

## How We Improved Our Results of Hair Transplantation

Jalal Hamasalih Fattah

Assistant Prof. in plastic surgery, Head of Plastic surgery unit /  
College of medicine/HMU, Erbil-Iraq

### \*Corresponding author

Jalal Hamasalih Fattah, Assistant Prof. in plastic surgery, Head of Plastic surgery unit / College of medicine/HMU, Erbil-Iraq

Submitted: 15 Aug 2020; Accepted: 22 Aug 2020; Published: 01 Sep 2020

### Abstract

**Background:** Follicular unit extraction has evolved dramatically as the most recent advancement in surgical hair restoration as it leaves little scar, and creates natural, and pleasing result. The aim of this study is to demonstrate our new modifications and showing its effectiveness in improving our results.

**Materials and Methods:** A Prospective analysis of 247 male patients with Androgenic alopecia who underwent hair transplantation with Strip or FUE technique Between August. 2015 and June 2019 at our center was conducted. The mean age was  $[35.93 \pm 4.40]$  Years. At one year postoperatively, patients were asked to fill up a questionnaire which included their satisfaction level, need for 2nd session, and complications. Informed written consent obtained from all patients. Data were analyzed using the statistical package for social science SPSS V. 23.

**Results:** In the last 134 cases, addition of 40 mg of Triamcinolone to the LA solution led to dramatic reduction of the incidence of postoperative oedema, from 74.3% to 6.7%. Adding three sessions of PRP at 2nd, 4th, and 6th month post operatively resulted in increased patient satisfaction rate with better hair density and thickness where the rate of highly satisfied patient increased from 62.6% to 74.3%.

**Conclusions:** Addition of 40 mg Triamcinolone to the LA solution is highly effective in reducing postoperative oedema. FUE is preferred over strip method to avoid visible donor scar totally. Three sessions of PRP at 2nd, 4th, and 6th month post operatively is recommended.

**Keywords:** Follicular unit, Follicular unit extraction, Platelet rich plasma

### Introduction

Androgenic alopecia (AGA) cause considerable psychological disturbances and low self-esteem [1, 2]. Orentreich in 1959 popularized the concept of hair transplantation for treating baldness [3]. Hair transplantation has gone through a big revolution with the pioneers in this field [4-6]. Follicular unit extraction (FUE) first described in 2002 by Inabas has evolved as the most recent advancement in surgical hair restoration with little scar, and natural result [7-10]. In the last two years we refined our hair transplantation that improved our results. The aim of this study is to demonstrate our new modifications and showing its effectiveness for increasing patient satisfaction.

### Materials and Methods

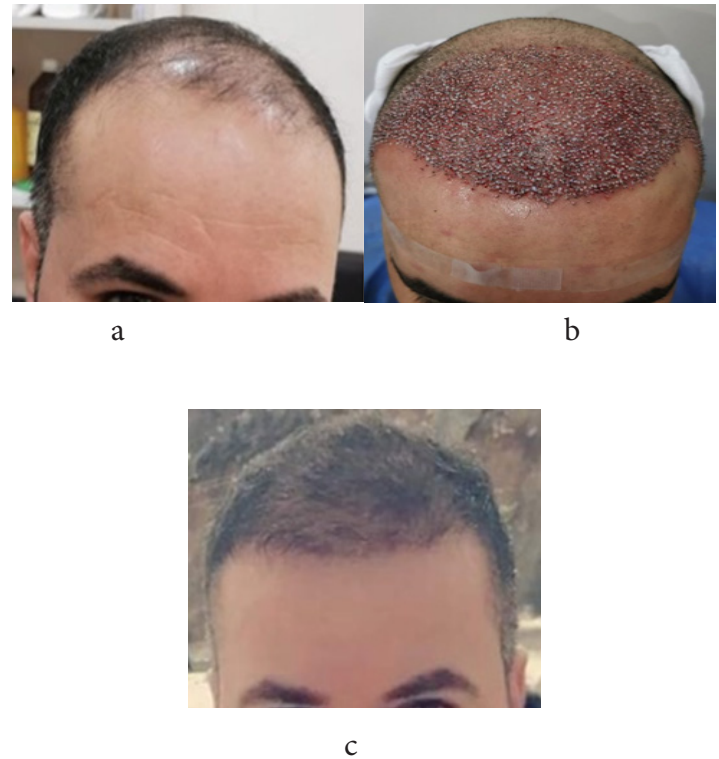
**Design and sample collection:** A Prospective analysis of 253 patients with AGA who underwent hair transplantation with Strip or FUE technique Between Augusts. 2015 and June 2019 at our center was conducted. The mean age was  $[35.93 \pm 4.40 \text{ SD}]$  Years, Ranging from 29-43 years.

