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Maurice Fekry

Department of Plastic Surgery, Mataria Teaching Hospital, Cairo, Egypt, morisplastic7@gmail.com

Ebrahim Awad

Department of Plastic Surgery, Mataria Teaching Hospital, Cairo, Egypt

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Improvement of hair transplantation in postcicatricial alopecia

Maurice F. Khalil ^{a,*}, Ebrahim A. Rizk ^b

^a Consultant of Plastic Surgery in Mataria Teaching Hospital, Cairo, Egypt

^b Fellow of Plastic Surgery in Mataria Teaching Hospital, Cairo, Egypt

Abstract

Background: Because scarred tissue has less blood flow than normal tissue, fewer hair grafts are taken, and the patient may require many sessions to achieve the acquired density, resulting in a lengthy treatment duration of up to 5 years. The use of platelet-rich plasma (PRP) improves these findings.

Patients and methods: A prospective randomized-controlled study was conducted on 15 patients with cicatricial alopecia and candidates for follicular unit extraction hair transplantation, with ages between 25 and 60 years.

Results: Functional and esthetic outcomes were achieved by adding PRP regimen to follicular unit extraction hair transplantation for cases presented to us with postcicatricial alopecia. Improvement was noticed in early recovery time and increase in density.

Conclusion: PRP therapy after hair transplantation improves density and reduces recovery time in cases of cicatricial alopecia.

Keywords: Follicular unit extraction hair, Hair, Hair restoration, Platelet-rich plasma, Postcicatricial alopecia

1. Introduction

Scars that occur in regions where hair develop can be quite noticeable. Some scars are minor and easily concealed, whereas others require scar healing. Scars can appear on the hairy areas for a variety of reasons, including an accident or a burn. Hair transplant surgery using follicular unit extraction (FUE) is used to help conceal scars in hairy places [1].

The FUE technique is used to remove hair from a donor's body or head and transplant it into the scarred tissue. We want to increase the rate of transplant development and survival in scar tissue [2].

Hair can be grafted into scarred tissues, and grafted follicles develop with time. Scar tissue, on the contrary, frequently has lower levels of blood supply than normal tissues. Hair follicles require blood to survive, which is an issue. The transplanted hair follicles will die or be unable to

function effectively if the blood supply is insufficient. Platelet-rich plasma (PRP) injections before surgery boost blood flow into the scarred tissue, which improves graft take. Moreover, PRP injections after the procedure improve graft survival and take [1].

Scars on hairy areas are caused by a variety of factors, including car accidents, sports injuries, birthmarks, and burn injuries. After healing, the wounded areas are frequently hairless. Hair restoration treatments such as FUE transplantation, on the contrary, make scars unnoticeable [3].

Although hair follicle transplantation into scar tissue is successful in most cases, various individual factors can influence the final cosmetic outcome. If the scar is hypertrophic, for example, it can limit the amount of blood that reaches the newly grafted hair follicles, preventing them from developing and functioning normally. This affects the overall outcome of the hair scar removal technique. Scar

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* Corresponding author at: Department of Plastic Surgery, Mataria Teaching Hospital, Cairo, Egypt.
E-mail address: morisplastic7@gmail.com (M.F. Khalil).

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tissue that is atrophic, on the contrary, may be too thin to hold transplanted follicles. This indicates that the graft acceptance will be lower than anticipated [1].

Treating scars in hairy places is a difficult task for the surgeon. Because graft take is not as consistent as in healthy, nonscarred skin, it may be necessary to repeat the procedure to attain appropriate density. The degree of hair loss and availability of donor's hair, as well as scar tissue quality, indicate whether the patient is a candidate for FUE. The scalp, beard, and brow are the most commonly affected locations [4].

This procedure is not suitable for individuals having not enough donor hair to cover the nonhair bearing defects, males who have advanced male pattern baldness themselves, or a significant family history of advanced male pattern hair loss (which limits the size of the safe occipital scalp donor area), and inflammatory dermatological conditions that are contraindications to hair transplantation (e.g. lichen planopilaris). Patients may also be unsuitable for hair transplantation because there are multiple other reconstructive surgical priorities for functional rehabilitation that are higher on the priority list [5].

