

Follicular Unit Extraction [FUE]: One Process, Multiple Applications

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Abstract

Hair transplantation techniques have been transformed by Follicular Unit Extraction (FUE). The objective of this review paper is to examine the numerous FUE applications in the context of hair restoration and elsewhere. Individual hair follicles are removed from the donor location and transplanted to the recipient site during FUE. The versatility of FUE has led to its usage in non-hair applications such the treatment of acne scars and scar concealment as well as in the treatment of androgenetic alopecia, scarring alopecia, eyebrow and eyelash rebuilding, and facial hair transplantation.

FUE has been a ground-breaking procedure for treating androgenetic alopecia because, unlike the conventional strip harvesting method, it may remove hair follicles without creating a linear scar. It offers a minimally invasive method with results that seem natural. Scarring alopecia, which is characterized by permanent hair follicle damage, might also profit from FUE since it enables the transplanting of healthy follicles into scarred regions.

FUE has also become more popular in the field of aesthetic operations. With FUE, eyebrow and eyelash density can be restored and improved, making eyebrow and eyelash repair applications increasingly popular. Demand for facial hair transplantation, including the restoration of sideburns, mustaches, and beards, has also increased, and FUE has shown to be a successful method in these situations.

It's interesting to note that FUE has uses outside of the hair industry. It offers a practical option for scar repair and has demonstrated potential in the treatment of acne scars. Additionally, FUE can be used to disguise scars by implanting hair follicles to cover scars on various body parts.

FUE is a useful tool in the fields of hair restoration and aesthetic medicine due to its adaptability and efficacy in these various applications. This study emphasizes the potential of FUE to enhance cosmetic outcomes and boost patients' quality of life by examining the procedural elements, benefits, limitations, and outcomes of FUE in diverse applications.

1. Introduction

Background and Historical Perspective

A ground-breaking method for hair regrowth is called Follicular Unit Extraction (FUE). Individual hair follicles are removed from the donor location and transplanted to the recipient site using the less invasive FUE process. FUE enables the extraction of follicular units without creating a linear scar, in

contrast to the conventional strip harvesting technique [1].

When Dr. Masumi Inaba proposed the idea of removing individual hair follicles for transplanting, the history of FUE began [2]. Due to technical and instrumentation restrictions, FUE first encountered difficulties. FUE has, nevertheless, become increasingly well-liked and accepted in recent years thanks to improvements in technology and surgical techniques..

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2. FUE Procedure and Technique

The first step in the FUE technique is choosing a suitable donor location, which is often the rear of the scalp where there are many hair follicles that are genetically resistant to balding [3]. To assure the patient's comfort throughout the surgery, local anesthetic is used. According to the desired hairline or pattern, tiny incisions or punctures are made at the recipient site to prepare it [4].

utilizing specialized tools, like as micropunches or robotic devices, the individual follicular units are extracted utilizing FUE. These tools make it possible to remove undamaged hair follicles with accuracy and precision [5]. In order to obtain outcomes that appear natural, the harvested follicular units are then carefully transplanted into the recipient site.

Due to its many benefits, FUE has become the preferred method for hair transplantation. FUE is especially appealing to patients who prefer shorter haircuts or shaved heads because there is no linear scar and therefore more stylistic freedom [6]. In comparison to the strip harvesting procedure, FUE is also linked to decreased postoperative discomfort, a quicker recovery, and minimum disruption of daily activities [7].

3. FUE in Androgenetic Alopecia

The most common kind of hair loss, androgenetic alopecia, often known as male or female pattern baldness, affects a large number of people worldwide. FUE has evolved as a ground-breaking procedure for treating androgenetic alopecia, providing a number of benefits over the conventional strip harvesting technique.

FUE is a popular choice for patients who want to prevent noticeable scarring since it allows for the extraction of individual hair follicles without leaving a linear scar. During the process, tiny punches with a diameter of between 0.8 and 1.2 mm are used to retrieve follicular units [8]. To reduce stress and maintain the survival of the removed grafts, these punches are delicately implanted around the hair follicles.

According to studies, FUE has a good success rate in treating androgenetic alopecia. In a Harris et al. study, adequate hair growth was seen in the transplanted

sites, and graft survival rates utilizing FUE were above 90% [9]. Additionally, FUE enables the selective extraction of hair follicles, enabling the harvest and transplantation of healthy hair follicles from non-balding areas to bald or thinning areas.

The adaptability of FUE in the treatment of androgenetic alopecia is also enhanced by the capability to remove follicles from different body regions. Follicles can be removed from the beard, chest, or other acceptable areas if the donor area at the back of the scalp is insufficient [10]. This increases the number of grafts that are available and gives people with low scalp donor reserves more options for hair restoration.

FUE has gained favor among both patients and hair restoration physicians due to the realistic results it produces, as well as the little scarring and shorter recovery times. FUE has changed the way that androgenetic alopecia is treated, giving people a practical way to deal with hair loss and boost their self-esteem..

4. FUE in Scarring Alopecia

Scarring alopecia is a set of hair loss illnesses that are characterized by permanent scarring of the hair follicles. FUE has demonstrated potential as an effective method for treating scarring alopecia, providing an answer for patients with low donor reserves or those looking for minimally invasive treatments.

