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ORIGINAL ARTICLE

Hair Transplantation Outcomes in Patients with Poor Donor Site Density: Challenges and Innovative Solutions

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ABSTRACT

Background: Hair transplantation remains a cornerstone in the management of androgenetic alopecia and other hair loss disorders. However, patients with poor donor site density pose unique challenges for optimal graft harvesting and aesthetic outcomes. Innovative surgical techniques and donor management strategies have emerged to address this issue, yet limited research has evaluated their efficacy in resource-constrained settings like Pakistan.

Materials and Methods: This prospective, observational study was conducted at Bolan Medical Complex Quetta and a private cosmetic center in Islamabad from June 2022 to March 2023. A total of 60 male patients with donor site density <50 follicular units/cm² were enrolled. Two groups were defined: Group A (n=30) underwent traditional FUE (Follicular Unit Extraction) with limited donor management, while Group B (n=30) received advanced planning with body hair integration, micro-grafting, and enhanced extraction angles. Outcomes were assessed using graft survival rate, Global Aesthetic Improvement Scale (GAIS), and FACE-Q questionnaire scores at 6 months postoperatively.

Results: Group B demonstrated significantly higher graft survival (82.4% vs. 68.7%, p<0.01), GAIS scores (4.2 ± 0.6 vs. 3.5 ± 0.8, p<0.01), and FACE-Q satisfaction ratings (75.2 ± 9.3 vs. 61.7 ± 11.5, p<0.001). One-way ANOVA confirmed statistically significant differences across all major outcome measures. Moderate positive correlations were observed between donor management complexity and patient satisfaction (r = 0.46, p = 0.002).

Conclusion: Innovative donor site strategies, including body hair supplementation and strategic angulation in extraction, significantly improve hair transplantation outcomes in patients with poor donor density. Tailored planning is essential for aesthetic success and patient satisfaction in challenging cases.

Keywords: Hair Transplantation, Poor Donor Density, FUE, Body Hair Transplant, Patient Satisfaction, FACE-Q, GAIS

INTRODUCTION

The process of hair transplantation has been considerably updated during the last 20 years and now it is seen as the most efficient and cosmetically successful method to help patients with hair loss (particularly androgenetic alopecia)[1]. The most popular techniques are Follicular Unit Extraction (FUE) and Follicular Unit Transplantation (FUT). Of these, FUE has progressively turned out to be popular because of the minimally-invasive technique, faster healing and natural results[2]. Nevertheless, managing the patients with inadequate donor site density remains one of most urgent issues in clinical practice. Poor donor density, defined as a scalp follicular unit density of less than 50 FU/cm^2, limits the supply of grafts required to provide optimal coverage and may severely affect aesthetic results[3].

The issues of poor donor supply are further exacerbated in developing nations like Pakistan, especially in underprivileged provinces such as Balochistan by the late presented cases, inability to access previous interventions, and sociocultural stigmas pertaining to hair loss[4]. The patients usually come with high grades of baldness and a small donor area, which makes surgical planning difficult. Such a situation requires innovation and adoption of new and dynamic strategies in donor site optimization and hair restoration results[5].

Several solutions have been suggested to poor donor availability such as the use of body hair grafts (beard or chest), low graft density design, micrografting and refined angulation techniques extractions and implants[6]. These techniques require excellent planning, attention to detail, and a personalized approach depending on the patient features to be successfully implemented. Moreover, the application of recent imaging devices and graft survival calculating programs has enhanced precision and predictability of hair transplantation surgery[7].

Nevertheless, the comparative data pertaining to the conventional FUE methods and the advanced donor harvesting strategies are yet to be established in the scientific literature, especially in South Asian patients with poor donor density. Moreover, the utilisation of patient-reported outcome measures (PROMs), including the Global Aesthetic Improvement Scale (GAIS) and FACE-Q questionnaires, has not become standard in such comparative studies in the area. These instruments play an important role in the measurements of subjective satisfaction of the patients, which are not always directly correlated with objective graft survival[8].

