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Treatment of segmental vitiligo with normal-hair follicle autograft

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Abstract

Background: Segmental vitiligo is a small subset albeit persistent form of focal vitiligo with dermatomal distribution and resistant to medical therapy. In recent years, surgical therapy as hair follicle autograft transplantation has been a hot topic in management of segmental vitiligo. In this study, we evaluated the efficacy of this method in segmental vitiligo lesions.

Methods: The study recruited 10 patients who suffered from resistant segmental vitiligo to evaluate the effect of transplantation of pigmented hair follicles on re-pigmentation of the affected area. In this method, one or two punched-biopsy skin sample with a diameter of 5mm were harvested from occipital area of the scalps. Grafts were trimmed and divided into the follicular segments with at least one follicle in the interior and then inserted in the depigmented areas. Follow-up plan studies were scheduled to evaluate presence of pigmentation in the perifollicular areas.

Results: After 2 weeks, re-pigmentation was detectable surrounding the grafted hair follicles in 60 % of the cases. After 6 months, all of the patients had detectable re-pigmented area of about 2-9 mm.

Conclusion: giving the surprising result of the study, hair follicle autograft transplant is an effective treatment option in the persistent segmental vitiligo.

Keywords: Vitiligo, Surgical therapy, Hair follicle, Autologous transplantation.

Introduction

There are two clinically recognized distinct variants of vitiligo based on distribution of depigmented areas; generalized and localized (1, 2). Generalized or bilateral symmetrical form of vitiligo is a disease that destroys skin and mucosal membranes melanocytes progressively, and in some cases could involve ears and eyes (3, 4). Localized form of vitiligo is further divided into segmental and focal form. Segmental vitiligo is an uncommon form of localized vitiligo, characterized by dermatomal distribution. It is often unilateral and asymmetrical that never crosses the midline of body (1,4,5). In this form of the disease, depigmentation spots spread quickly in the affected dermatomes and then stop growing. It is believed that in the vast majority of the patients with segmental vitiligo melanocytes of the hair follicles are as well affected, resulting in leukotrichia (6). Medical therapy has been exclusive treatment option for vitiligo for several decades. The most commonly used medical therapies for

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localized vitiligo include topical steroids and Calcineurin inhibitors such as Tacrolimus (7, 8). However, systemic corticosteroids are used only in the rapidly progressive form of the disease nowadays (9). In the recent decades, scientists have focused on non-medical treatment options as a first-line or an adjuvant therapy. For instance, ultraviolet (UV) radiation in the form of UVB and UVA as a first-line therapy in generalized vitiligo or UVA as an adjuvant therapy to systemic Psoralen that is believed to be increases the number of residual melanocytes (10-12). The latest non-medical option in treatment of vitiligo and management of melanocyte distribution is surgical intervention that has been described first by authors like Behl and Falabella and colleagues (13-15). Hair follicular transplant is one of these various surgical modalities that are followed to re-pigment the vitiligo patches. This procedure is based on the concept of existence of undifferentiated stem cells in the hair follicle, which forms a good source of melanocytes for re-pigmentation. After few weeks of grafting, the melanocytes spread to surrounding depigmented epiderm and the skin appears re-pigmented. When compared to other modalities, except the color match and tiny scars, the appearance of re-pigmentation area was much more acceptable in this method. This method is effective in focal vitiligo, vitiligo in hairy and non-glabrous areas and in those patches with leukotrichia. In this study, the hair follicular transplantation effect on re-pigmentation of affected areas in segmental vitiligo was evaluated.

Methods

Study population: This registered clinical trial recruited 10 patients with documented diagnosis of segmental vitiligo who suffered from persistent form of segmental vitiligo for more than 3 years. The patients were not in the progressing phase of their disease at the time of enrollment.

It is noted that a written informed consent was obtained from all of the patients and the ethics committee of our University of Medical Sciences approved the research project.

Hair follicle autograft transplantation: After cutting hair of occipital area just by scissors and sterilization, local anesthesia was performed. 3 to 5 punch biopsies with the diameter of 5mm were harvested from the scalp and the donor site were sutured using nylon 0.3. Grafts were irrigated with normal saline, and separated into follicular units, which then reimplanted into the recipient sites created by 19- and 20-scalpel or Nokor needles. Then the recipient sites were dressed. Patients were followed-up every two weeks for a month, then every month for 6 months evaluated for presence of re-pigmentation around the follicles. Diameters of re-pigmented area were measured as millimeter. Photographs of all patients were taken before and after procedure.

Statistical analysis: Data presented as frequency and percentage.

Results

We analyzed data for eight male (80%) and two female (20 %) patients within an age range of 21 to 43, who were enrolled into the study. Depigmented skin areas were located in the face of 4 patients (40 %), extremities of 4 patients (40 %) and in the trunk of the body of 2 patients (20 %).

