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Original Article

Punch Skin Graft in Stable Vitiligo: Donor and Recipient Site Changes - A Retrospective Study

Muthukumaran Rajaram[1], Uma Selvaraj[2], Sudha Alagarsamy[3]

[1]Associate Professor, Department of Dermatology, Government Dharmapuri Medical College, Dharmapuri, Tamil Nadu, India.,[2]Associate Professor, Department of Dermatology, Government Theni Medical College, Theni, Tamil Nadu, India, [3]Assistant Professor, Department of Dermatology, Government Theni Medical College, Theni, Tamil Nadu, India

Abstract

Introduction: Punch skin graft procedure in the treatment of stable vitiligo is a simple and best office procedure.

Aim of the Study: The aim of the study was to evaluate the donor and recipient site changes occurred during the treatment of vitiligo with punch skin graft.

Materials and Methods: A total of 25 cases of vitiligo treated with punch skin graft with data and photographs were collected and analyzed retrospectively in the Department of Dermatology, Government Theni Medical College, Theni.

Results: Out of 25 cases of stable vitiligo, 9 were male and 16 were female. Donor site changes were noted as hypertrophic scarring, depigmentation, and hyperpigmentation. Out of 222 grafts placed, the graft uptake percentage was 77.8%. The mean pigment spread was 4.8 mm in non-glabrous area. Cosmetic improvement was 100% in mucosal vitiligo. Depigmentary joining line, peri-individual graft halo (target-like pigmentation), cobblestoning, graft rejection, crowding of grafts, and reactivation of vitiligo as recipient site changes were noted. Repigmentation of leukotrichia was noted. Overall cosmetic improvement was 70%.

Conclusion: If the selection of the stable vitiligo cases and the expertise of the operating surgeon are good, the donor and recipient site changes may be reduced to a greater extent to yield a better cosmetic result.

Key words: Stable vitiligo, Donor site, Recipient site

INTRODUCTION

Vitiligo is a common depigmenting disorder, characterized clinically by milky white macules, and histologically by an absence of functional melanocytes in the affected area. It causes severe cosmetic distress, particularly in darkly pigmented skins and is also associated with a great social stigma. It has a profound psychological impact and greatly affects the quality of life.[1] In 1947, Haxthausen transplanted thin split thickness skin grafts from normal to vitiliginous skin in three cases, to study the pathogenesis of the disease.[2,3] In 1964, Behl from India, was the first to describe the surgical treatment of vitiligo in a large series of 107 patients with thin Thiersch grafts.[4,5] Falabella described the suction blister technique for repigmentation of vitiligo in 1971, and later the miniature punch grafting technique in 1978.[6]

The basic principle of all surgical methods is transfer of melanocytes from uninvolved skin into a stable leukoderma lesion, where they grow into, and function as, effective epidermal-melanin units. "Donor dominance" principle states that when a graft from normal skin is transplanted to an affected site, the transposed grafted area maintains its integrity and characteristics, independent of the recipient site. When a normal pigmented donor auto punch graft is transplanted onto a depigmented stable vitiligo area, it dominates, and the melanocytes in the minigrafts not only continue to produce melanin but also migrate into the adjacent depigmented epidermis; seen clinically as initial perigraft pigmentation.[7] When the graft is taken from the donor site, it is placed on the vascular bed in the recipient area. From this vascular bed, it derives its blood supply. Initially, the graft adheres to its new bed with the help of

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Corresponding Author: Dr. Uma Selvaraj, 15/1/38A, Arjunillam, Sivanandha Nagar, P.C. Patty, Theni – 625 531, Tamil Nadu, India.
E-mail: drumashrikannan@gmail.com

fibrin. There is diffusion of nutrients through this fibrous layer which keeps the graft alive. Within 2-3 days, capillary linkage occurs with vascularization of the graft. The thinner the graft, the denser the capillary network in the superficial dermis, and thus earlier is the process of vascularization.[8]

MATERIALS AND METHODS

A retrospective study was done in 25 cases of stable vitiligo underwent punch skin graft procedure. The cases done by the author were collected with case records and photographs and results were analyzed in the point of donor and recipient site changes. This study was done in the Department of Dermatology, Theni Medical College, Theni, Tamil Nadu.