**Inclusion criteria:** male patients with AGA with good donor site, realistic expectations and good body health.

**Exclusion criteria:** Female patients, Patients with AGA with inadequate donor hair density or when one hair FU predominate,

other causes of alopecia, Unrealistic expectations, patients with associated medical diseases, and Six cases excluded because of lack of follow up (the remaining 247 cases enrolled in the study).

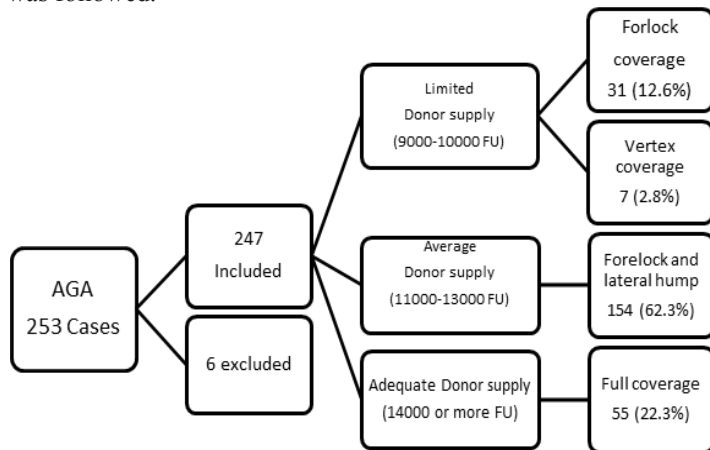
**Procedure:** After detailed counselling session with the patients, the following were explained: The process of AGA pattern hair loss, different management options, explanation about the procedure (Strip method in the first 113 cases 45.7% and FUE method in other 134 cases 54.3%), possible postoperative complications, explaining that the final result will not be seen before Six months, postoperatively should continue on minoxidil shampoo indefinitely to preserve existing hair. Then donor site assessed for density and hair quality, any patient with donor site density less than 80 FU/cm<sup>2</sup> or when one hair FU predominate or when the total donor FU was less than 8000 FU or with poor hair quality considered unsuitable for hair transplantation. The region between the occipital protuberance and 1 cm above the top of the ears was considered the safe donor site from which to harvest hair. Extraction was limited to 25% of the donor hair available. A plan formulated based on the amount of donor hair available and the desired coverage area expressed by the patients (Figure 1). Therefore, patients with limited donor area offered frontal forelock (Figure 2) or Vertex only while patients with average donor area offered forelock and lateral hump coverage (Figure 3) and patients with adequate donor hair offered full coverage (Figure 4). Scalp was the only donor area for our patients. The patients underwent routine laboratory blood investigations like CBC, Coagulation profile, and viral screen tests. All patients advised to have a preoperative shampooing of scalp with chlorhexidine gluconate the night before and the morning of surgery. The patient's hair was trimmed short before the surgery. Analgesic and antibiotics were administered at the start of surgery. Strict surgical asepsis was followed.



**Figure 2:** Norwood grade 5 baldness, planned for Frontal forelock coverage (limited donor supply). a- Preoperative, b- Intraoperative c- One year post-operatively.



**Figure 3:** Norwood grade 4 baldness, planned for Frontal forelock and lateral hump coverage because of average donor supply. A,b: Intraoperative.