1.1. Surgical options for management

The surgical options for treating burn alopecia depend on the location of the hair-bearing area affected and the size of the defect. These include one or a combination of the following techniques:

- (1) Serial excision with or without tissue expansion.
- (2) Hair-bearing flaps with or without tissue expansion.
- (3) Hair-bearing full-thickness grafts.
- (4) Hair transplant surgery.

1.2. Follicular unit extraction hair transplantation methods

Follicular hair transplantation focuses on FUE from the donor zone in the scalp: the posterior and lateral zones (nonbalding areas), as these produce the most natural results. The idea of the donor:recipient ratio refers to the amount of hair available in the donor area versus the number of hair necessary to cover a damaged area.

Each punch site in FUE surgery leaves a little round dot scar that can be covered with short hair. Punches with diameters ranging from 0.8 to 1.2 mm are coupled to a portable automated drill gear. Unlike strip hair transplantation, this procedure does not create a linear scar [6].

However, large harvesting sessions need shaving of the entire donor area, and the grafts tend to have less tissue around them, necessitating extra care in handling. When this operation is repeated several times, the donor area can thin out. Because the scalp in postburn alopecia is frequently very tight in these cases, strip FUT is not recommended because only a small area may be removed, limiting the amount of hair that can be transferred, and closure under strain will result in scar enlargement and/or hypertrophic scarring. The FUE method can also be used to harvest beard hair for beard-to-beard or beard-to-scalp transplantation. Body hair can also be extracted with FUE, although it has a distinct development pattern than scalp and beard hair, with a shorter growing phase and a longer resting period. This means that body hair transplants to the scalp may cause hair density changes as body hair tend to enter the resting phase of their prolonged hair growth cycle. The implantation is the same regardless of the method used to collect hair, and it is the angle and direction of the transplanted hairs, as well as the hairline design and recipient site density, that determine a good hair transplant result. Follicular unit grafts can be inserted into premade incisions with a scalpel or implanters; the implanters can also be used to make incisions while the graft is being implanted. The advantage of the prefabricated opening is that the entire design of the transplant area is completed before the start of graft implantation, whereas the implanter has the advantage of not missing any incision sites. Hair transplant surgical complications are mostly related to the esthetic outcome with density. Infection is extremely rare. Skin necrosis at the donor or recipient location is also uncommon [5].

Patients with postburn scar alopecia frequently have dense hair around the alopecia patches. As a result, many treatments are required to obtain acceptable hair density, which should be explained to the patient during the consultation. It can take up to 18 months for transplanted hairs to mature and allow for evaluation of the transplanted results. Several processes could take up to 5 years to complete. Micropigmentation tattooing, which can give scars a color comparable to hair, can be used to hide the scar for a long time [1].

2. Patients and methods

The institutional committee's ethical criteria were followed during all proceedings. The Ethics Committee approved the study.

This study was done on 15 patients with post-cicatricial alopecia and candidate for FUE hair transplantation, with ages between 25 and 60 years, who

were divided into two groups: group 1 was the case group, which included 10 patients [posttraumatic (x) six patients and postburn (y) four patients] and managed by injection of PRP four sessions before hair transplantation, a session every week; 1 week separates the last session from hair transplantation. Then, FUE hair transplantation was done with addition of PRP injection of 0.1 ml for every square centimeter in the recipient area; during the procedure, the grafts were kept in PRP-soaked gauze.

Postoperative regimen for group 1: day 1 after hair transplantation, preparation of PRP was done. Then, it was sprayed with a syringe without injection and repeated daily for the first week, and then injection was started 1 week postoperatively, 2 weeks postoperatively, 3 weeks postoperatively, and then each month for 4 consecutive months (cases 1, 2, and 3).

Group 2 was the control group, which included five patients [posttraumatic (x) two patients and postburn (y) three patients] and managed by four sessions of PRP only after the transplantation session every week (case 4).

The evaluation was done by the analysis of graft take density and patient satisfaction up to 1 year.

2.1. Operative technique

In this study, we used FUE hair transplantation based on a micromotor and straight handpiece, jewelers micro forceps (extraction and implantation), punches of size 0.8 mm, and a needle holder with slits or blade knife no. 11.

2.2. Site of donor

Back and sides of the scalp were used as donor sites.