A selection criteria was followed while selecting the cases for punch skin graft procedure.

1. "Stable vitiligo" which is stationary and without the development of new lesions in the past 2 years
2. Patients in whom the lesions were not improving in spite of long medical management
3. Patients with no history of Koebner's phenomenon in the lesions
4. Patients who do not have keloidal tendency and
5. Patients with no history of bleeding diatheses.

The cases which had undergone the following methodology were selected for the study.

Donor site was selected as extensor aspect of thigh or gluteal region. Skin punches of 2.5 mm size are rotated till the cutting edge descends to the depth of upper dermis. At donor site, the punches are cut adjacent to one another keeping 1-2 mm of normal skin in between 5 and 10 parallel rows. Recipient site was the stable vitiligo patches. Skin punches of 2-mm size are rotated till the cutting end descends to the depth of mid-dermis, and the cuts are spaced 5-10 mm away from each other. In a single session, 5-10 or up to 50-60 grafts were taken and ensuring the dermal side of the graft down to the recipient site, all grafts were transferred and with a firm pressure a snug fit was achieved. Dressing was done with double layer of Framycetin Tulle, gauge, and Elastocrepe bandage. At recipient site, follow-up dressing was done after 24 h once to rule out the shift of grafts and next dressing after 8-10 days. At donor site, dressing was removed after 8-10 days. Photographs were taken prior and soon after the procedure with grafts *in situ*, at the end of 8-10 days and periodically after every 15 days for 2 months and there after every 1 month till the end of 1 year. Changes in the donor site were noted. In the recipient site, the number of grafts taken and rejected, the mean pigment spread (MPS), cosmetic improvement and disfigurement, and overall cosmetic improvement were noted and calculated. Cosmetic assessment was done in relation to the age, sex, type, and site of vitiligo at the end of 12 months by a single-blind observer. It was graded as excellent 91-100%, good 71-90%, fair 51-70%, and bad with <50% improvement.

RESULTS

Out of 25 cases of stable vitiligo, 9 were male and 16 were female. Young females were more in the below 20 years age group. Lowest age was 12 years and upper limit was 50 years (Table 1). On evaluating the types of vitiligo, 15 cases were focal vitiligo, 6 cases were segmental vitiligo, 2 cases were mucosal vitiligo, and 2 cases were acrofacial type (Table 2). Donor site changes were noted as hypertrophic scarring in 21 cases (84%) (Figure 1), depigmentation of grafts in 1 case (4%) (Figure 2), and hyperpigmentation in 1 case (4%) (Figure 3) were noted.

No scarring was seen in two patients (8%) in the age of 43 years and 50 years (Table 3). 222 were grafts and were grafted in 15 sites. In focal vitiligo, out of 84 grafts placed, 79 grafts were taken (97%) and 5 rejected. In segmental vitiligo, out of 117 grafts placed, 90 (77%) grafts were taken while 27 rejected. In mucosal vitiligo, out of 6 grafts placed, 5 (83%) grafts were taken and 1 graft rejected. In acrofacial

Table 1: Age and sex distribution

Age group (year)	10-20		21-30		31-40		41-50	
	Male	Female	Male	Female	Male	Female	Male	Female
Focal	1	7	2	1	-	3	-	1
Segmental	1	-	2	2	-	1	-	-
Mucosal	1	-	-	-	-	-	1	-
Acrofacial	1	1	-	-	-	-	-	-
Total	4	8	4	3	0	4	1	1

Table 2: Type of vitiligo

Type of vitiligo	Number of cases
Focal	15
Segmental	6
Mucosal	2
Acrofacial	2
Total	25

Table 3: Donor site changes (*n*=25)

Donor site changes	Age group (years)	Number of cases	Total (%)
Hypertrophic scarring	<38	21	84
Depigmentation	24	1	4
Hyperpigmentation	38	1	4
No scarring	43 and 50	2	8

vitiligo, out of 15 grafts placed, 8 (54%) grafts were taken and 7 rejected. Average graft uptake percentage was 77.8% (Table 4). The pigment spread in mm was calculated from the grafts placed in 15 sites. In non-glabrous (hairy skin), 9 mm spread was seen in one scalp case (Figure 4), forehead (1 case), nose (2 cases), cheek (3 cases), and mandibular area (1 case) (Figure 5) showed 4.5 mm spread as an average. Upper interscapular and back (2 cases) showed 3-mm spread. In parasternal area, 7 mm (1 case) (Figure 6), lumbar 3 mm (2 cases), leg hairy area 3 mm (1 case) spread