**Figure 1:** Flow diagram Shows Plan for recipient coverage based on the amount of donor supply (AGA: androgenic alopecia, FU: Follicular unit)



a

b



c

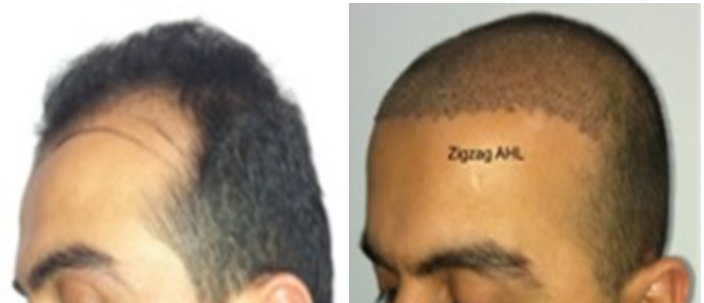
**Figure 4:** Norwood grade 4 baldness, planned for full coverage (adequate donor supply), a- Preoperative, b and c: One year postoperatively.

**Marking:** The most important landmark that needs to be determined is the height of the anterior hairline (AHL) (Figure 5). The location of the most anterior, midfrontal portion of the hairline was marked 8.5- 10 cm above the glabella, a gently curving hairline was created, with care taken to always maintain a significant frontal-temporal recession. Then marking the lateral hump (Figure 6). This landmark is important because it represents the lateral extent of the AHL. When a forelock pattern is designed, the posterior border located somewhere along the midscalp. For donor area marking, the region between the occipital protuberance and 1 cm above the top of the ears was considered the safe donor site.



a

b



c

d

**Figure 5:** The height of the anterior hairline (AHL), was marked 8.5- 10 cm above the glabella (a,b,c). Zigzag AHL (d).



a

b

**Figure 6:** (a,b)The lateral hump. This landmark is important because it represents the lateral extent of the AHL

**Anesthesia:** The procedure performed under local anesthesia. The local anesthesia solution was a 40 mL mixture of 0.25% bupivacaine with 1:200 000 epinephrine + 20 mL 1.0% lidocaine with 1:200 000 epinephrine and in the last 134 cases 40 mg of Triamcinolone was added to the solution. Supraorbital and supratrochlear nerve blocks were given to anesthetize the recipient area. Ring block anesthesia was administered to the recipient and donor area. This was followed by the tumescent injection to the whole donor area and recipient site for those who planned to undergo FUE, while for those who planned for strip excision method, the tumescent was limited to the donor ellipse, in addition to the recipient site.

**Donor site harvest:** For Strip excision. The patient is positioned in a lateral decubitus position. An ellipse of donor scalp was outlined, the ellipse excised with precise knife blade angulation parallel to the hair shafts. Dissection level of the donor strip limited to the superficial fat to avoid injury to the occipital neurovascular bundle. The wound was closed in two layers. Once the donor tissue has been harvested, the tissue was immediately immersed in chilled isotonic saline. Graft preparation was performed using Loupe and microsurgical instrumentation. Initially, the donor strip was sub sectioned into slivers, each being 1 FU in width. Every effort made to avoid transection of grafts during slivering. Each sliver is then



dissected into FU grafts. These grafts are placed back into chilled isotonic saline until they are planted.

For FUE, follicles were extracted using micro motor punches with sharp small punches (0.8-1.1 mm) in diameter (Figure 7), from the safe donor area; the net result was the isolation and removal of a single FU (Figure 8). The remaining puncture was left to heal by secondary intention.



**Figure 7:** Instruments used for hair transplantation.



**Figure 8:** The FU grafts arranged as a single, Two, and Three or more hair FU grafts in rows for easy identification

**Recipient site creation:** we used 19-gauge needle, which produce 1.1 mm slit that accommodate the size of majority of FU and some time we used Customized recipient blades cut to specific size from surgical prep blades. The angle of the recipient slit was parallel to the angle of the existed hair.

