

Research Article

Restoration of Pigmentation by Follicular Unit Excision *versus* Transected Follicular Unit Excision in Patients with Vitiligo

Rachita S Dhurat^{*}, Suraj Uday Pai and Richa Sharma

Department of Dermatology, Lokmanya Tilak Municipal Medical College and General Hospital, India

Abstract

Background: Being hair growth at the recipient site. Follicular Unit Excision (FUE) in vitiligo is a reasonable modality for pigmentation with only disadvantage.

Objectives: We hypothesized that transected hair follicle would give similar quantum of pigmentation in vitiligo with less hair growth at recipient site in comparison to conventional FUE.

Methods: After consideration of inclusion and exclusion criteria, twenty-six stable vitiligo patches were recruited. Complete FUE in half sample size and transected FUE in other half were performed. Outcome of the surgery was analyzed for percentage re-pigmentation, color matching, linear hair growth and quality of hair at the end of six months.

Results: The percentage re-pigmentation of vitiligo patch was 73% and 71% in complete follicular and transected follicular group respectively at the end of six months. Re-pigmentation achieved in transected follicular group was almost similar to complete follicular group. Mean linear hair growth of transected group was almost half compared to complete follicular group with thinner and lighter hair in the former group.

Conclusion: Transected FUE was found to be non-inferior to complete FUE with lesser hair growth but equal quantum of pigmentation.

Keywords: Follicular unit excision; Transected FUE; Vitiligo

Introduction

Vitiligo is a common acquired skin disorder characterized by depigmentation of the skin due to the loss of functional melanocytes from the cutaneous epidermis [1]. Treatment for vitiligo aims at providing re-pigmentation which can be achieved either by stimulating or repopulating the melanocytes or targeting the immune mechanisms associated with the etiopathogenesis. Various surgical options in vitiligo which aim at repopulation of melanocytes include miniature punch grafting, split skin grafting, suction blister grafting, hair follicle grafting (FUE) and mesh grafting. Hair follicles serve as reservoir of melanocytes which can proliferate, migrate through the infundibulum towards depigmented epidermis, and radially repigment the skin making FUE as a viable vitiligo surgery option. Regrowth of hair at recipient site is a major disadvantage of FUE which may deter patients from undergoing this procedure.

A study done by [2] showed that there was no hair regrowth when the hair follicles were transected. Melanocytes are not only present in bulb of hair follicles but are also present in outer root sheath and infundibulum and thus transected hair follicle should also result in

repigmentation. Taking this concept forward, we performed this study of complete FUE *versus* transected FUE in vitiligo.

Methodology

Study design

A comparative study was conducted from February 2020 to November 2021 in department of dermatology in a tertiary care centre, after institutional ethics committee approval.

Patient selection

This study included patients with stable vitiligo patches (stable vitiligo is defined as a patient reporting no new lesions, no progression of pre-existing lesions and absence of Koebner's phenomenon during the past one year) [3]. Exclusion criteria included keloid tendency, pregnancy, lactation, bleeding disorders, uncontrolled diabetes or any form of immune suppression and unstable vitiligo disease activity. The vitiligo patches were grouped into two categories of intervention-Group one with complete follicular units and group two with transected follicular units.

Follicular unit excision procedure

The number of grafts to be extracted was decided on the basis of area of vitiliginous patch. Area of vitiligo patch to be taken up for surgery was calculated using point counting method with transparent sheet and graph paper. The outline of the patch to be measured was jotted on a transparent sheet and traced over the graph paper. The area of patch was calculated in terms of centimeter square and fifteen to twenty follicular units per centimeter square were decided to be implanted in recipient site. The grafts were harvested from occipital scalp. The donor area was trimmed to 1-2 millimeters length, local anesthesia was administered and the follicles were incised using motorized 1 mm sharp cylindrical punch. Extracted hair follicles were

Citation: Dhurat RS, Pai SU, Sharma R. Restoration of Pigmentation by Follicular Unit Excision versus Transected Follicular Unit Excision in Patients with Vitiligo. Am J Surg Tech Case Rep. 2024;4(1):1024.

Copyright: © 2024 Uthman Aluthman

Publisher Name: Medtext Publications LLC

Manuscript compiled: Jan 08th, 2024

***Corresponding author:** Rachita S Dhurat, Department of Dermatology, OPD 16, New OPD Building, Lokmanya Tilak Municipal Medical College and General Hospital, Sion, Mumbai 22, India

preserved in a petri dish in cold normal saline until the extraction was completed. The donor area was dressed. For transected follicular unit group, follicles were placed on a sterile glass slide and proximal three fourth portion of hair bulb was sectioned with a sharp razor blade.

