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Usefulness of Micro-Punch Skin Grafting for Treatment of Resistant Vitiligo

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ABSTRACT

Introduction: Vitiligo is a depigmented common skin disorder. The disease may lead to social and psychological distress to the patient. Therefore, a good treatment can improve the patient's life quality. Punch grafting is a simple and commonly used method of treating vitiligo. However, it is time consuming with the risk of post-operative cobble stoning appearance. We used motorized 0.8-1.3 micro-punch grafting procedure to overcome these limitations.

Aim: To evaluate the therapeutic effectiveness of using micro-punch grafting to treat vitiligo and adverse events associated with this method.

Patients and Methods: This is a prospective study for 20 patients with vitiligo. They underwent motorized 0.8-1.3 micro-punch grafting from 2019 to June 2020.

Results: Thirty percent of the patients showed excellent re-pigmentation ≥75%. Forty percent of the patients showed moderate re-pigmentation. Twenty percent of the cases showed mild re-pigmentation and only 10% showed no improvement.

Conclusion: Micro-punch grafting is an effective way to treat vitiligo; it is also considered a suitable option with tolerable adverse events.

Key Words: *Vitiligo – Resistant cases – Micro-punch grafting.*

Disclosure: No conflict of interest.

INTRODUCTION

Vitiligo is a common acquired skin disorder, characterized by well-defined depigmented lesions of various sizes and shapes **[1]**. The disease may lead to social and psychological distress. It alters the patient's appearance dramatically especially if it affects the face or other exposed areas **[2]**.

Although a variety of medical treatments are available; the results are not satisfactory. Using topical steroids, ultraviolet A plus psoralen and narrow band UVB are not effective in many cases; even after consistent and prolonged treatment. Only half of the patients could achieve more than 75% re-pigmentation **[3]**. So, surgical treatment was delivered as an option for treatment of resistant cases.

Surgical procedures for vitiligo can be divided into cellular and tissue grafting. Cellular grafting includes cultured pure melanocytes suspension and non-cultured epidermal cellular suspensions. These techniques could achieve good results. However, they are very expensive and they are time consuming. Also, these methods required 6 to 8 weeks for preparation. In addition, they need special laboratory setup and trained personals **[4]**.

In tissue grafting, donor skin is transplanted into hypo pigmented areas in the form of punch grafts, split thickness skin grafts (STSG), and suction blister epidermal grafting (SBEG). Full and partial thickness grafts are good methods for surgical treatment of vitiligo. Their drawbacks are donor site morbidity in the form of infection, pigmentation changes and scarring **[5]**.

Punch grafting technique is considered the least expensive and the simplest of all the grafting procedures. In this work, we evaluated the use of micro-punch grafting to treat vitiligo.

PATIENTS AND METHODS

This prospective interventional study was conducted in Burn and Plastic Surgery Centre, Mansoura University between June 2019 and June 2020 on twenty patients with vitiligo that didn't show any improvement with non-surgical therapy for 6 months. This study was approved by Mansoura University Hospitals (MS.19.04.579).

Preparing recipient and donor sites were done by their cleaning with antiseptic solution. This was

followed by anaesthesia infiltration with a solution containing 70ml normal saline 0.9%, 30ml of 0.5% lidocaine hydrochloride and 1ml of adrenaline (1mg/ml). The donor area was either the thigh, the inner arm or the post-auricular region (Fig. 1).

A stainless-steel micro punch 0.8-1.3mm (Fig. 2) in diameter was used for graft harvesting at intervals of 1mm. The micromotor (Fig. 3) was adjusted to a speed of 1500-3000 rpm.

At the recipient site, skin incisions were made to create chambers for graft implants using micro slits (Fig. 4). In vitiligo cases, we made slits in recipient sites every 2mm so the mean transplanted micro-grafts was 24.2±2.48. A curved jeweler forceps was used in grafts handling and then their placing in recipient chambers.

Dermlite Dermatoschope™ II Pro HR (Fig. 5) was used for manual counting of the transplanted micro-punch skin grafts (Fig. 6) per cm square to be compared with the counting after the follow-up period.