**Graft planting:** two assistants working simultaneously were planting FU grafts using forceps of microsurgery. Doing gentle grasping of the FU grafts, placing the grafts in the identical angle of slit creation, and each time putting small amount of FU grafts on his gloved hand so that it can be planted within 4 minutes to decrease the warm ischemia time of the FU grafts. The shape of the frontal hairline should not be linear but should be broken up with triangles and gaps (Figure 3 and 5). consisting of random placement of single hair grafts from the softest hair available in donor supply. Posterior to the single hair grafts putting FU containing 2 and 3 stronger hair.

**Post-Operative:** all patients received postoperative oral antibiotic and analgesic and instructed about head elevation and applying cold gel pad to the forehead and donor area. Gentle shampooing commenced on 2nd postoperative day. Patients were followed up at 3rd, 7th, and 14th day and then monthly up to Six month then after 1 year postoperatively. In each visit, the patients checked for any possible complications and managed accordingly. In the last 140 cases Three sessions of Platelet rich plasma (PRP) were done at 2nd,4th, and 6th month post operatively using (YCELLBIO PRP Kit.) using single spin method at 1500 rpm for 5 minutes, Following the centrifugation, the sample separate in to three layers, the yellow top layer(Platelet poor plasma PPP), a thin middle layer, the buffy coat (PRP), and a red bottom layer (Red blood corpuscles RBC) (Figure 9). Then the buffy coat transferred to an empty syringe, from each Kit we got 1.5 ml of PRP so by using two Kits we will get about Three ml of PRP. After that the PRP will be mixed with activator (calcium chloride), mixing done by 20-time quick transferring between two 10 ml syringes. Then the activated PRP injected to the recipient site intradermally at 0.1 ml/cm<sup>2</sup> in a linear pattern 1 cm apart to a depth of 2-3 mm).



**Figure 9:** Following centrifugation, the sample separate in to three layers, the top layer (PPP), middle layer (PRP), and a red bottom layer (RBC)

At one year postoperatively, patients were asked to fill up a questionnaire which included their satisfaction level on a three-point scale (Unsatisfied, Satisfied, highly satisfied), need for 2nd session, and complications.

**Ethical considerations:** The study protocol was approved by Medical Ethics Committee of the College of Medicine of Hawler Medical University. Informed written consent obtained from all patients.

**Statistical analysis:** Data were analyzed using the statistical package for social science SPSS V. 23. Chi square test of associates was used to compare between proportions. Fisher exact test was used when the expected count of more than 20% of the cells of the table was less than 5. A P-value of less or equal to 0.05 was considered statistically significant.

## Results

The severity of Androgenic alopecia was Norwood III, IV, V, and VI in 31(12.6%), 55 (22.3%), 142(57.5%), and 19(7.7%) patients, respectively. Total of 728,800 FU grafts were transplanted in 247 cases. Of these 113 cases with strip method (45.7%), and 134 cases with FUE method (54.3%). The Minimum amount transplanted was 2000 FU graft, and the Maximum was 3400 FU graft, with the mean of  $2930 \pm 412.91$  SD FU graft.

The Incidence of post-operative edema in relation to adding Triamcinolone to LA solution is shown in Table 1:

The effect of adding 40 mg Triamcinolone to decrease the incidence of postoperative oedema is shown in Table 1

**Table 1: The Incidence of post-operative edema in relation to adding Triamcinolone to LA solution**

Triamcinolone in LA solution	Post-operative oedema					P- Value
	NO Oedema	Upper forehead oedema	Upper and lower forehead oedema	Periorbital oedema	Total	
NO	29 25.7%	6 5.3%	67 59.3%	11 9.7%	113 100%	0.000
YES	125 93.3%	7 5.2%	2 1.5%	0 0%	134 100%	
Total	154	13	69	11	247	

The effect of adding Three sessions of PRP at 2nd,4th, and 6th month postoperatively is shown in Table 2

**Table 2: Patient Satisfaction at One year postoperatively in relation to addition of Three PRP sessions at 2<sup>nd</sup>,4<sup>th</sup>, and 6<sup>th</sup> month post-operatively**