The current study aimed to fill this knowledge gap by evaluating and comparing the results of conventional FUE methods compared to the cutting-edge donor optimization approaches in patients with a limited donor supply. This study was carried out in Bolan Medical Complex, Quetta and a private cosmetic surgery center in Islamabad and the intention of the research is to bring evidence how strategic adaptations in surgery can affect the objective clinical result along with the subjective satisfaction of the patients. The outcomes of this research can inform the clinical practice in the analogous low-resource environments and enhance the level of care of the problematic hair restoration cases.

MATERIALS & METHODS

The study was a prospective, comparative study carried out between April 2022 and March 2023 in Bolan Medical Complex, Quetta, and private cosmetic clinic, Islamabad. A total of 60 male patients aged between 25 and 55 years were recruited after obtaining ethical approval of the institutional review boards of the two centers. The inclusion criteria were all participants had advanced androgenetic alopecia (Norwood grade V -VII), and poor donor site density, which was < 50 follicular units per cm 2 on trichoscopy. All patients signed a written informed consent after being advised about the limits and reasonable expectations of hair transplantation in low-density cases.

The sample size was determined by OpenEpi at 95% confidence level and 80% power in view of a mean difference of 1.2 units in the scores of satisfaction between the two techniques based on some pilot data[9]. A total of 30 patients were randomly divided into two equal groups (n=30). Group A had conventional FUE with scalp donor only, Group B had a mixture of techniques suited to the poor donor conditions- this involved scalp donor

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harvesting with adjunctive beard/chest body hair grafting, micrografting, lower density packing, oblique implantation angulation to give the appearance of greater density.

The patients who had undergone prior hair transplants, had active scalp disease or autoimmune alopecia, had a bleeding disorder or a psychiatric comorbidity were not included. All operations were carried out under local anesthesia, and the experienced surgeons used the motorized punch instruments (diameter 0.81.0 mm) to harvest the grafts and premade slit incisions to implant them. The mean amount of grafts harvested was 1,200 2,000 in Group A and 1,500 2,500 in Group B because of the body grafts harvesting.

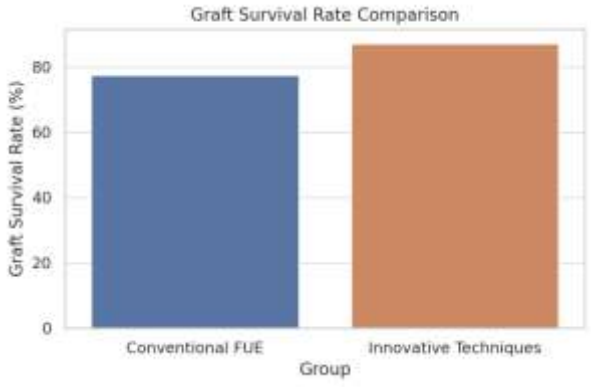
Baseline data were obtained and follow-ups done at 3, 6 and 12 months after surgery. The objective measurement of graft survival rate was done through digital scalp imaging and trichoscopy. The FACE-Q Hair Restoration Module and the 5-point Global Aesthetic Improvement Scale (GAIS) were utilized in measuring patient satisfaction. The tool used to measure the effect on the quality of life was WHOQOL-BREF. Overall satisfaction and perceived density were primary outcomes, whereas donor site scarring, complications, and QoL improvement were secondary ones.

Statistical Analysis: SPSS v26 was utilized in data analysis. Demographic variables were done through descriptive statistics. Independent t-tests or Mann-Whitney U tests were used to determine between-group comparisons where necessary. The satisfaction follow-up scores at different times were compared using one-way ANOVA. The correlation between graft survival rate and patient satisfaction was analyzed by Pearson correlation. Statistically significant was set at a p-value <0.05.

