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Original article

Implanter technique in hair transplant surgery always a surgical challenge for the operating surgeon - A prospective randomized study assessment

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Abstract *Background:* hair transplant surgery has evolved significantly, with the implanter technique gaining attention due to its purported advantages over traditional methods. However, the ability of the surgeon to adapt to this technique is always a challenge, and also achieving density in the recipient area becomes difficult and patient satisfaction all plays at most importance in a successful success of hair transplant surgery using implanters. *Objectives:* to evaluate the challenges of the implanter technique of Hair Transplant surgery in terms of number of grafts placed per cm square and patients satisfaction with a grade range from 1 to 3 wherein 1 being the poor satisfaction and 3 being good satisfaction. *Materials and methods:* this study aimed to evaluate the efficacy and challenges of the implanter technique compared to conventional needle methods. Patients were randomly assigned to either technique, and outcomes such as graft survival rates, procedure duration, and patient comfort were measured. *Results:* the results of this study show that the number of grafts present within a 1 cm^2 box were 27-35 irrespective of the number of follicles. Patient satisfaction terms were assessed on a score grade from 1 to 3, with 1 being poor satisfaction, 2 being moderate satisfaction and 3 being good satisfaction. An assessment was done immediately post op and after 1 month of surgery. *Conclusion:* this study concludes that according to ISHR (International Society of Hair Restoration) a density of 80-100 grafts per 1 cm square is required. In this study it is reduced to around 27-35 grafts per 1cm^2 box in the implanter technique. Furthermore, the patient's satisfaction is at grade level of 2 showing that it is moderate. To increase the efficacy and outcomes of the implanter technique, further studies have to be conducted to increase the number of grafts per centimeters square and patients satisfaction.

Key words: implanters, density, FUE hair transplant

Introduction

Hair Transplant surgery using FUE (Follicular Unit extraction) has gained its popularity for the past decade[1]. Lots of surgeons continue to use the injectable technique and their adaptation to new a implanter technique appears to be relatively slow[2]. Hair loss due to disease, scarring and in particular androgenetic alopecia, seems to have troubled human beings since the dawn of history. From the days of punch grafting to the present-day techniques of follicular unit hair transplantation, the field has seen a number of new advances[3]. Two common methods of implantation of hair follicles are the Implanter and Needle technique.

The former technique requires the use of Choi, KNU, Smart or Lion implanter pens for implantation and the latter uses a sharp blade to create a slit in the scalp followed by the placement of hair follicles into

the created slit using needles[4]. In the slit technique, which is commonly called stick and place technique, a greater number of operating hands will be needed which will lead to greater labor costs[5]. On the other side, a minimum number of assistances will be needed for the implanter technique based on the levels of experience. The use of implanters has increased in recent past[6]. Despite this increase, density placement continues to pose a challenge for the surgeon. Achieving implantation density depends on various factors that are important to consider for optimal treatment outcomes[7]. This study highlights various problems encountered by the surgeon in implantation of hair follicles during the implant technique of Hair transplantation. The implantation rate should be 12 grafts per minute at the rate of 700 grafts per hour[8].

Materials and Methods

This is a prospective study conducted at Saveetha Dental College, Chennai – Tamil Nadu under section of Facial Aesthetics and Hair Transplant Surgery from the Department of Oral and Maxillofacial Surgery. The study got approval from the Institutional Human Ethical committee (IHEC) with reference number – IHEC/SDC/PhD/OMFS-2343/23/TH-092. The sample size was calculated using the G-power software with a confidence interval of 95% using simple randomization. 40 patients were included in the study, and they all underwent hair transplant surgery by FUE (Follicular Unit Extraction) followed by an implantation using Implanters. The back of the head hair donor site was marked after zero trim and FU (Follicular Units) were extracted and collected in a saline medium. After extraction of all follicles, the recipient area which was front of the head was prepared and an implantation was done using implanters.

Inclusion criteria

Patients with Androgenic Alopecia (MPB) and Generalized Alopecia, where considered for this treatment. The mean age inclusion criteria for this study ranged from 18 to 50 years, resulting in an average of 43 years old. Male patients were considered. Baldness degrees ranging according to Norwood's classification from 2 to 5 were taken into consideration, and a Direct Hair Implantation (DHI) technique was followed for all patients.