The capacity to remove healthy hair follicles from unaffected areas and transplant them into scarred parts is one of the primary benefits of FUE in scarring alopecia. In places where follicular units have been damaged by the underlying pathology, this approach enables the restoration of hair [11]. FUE makes it possible to remove only healthy follicles, preserving their viability and potential for transplantation.

FUE has produced successful results in treating scarring alopecia, according to several studies. FUE was successfully performed to transplant hair follicles in individuals with cicatricial alopecia in a research by Jimenez et al., leading to better hair density and general cosmetic effects [12]. The study demonstrated FUE's effectiveness at reviving hair growth in scarred areas.

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FUE also has the benefit of leaving just little scars, which is particularly advantageous for people with scarring alopecia. In circumstances where the scarred portions are exposed or apparent, the lack of a linear scar enables a more discrete and natural-looking outcome [13]. Additionally, FUE doesn't require the removal of a strip of scalp tissue, which lowers the possibility of problems and promotes quicker healing.

While FUE has showed promise in treating scarring alopecia, it is important to take into account the unique characteristics of each patient, including the degree of scarring, the availability of donors, and reasonable expectations. In order to assess the viability and prospective outcomes of FUE in situations of scarring alopecia, close communication between the patient and the hair restoration surgeon is essential.

5. FUE in Eyebrow and Eyelash Reconstruction

The restoration and enhancement of eyebrow and eyelash density with FUE has become a crucial method as aesthetic medicine's focus on brow and eyelash regeneration has grown significantly. FUE is a desirable choice for people trying to restore their brows and eyelashes since it uses a minimally invasive procedure and produces results that seem natural.

FUE involves removing individual hair follicles from the donor location, which is often the scalp, and transplanting them to the area around the eyebrows. Well-defined and aesthetically acceptable eyebrows can be produced because to the accurate extraction and transplantation procedure [14]. The surgeon is able to create ideal eyebrow symmetry and match the natural development pattern by being able to harvest single hair follicles.

Similar to this, eyelash repair via FUE has produced encouraging results. In order to reproduce eyelash density, individual hair follicles are extracted, frequently from the scalp, and carefully placed along the eyelid edge [15]. FUE makes it possible to implant tiny, single hair follicles that resemble natural eyelashes and produce an attractive and lifelike result.

Studies on the repair of eyebrows and eyelashes with FUE have shown positive outcomes. In a research by

Puig et al., FUE was used to successfully restore eyebrows in individuals with a range of etiologies, including trauma and alopecia areata [16]. Similar to this, FUE has been used in eyelash rebuilding to address eyelash loss brought on by trauma or medical problems, improving patient satisfaction and eyelash density.

The benefits of FUE in reconstructing eyebrows and eyelashes include minimum scarring, realistic results, and the flexibility to tailor the transplantation procedure to the patient's unique requirements. For those looking to maintain and improve their brow and lash attractiveness, FUE offers a flexible and practical alternative.

6. FUE in Facial Hair Transplantation and Non-Hair-Related Applications

Beyond scalp hair restoration, FUE has found use in non-hair-related aesthetic procedures as well as facial hair transplantation. FUE has emerged as an effective method for producing desired facial hair density and look, and facial hair transplantation, including beard, mustache, and sideburn restoration, is growing in popularity [17].

FUE makes it possible to remove individual hair follicles from the donor location, which is often the scalp or another part of the body, and transplant them to the targeted facial regions. A natural-looking outcome is guaranteed with correct angulation and distribution of the transplanted hairs thanks to the capacity to carefully harvest follicular units [18]. Patients can strengthen sparse regions of their beards or mustaches or create a full facial hair pattern with FUE to get the aesthetics they want.

Additionally, FUE has shown success in non-hair-related aesthetic operations. Treating acne scars is one of these applications. By transplanting hair follicles into the damaged areas, FUE offers a practical method for scar revision that can assist to enhance the texture and look of the scars [19]. The transplanted hair follicles help the scar to disappear and blend in, producing a more visually acceptable outcome.

Another non-hair application of FUE is scar camouflage. FUE can help hide scars and enhance their appearance by removing hair follicles from the donor area and transplanting them into damaged areas

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of the body. Surgical scars, burn scars, and traumatic scars have all been treated successfully with this approach [20].

The adaptability of FUE in non-hair-related applications and facial hair transplantation emphasizes its potential to increase cosmetic results and raise patients' quality of life. Its applicability in these fields will grow as FUE techniques continue to progress and research is conducted.

7. Conclusion

In the realm of hair restoration, follicular unit extraction (FUE) has become a flexible and successful procedure with many uses. It has showed encouraging results when used to treat androgenetic alopecia, scarring alopecia, reconstruct eyebrows and eyelashes, transplant facial hair, cover scars, and treat acne scars. FUE has a number of benefits, including the ability to harvest follicles from diverse body parts, minimum scarring, and natural results. The need for qualified surgeons and a potential cap on the number of grafts that can be collected are some of its drawbacks. Future studies should concentrate on improving FUE procedures and broadening its applicability. FUE has transformed hair transplantation as a whole and has the potential to continue revolutionizing cosmetic treatment.

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