PRP Postoperatively	Patient satisfaction				P- Value
	Unsatisfied	Satisfied	Highly Satisfied	Total	
NO	6 5.6%	34 31.8%	67 62.6%	107 100%	0.026
YES	1 0.7%	35 25%	104 74.3%	140 100%	
Total	7	69	171	247	

Donor complications with strip method is shown in Table 3

**Table 3: Frequency of donor complications with Strip method**

Donor Complication In Strip method	No complication	Infection	Donor hair effluvium	Visible scar	Total
Frequency	89	2	16	6	113
Percent	78.8%	1.8%	14.2%	5.3%	100%

Donor complications with FUE method is shown in Table 4

**Table 4: Frequency of donor complications with FUE method**

Donor complications In FUE method	No complications	Donor hair effluvium	Cyst	Total
Frequency	129	4	1	134
Percent	96.3%	3%	0.7%	100%

Recipient site complications is shown in Table 5

**Table 5: Frequency of Recipient site complications**

Recipient complications	No complications	Recipient effluvium	Folliculitis	Cyst	Crusting	Total
Frequency	198	7	18	9	15	247
Percent	80.2%	2.8%	7.3%	3.6%	6.1%	100%

## Discussion

Male type baldness causes a negative effect on individual's self-esteem and emotional well-being. Hair transplantation gives a permanent solution for those patients [11-13]. Hair transplantation is a relatively new and continuously evolving art, with several new advances, leading to more natural results for patients [14-16]. For the hair transplantation to be successful it needs adequate experience of the surgeon and staff, Excellent lightening, using loupe magnification, adhering to sterile precautions, using proper instruments, and proper patient selection. We selected Male patients with AGA with acceptable donor hair density and quality. We avoided patients with AGA with inadequate donor hair density,

patients with other causes of alopecia, patients with unrealistic expectations, and patients with associated medical diseases. Because of the progressive nature of Male-pattern baldness, patients who request inappropriate low hairline should be rejected for hair transplantation because they are unrealistic and will be dissatisfied later when the progressive hair loss during the next decade leads to Bizarre appearance of the low hairline [17-19].

We planned to determine the amount of recipient coverage according to the amount of donor supply and the patient desire (Figure 1). Any patient with donor supply less than 8,000 FU were rejected for hair transplantation. Patients with limited donor

supply offered frontal forelock or Vertex only while patients with average donor supply offered forelock and lateral hump coverage and patients with adequate donor hair offered full coverage. Any patient with limited donor supply and extensive hair loss who asks for full coverage, should be rejected because FU extraction should be limited to 25% of the donor FU and overharvesting should be avoided to avoid permanent damage of the donor area with resultant donor thinning and patchy hair loss [16, 20, 21]. Oedema of the forehead and or eyelid in the first week was a common consequence after hair transplantation in the first 113 patients. In an attempt to decrease postoperative oedema, in the last 134 cases, 40 mg of Triamcinolone was added to the LA solution in addition to the usual postoperative instruction about head elevation and applying cold gel pad to the forehead and donor area, led to dramatic reduction of the incidence of postoperative oedema, from 74.3% to 6.7% (Table 1) with highly significant P-value. Therefore, we can conclude that post-operative head elevation with application of cold gel pad alone is ineffective way to prevent post-operative oedema, while addition of 40 mg Triamcinolone to the LA solution is highly effective and we recommend it. Adding Steroid to tumescent solution was first recommended by Neil Dwyer for the cranio-facial surgeries. His study was on 20 cases of remodeling craniofacial surgery and concluded that, the formula can decrease the incidence of postoperative periorbital oedema [22]. Our findings reinforce the findings of Neil Dwyer. In another study, Abbasi G. et al found that addition of Steroid to the tumescent solution is the most effective way to prevent postoperative oedema, However, physical methods and oral steroid was ineffective [23]. Platelet rich plasma (PRP) therapy is a relatively new appealing approach to tissue regeneration to promote healing in maxillofacial surgery, periodontal surgery, orthopedic, burns, cosmetic and plastic surgery and more recently for its role in treating acne scar, fat grafting, and AGA [24-26]. In an attempt to improve our result of hair transplantation we added Three sessions of PRP at 2nd,4th, and 6th month post operatively using (YCELLBIO PRP Kit.) Which resulted in increased patient satisfaction rate with better hair density and thickness (Figure 4,10,11,12,13). where the rate of highly satisfied patient increased from 62.6% to 74.3% with P-value of 0.026 which is statistically significant (Table 2). PRP is rich in many growth factors and proteins. It is very rich in Platelet derived growth factor (PDGF), epidermal growth factor (EGF), Transforming growth factor (TGF), Fibroblast growth factor (FGF), vascular endothelial growth factor (VEGF) and various pro and anti-inflammatory cytokines [25, 27]. Growth factors in PRP promote hair regrowth by binding to their respective receptors expressed by stem cells of the hair follicle bulge region and associated tissues. Upon ligand binding, stem cells induce the proliferative phase of the hair follicle, producing the anagen follicular unit and facilitating hair regrowth [28, 29]. Hair transplantation is a relatively safe surgery and is associated with very few complications; However, it can seriously impact the cosmetic and psychological outcome for the patient [16].