After one week, all patients were treated with Narrow Band Ultraviolet B (NB-UVB) on 2 or 3 non-consecutive days per week. Also, topical 0.1% tacrolimus was used twice daily as a combination with the NB-UVB for more satisfying results in shorter period. We used this combination for 6 months in all cases, but we took in consideration the probable side effects in patients with large recipient area by decreasing the tacrolimus concentration to 0.03% and using it once daily.

Data collection:

Data was completed by paramedical staffs and they had noexperience in scar assessment before. They were allowed to read the instructions before seeing the patient.

Fig. (1): Donor area (the thigh) after harvesting the micro-punch grafts.

Fig. (2): Micro punches.

Fig. (3): Micro motor system.

Fig. (4): Micro slits.

Fig. (5): Dermlite Dermatoscope™ II Pro HR.

Fig. (6): Implanted micro-punch grafts in recipient site (lateral malleolus of right leg).

RESULTS

Micro-punch grafting was used in 20 patients (8 males, 12 females) with stable vitiligo. The mean age ± SD of the patients was 22.75±7.05 years (range 10 to 35). The mean duration of vitiligo before grafting ± SD was 7.45±4.04 years. 12.5± 3.84 months was the mean follow-up period that ranged from 6 to 18 months. The face and neck (45%) were the most common sites (Fig. 7), followed by lower limbs (40%) (Fig. 8), upper limbs (10%) and abdomen (5%) (Fig. 9). According to the size of the recipient site, there were 10 (50%) small size lesions, 8 (40%) medium size lesions and 2 (10%) large size lesions (Table 1).

The mean operative time was 154±71.66 minutes (range 60 to 350 minutes). The mean transplanted micro-punch grafts was 262±176.56 (range 50 to 700 micro graft per area). The mean density was 28.1±2.58 (range 23 to 32 micro-grafts per cm^2). The mean transplanted micro-grafts after 6 months was 24.2±2.48 (ranging from 20 to 28 micro-grafts per cm^2). The mean number of sessions was 1.3±0.64 (ranging from one to three sessions). The average survival rate was 86.12% of the transplanted grafts (Table 2).

Patients' good satisfaction for the results were 30% (15% very satisfied and 15% extremely satisfied). About 40% of patients were moderately satisfied, 20% were mildly satisfied and only 10% of the patients were unsatisfied about the result (Table 3). There were only 15% of the patients who showed post-operative complications. 10% of the patients experienced partial graft loss, which resulted in failure of re-pigmentation. A cobblestone appearance was observed in 5% of the cases (Table 4).

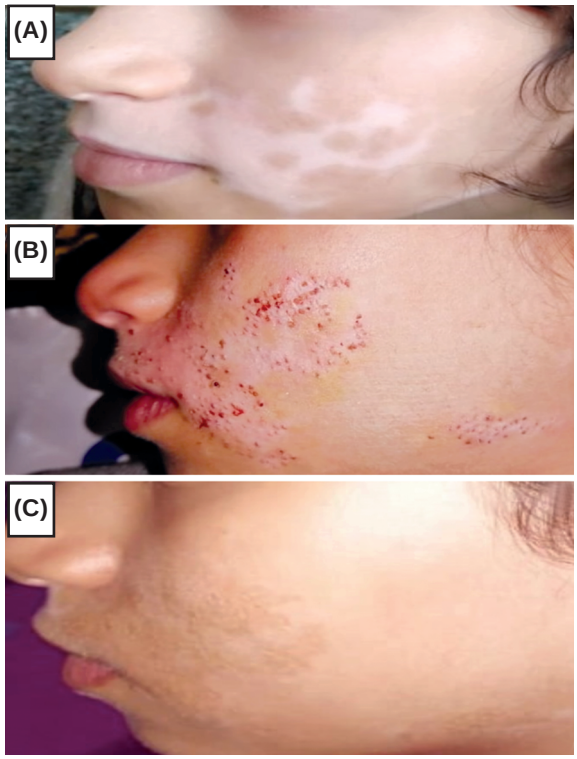

Fig. (7): (A) The picture shows vitiligo patches in the left cheek and the upper lip. (B) The lesion 1 week post-operative. (C) The result after 13 months was excellent with highly satisfied patient.