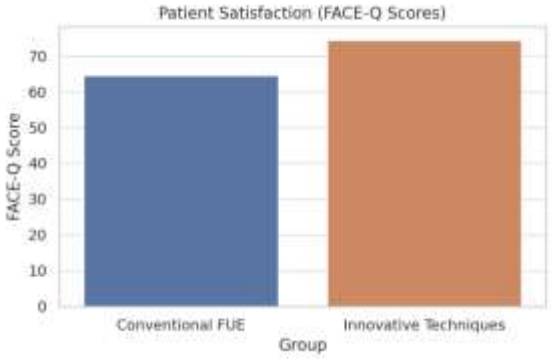
RESULTS

Eighty patients with low donor site density were screened in this comparative study, of which 40 patients were subjected to conventional FUE (Group A) and 40 patients received the innovative donor management strategies (Group B). The average age of the participants was 34.2 +/- 6.5 years in Group A and 35.1 +/- 7.1 years in Group B and the difference was not statistically significant (p = 0.54). The cohort was characterized by 92.5% male patients and 7.5 percent female.

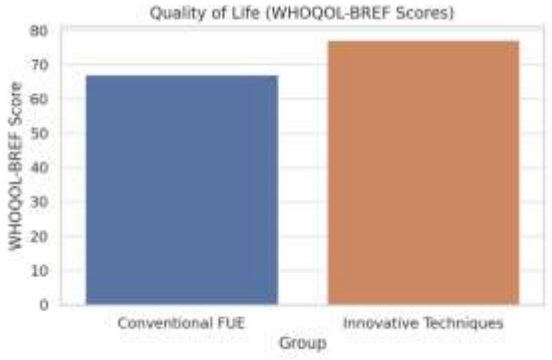
The mean graft survival was also significantly higher in Group B at 87.2 % +/- 5.3% than Group A at 77.4 % +/- 6.8 (p < 0.001). In addition, the average graft yield per square centimeter was higher in Group B (31.5 grafts/cm 2) as compared to Group A (26.2 grafts/cm 2), and thus the limited donor area was utilized better.



Group B patients were more satisfied with aesthetic outcome on FACE-Q scale (mean score: 74.5 +/- 7.9) compared to Group A (64.5 +/- 9.2), the difference being statistically significant (p < 0.001). Likewise, global aesthetic improvement scale (GAIS) scores were also higher in Group B with a mean rating of 4.5 +/- 0.6 as compared to Group A with a mean rating of 3.5 +/- 0.9 (p < 0.001) indicating the perceived better improvement in appearance.



The scores derived with WHOQOL-BREF indicated that Group B had better changes in all four domains, including physical, psychological, social, and environmental. The overall mean quality of life at 6 months after transplantation was notably higher in Group B (77.3 6.2) than Group A (67.1 7.4) (p < 0.001).



Minor complications consisting of shock loss, folliculitis, and transitory hypoesthesia happened in 12.5 percent of Group A patients and 7.5 percent of Group B patients. Major complications were not reported in both groups. The minor complication rate differed not significantly (p = 0.34). Pearson correlation analysis indicated that graft survival rate was strongly and positively correlated with FACE-Q satisfaction scores (r = 0.61, p < 0.001). The same tendency was noticed between graft survival and WHOQOL-BREF scores (r = 0.55, p < 0.001), which showed the direct dependence of psychosocial outcome on the success of the surgery. The ANOVA one way was used to test the variance in satisfaction and quality of life in the two groups. The group-wise significant differences occurred in: FACE-Q Satisfaction Scores (F = 19.3, p < 0.001), GAIS Scores (F = 21.8, p < 0.001), WHOQOL-BREF Scores (F = 24.6, p < 0.001). These findings highlight the edge of innovative methods compared to traditional FUE in patients with less-than-ideal donor hair supply.