**Figure 10,11:** a- preoperative. b- One year postoperatively, In Figure 10 show the result without using Three postoperative PRP sessions. Figures 11: shows result of Hair transplantation with three sessions of PRP at 2nd, 4th, and 6th month post operatively, leading to excellent natural result with denser, thicker and shiny hair.



**Figure 12:** Invisible donor scar in FUE method due to limiting our extraction rate to 25% of FU.





**Figure 13:** Visible donor scar in a patient with Strip method

To avoid complications, the surgeon and the staffs should be aware of possible complications, and have plan for prevention, and their management.

Edema is not a complication per se, but more of a surgical consequence [30]. As mentioned above we successfully reduced the incidence of postoperative oedema by addition of 40 mg Triamcinolone to the LA solution from 74.3% to 6.7%. Systemic complications were not seen in our study apart from transient hypotension in 4 cases that responded to lowering down the head and leg elevation.

In the strip method wound infection occurred in two cases (1.8%) which responded to local wound care and systemic antibiotic (Table 3). The low incidence of wound infection could be attributed to our strict adherence to sterile precautions, preoperative shampooing with chlorhexidine gluconate, prophylactic antibiotic, excluding patients with medical disease like diabetes, and good scalp vascularity. Farjio N. reported 1% incidence of wound infection [31]. Recipient site effluvium seen in 7 (2.8%) Patients, however; donor hair effluvium seen in 16 (14.2%) patients in Strip method above and below the incision line, while only in 4 (3%) patients with FUE method (Table 4) as a diffuse donor effluvium after 3-6 weeks. The patients reassured that it is a temporary phenomenon and Minoxidil spray prescribed, and full recovery seen after 3-4 months. Donor site effluvium is more common with overharvesting in FUE method [32]. The low incidence of donor effluvium in our study could be due to limiting our extraction rate to 25% of FU (Figure 12).

Visible scar was seen in 6 (5.3%) patients with Strip method (Figure 13) in whom the donor hair was not long enough or thick

enough to conceal it. Although the incidence is low, however; it was the main cause of patient dissatisfaction, which was the main reason to modify our harvesting method to FUE method. There were no wide scar, no hypertrophic scar, and no keloid scar in our study, possibly due to our proper patient selection, limiting the width of donor scar, avoiding closure under tension, and layered trichophytic closure of the donor site.

Over the past 10 years, there has been increased concern about the donor area scar that results from strip harvesting [33]. Rassman R et al and Rose PT founded that the concern about a donor linear scar has led to increasing acceptance of the follicular unit extraction/follicular isolation technique (FUE/FIT) [34, 35].

Folliculitis in recipient area seen in 18 (7.3%) patients after 2-3 months who treated successfully with topical mupirocin and warm compresses. The reported incidence of post-operative folliculitis in hair transplantation varies from 1.1-20% [36]. Crusting in recipient area seen in 15 (6.1%) patients in the first few days, treated successfully with application of emollient for 60 minutes to soften the crust followed by gentle washing and application of wet compresses.