Exclusion criteria

Patients with systemic diseases such as uncontrolled Diabetes, Hypertension, or thyroid issues, ages higher or lower than the criteria mentioned above, patients allergic to local anesthetic medication, patients who didn't consent to FUE and implanter technique for hair transplant, patients with bleeding disorder, psychiatric issues and neurological deficits were excluded from the study.

Surgical procedure

Under standard aseptic conditions, patient draping was performed using 2% lignocaine with a 1:80000 adrenaline ratio. Bilateral locoregional infiltration in the safe donor area of the scalp was given to anesthetize the area, followed by a FUE punch of diameter 1.1 mm and 1.2mm, which was used to give individual punches around the hair emerging from the scalp. A micromotor straight handpiece was used to create punches at a depth of 0.3 to 0.5 mm to detach at the level of the arrector pili muscles. Hair grafts were then extracted (Figure 1) and separated into individual

Figure 1. Extraction of Hair follicles from the donor area.

Figure 2. Implantation of hair follicles at the recipient area.

bowls, categorized into singles, doubles, triples, and quadruple hair grafts. After the extraction process, the patient was given a 15 minute break. The patient was then recalled, and local anesthesia consisting of lignocaine with adrenaline at a ratio of 1:80,000 was administered to the recipient area. This was achieved through bilateral supraorbital and supratrochlear nerve blocks, followed by local infiltrations in the frontal region[9]. After an assessment of the patient's comfort, an implantation of hair grafts using an implanter was initiated. Implanters of size 1.2 and 1 mm were used for grafts numbered 4, 3, 2 and 1 respectively. During the entire duration of the procedure, it was made sure that the hair grafts were maintained hydrated. Larger grafts were implanted in the distal portion, while single grafts were used for implantation and the creation of the hairline anteriorly (Figure 2). Generally, an 'M' or 'S' pattern hair line was attempted for males[10]. The patient's comfort was monitored throughout the entire procedure. Post-procedure, the donor site was draped, while the recipient site was left uncovered. The patient was advised to follow proper postoperative instructions. They were advised to review on the 1st, 4th and 15th days for a periodic assessment. Post surgery medications were given for 4 days and the patient was advised to start on supplements after 15 days regularly.

Outcome parameters

Cosmetic Density per 1cm square was assessed (usually it should be 35-40 grafts per cm^2 for moderate density and 50-60 grafts per cm^2 for good density). Overall patient satisfaction regarding treatment outcomes, as well as the aspects of density and depth control during hair follicle implantation using implanters, was assessed.

Statistical analysis

Data analysis was done using the SPSS software version 22.0 for Windows (IBM Corp., Armonk, NY). The multiple data were interpreted using an unpaired t-test with $p<0.05$ considered as statistically significant.

Results

The results of this study show that according to ISHR (International Society of Hair Restoration) the number of follicles should be around 80-100 follicle grafts per centimeter square. A standard-sized figure was used post-implantation, and a 1 cm² measurement was marked using Microsoft Office 2016, set to centimeters. The bar graph (Figure 3) shows the number of follicles grafted on hair transplant patients of 3 different regions on the scalp (frontal, right and left) which shows various numerical values ranging from 10-51 follicles. The follicle count (Figure 4) was recorded per 1 cm² unit for each hair transplant patient. The number of grafts present is 27-35 irrespective of the number of follicles. Patient satisfaction terms were assessed on a score grade from 1 to 3, with 1 being poor satisfaction, 2 being moderate satisfaction and 3 being good satisfaction. An assessment was done immediately post op and after 1 month of surgery. The depth of graft insertion was assessed based on the ease of placement through the loose areolar tissue while maintaining a 45-degree angulation to the scalp surface.

