trichiasis and entropion were common problems with the older technique placing a single row-wedge of temporal hair along a split eyelid border [Figure 8]. Entropion can be avoided if we do not place the grafts along the lid margin, but place them 1-2 mm above, over the tarsal plate [Figure 9].^[5] The tarsal plate directs the hair to grow outwards and forwards preventing the hair from curling inwards, toward the cornea. The clinical photograph of first sitting for eyelash placement 1 mm above the tarsal



Figure 7: (a) Postburn scar left eyebrow pre (b) postburn eyebrow restoration result



Figure 8: Eyelash restoration old technique

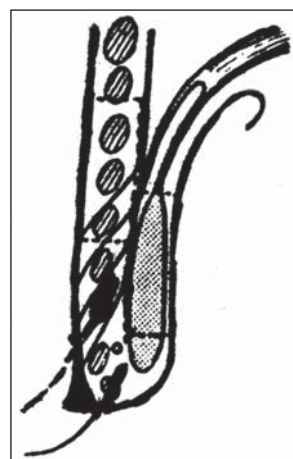


Figure 9: Eyelash grafts placed 2 mm higher to prevent entropion

plate and not along the border of the eyelid, directing the hair forwards is shown in Figure 10. The slightly higher placement of grafts is not clinically noticeable. Place two inter-digitating rows with 15-25 grafts. Grafts from slow growing lower neckline are preferred.^[5,6,8] With latest FUE, one can selectively harvest thin, one hair grafts to suit the purpose.

A French needle technique uses long hair grafts to thread the hair into a suturing needle and draw the needle through the lid exiting 1-2 mm above the tarsal plate. The hair is pulled so that the follicle follows in place along the needle track.^[5]

Difficulties in moustache and beard restoration

Mobile facial skin makes it difficult to implant grafts for moustache and beard. An assistant stretching and stabilizing the skin facilitates placement of the grafts. It is important to keep the grafts flush to the skin. In case of complete loss of beard, a limited restoration around the lip and chin area can change the looks [Figure 2]. A moustache would need 150-300 grafts. The grafts are directed downwards and outwards with increasing lateral tilt toward the angle of the mouth. The moustache area from 2 mm below the nostril to 2 mm above the white roll, is covered in 7-10 inter-digitating rows.

CONCLUSION

Follicular unit micro grafting imparts natural looking layout and replacement for restoration of eyebrows, eyelashes, moustache, beard, side burns, hairlines or scalp hair. It allows precise control of the angle, depth and direction of placement to match the surrounding hair. Implanting with hypodermic needles ensures minimal injury with faster healing. Wider spacing ensures good graft take. Multiple sitting are required to create good density and replace some lost grafts. The technique demands good surgical skills. The job is repetitive, time consuming and laborious but results are rewarding.



Figure 10: First sitting for eyelash grafts placed 1 mm above the tarsal plate to be directed forwards

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