2.3. Anesthesia

Local anesthesia with 2 % xylocaine concentration and adrenaline 1 mg for both donor and recipient was initiated.

2.4. Donor site anesthesia

For the ring block, at the donor site, we had prepared a solution of xylocaine 30 ml with the addition of 30 ml of normal saline with the concentration of adrenaline (1 : 1000) for donor and recipient block.

We inject the anesthetic at the posterior hairline for proper block of the posterior occipital nerve.

2.5. Recipient site anesthesia

Local infiltration of scar area with local anesthesia was done.

2.6. Procedure

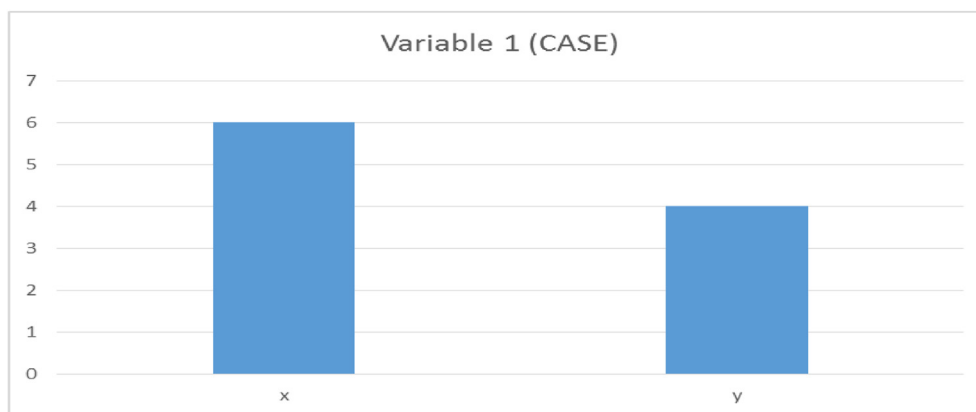
2.6.1. Harvesting of hair grafts

Follicular units were harvested by sharp punches. We used 0.8-mm diameter punches in this study.

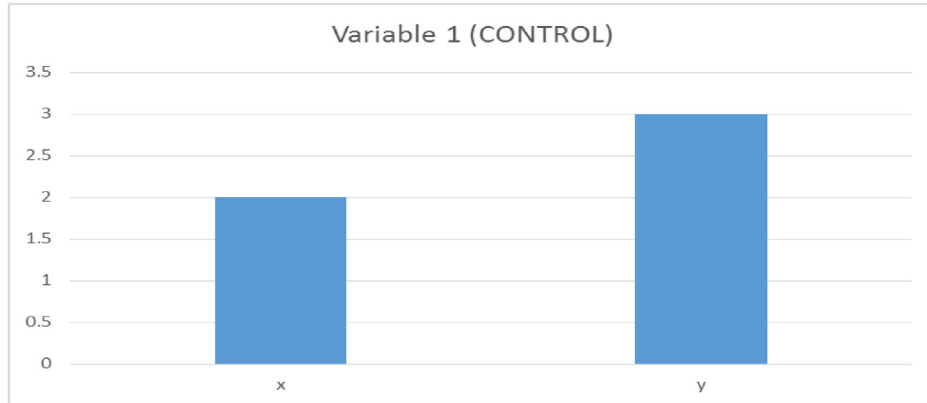
We stored the grafts in PRP soaked in a gauze during the procedure time.

