Treatment of Stable Vitiligo hands by ReCell® system: a preliminary report

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Abstract. – Background: The aim of this report was to analyze the results obtained with the ReCell® system for the surgical treatment of stable vitiligo hands.

Materials and Methods: One patient with stable vitiligo of the hands was admitted at the Department of Plastic and Reconstructive Surgery, University of Rome Tor Vergata. The patient underwent to ReCell® system for the treatment of stable vitiligo hands.

Results: The repigmentation was assessed using the Vitiligo Area Scoring Index (VASI). The extent of pigmentation was scored as excellent, good, fair, and poor depending on the percentage of the repigmentation in the previously depigmented site. The color of the repigmented area was compared with the adjacent normally pigmented area. The patient had an excellent repigmentation.

Conclusions: ReCell® system is a simple, safe and feasible technique. The method that uses noncultured autologous epidermal suspension is simpler, cheaper, less time consuming and does not require sophisticated laboratory facilities, when compared with methods employing cultured melanocytes.

Key Words:
Stable vitiligo, Skin epidermal graft, ReCell® system.

Introduction

The skin disorder vitiligo is the most common acquired hypomelanosis, affecting approximately 1% of the world’s population1, characterized by white macules on the skin that can be few or many in number. In most cases, loss of skin colour corresponds with melanocyte loss, first in the epidermal compartment, and later in the follicular reservoir where most melanocytic stem cells are probably situated. The pathogenesis of vitiligo is complex and not yet fully understood, but it is believed to involve a combination of autoimmune, genetic, and environmental factors and each of these factors plays the role in disease pathogenesis2. The characteristic depigmentation can be restricted to a limited skin area (segmental vitiligo) or generalized in symmetrical patches (nonsegmental vitiligo). Vitiligo lesions in the exposed areas of the body, especially in the face and in the hands, have profound influence on the patient’s self-esteem and social relationships3. Vitiligo is a visible cosmetic defect that leads to serious emotional stress.

Treatment of vitiligo is often difficult and disappointing. This is most probably because the aetiopathogenesis is unknown, and a treatment directed to the cause has not been established. It is very difficult to treat vitiliginous lesions located on the back of the hands, feet, distal sections of limbs, eyelids, and genitals and around the mouth and nipples3. There are several ways to treat stable vitiligo. We know medical treatments as psoralens plus ultraviolet A (PUVA), broad-band and narrow-band ultraviolet (UVB) and corticosteroids. When medical therapy fails, surgical therapy is indicated. There are many surgical options but our attention, in this study, was addressed to ReCell® System, a fast, safe and tolerated procedure by the patient, who was able to restore melanocytes at vitiliginous sites.

Preliminary Report

A 30-years-old man, with 7-years history of stable vitiligo of the hands, was admitted at the Department of Plastic and Reconstructive Surgery, University of Rome “Tor Vergata”. Patient anonymity was respected and informed consent obtained before the surgical procedure and digital image production. The protocol of the study was approved by the Research Ethics Board of our institution. The patient was smoker and was not taking any medicines; laboratory data were either negative or within normal limits.
His medical history showed a treatment with vitamin supplements (vit. A, vit. C, vit. E) and with UVB therapy (narrow-band, 311 nm) 5 years ago. These treatments have given no remarkable results. Physical examination revealed an intense 6-cm-long depigmentate area of the hands (Figure 1). A diagnosis of stable vitiligo was made, and treatment with ReCell® system was started. Surgery was performed with the patient under local anesthesia. After 3 months, we noted that the treated areas show not only a satisfactory repigmentation (Figure 2) but also seemed to soften or even completely eliminate the depigmentate areas making it appear as normal skin. This result was obtained despite the acral areas, such as periorificial, are the most difficult to treat because they are subject to continuous movement.

Materials and Methods

ReCell® Kit

ReCell® is a single-use battery-operated autologous cell-harvesting device. It consists of a processing unit with built-in heating mechanism for warming the enzyme solution to optimum working temperature (37°C) and a removable insert to act as a sterile Petri dish for use when separating and scraping the skin biopsy. In addition it contains a sealed glass vial of enzyme, lyophilized trypsin 0-75% (minimum activity 3000 Tu mL⁻¹, equivalent to 50 lkat mL⁻¹), 1 · 10 mL ampoule of sterile water, 1 · 10 mL vial of compound sodium lactate, needles, syringes, cell strainer, and size 23 disposable surgical scalpel. The kit does not contain sterile surgical instruments.

ReCell® Procedure

A thin split-thickness cutaneous biopsy (0.2-0.3 mm) was harvested from an uninvolved area (the inguinal region whenever possible) using a Zimmer dermatome (Zimmer, IN, USA). According to the manufacturer’s instruction, as the cellular spread rate is 1:80, the biopsy area was 1 cm² when the recipient area was 80 cm² and 4 cm² when the recipient area was 320 cm². The epidermis was put in 4.5 ml of trypsin solution for 20 min at 37°C to begin the intercellular detachment. After digestion with trypsin was completed, the epidermis was separated from the dermal layers and epidermal cells further divided with the scalpel’s blade. Cells were further suspended in a lactate solution, aspirated with a 5 ml syringe and sprayed over the area to be treated and the biopsy site. With routine aseptic precautions, the vitiligo patches under study were dermabraded under local anaesthesia (1% lidocaine without adrenaline) using a diamond fraise wheel to the dermoepidermal junction, which was identified by the presence of pinpoint bleeding. Medication was performed with non-adhering dressings (Adaptic, Johnson and Johnson Wound Management, Ethicon, Pomezia, Rome, Italy) and gauzes on both areas.