Few small slow growing cysts around transplanted hair follicles seen in 9 (3.6%) patients, treated successfully with incising the cysts and expelling its contents followed by using wet compresses. These cysts result because of small grafts slipping under the skin [37].

### Conclusion

For the hair transplantation to be successful it needs adequate experience of the surgeon and staff, proper patient selection, and proper planning to determine the amount of recipient coverage according to the amount of donor supply and the patient desire. Addition of 40 mg Triamcinolone to the LA solution is highly effective in reducing postoperative oedema and we recommend it. FUE is preferred over strip method to avoid visible donor scar totally and the FU extraction should be limited to 25% of the donor FU. Three sessions of PRP at 2nd, 4th, and 6th month post operatively resulted in increased patient satisfaction rate with better hair density and thickness

**Acknowledgement:** I would like to express my acknowledgement to Mr. Shivan Hasan for his great help in patients, data collection.

### References

1. Suruchi Garg, Ipsa Pandya, Sonali Bhatt (2019) Follicular Unit Extraction (FUE) Hair Transplantation in Combination with Platelet Rich Plasma for the Treatment of Scarring Alopecia: A Case Series. Arch Clin Med Case Rep 3: 299-308.



2. Blume-Peytavi U, Blumeyer A, Tosti A, A Finner, V Marmol, et al. (2011) Guidelines for diagnostic evaluation in androgenetic alopecia in men, women and adolescents. *Br J Dermatol* 164: 5-15.
3. Orentreich N (1959) Autografts in alopecias and other selected dermatological conditions. *Annals of the New York Academy of Sciences* 83: 463-479.
4. Barrera A (2003) Advances in aesthetic hair restoration. *Aesthet Surg J* 23: 259-264.
5. Shiell RC (2008) A review of modern surgical hair restoration techniques. *J Cutan Aesthet Surg* 1: 12-16.
6. Rose PT (2011) The latest innovations in hair transplantation. *Facial Plast Surg* 27: 366-377.
7. Rassman WR, Bernstein RM, McClellan R, Jones R, Worton E, et al. (2002) Follicular unit extraction: minimally invasive surgery for hair transplantation. *Dermatol Surg* 28: 720-728.
8. Bicknell LM, Kash N, Kavouspour C, Rashid RM (2014) Follicular unit extraction hair transplant harvest: A review of current recommendations and future considerations. *Dermatology Online J* 20: 3.
9. Rassman W, Pak J, Kim J (2016) Follicular unit extraction: evolution of a technology. *J Transplant Technol Res* 6: 158.
10. Cole JP (2013) An analysis of follicular punches, mechanics, and dynamics in follicular unit extraction. *Facial Plast Surg Clin North Am* 21: 437-447.
11. Avram MR, Watkins SA (2014) Robotic follicular unit extraction in hair transplantation. *Dermatol Surg* 40: 1319-1327.
12. Oguz Kayiran, Ercan Cihandide (2018) Evolution of hair transplantation. *Plast Aesthet Res* 5: 9.
13. Paul T Rose (2015) Hair restoration surgery: challenges and solutions. *Clin Cosmet Investig Dermatol* 8: 361-370.
14. Rose PT, Parsley WP (2006) The science of hair line design. In: Haber RS, Stough DB, editors. *Procedures in Cosmetic Dermatology. Hair Transplantation*. Philadelphia: Elsevier Saunders 2006: 55-72.
15. Shapiro R, Shapiro P (2013) Hairline design and frontal hairline restoration. *Facial Plast Surg Clin North Am* 21: 351-362.
16. Amit Kerure, Narendra Patwardhan (2018) Complications in hair transplantation. *JCAS* 11: 182-189
17. James E Vogel, Francisco Jimenez, John Cole, Sharon A Keene, James A Harris, et al. (2013) Hair Restoration Surgery: The State of the Art. *Aesthetic Surgery Journal* 33: 128-151.