Discussion

Hair transplant surgery involves the critical step of implanting hair follicles into the recipient area, which is crucial for achieving natural-looking results and satisfactory hair density[11]. This process, known

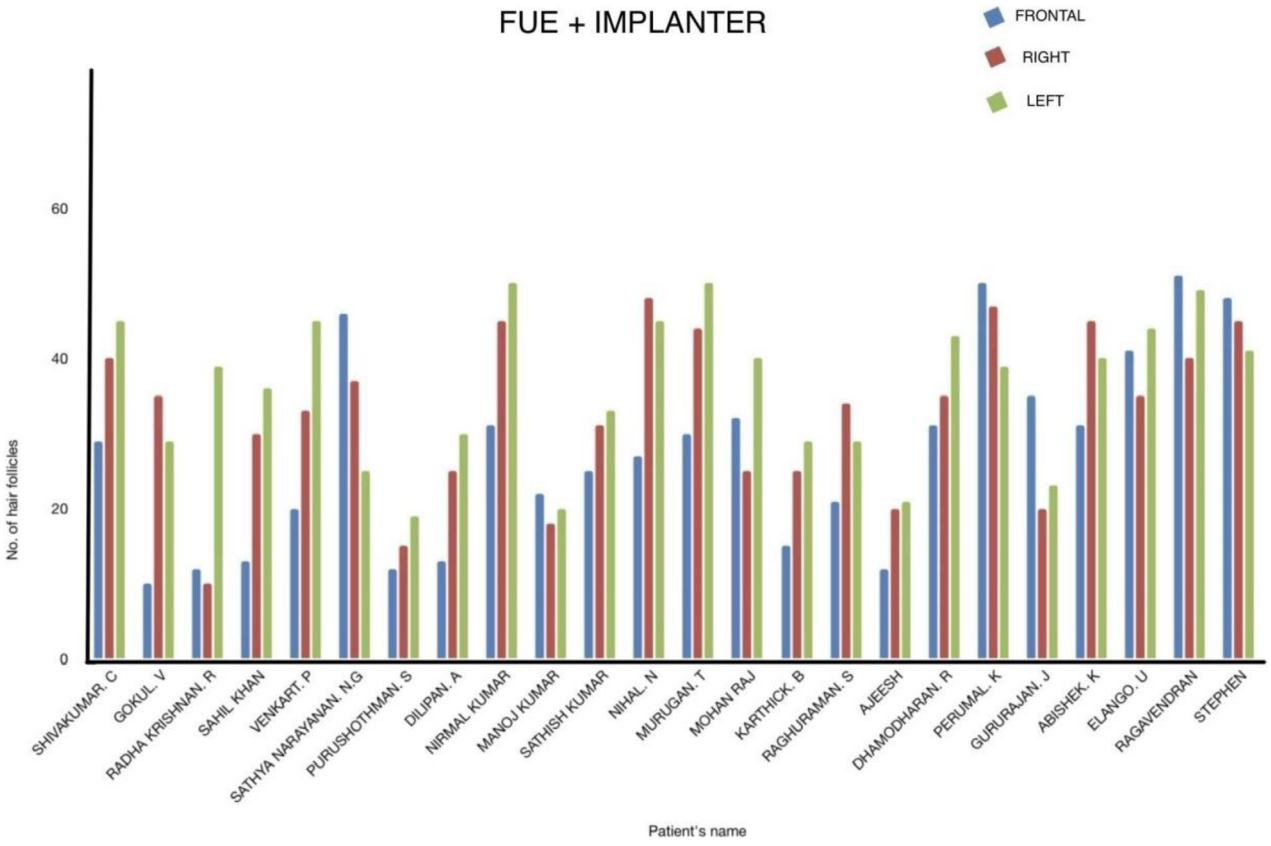

Figure 3. Number of grafts place in different area of scalp (blue represent front region, red represents right lateral and green represents left lateral).

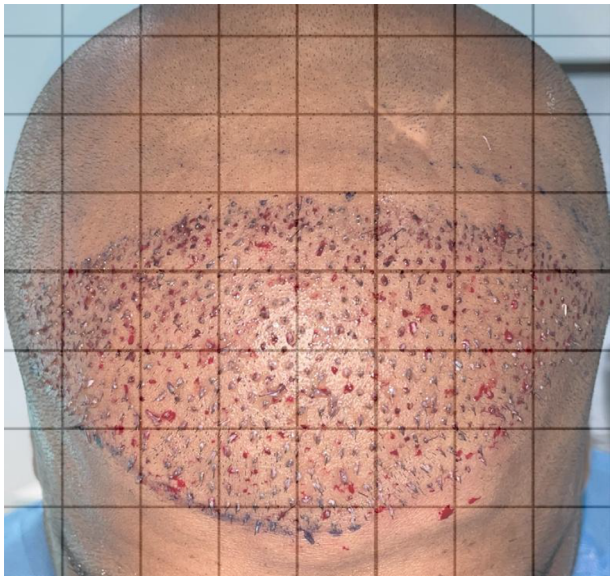

Figure 4. 1cm square box placed on implanted area of forehead.