Graft insertion procedure

After preparation of recipient site, slits were created with 18G needle at distance of 3 mm-5 mm and hair follicle was gently inserted using a jeweler's forceps into the created slits. The recipient area was dressed for five days. Phototherapy (NBUVB) was initiated at recipient site for acceleration of pigmentation after two weeks of surgery.

Assessment

The outcome variables in the study assessed at six months were percentage re-pigmentation, color matching, linear hair growth and quality of hair. Area of re-pigmentation of vitiligo patch was calculated using the point counting method (with transparent sheet and graph paper) and was graded in terms of percentage as poor response (0% to 24%), fair response (25% to 49%), good response (50% to 74%) and excellent response (75% to 100%). Matching of re-pigmentation of vitiliginous patch with the surrounding normal skin was analyzed, and graded as normal (same colour as surrounding skin), light and dark pigmentation. For assessment of linear hair growth and quality of hair shaft, 10 random hairs were selected from each recipient vitiliginous patch. Hair shaft was epilated at skin surface and length was measured with a scale for calculation of linear hair growth. Quality of cut hair was evaluated for hair shaft color under a microscope and compared with normal scalp hair and graded as having same pigment, light pigment and no pigment.

Statistical tools

The information collected regarding all the patches were recorded in a master chart. Data analysis was done with the help of computer using online SPSS version 21.0 software for statistical analysis.

Results

Twenty-six patches were selected in the study. The mean duration of vitiligo in our study population was 6.84 years (3-10 years). The distributions of patches in our study were trunk (23%), leg (15%), arm (15%), forearm (15%), abdomen (15%), chest (8%) and axilla and areola with 4% each. Re-pigmentation of vitiliginous recipient areas were 73% in complete follicular unit group and 71% in transected follicular unit group respectively at the end of 6 months (Table 1). This difference was not statistically significant ($p>0.05$). Analysis of color matching showed same pigmentation in seven (54%), lighter pigmentation in three (23%) and darker pigmentation in three (23%) patches in complete follicular unit group while transected follicular group had ten (77%) patches with similar pigmentation, three (23%) patches showed lighter pigmentation and none had darker pigmentation (Table 2). This difference between the two groups was not statistically significant ($p>0.05$). Mean linear hair growth was 3.71 cm in complete follicular unit group and 1.96 cm in transected follicular unit group (Table 3). The mean linear hair growth in group two was 47% slower as compared to group one. This difference was statistically significant ($p<0.05$). All the patches with complete follicular units had similarly pigmented hair shaft as compared to normal scalp hair while in transected follicular unit group 20% were similarly pigmented and 80% were lightly pigmented hair shaft.

Discussion

Hair follicle is a reservoir of melanocytes with DOPA positive

Table 1: Comparison in mean percentage of re-pigmentation in both the groups in the study population (n=26).

Time	Complete	Transected	P - Value
Baseline	0	0	0.68 (NS)
6 months follow up	73.24 ± 25.02	71.81 ± 26.73	

Table 2: Comparison of degree of color matching in both the groups in the study population (n=26).

Colour Matching	Number(n)	
	Complete	Transected
Dark pigmentation	3	0
Light pigmentation	3	3
Normal pigmentation	7	10

Table 3: Comparison of mean of average length of hair follicles (cm) in both the groups in the study population (n=26).

Avg. length (cm)	Complete	Transected	P-Value
Mean	3.71	1.96	0.001*(S)
SD	1.09	0.78	

in the wall of the pilary canal (infundibulum), and in the pigmented part of the bulb, close to the upper part of the dermal papilla and DOPA negative melanocytes along the outer root sheath of the middle and lower parts of the follicle, between the basal portions of the tall epithelial cells forming the outer peripheral layer [4]. Amelanotic melanocytes become activated to melanotic melanocytes by certain procedures like dermabrasion and phototherapy [5,6]. Migration of amelanotic melanocyte to a mature melanocyte is divided into five phases-

1. Passive transport by the epidermal regenerative flow.
2. Phase of division in the middle hair follicle.
3. Phase of pigmentation and formation of premature melanocytes (pre-melanocytes).
4. Phase of transformation of the pre-melanocytes into normal melanocytes and later on into hypertrophic melanocytes.
5. Phase of migration of the hypertrophic melanocytes from the infundibulum into the basal layer [5].

Therefore, hair follicles serve as a rich source of melanocytes. More melanocytes are present in a single hair follicle than normally pigmented non-glabrous skin that provides a larger melanocyte and stem cell reservoir. In process of FUE, which involves microtrauma may trigger amelanotic melanocyte to mature melanocyte and give pigmentation. Utility of FUE as a treatment option has been reported by [7]. FUE has the benefits of reduced downtime for patients, rapid onset of pigmentation and better color match. Further this method can be easily applied to a small area of vitiligo. FUE does not require special equipment or a sophisticated operation theatre setting making it quite affordable option. Moreover, this procedure does not require any cell separation technique like in follicular or epidermal cell suspension transplant, thus, making it less time consuming and comparatively easier.