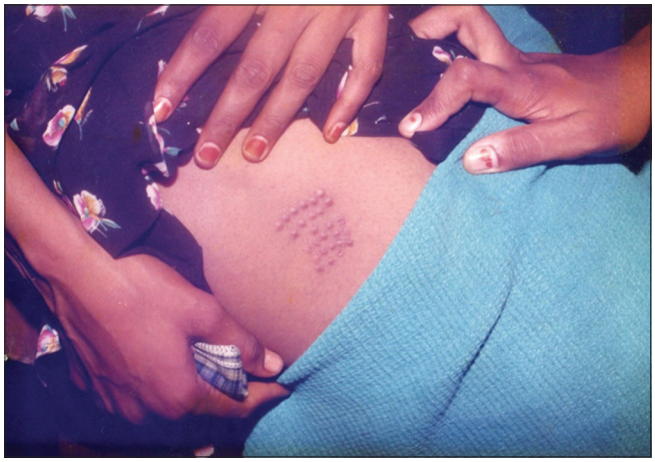

Figure 1: Hypertrophic scarring at donor site

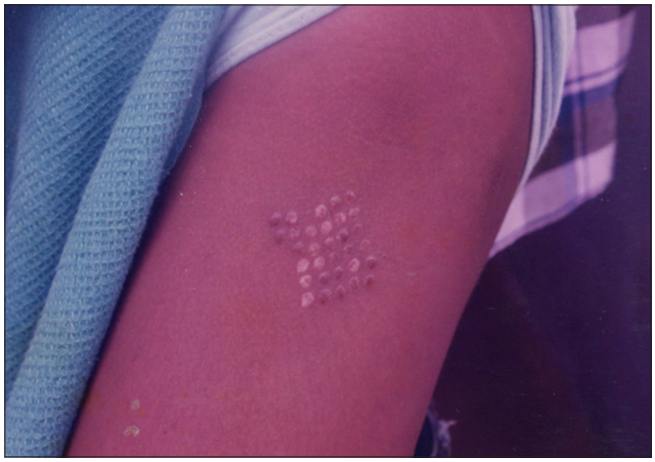

Figure 2: Depigmentation at donor site

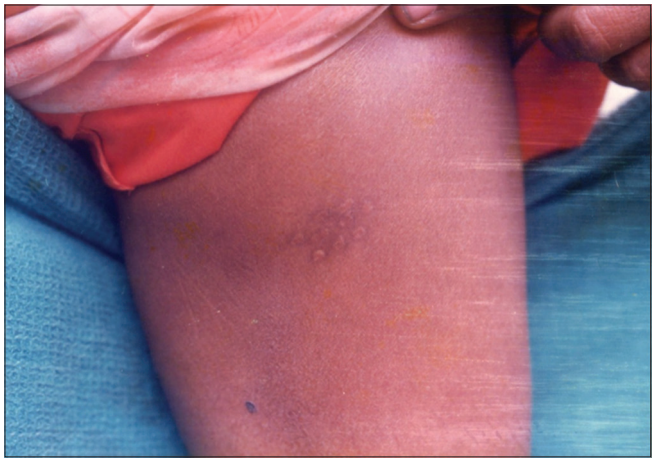

Figure 3: Hyperpigmentation at donor site

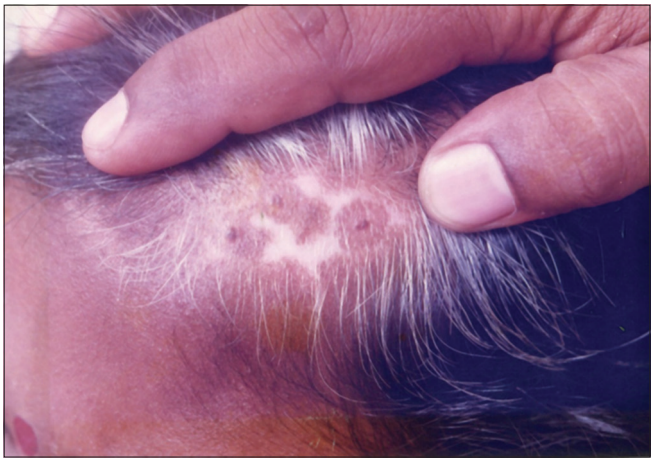

Figure 4: Pigment spread of 9 mm in scalp

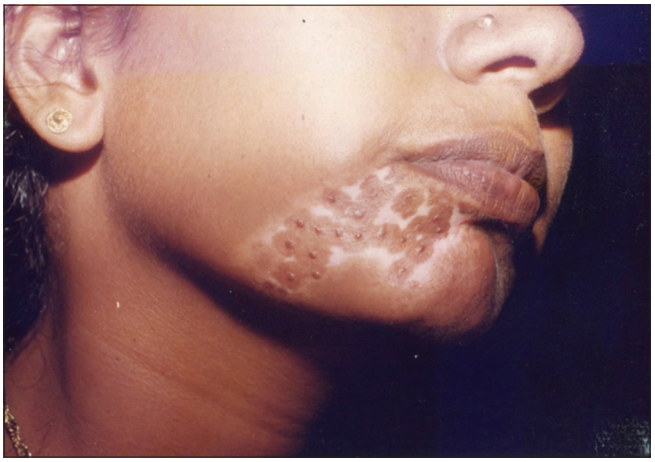

Figure 5: Pigment spread of 4.5 mm in mandibular area, cobblestoning, perigraft halo

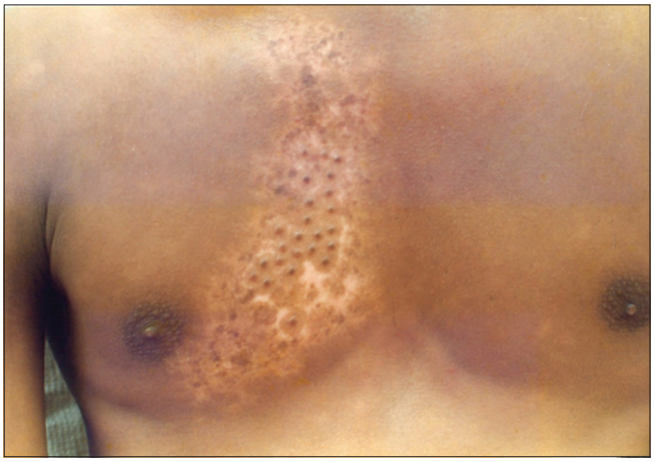

Figure 6: Pigment spread of 7 mm in parasternal area, cobble stoning, perigraft halo

Table 4: Recipient site: Number of grafts taken and rejected (*n*=222)

Type of vitiligo	Total number of grafts placed	Grafts taken	Grafts rejected	Grafts taken (%)
Focal	84	79	5	97
Segmental	117	90	27	77
Mucosal	6	5	1	83
Acrofacial	15	8	7	54

Average graft uptake 77.8%

were noted with a MPS of 4.8 mm in non-glabrous area. Two mucosal area cases showed 3-mm pigment spread as an average. In Glaborous skin, the pigment spread was noted as 2.5mm in 2 cases of dorsum of hand,2mm in 2 cases of finger,4mm in 2 cases of leg-medial malleolus and 3mm in 1 case of foot.Pigmentation of grafts alone was noted in one case of leg.The average MPS was calculated as 2-3mm(Table 5)

In recipient area, cosmetic disfigurement was noted as depigmentary or hypopigmentary joining line[7]/perigraft halo[9-11] in 9 cases (36%) (Figures 5 and 6), cobblestoning in 7 cases (28%) (Figures 5 and 6), graft rejection in 1 case (Figure 7), crowding of grafts in 2 cases (8%) (Figure 8), static graft with no pigment spread in 1 case (4%) (Figure 9), reactivation of vitiligo in two cases (8%) (Figures 10 and 11), and target-like pigmentation[12] (halo around individual grafts) in two cases (Figures 11 and 12) were noted. In Figure 11, the case developed pigment dilution and depigmentation in recipient area and around the grafts at the end of 5 months of punch graft with appearance of depigmentary macules as spots throughout the body and with subsequent steroid therapy, depigmentation disappeared, and repigmentation started. In Figure 12, perigraft halo was noted around individual grafts at the end of 7 months. In 1 case, pigmentation of white hair (leukotrichia) in scalp (4%) (Figure 13 and Table 6) was noted. Sinking, polka dot appearance,[7] and color mismatching were not seen in our study.