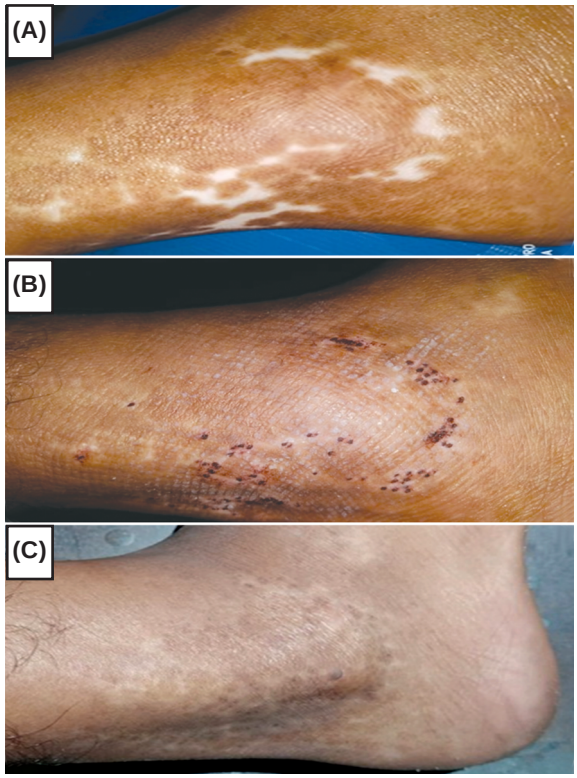

Fig. (8): (A) The picture Shows post-burn hypo-pigmentation in lateral malleolus of the right leg. (B) The lesion 1 week post-operative. (C) The result after 8 months was moderate pigmentation with moderately satisfied patient seeking another session.

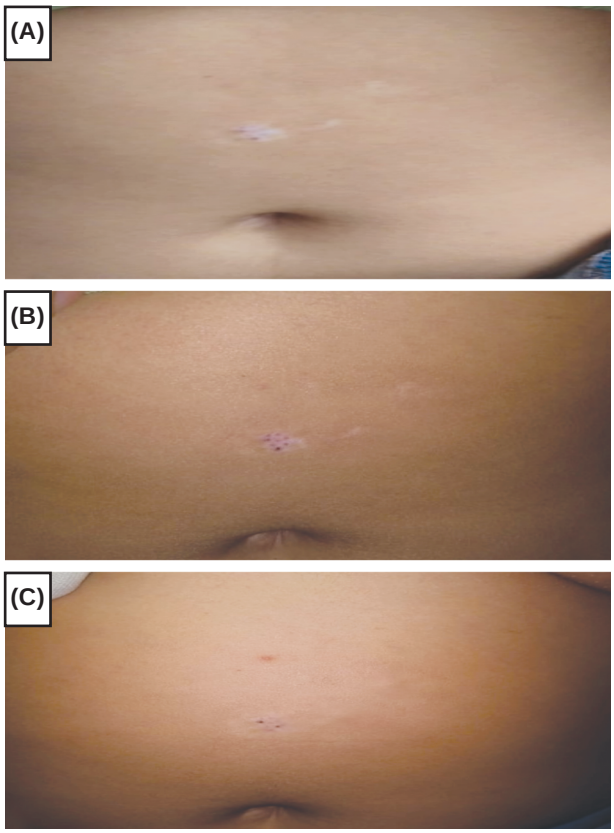

Fig. (9): (A) The picture shows vitiligo patch in the abdomen above the umbilicus. (B) The lesion 2 weeks post-operative. (C) The result after 12 months was good with satisfied patient.

Table (1): Distribution of sex, age, site and size of the lesion in vitiligo patients.

Characteristics	Value No (% or Mean ± SD)
Sex:	
Male	8 (40%)
Female	12 (60%)
Age	10-35 (22.75±7.05)
Site:	
Face & neck	9 (45%)
Abdomen	1 (5%)
Upper limb	2 (10%)
Lower limb	8 (40%)
Size of lesion:	
Small-sized	10 (50%)
Medium-sized	8 (40%)
Large-sized	2 (10%)

Table (2): Micro-punch grafting clinical outcome analysis.

Characteristics	Value Mean ± SD or %
Approximate immediate count	28.1±2.58
Approximate post-operative count	24.2±2.48
The average survival rate	86.12%
Total number of grafts per session	262±176.56
Time of interference	7.45±4.04
Follow-up period	12.5±3.84

Table (3): Patients' satisfaction scale.