The major drawback of FUE is terminal hair growth at the recipient site [2] conducted a study wherein three groups of transected hair follicles were transplanted in athymic mice. First group was transected at the level of bulb, second group between middle of sebaceous gland and below bulge and third at level of infundibulum and isthmus and 12 hair follicles were included in each group. Amongst thirty-six transplanted hair follicles, only one hair fragment grew from the upper section while the rest failed to show hair growth.

This suggests that when follicular unit is transected at bulge level and above fails to develop hair. It is important for hair regeneration to have an intact bulb. However, in this study, pigmentation from hair melanocytes was not studied. There is scarcity of data on usefulness of complete hair follicular unit in vitiligo and no study is available on utility of transected follicular unit in vitiligo till date. In present study we studied mean percentage of re-pigmentation in both the groups with complete FUE and transected FUE. We observed that in both the groups mean percentage of re-pigmentation at the end of 6 months was 73% in complete follicular group and 71% in transected follicular group [7] performed a study on sixty- three stable vitiligo patches using complete follicular units which showed excellent re-pigmentation in 61.9%, good in 25.4% and poor in 12.7%. No study has been done till date using transected follicular units in vitiligo. As a speculation that transected hair gives lighter pigmentation, our study showed that it gave similar pigmentation as compared to complete follicular group (Figure 1 and 2). Despite the linear growth of hair was slower by nearly 50% in transected follicles, the pigmentation was comparable with the complete follicular group (Figure 3). Complete follicular unit was able to grow same quality of hair as compared to occipital area while majority of transected follicular unit failed to grow same quality of hair which was desirable in vitiligo.



Figure 1: (a) Pre photo of vitiligo patch where complete follicles were transplanted (b) Pre photo of vitiligo patch where transected follicles were transplanted.



Figure 2: (a) Post photo of vitiligo patch where complete follicles were transplanted (b) Post photo of vitiligo patch where transected follicles were transplanted.

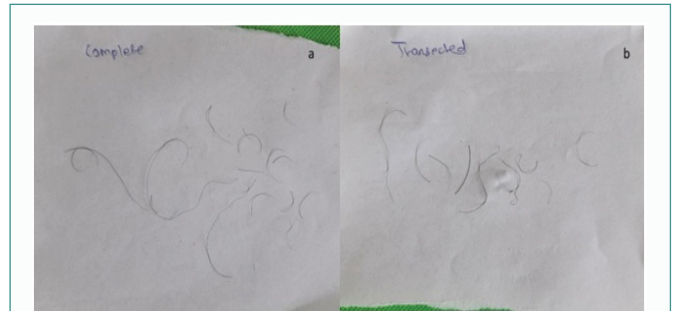


Figure 3: (a) Hair epilated at skin surface from complete follicular group at end of six months (b) Hair epilated at skin surface from transected follicular group at end of six months.

Conclusion

FUE serves as a good reservoir of melanocytes in patients with vitiligo due to high density of melanocytes in hair follicle. Although re-pigmentation capacity of transected follicular unit was comparable to complete follicular unit, however, former procedure serves as a superior modality in terms of less linear hair growth and poor hair shaft quality which is desirable in vitiliginous patches.

References

1. Alikhan A, Felsten LM, Daly M, Petronic-Rosic V. Vitiligo: a comprehensive overview Part I. Introduction, epidemiology, quality of life, diagnosis, differential diagnosis, associations, histopathology, etiology, and work-up. *J Am Acad Dermatol* . 2011;65(3):473-91.
2. Tang L, Madani S, Lui H, Shapiro J. Regeneration of a new hair follicle from the upper half of a human hair follicle in a nude mouse. *J Invest Dermatol*. 2002;119(4):983-4.
3. Prasad D, Gupta S. IADVL Dermatosurgery Task Force. Standard guidelines of care of vitiligo surgery. *Indian J Dermatol Venereol Leprol*. 2008;74(1):S37-45.
4. Staricco RG. Amelanotic melanocytes in outer root sheath of the human hair follicle. *J Invest Dermatol*. 1959;33:295-7.
5. Staricco RG. Mechanism of migration of the melanocytes from the hair follicle into the epidermis following dermabrasion. *J Invest Dermatol*. 1961;36(2):99-104.
6. Staricco RG, Miller-Milinska A. Activation of amelanotic melanocytes in the outer root sheath of the human hair follicle following ultra violet rays exposure. *J Invest Dermatol* 1962;39:163-4.
7. Thakur P, Sacchidanand S, Nataraj HV, Savitha AS. A Study of Hair Follicular Transplantation as a Treatment Option for Vitiligo. *J Cutan Aesthet Surg*. 2015;8(4):211-7.