Postoperative Follow-up Evaluation

The dressing was removed after 7 days. The patient was treated with prophylactic antibiotic
twice daily for 1 week starting 1 day prior to the cell transplantation. Recipient site healed within 7 days and did not require another dressing thereafter. Postoperative exposure to ultraviolet or solar radiation was not advised. Postoperative follow-up consisted of four visits during the first month – one for each week – and two additional visits at the third and sixth month. The aesthetic appearance of the epithelization was evaluated with the help of one plastic surgeon unaware of the procedure (A.A.), according to a simplified version of the Vancouver scar scale that analyzed only the scar pigmentation and vascularity. The degree of repigmentation was assessed as follows: no response or less than 25%, minimal repigmentation; 26-50%, mild repigmentation; 51-75%, moderate repigmentation; >75%, marked repigmentation. Less than 25% repigmentation seen at the end of 3 months was labeled as treatment failure. Compared with the surrounding skin, the color of repigmentation was graded as follows: somewhat darker; somewhat lighter; the same. The patient’s active and passive range of motion in a single plane was evaluated with the help of a physical therapist at 1 and 6 months from surgery. Secondary endpoints were the assessment of infections, inflammations or any adverse effects of the ReCell procedure, particular medications assumed, postoperative pain (evaluated with the visual-analogic scale – VAS).

The postoperative course was uneventful, and the early postoperative result was very satisfactory to both the surgeon and the patient.

Discussion

Treatment of vitiligo is often difficult and disappointing. Causative treatment of vitiligo is not available, so current modalities are directed toward stopping progression and to achieving repigmentation. Nowadays, vitiligo can be managed using a wide range of traditional, new, and experimental therapeutic methods, each of which has different indications, efficacy and side effects. Several treatment modalities, such as PU-VA (psoralen + UVA (320-400 nm) radiation), broad-band (280-320 nm) and narrow-band (311 nm) UVB, and local corticosteroids are currently used. However, it has been reported that these standard treatments result in limited success; less than 25% of patients responded successfully to topical corticosteroids. Moreover, corticosteroids applied either systemically or topically carry the risk of significant side effects in long-term therapy. Alternatively, PUVA therapy seldom achieves extensive repigmentation that is cosmetically acceptable, and treatment response is often followed by relapse.

Surgical therapy is indicated in stable vitiligo when medical therapy fails. The mode of action of surgical therapies is to restore melanocytes at vitiliginous sites. Surgical modalities in stable vitiligo are best indicated in unilateral vitiligo, either segmental or focal, with a success rate of about 95%; bilateral stable vitiligo may also respond in about 48% of cases. There are many surgical options including minigrafting, micropigmentation, split-thickness skin grafting, suction blister transplantation, transplantation of cultured autologous melanocytes, keratinocyte/melanocyte cocultures, or noncultured suspension of epidermal cells. Patients with lesions affecting more than 80% total body surface can be treated with depigmenting methods such as the application of monobenzylether of hydroquinone 20% or Q-switched ruby laser therapy.

New techniques of keratinocytes delivery were investigated and, among these, those involving keratinocytes spray obtained better results. In the ReCell procedure the isolation of the cell population directly from the dermal epidermal junction (DEJ) provides a source of cells with no selection, as would be expected during culturing, and contains not only basal layer keratinocytes but melanocytes, papillary dermal fibroblasts and Langerhans giant cells. We used the ReCell system to treat the deep partial thickness burns, the post-traumatic scars and the stable vitiligo involving different areas of body. During the management of stable vitiligo by ReCell it was observed that the resultant healing was accompanied by a satisfactory repigmentation. This led to use of this device for large variation of pathology.

Conclusion

During recent years, several molecules, such as leukotriene C4, transforming growth factor, 50 basic fibroblast growth factor, stem cell factor, and endothelin 151, have been shown to stimulate pigment cell migration in vitro. If similar and/or more potent molecule become identi-
fied, it is conceivable that when applied to vitiliginous skin, they could stimulate a continuous melanocyte migration from the edge of lesions and/or the hair follicle reservoir toward depigmented skin for repigmenting extensive vitiligo areas.

Tissue-engineered skin has delivered considerable benefits to patients with burns and chronic wounds and has enormous potential that is only just beginning to be realized.

The method that uses noncultured autologous epidermal suspension is simpler, cheaper, less time consuming, and does not require sophisticated laboratory facilities, when compared with methods employing cultured melanocytes. However, limitation still exist: the surface areas that can be covered using the noncultured method are smaller than those which can be treated with cultured melanocyte grafting.

In conclusion, ReCell® may be an effective method to treat Stable vitiligo of the hands. Studies on larger series of patients are required to confirm its efficacy.

References