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Comparison between Platelet Rich plasma and Nanofat as an Adjuvant Therapy in Hair Transplantation in Male Androgenic Alopecia

Protocol for thesis Submitted for partial fulfillment of the Doctorate
degree in plastic surgery

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11\11\2025

Introduction:

- Androgenic alopecia is a genetically predetermined disorder due to excessive response to androgens, impacting approximately 50% of males and females.(1)
- This condition is characterized by progressive loss of terminal hair of the scalp, typically occurring following puberty, with a distinctive pattern in both males and females. In males, hair loss is most prominent in the vertex and frontotemporal regions, whereas females tend to retain their frontal hairline while experiencing diffuse apical hair thinning, causing a broader appearance of the anterior part of the hair (2-4).
- Humans have 2 types of hair follicle >terminal and vellus. Terminal hair follicles are larger and extend deeper into the skin, reaching the subcutaneous fat. These follicles produce thicker hairs, typically greater than 0.06 mm in diameter. In contrast, vellus hair follicles are smaller, reach only into the reticular dermis, and produce short, fine hairs typically less than 0.03 mm in diameter.. At birth, terminal hairs appear on the scalp, eyebrows, and eyelashes, whereas vellus hairs cover most other areas. During puberty, vellus hairs in regions such as the axilla and genital area convert to terminal hairs. Pathologic transitions can also occur. Vellus-to-terminal conversion is observed in hirsutism in women, whereas terminal-to-vellus transformation, referred to as miniaturization, is characteristic of androgenetic alopecia (5).
- The hair growth cycle consists of 4 phases—anagen, catagen, telogen, and exogen.
 - Anagen: Anagen is the active growing phase of the hair follicle, lasting 2 to 6 years. Approximately 90% to 95% of scalp hairs are in the anagen phase at any given time.
 - Catagen: Catagen refers to the involutinal phase of the hair follicle characterized by acute follicular regression. Catagen typically lasts 2 to 3 weeks, and at any given time, less than 1% of scalp hairs are in catagen.
 - Telogen: Telogen refers to the resting phase of the hair follicle, lasting 2 to 3 months, and a cessation of all activity marks this phase. Approximately 5% to 10% of scalp hairs are in the telogen phase at any given time.
 - Exogen: Exogen is the daily shedding of hair follicles characterized by a loss of 25 to 100 telogen hairs, replaced by new anagen hairs. (6)
- The pathogenesis of Androgenic alopecia involves two main components:
 - (a) Hair follicle miniaturization: progressive miniaturization of the terminal hair follicles and eventual conversion of terminal hair to vellus hair.
 - (b) Changes to the hair cycle: shortening of anagen and an increase in telogen duration. . (7)

- Historically, androgenic alopecia was treated with techniques such as plug grafts, scalp reductions, and transposition flaps. Today, hair transplantation is the standard surgical approach, which involves harvesting follicular units from the patient's occipital scalp. (5)
- In 1931, Okuda was the first physician to describe in detail the technique of autologous hair transplantation. He explained how circular punches were used to excise grafts from the scalp, which were subsequently inserted into holes made with slightly smaller punches in areas affected by alopecia (8)
- In the mid-1990s the follicular unit transplantation (FUT) procedure, also known as strip harvesting FUT, involves excising a strip from the mid-occipital scalp followed by its stereomicroscopic dissection into follicular units. This results in long thin scars, which may be camouflaged by the remaining occipital hair, except in patients with very short hair. (9)
- In the early 2000s, follicular unit extraction was developed, using 0.8-1.0 mm punches to directly remove individual follicular units from the donor hair. As a result, there are no sutures and no linear scars. Follicular unit extraction has now surpassed strip harvesting FUT to become the most commonly used donor harvesting technique.(9)
- Ideal candidates for hair transplantation typically present with a clear, stable pattern of hair loss, characterized by at least 50% thinning or balding in 1 or more areas. The scalp must be healthy, with donor hair of good quality and quantity. Patients must have realistic expectations and be free of medical conditions that compromise surgical outcomes. The safe donor zone is located in the mid-occipital region between the upper and lower occipital protuberances, typically containing 65 to 85 follicular units/cm² (10)
- Intra-operative injection of PRP is beneficial in giving faster density, reducing the catagen loss of transplanted hair, early recovery of the skin, the faster appearance of new anagen hair in FUE hair transplantation.(11)
- This study compares the effects of PRP and Nano fat as adjuvants in Androgenic alopecia patients undergoing FUE hair transplantation.
- Nanofat contain stem cells supposed to improve the results of FUE hair transplantation (12), but the question that we hope to answer at the end of our study which one we recommend as an adjuvant therapy PRP or Nano fat?