2.6.2. Creation of recipient sites and implantation of hair grafts

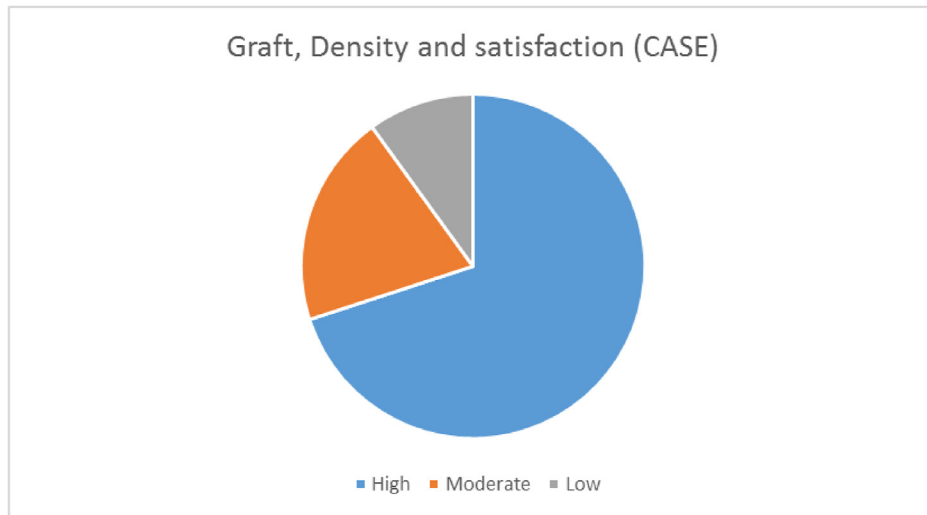
Creation of the recipient sites in the recipient area was done with a blade of width of about 1 mm or with a scalpel knife no. 11 carried on the needle holder. Insertion of the graft was done using implantation jewelers.



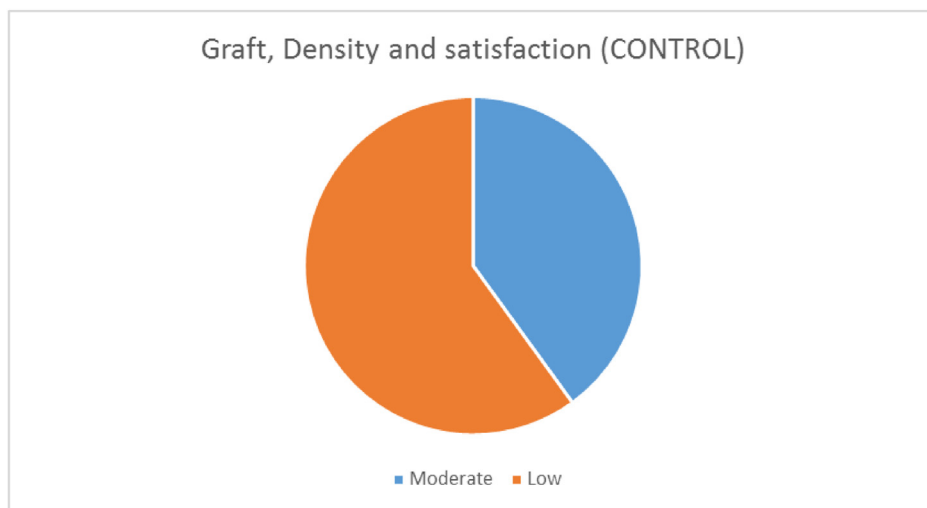
Histogram 1.



Histogram 2.



Piechart 1.



Piechart 2.

2.7. Dressing

The dressing was exposed or closed according to site and patient tolerance; the closed dressing was removed daily postoperatively for PRP application.

2.8. Platelet-rich plasma preparation

The sample is first collected in tubes containing anticoagulants, roughly 1 ml of sodium citrate for every 10 ml of blood, in the double-centrifugation process of PRP. PRP is extracted from a sample of the patient's blood taken during treatment. A 10-ml venous blood drawn will provide 1–2 ml of PRP, which is obtained through a double-centrifugation procedure in which the sample is first collected in tubes containing anticoagulants containing around 1 ml sodium citrate for every 10 ml of blood.

The first spin step was performed at 2500 rpm for 4–5 min for the separation of whole plasma from red blood cells.

For the production of pure PRP, the upper layer and superficial buffy coat are transferred to an empty sterile tube.

The second spin step was performed at 3500–4000 rpm for 15 min for sedimentation of buffy coats and the creation of PRP.

The upper portion of the volume that is composed mostly of platelet-poor plasma is removed. Pellets are homogenized in lower one third (5 ml of plasma) to create the PRP.

3. Result

Group 1 included 10 patients [six posttraumatic (x) and four postburn (y)] (Fig. 1). Group 2 was the control group, which included five patients [two posttraumatic (x) and three postburn (y)] (Fig. 2).

In group 1, seven patients had high-density graft take and their satisfaction was high; two patients had moderate graft take, moderate density, and moderate satisfaction; and only one patient had low graft take, less density, and low satisfaction (Fig. 3).