Patient satisfaction	No. of patients
Extremely satisfied	3 (15%)
Very satisfied	3 (15%)
Moderate sat.	8 (40%)
Mild sat.	4 (20%)
Unsatisfied	2 (10%)

Table (4): Complications scale.

Complications	No. of patients
Partial graft loss	2 (10%)
Hypertrophic scar & keloid	1 (5%)
Infection	0 (0%)
No complications	17 (85%)

DISCUSSION

Micro-punch grafting became a very common surgical technique that has been used in plastic surgery for aesthetic and reconstructive purposes, it was reported for the first time by Orentreich in 1972. Then the basis of using micro-punch grafting in vitiligo was developed by Falabella in 1983 **[6]**.

Babu carried out a study about vitiligo surgical treatment which the total number of cases was eighteen and the number of patients that underwent micro-punch grafting was eight **[7]**. Sachdev also conducted a study about using laser-assisted punch grafting on thirteen patients **[8]**. In our study, twenty patients underwent micro-punch grafting for vitiligo treatment which considered a big number of cases according to other studies cases number.

Aging skin retains less water and its content of collagen and elastic fibres start to degrade. Feetham reported that the micro-punch grafting outcome was greatest in young aged patients, while older one's graft showed less degree of improvement **[9]**. In our study, there was a significant difference in the micro-punch grafting in relation to the ages of patients. Patients between 10 and 30 years old showed better results when compared to patients over 30 years old.

Babu reported that both male and female patients showed no difference in the graft outcome and complications **[7]**. In contrast with our study, females reported better micro-punch grafting outcome vs. males. Hardman supported our study and reported that this could be due to the negative effect of androgens on repair regulators **[10]**. Besides the effect of estrogens and dehydroepiandrosterone on wound healing acceleration by re-

ducing inflammation and promoting extracellular matrix deposition **[11]**.

Researchers reported that there was no significant difference in the outcome of the procedure with respect to the location of the recipient in different parts of the body. However, Bae found that face and neck lesions had better prognosis than other body sites like hands and feet **[6,9]**. We found excellent improvement in face and neck lesions after one session; on the other hand, upper and lower limbs lesions needed two or three sessions to achieve accepted results.

Gupta reported that there is significant difference in the pigmentation result according to the type of leukoderma. They found that although all the patients achieved re-pigmentation, patients with segmental vitiligo had satisfactory re-pigmentation than patients with generalized vitiligo **[9,12]**. In our study, we did not find a significant difference in the outcome of micro-punch grafting with respect to vitiligo types. All the patients with different vitiligo types achieved re-pigmentation and 72% of them didn't need another session to achieve the best results.

Falabella reported that micro-punch grafts implanting in recipient sites at intervals of 3-4mm would be enough for obtaining satisfying results in acceptable time, as the extent resulted pigmented area could reach 25 times of the punch graft size. However, in our study we implanted the micro-punch grafts at intervals of 2mm with a mean transplanted micro-grafts was 24.2±2.48 in order to achieving better results in shorter period, especially in patients with acceptable state of skin vascularity and wound healing **[6]**.

Complications were very limited at the recipient site, while, no patients showed complications in the donor site. 85% of the patients didn't show any complication during the follow-up period. Two patients (10%) showed partial graft loss; the common cause was the excessive movement or trauma to the graft site leading to separating the punch graft from the recipient bed. Only one patient (5%) showed mild cobble stoning with the usage of punch size 1.3mm. This was gradually improved during the follow-up period. In contrast with Lahiri study, which cobblestoning was noted in 31.8% of the cases using punch size 1.5mm **[13]**. Falabella reported that cobblestoning incidence was higher with a punch size 1.5mm or bigger **[14]**.

Limitations of our study were the few number of cases and limited follow-up. So, we recommend increasing the number of cases to assess the technique in a wide range of patients. Best results can be obtained by increasing the follow-up period; to assess the improvement of the lesion and to minimize the possible long-term side effects.

In summary, vitiligo can be successfully treated by micro-punch grafting technique utilizing a motorized 0.8-1.3 punch; with the advantage of obtaining excellent results in a short procedure time. This procedure can be considered a rapid and convenient surgical alternative with acceptable adverse events for the treatment of pigmentary lesions. It is a perfect choice for patients who can't tolerate prolonged surgeries as it can be done on outpatient basis.

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