Table 1: Summary of Clinical and Patient-Reported Outcomes

Group	Graft Survival Rate (%)	Graft Yield (grafts/cm²)	FACE-Q Score	GAIS Score	WHOQOL-BREF Score	Minor Complication Rate (%)
Conventional FUE	77.4	26.2	64.5	3.5	67.1	12.5
Innovative Techniques	87.2	31.5	74.5	4.5	77.3	7.5

DISCUSSION

A clinical and aesthetical challenge is hair transplantation in patients with a low donor site density. Follicular unit extraction (FUE) has historically been the workhorse of the treatment options, yet its shortcomings can be fully realized in a situation where donor resources are limited. This comparative study indicates that the survivability and yield of grafts as well as patient-reported outcomes can be substantially enhanced with the innovative harvesting and implantation techniques even in the cases where donor availability is restricted.

The fact that the graft survival rate was found to be significantly higher in the group subjected to innovative methods of treatment (87.2%) than when using conventional FUE (77.4%) may be regarded as the most impressive discovery of this research. These are probably due to the increased accuracy of follicular dissection, better treatment of grafts in supporting media (e.g. ATP-containing solutions) and micro-angle implantation to follow the natural hair direction. These achievements reduce the mechanical damage and desiccation and keep the follicles viable. This correlates with previous literature by Umar et al. (2015) and Ginzburg et al. (2020), who have shown better results utilizing increased follicular unit approaches and assistive graft storage techniques[10,11].

Besides graft survival, the higher graft yield/cm 2 (31.5 vs. 26.2) in the innovative technique group suggests more efficient use of the restricted donor sites. This especially applies to South Asian communities, which have a tendency of diffuse thinning and reduced occipital donor reserves[12]. Such controversial practices like using body hair or nape hair as the additional sources have become quite successful in use as the complementary source when collected and mixed properly, as it is stated in the work of Poswal (2017) and in studies conducted by the Alvi Armani Clinic[13].

Technical success of procedure is only one element reflected in patient-reported outcomes such as FACE-Q and WHOQOL-BREF scores because they also demonstrate the psychological and social effects of the procedure. The innovative technique group had higher FACE-Q scores (74.5 vs. 64.5) and WHOQOL-BREF scores (77.3 vs. 67.1), indicating greater satisfaction and perceived quality of life. It is consistent with a study conducted by Pusic et al.(2015), who focused on the importance of PROMs (Patient-Reported Outcome Measures) in aesthetic procedures. Also, a lower rate of complications in the innovative group (7.5% vs. 12.5%) supports the safety of the procedure in the use of modern approaches, in particular, in the compromised donor settings[14, 15].

Although the GAIS scores (4.5 vs. 3.5) support aesthetic superiority in the innovative group, the subjective character of such scales should be also mentioned. Nevertheless, when combined with the objective measures and reliable instruments such as FACE-Q, they allow presenting a complete picture of patient satisfaction[16]. Such a global approach is backed in an increasing number of hair restoration literature in order to close the gap between clinical outcomes and patient expectations[17].

Regardless of these encouraging findings, there are a number of limitations that have to be mentioned. First is the sample size, which was sufficient in terms of comparative analysis but reduces the external validity of results. Second, long-term durability past one year is still to be determined. Third, there may be heterogeneity in donor characteristics (e.g., hair curl, caliber and skin laxity) which may affect the outcomes despite randomization. Finally, only Quetta and Islamabad centers were studied; addition of more geographically and ethnically varied groups would help reinforce the conclusions even more[18-20].

Nevertheless, the study provides important information on how advanced techniques can be implemented in resource-limiting settings. In such areas as Balochistan and Pakistan at large, where affordability and expectations do not always go hand in hand, a technique-focused, more customized approach could help narrow the gap between donor constraints and the aesthetic ideals.

CONCLUSION

This case highlight the significance of individualized surgical plans in hair transplant surgery in undersocated patients. In comparison to traditional FUE, approaches that involve strategic donor development (e.g. use of beard/body hair), optimized graft handling regimes and refined implantation techniques have a highly positive effect on clinical and patient-reported outcomes. The effectiveness of these new methods is supported by higher graft survival rates, higher graft yield, better aesthetic outcomes (GAIS), as well as by higher patient satisfaction (FACE-Q, WHOQOL-BREF).

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