

## Stem Cell Therapy Following Hair Transplantation with Follicular Unit Extraction Technique

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### ABSTRACT

Follicular unit extraction uses small punches less than 1 mm in diameter to extract the follicular unit. It has gained in popularity as having better instrumentation and results barely visible scarring from the punches. However, its main limitation is up to 5000-6000 hair follicles transfer for single session, when compared that of healthy human scalp's 120000 hair follicles. Here, we present six months follow-up of adipose derived stem cell therapy for a male who had hair transplantation with follicular unit extraction technique.

**Keywords:** Adipose derived stem cell therapy; Follicular unit extraction; Androgenetic alopecia

### INTRODUCTION

Excess responsiveness of testosterone and its active metabolites is known as Androgenetic Alopecia (AGA). Androgenetic alopecia is the most common form of hair loss that is thought to affect up to 80% caucasian men and up to 40% of caucasian women by age of 70. The scaling down of the follicles depletion as characterised by a depletion of anagen stage with an enhancement in the measure of resting hair follicles telogen and the presence of infinite small hairs. Hormonal and non-hormonal causes cause loss of hair density or hair thinning or both. Diffuse, hyper hair loss is characterised by hair thinning commonly presented in telogen effluvium and Androgenetic Alopecia (AGA) represented as bitemporal thinning of the frontal and vertex scalp.

Stem cell based therapies for Hair Loss (HL) are at their infancy. Many authors concentrated on Stromal vascular cells (SVF) due to their ability to separate into numerous cell geneologies. Another field involves the possibility of using fat and Stromal Vascular Fraction cells (SVFs) for hair regrowth. Stromal Vascular Fraction cells (SVFs) are a heterogeneous gathering of non-cultured cells that can be constantly isolated from fat using minimal manipulation. Several methods are available for obtaining stem cells from fat tissue using centrifugation, filtration,

and the purification of fat tissue or using enzymatic digestion. Adipose Derived Stem Cell Cultured Medium (ADSC-CM) was shown to induce the anagen phase and promotes hair growth clinically and experimentally. It was also shown that this medium increased the proliferation rate of human follicular cells [1]. Another clinical study in which forty patients with alopecia were treated by intradermal injection of ADSC-CM every month for 6 months showed an significant increase in hair numbers [2]. We report a case who was treated with FUE transplantation received a further svf therapy for improving the hair density and quality.

### CASE PRESENTATION

32 year-old male presented with fronto-occipital scalp hair transplant with follicular unit excision technique (Figure 1). The patient sought much improved hair density in the transplanted area of the scalp. SVF therapy was offered and he accepted single dose stem cell therapy to be injected intradermally. Under local anesthesia, 60 ml fat obtained with syringe liposuction and then it was subjected to svf isolation with filtration technique as previously described [3-4]. 6 ml svf was injected to the of fue transplant scalp zone freshly with 0.1 cc for 1 cm<sup>2</sup> area of scalp. No other local or systemic medical treatment was given.

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Figure 1. The patient at presentation.

## RESULTS

6 months later, he was reexamined and a mean increase of 30 hairs/cm<sup>2</sup> of scalp (represents a 22% relative percentage increase) is documented in this patient with a single dose Stromal Vascular Cells (SVF) (Figure 2). Sixty fixed sites on patients were investigated by trichograms at 3 time points (before treatment, at third month and sixth month posttreatment). No adverse reaction observed during the follow-up period.



Figure 2. 6 months after svf therapy

## DISCUSSION

Only one case study in which fresh SVFs was used for female pattern hair loss was reported as successful result following single dose therapy [4]. This report used filtration technique and applied the svf without any storage or time interwall. In this case, the same protocol was used and the follow-up period lasted 6 months. There was no adverse reaction with a promising clinical result. In ADSC-CM of half-side comparison study, the increase in hair numbers was reported to be significantly higher on the treatment side than on the placebo side [3]. This medium contains cytokines and growth factors that can facilitate the regeneration and repair of various tissues and organs.

Perez-Meza et al used Puregraft system to obtain a purified autologous fat graft. The mixing and preparation of enriched adipose occurred in a sterile environment within the procedure room.

After the preparation of the tissue was complete, needle-puncture incisions were made near the area to be treated. They used 30 ml volume adipose cells obtained from 120 fat graft harvest aiming to apply 1.0 mL of enriched fat per square centimeter with injecting the fat in a fan-like patterned movement in the subcutaneous tissue of the scalp with a 1.0-mL cc Luer Lock syringe attached to a 1.2-mm cannula [5]. We used micro fine injectors for intradermal injections with a total 6 ml svf to occipito-frontal scalp region.

Nakajima et al. demonstrated the assembly of Human Adipose-derived Stem Cells (hASCs) into hair follicle germ (HFG)-like aggregates for de novo hair regeneration [6]. They reported that the involvement of hASCs significantly increased gene expression associated with hair morphogenesis compared to Hair Follicle Germ (HFGs) without Human Adipose-derived Stem Cells (hASCs).

## CONCLUSION

Whatever the mechanism is, therapy with svf and/or enriched fat, observations shows promising clinical outcomes for HL. Mechanisms underlying experimental and /or clinical studies of improved outcomes with the stem cell based therapies are believed to be result of multiple factors. ADSCs-derived proteins is supposed to improve hair growth and protect human dermal papilla cells against cytotoxic injury caused by androgen and reactive oxygen species. Further studies must be conducted in order to determine efficacy of stem cell therapy in this era. Follicular bulb encircles the dermal papilla which is composed of dermal papillary cells connective tissues and a capillary network. It is supposed that svf promotes new capillary formation which interacts with the capillary network around the follicular bulb. A longer of hair matrix keratinocytes surrounds the lower dermal papilla with healthy capillary network. Dermal papilla constitute a special mesenchymal component that regulates periodic regeneration of HF. So an adequate continuous blood supply is needed for optimal function of dermal papilla.

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