Fig.1. (A) Skin area before treatment

Fig.2. (B) Skin area 6 month after hair follicle transplantation

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Table 1. Re-pigmented area around hair follicles in the patients during follow-up period

	Follow-up time after procedure						
Patient's number	Week 2	Week 4	Week 8	Week 12	Week 16	Week 20	Week 24
1	-	1 mm	1-2 mm	2-4 mm	2-4 mm	2-4 mm	2-4 mm
2	-	1 mm	1-2 mm	2-4 mm	2-4 mm	2-4 mm	2-4 mm
3	-	1 mm	1-2 mm	2-4 mm	2-4 mm	2-4 mm	2-6 mm
4	-	1 mm	1-2 mm	2-4 mm	2-4 mm	2-4 mm	2-6 mm
5	1 mm	1-2 mm	1-2 mm	2 mm	2 mm	2 mm	2 mm
6	1 mm	1-2 mm	1-2 mm	2 mm	2 mm	2 mm	2 mm
7	1 mm	1-2 mm	2-4 mm	2-4 mm	2-4 mm	2-4 mm	4-6 mm
8	1 mm	1-2 mm	2-4 mm	2-4 mm	2-4 mm	2-4 mm	4-6 mm
9	1 mm	2-4 mm	2-4 mm	4-6 mm	6-8 mm	6-8 mm	6-9 mm
10	1 mm	2-4 mm	2-4 mm	4-6 mm	6-8 mm	6-8 mm	6-9 mm

Re-pigmented areas are presented as millimeter.

Table 2. Comparison of the result of the present study with others

	Number of the patients	Patients with re-pigmentation n (%)	Extent of re-pigmentation
Malakar[23]	3	3 (100%)	-
Arrunetagui[25]	10	4 (40%)	-
Na- Gy[18]	21	15 (71%)	2-10 mm
The present study	10	10 (100%)	2-9 mm

Re-pigmentation was detectable in 6 cases (60 %) following 2 weeks procedure. Re-pigmentation was appeared in all of the cases after 4 weeks, which continued to improve during the follow up period. Afterward, all the patients had detectable re-pigmented area of at least 2 mm and maximum of 9 mm during 6 month (Fig.1,2). Follow-up results are reported in Table.1.

Discussion

Surgical interventions remain a therapeutic option for the treatment of the patients with localized form of vitiligo that have failed medical therapy. Clinically stabled segmental vitiligo with leukotrichia is one of the indications of surgical intervention. Until now, various kinds of surgical procedure have been used in treating stable vitiligo macules and patches, such as punch graft, Thiersch's graft, blister-graft, full-thickness skin graft and autologous melanocyte transplants (16, 17). Hair follicle transplantation was first introduced to initiate re-pigment vitiligo lesions in 1998 (18). This procedure is based on the concept of existence of undifferentiated stem cells in the hair follicle, which forms an excellent reservoir of melanocytes for re-pigmentation. Staricco (19) demonstrated that there were two types of pigment cells in the hair follicle, inactive and active melanocytes and the inactive melanocytes could migrate along with regenerated epidermis and would mature gradually. Ortonne et al (20) postulated the existence of a melanocyte reservoir, specifically located in the lower portion of human hair follicles and they proposed that re-pigmentation of vitiligo was derived from the melanocyte reservoir in the hair follicles. Cui and colleagues (21) demonstrated that during the re-pigmentation of vitiligo the number of inactive melanocytes in the outer sheath of hair follicles significantly increased and some active melanocytes appeared in the outer root sheaths, hair follicle orifices and around the perifollicular epidermis. The hypothesis of stimulation of melanocytes migration from the hair follicle reservoir by phototherapy is now a well-established fact. Melanocytes spread centrifugally from the infundibulum to the basal layer and recolonize the epidermis with active and functional melanocytes (22). Regardless of the mode of treatment, re-pigmentation in vitiligo usually begins in the perifollicular area. Transplant of hair follicle in order to

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stimulate re-pigmentation in vitiligo-affected areas has been reported earlier by some authors (18, 23, 24). Pigmentation starts appearing at 4th to 5th week and continues up to 6 months or even longer (25). In this method, although the appearance of pigmentation was delayed when compared to other modalities, the color match was much more acceptable than others (Table. 2) (18, 23, 25). Hair follicle transplantation is also more effective than the other treatment options, as transformation of depigmented hairs into the pigmented ones become evident and grafted hairs could retain the pigmentation even in cases of unresponsive or treatment-resistant (3). Our experience showed initiation and progression of re-pigmentation in all patients that was comparable and even more effective than previously reported ones. Except the undeniable limitation of the present study regarding small number of patients, it showed excellent result with high patients' satisfaction. In this method, we used small punched biopsy in order to harvest follicles from the scalp to decrease risk of scar formation and Kobner effect. In addition, this method could perform in a one session and has a low cost that is much more acceptable for the patients.

Conclusion

Given the result of the present study, autologous hair follicle harvesting through punch biopsy direct transplanting into the hairy and non-glabrous areas could effectively initiate re-pigmentation of depigmented areas in segmental vitiligo. As it may form tiny scars, it is better to apply in the hairy areas. Since segmental vitiligo is a rare form of the disease, further multi central studies or studies with and an appropriate sample size is recommended to confirm these findings.

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