In group 2, three patients had moderate graft take, moderate density, moderate satisfaction, and only two patients had low graft take, less density, and low satisfaction (Fig. 4).

4. Discussion

PRP therapy helps to improve the skin quality of grafted areas by stimulating cell proliferation and differentiation, inhibiting apoptosis, and increasing neovascularization, making grafted areas more suitable for newly transplanted hair. It also aids in the formation of new hair follicles, resulting in increased survival, activity, and the appearance of new recovered hair as early as 3 months. PRP injections under the skin are thought to minimize hair loss and enhance hair diameter and density, according to most research [7].

When follicular units are prepared with PRP before implantation, there is considerable improvement in hair density and stimulation of growth, which leads to higher patient satisfaction [8].



Fig. 1. Shows case 1 posttraumatic(x) patient before and after hair transplantation.



Fig. 2. Shows case 2 posttraumatic(x) patient before and after hair transplantation.

In this study, we used PRP-preserved hair grafts using the FUE technique, which resulted in a significantly increased percentage of hair graft uptake in the implanted area [9] (cases 1, 2, and 3).

There was a significant visual difference in the hair cross-section. Microscopic findings showed a thickened epithelium, proliferation of fibroblasts and collagen fibers, and increased vessels around the new follicles [9].

The effect of autologous PRP injections on the affected area of alopecia was studied. Three months

after the treatment, the patients presented with clinical improvements in hair count, hair thickness, and hair root strength [9]. Of the other cases that were treated only with postoperative PRP (case 4), the density of hair was less and needed more than the postoperative session.

Mahapatra and colleagues did a study on 177 patients in 2016. They found that PRP injections resulted in considerably more hair per square centimeter than controls (mean difference, 17.90; 95 % confidence interval, 5.84–29.95; $P = 0.004$).



Fig. 3. Shows case 3 posttraumatic(x) patient before and after hair transplantation.



Fig. 4. Shows case 4 post burn (y) patient before and after hair transplantation.

They also found that the PRP group had a considerably higher hair thickness cross-section per 104 mm^2 (mean difference, 0.22; 95 % confidence interval, 0.07–0.38; $P = 0.005$) [10].

In consistence with Saxena and colleagues, the quality of scarred tissue improved following hair transplantation with the addition of PRP therapy as skin atrophy in the cicatricial areas looked to be reduced. This could be explained by the PRP's activity, as well as the fact that the transplanted hair causes neovascularization and dermal rearrangement [1].

In our study, adding PRP therapy with post-cicatricial alopecia hair transplantation gives the patient more better results with high patient satisfaction in scar quality, hair density, and length results, which were evaluated by a patient questionnaire at the sixth-month postoperative follow-up.

Our study can explain and in agreement with Uebel and colleagues, that PRP, with its action of tissue regeneration and remodeling with angiogenesis, has the potential to revitalize the scarred tissue, improve its vascularity to make it more receptive for transplant, and help increase the donor yield. Such PRP can serve as an adjuvant to hair transplant in compromised recipient areas as seen in scarring alopecia [11].

Garg looked into the results of intraoperative injected PRP therapy for 40 patients who had FUE hair transplantation. The number of patients with multiple grafts was substantially higher in the PRP-treated group (20 patients) than in the non-PRP-treated group (20 patients), and 65 % of the PRP-treated group had more than 10-mm hair shaft

length. Only 10 % of patients in the non-PRP treated group had a shaft length of more than 10 mm.

Garg noted that after 3 months of hair transplantation, all 20 patients in the PRP group had numerous grafts regrowing and exploding out. Only 60 % of patients in the non-PRP group had multiple grafts at 6 months, compared with 80 % in the PRP group.

Moreover, in our study, we noticed the same results, mainly in cicatricial alopecia. PRP decreases the time of regrowth and appearance of grafts again at the end of the sixth month [12].

After a year of follow-up, we found that not only the PRP injections but also the handling of grafts, storage, graft harvesting techniques, and overall time of operation made a significant effect in FUE hair transplantation for scalp baldness.

5. Conclusion

Hair transplantation with PRP therapy results in more density and a shorter recovery time after cicatricial alopecia.

Conflicts of interest

No conflict of interest.

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