Overall cosmetic improvement in recipient site was noted. On an average, the cosmetic improvement was 83% in the patients in the age group of 21-30 years and 67% in the group of 10-20 years age and 17% in the age group of 31-40 years. The cosmetic improvement was observed to be 90% in a focal, non-glabrous forehead case of 19-years-old girl (Figure 14a and b), 100% in a male patient of 43 years with lip vitiligo, in mucosal type (Figure 15a and b), 85% in non-glabrous skin, over nose, segmental vitiligo in 25-year-old male (Figure 16a and b), 85% in a segmental right mandibular area in a 25-year-old woman (Figure 17a and b), and 56% in glabrous skin (Table 7). The overall cosmetic improvement achieved was 70% in this retrospective study using the punch graft procedure.

Table 5: Recipient site: MPS

Site of vitiligo	Number of cases	MPS (in mm)	
Non-glabrous			
Scalp	1	9	4.8
Forehead	1	4.5	
Nose	2	4.5	
Cheek	3	4.5	
Mandibular area	1	4.5	
Upper interscapular and back	2	3	
Parasternal area	1	7	
Lumbar	2	3	
Leg	1	3	
Mucosal			
Lip	2	3	3
Glabrous			
Dorsum of hand	2	2.5	2.3
Fingers	2	2	
Leg	1	0	
Leg medial malleolus	2	4	
Foot	1	3	

MPS: Mean pigment spread

Table 6: Recipient site: Cosmetic disfigurement and improvement (*n*=25)

Recipient site cosmetic changes	Number of cases (%)
Cosmetic disfigurement	
Depigmentary joining line	9 (36)
Graft rejection	7 (28)
Reactivation of vitiligo	1 (4)
Cobblestoning	7 (28)
Crowding of grafts	2 (8)
Static graft (no pigment spread)	1 (4)
Target-like pigmentation	2 (8)
Cosmetic improvement	
Pigmentation of white hair (leukotrichia)	1 (4)

DISCUSSION

The changes that occur in donor or recipient sites as complications can be prevented if proper precautions are taken before, during, and after the grafting procedure. Proper selection of the patient is the most important factor for achieving a good cosmetic result with any grafting procedure in vitiligo. The recommendation to be followed is to select a patient with no history of progression of lesions, no new lesions, and no history of a Koebner's phenomenon over at least 1 year before the procedure.[13] In a recent study on the issue of vitiligo stability, a period of "18 months