Aim of the work:

- To compare the efficacy of PRP and Nanofat injection as adjuvant therapies with FUE hair transplantation in improving graft survival rate,
- To measure hair density and thickness postoperatively using dermoscopy or trichoscopy.
- To evaluate patient satisfaction and photographic assessment by blinded evaluators.
- To assess any adverse effects or complications related to each modality

Materials and methods:

Place of the study: Plastic surgery department, Sohag university hospital, Egypt.

Type of the study: Prospective randomized control clinical trial.

Number of cases: 30 cases, 10 in each group,

Group A: Control group (FUE hair transplantation alone)

Group B: FUE hair transplantation + PRP.

Group C: FUE hair transplantation + Nanofat

Inclusion criteria :

1. Male patients with stable androgenic alopecia more than 2 years.
2. Age 20-50 years
3. No recent medical hair loss treatments.

Exclusion criteria :

1. Active scalp infections or scarring alopecia.
2. Systemic diseases affecting wound healing.
3. Platelet disorders or anticoagulant use.
4. Smoking or heavy alcohol intake.

Plan of study :

- All patients were subjected to full history taking, clinical examination either general for any associated diseases or local examination.
- Standard laboratory tests, such as complete blood counts (CBCs), coagulation profile, liver and kidney function.

- The steps for follicular unit extraction donor site harvest are as follows:
 - We will shave the donor site to a depth of 0.5 to 1.5 mm to visualize the angle of the follicles.
 - Then while the patient in a prone, supine, or lateral position we do clean the area with povidone-iodine or chlorhexidine solution.
 - We Administer anesthesia beginning with regional nerve blocks—supraorbital, supratrochlear, zygomaticofrontal, and occipital—followed by tumescent infiltration of the donor and recipient areas using a solution composed of 30 mL 2% lignocaine mixed with 5 mL 0.5% bupivacaine, 30 mL normal saline, 0.5 mL of epinephrine 1 mg/mL, and 1 mL of triamcinolone 40 mg/mL in a normal adult patient.
 - Then we start Harvesting follicular units with a motorized sharp punch.
- We calculate the desired total number of grafts needed by multiplying the measured recipient area by the desired graft density. The target density should be approximately 30 follicular units/cm².
- We store grafts in storage solution (cold saline) put at gauze during procedure time.
- Under magnification, we create recipient sites in a random and irregular pattern using either flat-edged blades or a combination of 19- or 21-gauge needles.
- We Place the graft gently into the recipient site, applying light pressure for several seconds using a wet cotton-tip applicator to promote hemostasis and prevent graft extrusion or popping.
- Then according to the groups we add the adjuvant therapy (first dose at the time of procedure)
 - PRP injection in group B
 - Nanofat injection in group C
- We inject 0.1cc for every square centimeter in the recipient scalp with second dose one week postoperative.
- The first follow up 2 days post-operative, then one week.
- All patients will be followed up about 6-12 months postoperative.

Statistical analysis:

- Statistical analysis will be done using Statistical Package for the Social Sciences (SPSS) for Windows version 17.0.
- Numerical data, such as age and duration of hospital stay, will be expressed as arithmetical mean \pm SD ,
- Categorical data will be expressed as frequencies and percentages

- The percentages of various outcome variables will be compared by employing chi-square test & t-test:
 - P value < 0.05 will be considered significant.
 - P value < 0.01 will be considered highly significant.
 - P value < 0.001 will be considered very highly significant.

Ethical considerations :

- Informed consent will be taken from all cases with approval of photo documentation.
- Ethical approval will be taken from the scientific ethics committee.

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