18. Narendra Patwardhan, Venkataram Mysore (2008) Hair transplantation: Standard guidelines of care. *IJDVL* 74: 46-53.
19. Aman Dua, Kapil Dua (2013) Follicular unit extraction hair transplant 3: 76-81.
20. Avram MR, Rogers N, Watkins S (2014) Side-effects from follicular unit extraction in hair transplantation. *J Cutan Aesthet Surg* 7: 177-179.
21. Kavish Chouhan, Gillian Roga, Amrendra Kumar, Jyoti Gupta (2019) Approach to Hair Transplantation in Advanced Grade Baldness by Follicular Unit Extraction: A Retrospective Analysis of 820 Cases. *JCAS* 12: 215-222
22. Neil-Dwyer JG, Evans RD, Jones BM, Hayward RD (2001) Tumescence steroid infiltration to reduce postoperative swelling after craniofacial surgery. *Br J Plast Surg* 54: 565-569.
23. Abbasi Gholamali, Pojhan Sepideh, Emami Susan (2010) Hair Transplantation: Preventing Post-operative Oedema. *JCAS* 3: 87-89.
24. Jessica Cervantes, Marina Perper Lulu L, Wong Ariel E, Eber Alexandra C, Villasante Fricke, et al. (2018) Effectiveness of Platelet-Rich Plasma for Androgenetic Alopecia: A Review of the Literature. *Skin Appendage Disord* 4: 1-11.
25. Salvator Giordano, Macro Romeo, Pietro Summa, Andre Salval, Petteri Lankinen (2018) A metaanalysis on evidence of platelet- rich plasma for androgenic alopecia. *Int J Trichology* 10: 1-10.
26. Suruchi Garg, Shweta Manchanda (2017) Platelet-rich plasma—an ‘Elixir’ for treatment of alopecia: personal experience on 117 patients with review of literature. *Stem Cell Investig* 4: 1-11.
27. Suruchi Garg (2016) Outcome of intraoperative injected Platelet-rich plasma therapy during follicular unit extraction hair transplant: a prospective randomised study in Forty patients. *J Cutan Aesthet Surg* 9: 157-164.
28. Gkini M-A, Kouskoukis A-E, Tripsianis G, Rigopoulos D, Kouskoukis K (2014) Study of platelet-rich plasma injections in the treatment of 219 androgenetic alopecia through a one-year period. *J Cutan Aesthet Surg* 7: 213-219.
29. Suruchi Garg, Ipsa Pandya, Sonali Bhatt (2019) Follicular Unit Extraction (FUE) Hair Transplantation in Combination with Platelet Rich Plasma for the Treatment of Scarring Alopecia: A Case Series. *Arch Clin Med Case Rep* 3: 299-308.
30. Gholamali A, Sepideh P, Susan E (2010) Hair transplantation: preventing post-operative oedema. *J Cutan Aesthet Surg* 3: 87-89.
31. Farjo N (2008) Infection control and policy development in hair restoration. *Hair Transplant Forum Int* 18: 141-144.
32. Avram MR, Rogers N, Watkins S (2014) Side-effects from follicular unit extraction in hair transplantation. *J Cutan Aesthet Surg* 7: 177-179.
33. Rose PT (2011) The trichophytic closure. In: Unger WP, Shapiro R, Unger R, editors. *Hair Transplantation*. 5th ed. New York: Informa Healthcare Publishing 2011: 261-279.
34. Rassman WR, Bernstein RM, McClellan R, Jones R, Worton E, et al. (2002) Follicular unit extraction: minimally invasive surgery for hair transplantation. *Dermatol Surg* 28: 720-728.

- 
35. Rose PT (2005) Approaches to FIT. Presented at: International Society of Hair Restoration Surgery, Annual Meeting; August 2005: 18-25.
  36. Sandro S, Gonçalves AJ, Americo HJ, Flavia HJ (2009) Surgical complications in hair trans-plantation a series of 533 procedures. *Aesthet Surg J* 29: 72-76.
  37. Beehner M (2007) Cyst formation post-transplant. *Hair Transpl Forum Int* 17: 30.

**Copyright:** ©2020 Jalal Hamasalih Fattah. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.