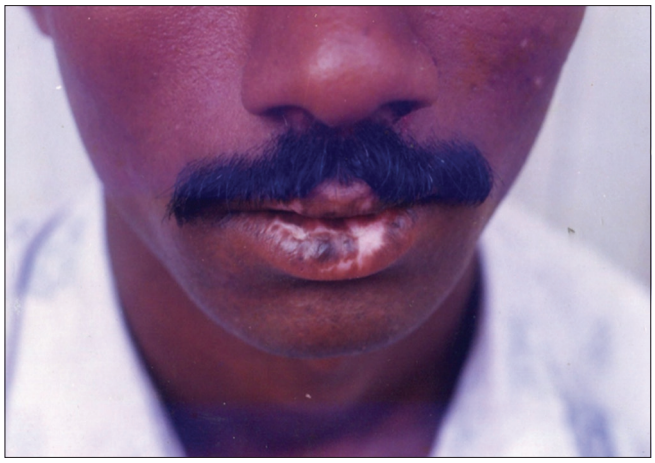

Figure 7: Graft rejection

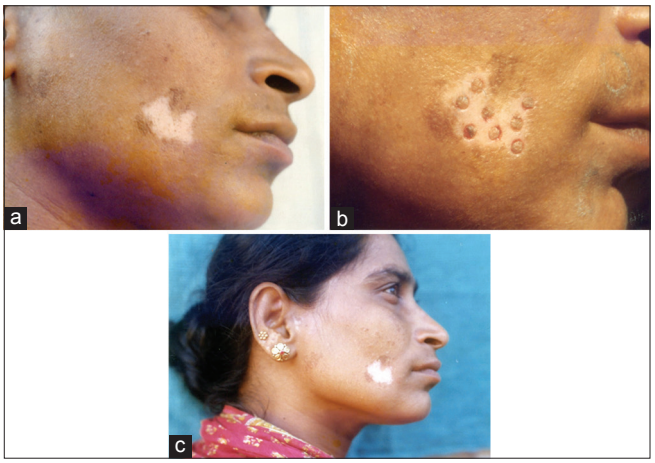

Figure 10: (a-c) Reactivation of vitiligo

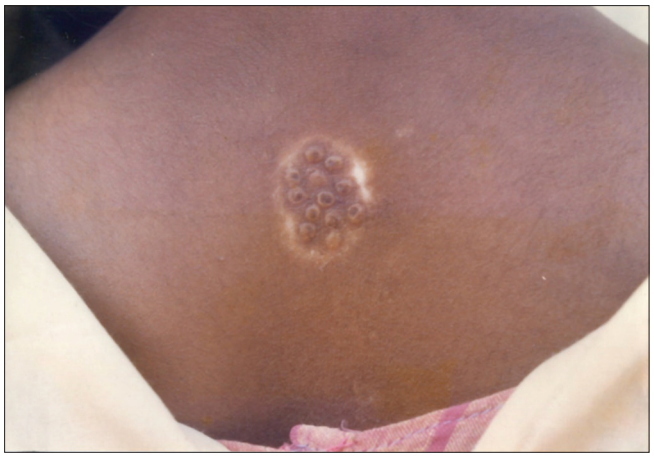

Figure 8: Crowding of grafts

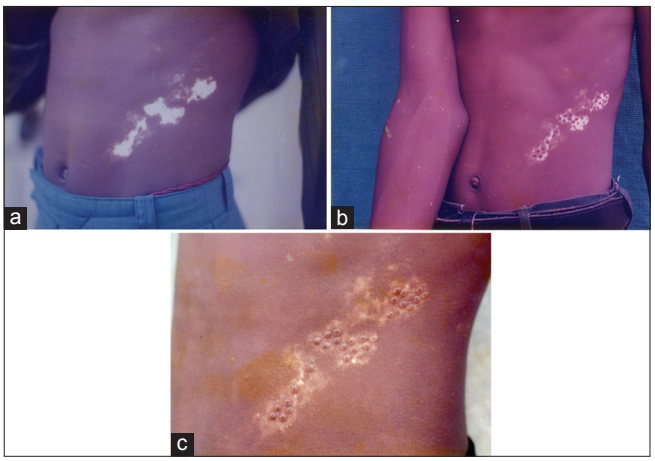

Figure 11: (a and b) Depigmentation started after 5 months of punch grafting. (c) Reactivation of vitiligo, target-like pigmentation, repigmentation after steroid therapy

