Print ISSN: 2321-6379
Online ISSN: 2395-1893

Original Article

Autologous Skin Cell Suspension for Accelerating Reepithelialization of Split-Thickness Donor Sites

Ramakanth Baloorkar[1], Vivekanand K Dalawai[2], M B Patil[3], Dayanand Biradar[4]

[1]Associate Professor, Department of General Surgery, Shri B M Patil Medical College Hospital and Research Center, Vijayapura, Karnataka, India, [2]Post Graduate, Department of General Surgery, Shri B M Patil Medical College Hospital and Research Center, Vijayapura, Karnataka, India, [3]Professor and Head, Department of General Surgery, Shri B M Patil Medical College Hospital and Research Center, Vijayapura, Karnataka, India, [4]Assistant Professor, Department of General Surgery, Shri B M Patil Medical College Hospital and Research Center, Vijayapura, Karnataka, India

Abstract

Aims and Objectives: This study aims to evaluate the safety and efficacy of local injection of autologous skin cell suspension in donor site of split skin thickness graft with colloid dressing.

Materials and Methods: A total of 84 patients were included in the study and were randomly divided into two groups, that is, 42 patients in skin cell suspension injection into donor site group and 42 patients in colloid dressing group. Subjects included were between the age group of 18–80 years in study groups; injection of skin cell suspension was infiltrated into the donor site and dressing opened on the 3rd day with every 3 weekly follow-up.

Results: In our study, we found that the mean healing time in the cases was 13 days, whereas in the control group, it was found to be 17 days, *P*-value was very significant ($P = 0.001$) which states that healing time was faster in cases compared to the control group.

Conclusion: In our study, there was no statistical difference in the distribution of patients between the study group and the control group with respect to age and sex, whereas skin cell suspension injecting group showed faster healing when compared to colloid dressings with minimal complications.

Key words: Autologous skin cell suspension injection, Colloid dressing, Donor site, Reepithelialization

INTRODUCTION

It is well-accepted fact that the largest organ in human body is skin. It corresponds to about 16% of entire body weight. It acts as a protective barrier and has a major role in regulation of body temperature and also its other significant roles are metabolic, particularly with respect to protein and Vitamin D. It has been proven that the epidermal layer of skin manufactures maximum quantity of Vitamin D.[1]

Other than its protective functions it also a role in immunity and has antigenic functions that is important with respect to allotransplantation.[2] All the donor sites there occurs in regeneration of epidermis from the leftover epithelium and also from the left out hair follicle sebaceous and sweat glands. This corresponds to the first stage in healing. This is followed by cellular migration outside till the wound is epithelized again. It has been seen normally that full reepithelialization takes 10–14 days, which also may be variable since it depends on the graft thickness.[3]

Access this article online

www.surgeryijss.com

Month of Submission : 10-2019
Month of Peer Review: 11-2019
Month of Acceptance : 12-2019
Month of Publishing : 01-2020

Need for the Study

Split-thickness skin graft (STSG) remains the most frequently used reconstructive option for skin and soft-tissue defects,

- The procedure involves harvesting of the full epidermis and STSG remains the most frequently used part of dermis but creates a secondary wound at the donor site.
- Patient may experience donor site discomfort (pain and itching), delayed healing and infection, an

Corresponding Author: Dr. Vivekanand Dalawai, Department of General Surgery, Shri B M Patil Medical College Hospital and Research Center, Vijayapura, Karnataka, India. Phone: 91-7829481668. E-mail: vivekananddalawai@gmail.com

unsatisfactory cosmetic appearance, and reduced quality of life.
- Comorbidities such as aging, poor nutrition, immobility, smoking, diabetes, and peripheral vascular disease contribute to impaired donor site healing.[4]
- Epidermal substitute is an autograft derived from split-thickness grafting or from cell line bioreactor expansion. Epidermal replacements are created by the expansion of patient-derived cells in the laboratory until enough cell mass is generated to be transferred to the wound.[5]

Autologous, non-cultured, heterogeneous skin cell suspension can be obtained which includes 65% keratinocytes, 30% fibroblasts, and 3–5% melanocytes. With only a small donor population of autologous basal layer cells, cells of suspension contain viable melanocytes, it has been used for pigmentation. The current therapeutic strategies for STSG donor sites are focused on creating an optimal environment that allows rapid reepithelialization by accelerating keratinocyte proliferation.[6]

MATERIALS AND METHODS

Source of Data

All patients presenting to BLDE University Shri B. M. Patil Medical College Hospital and Research Centre, Vijayapura, and admitted patients in whom posted for skin grafting between October 2017 and June 2019.

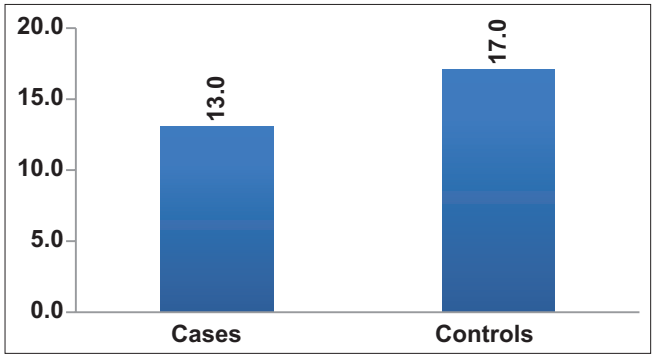

Figure 1: Healing time between the cases and controls

Table 1: Distribution of age between the cases and controls

Age (years)	Cases	Controls
	n (%)	*n* (%)
21–30	3 (7.1)	3 (7.1)
31–40	9 (21.4)	10 (23.8)
41–50	3 (7.1)	6 (14.3)
51–60	15 (35.7)	18 (42.9)
61–70	9 (21.4)	5 (11.9)
>70	3 (7.1)	0 (0.0)
Total	42 (100.0)	42 (100.0)

Method of Collection of Data

Two groups were made, Group 1 receiving local injection of skin cell suspension and Group 2 conventional colloid dressing.