as implantation, presents several technical challenges for surgeons that can impact the overall success of the procedure[12]. A prospective randomized study aimed at assessing implantation techniques would delve into various factors influencing outcomes, such as technique precision, follicle survival rates, and patient satisfaction[13].

Firstly, the precision of the implantation technique plays a pivotal role in determining the survival and growth of transplanted hair follicles. Surgeons must ensure that each follicular unit is placed at the correct angle, depth, and orientation to mimic natural hair growth patterns[14]. It requires meticulous attention to detail and a thorough understanding of hair anatomy and aesthetics[15]. Studies comparing different implantation methods, such as manual vs. automated techniques or different types of implanters (e.g., Choi implanter pen), can provide valuable insights into

which approach yields better results in terms of graft survival and cosmetic outcomes.

Secondly, the efficiency of the implantation process impacts the duration of the surgery and patient comfort[16]. Faster and less invasive techniques tend to reduce overall procedure time and minimize trauma to the recipient area, which can contribute to a quicker recovery and reduced postoperative complications[17]. Randomized studies can assess not only the technical aspects but also patient- reported outcomes such as pain levels, healing times, and satisfaction with the procedure. These factors are essential in refining surgical protocols and improving patient care in hair transplant surgery[18].

Lastly, a randomized study design allows for systematic comparison and validation of different implantation techniques under controlled conditions. By randomizing patients to receive different methods of implantation, researchers can mitigate bias and more accurately assess the impact of each technique on surgical outcomes. This scientific approach enhances the reliability of study findings and facilitates evidence-based improvements in surgical practice[19]. Ultimately, advancements in implantation techniques driven by rigorous research contribute to better outcomes, increased patient satisfaction, and the ongoing evolution of hair transplant surgery as a specialized field of aesthetic medicine[20].

In conclusion, the implantation phase of hair transplant surgery remains a challenging yet crucial aspect that significantly influences the success and aesthetics of the procedure[21]. Through prospective randomized studies, surgeons can evaluate and refine implantation techniques to optimize follicle survival, procedural efficiency, and patient satisfaction[22]. This research-driven approach not only enhances surgical outcomes, but fosters innovation in hair restoration practices, benefiting both practitioners and individuals seeking effective solutions for hair loss[23].

Conclusion

This study concludes that according to the ISHR (International Society of Hair Restoration), density is needed to be around 80-100 grafts per 1 cm square. In this study there is a reduced amount, to around 27-35 grafts per 1 cm^2 box in the implanter technique. Furthermore, the patient's satisfaction is at the grade level of 2 showing that the satisfaction is moderate. To increase the efficacy and outcomes of the implanter technique, further studies have to be conducted to increase the number of grafts per centimeters square and the patient's satisfaction.

Limitations and Future Scope

Limitation: uncontrolled medical complications, pts and surgeons with the concept of undergoing HT by needle or sapphire technique of implantation and patients having unrealistic expectations over hair growth.

Future scope: Increase the surface area of placing grafts by injecting medium, changing the angulation of implants for about 45 degrees (implanter-skin angulation technique), beveling technique of implantation towards the skin. Further studies have to be performed as the implanter technique has only been used in recent decade.

Abbrevations: ISHR - International Society of Hair Restoration, FUE: Follicular Unit Extraction, DHI: Direct Hair Implantation, MPB: Male Pattern Baldness.

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Conflicting Interests: The authors declare that they have no competing interests.

Ethics Approval and Consent to Participate: The study got approval from the Institutional Human Ethical Committee (IHEC) with the reference number – IHEC/SDC/PhD/OMFS-2343/23/TH-092. Treatment consents were obtained from all participants after explaining the procedure to the patient.

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