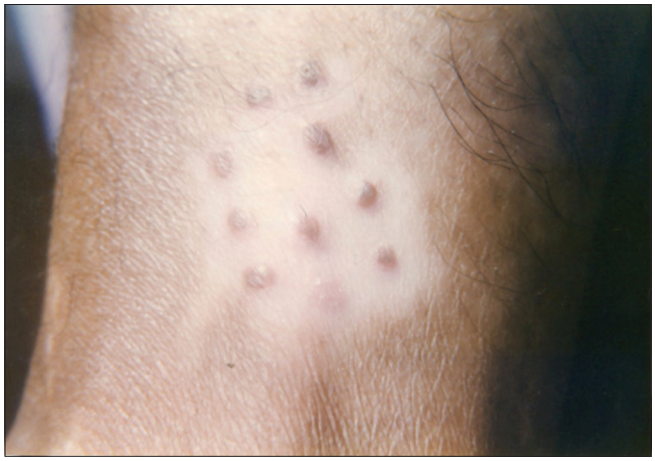

Figure 9: Static graft with no pigment spread

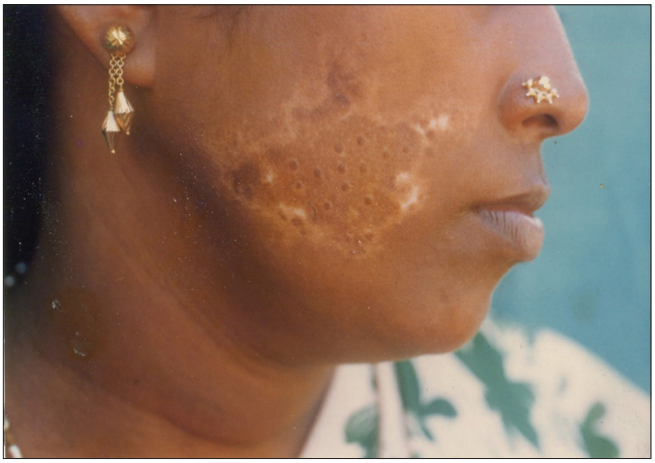

Figure 12: Target-like pigmentation - perigraft scarring

of stable disease" was shown to be most suitable one for undertaking any grafting procedure.[14] Recurrence of vitiligo at the grafted or donor site or appearance of new lesions may occur in unstable cases or if the disease becomes reactive after a period of stability.[10] Scarring at the donor site was observed more in patients in the younger age group compared to no scarring in the older age group probably due to the reduced activity of fibroblasts in the older age group. Hyperpigmentation in donor site was not reported in earlier studies. Depigmentation was due to reactivation

Table 7: Assessment of cosmetic improvement in relation to age, sex, type, and site of vitiligo

Cosmetic improvement grading (%)	Age				Sex		Type of vitiligo				Site of vitiligo		
	10-20	21-30	31-40	>41	M	F	S	F	M	AF	Non-glabrous	Glabrous	Mucosal lip
Excellent (91-100)				100%									
Good (71-90)		83%					71%	67%	80%		71%		80%
Fair (51-70)	67%				57%							56%	
Bad<50			17%							15%			

Over all cosmetic improvement = 70%. S: Segmental, F: Focal, M: Mucosal, AF: Acrofacial

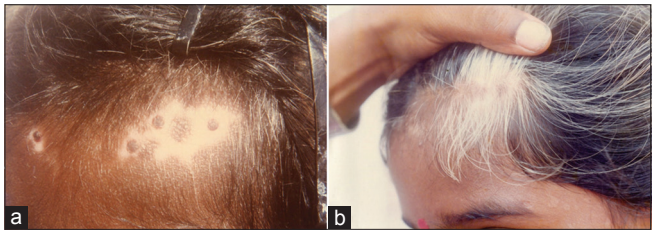

Figure 13: (a and b) Pigmentation of leukotrichia in scalp

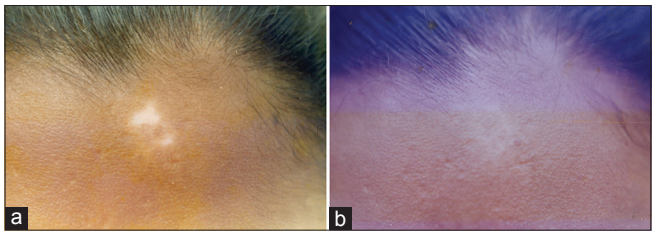

Figure 14: (a and b) Before and after grafting focal, non-glabrous vitiligo with 90% cosmetic improvement

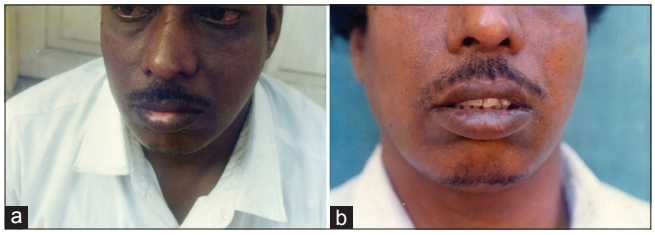

Figure 15: (a and b) Focal vitiligo before and after grafting with 100% cosmetic improvement

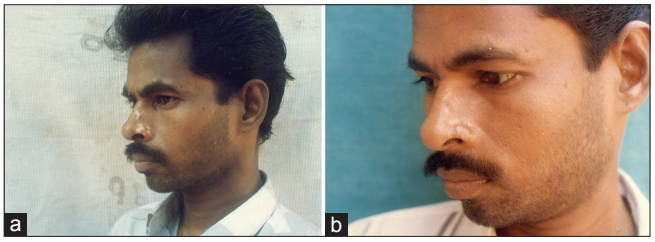

Figure 16: (a and b) Before and after grafting segmental vitiligo with 85% cosmetic improvement

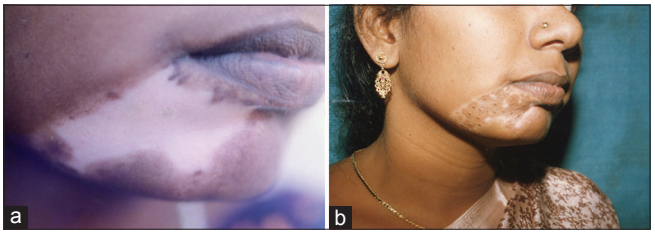

Figure 17: (a and b) Before and after grafting segmental vitiligo with of 85% cosmetic improvement

of or unstability of vitiligo and was also documented by Majid,[13] Khunger *et al.*[10] Graft rejection was 22%, whereas the same is 10% in the study reported by Das *et al.*[15] This can be avoided by mastering the technique and by providing proper dressing and aseptic environment to the movement prone areas. MPS in the recipient area correlates with the study conducted by Savant *et al.*,[7] Lahiri,[9] and Rajagopal *et al.*[16] Cosmetic disfigurement in the recipient areas such as depigmentary joining line or perigraft halo noted in our cases could be due to two factors. First, improper placement of donor grafts, that is, far from the margin of the patch so that the repigmentation does not extend till the margin. Second, reason could be grafting in cases of unstable/active vitiligo.[12] In active vitiligo, the autoimmune process consisting of activated T-cells is maximum at the margin of the lesion. These activated CD3+, CD4+, and CD8+ T cells express the cutaneous lymphocyte-associated antigen (HECA-452+) typical of infiltrating T cells. Hence, the periphery of the vitiligenous patch fails to repigment.[17] By placing the grafts, initially all along the periphery just about 1-2 mm inside the outer border of the recipient area, the perigraft halo can be prevented. Cobblestoning noted in the other studies[7,9,10,13,16,18] as well may be avoided using smaller punches of 1-1.5 mm size, putting upper surface of the thinner graft at the level of recipient skin, trimming the under surface of the thicker graft, using sharp cutting edge instruments, and avoiding trauma to the graft and using silicon sheet dressing. Overcrowding of grafts may be minimized by placing grafts at least 5 mm apart from each other. Target-like pigmentation (halo around individual grafts) noted in Figure 11 was due to reactivation of vitiligo, and the second case could be due to contraction of elastin fibers during harvesting of grafts or scarring around individual grafts and both the factors had been well stated by Bisen *et al.*[12]. Savant mentions use of donor grafts 0.5 mm larger than the recipient bed to compensate for any graft contraction and prevent perigraft circular scarring.[19] 2.5 mm punches which are 0.5 mm larger than the recipient site punches used by

Lahari *et al.* also noticed such target-like pigmentation in their studies. However, Rajagopal *et al.* reported the use of same size punches with good results.[16,20] Pigmentation of leukotrichia noted in our study is an added advantage of punch graft procedure and was already reported by Savant.[7] The cosmetic improvement achieved in our study was also recorded by many authors.[7,9,10,13,16,18]

CONCLUSION

Punch skin graft procedure is a simple, safe, inexpensive, and quickly responding office procedure with high success rate of pigmentation. If the selection of the stable vitiligo cases and the expertise of the operating surgeon are good, the donor and recipient site changes may be reduced to a greater extent to yield a better cosmetic result.

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