Inclusion Criteria

The following criteria were included in the study:
- Men and women (non-pregnant) between 18 and 80 years.
- Single donor site more than 20 cm^2.
- Multiple donor site allocated treatment on all wounds but only largest donor site meeting inclusion criteria.

Exclusion Criteria

The following criteria were excluded from the study:
- Malignancy.
- Autoimmune disease.
- Chemotherapy.
- Corticosteroid.
- Skin disease and local irradiation.

Procedure

A biopsy area of 1 cm^3 is required to treat donor site size of 40 cm^2. Skin biopsy is taken and normal saline (NS) is added into the tissue homogenizer. The process is performed at a room temperature of 22–24°C. Homogenizer is made to rotate at the rate of 1200 rpm. Autologous skin cell suspension is transferred to a 10 ml syringe and locally infiltrated in wound margin with 18 G needle at a distance of 0.2 ml/cm. Local dressing is opened on the 3rd day followed by alternate day dressing with NS.

The patient will be followed up to 12 weeks and photographs will be taken to evaluate physical appearance of donor site and quality of healing. Treatment outcome will be determined by median time of wound healing.

RESULTS

A total of 84 patients were included the study and were randomly divided into two groups, 42 patients in skin cell suspension injection into donor site group and 42 patients in colloid dressing group.

The mean age in the cases group was 35.7% and in the control group was 42.9%. The most of the patients

Table 2: Distribution of sex between the cases and controls

Sex	Cases	Controls	*P*-value
	n (%)	*n* (%)	
Male	36 (85.7)	34 (81.0)	0.558
Female	6 (14.3)	8 (19.0)	
Total	42 (100.0)	42 (100.0)	

were in between 51 and 60 years. In the case group, 15 patients and 18 patients control group were between 50 and 60 years.

In the cases, the number of males was 36 (85.7%) and female patients was 6 (14.3%). In the control group, male patients were 34 (81%) and females were 8 (19%).

The mean healing time in the cases was 13 days, whereas in the control group, it was found to be 17 days, *P* value was very significant ($P = 0.001$) which states that healing time was faster in the cases compared to the control group Figure 1 and Tables 1 and 2.

DISCUSSION

In our study, it was observed that in the case group, 15 patients (35.97%) and in the control group, 18 patients (42.9%) were between 51 and 60 years. In Hu *et al*.,[4] most of the patients were between 61 and 80 years in the cases, 24 patients (45%) and in the control group 20 patients (38%). In Hu *et al*.,[5] the mean age in the cases group was 48 years and in the control group 50 years. In Wood *et al*.[7] cases group, the mean age of patients was 49 years and in the control group 50 years.

Our study was in line with the above-mentioned studies. In our study, out of 84 patients, 70 (83.3%) were male and 14 (16.6%) were female. Among the male patients, 36 belonged to the case group, and among 14 female patients, 6 were in the case group. In Hu *et al*.,[4] out of 106 sample size, 76 (71.6%) were male and 30 (28.3%) were female.

Out of 76 male patients, 40 were from the case group and 36 from the control, and among the total female patients, 13 were from the case group and 17 from the control. In Hu *et al*.,[5] out of 88 sample size, 58 (65.9%) were male and 30 (34%) were female. Out of 88 male patients, 30 were from the case group and 28 from the control, and among the total female patients, 14 were from the case group and 16 from the control.

Our findings were in concordance with the above studies. There was no statistical difference between the study and control groups. In our study, the mean post-operative pain in the case group was 3.3% and in the control group 3.4% as per visual analog pain scale. In Hu *et al*.,[4] the mean post-operative pain was 1.7% and in the control group 1.6%. In Wood *et al*.,[7] the mean post-operative pain was 3% and in the control group 5.5%. In our study, it was found that the mean healing time in the case group was 13 days and in the control group 17 days. Hu *et al*.[4] concluded that the mean healing time in the case group was 9 days and in the control group 13 days. Hu *et al*.[5] concluded that the mean healing time in the case group was 14 days and in the control group 20 days.

However, in a study conducted by Wood *et al*.,[7] it was seen that the mean healing time in study group was 15 days and in the control group 34 days. Our findings are in line with the above compared studies. Out of the 84 patients included in our study, 9 patients (10.7%) were infected, among them, two cases were from the study group and 7 from the control group. In Hu *et al*.,[4] only two patients from the control group were infected. In Hu *et al*.,[5] one patient from the case group and three from the control group were infected. In Wood *et al*.,[7] one case from each group was infected.

CONCLUSION

In this study, there was no statistical difference in the distribution of patients between the study group and the control group with respect to age and sex, whereas skin cell suspension injecting group showed faster healing when compared to colloid dressings with minimal complications.

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How to cite this article: Baloorkar R, Dalawai VK, Patil MB, Biradar D. Autologous Skin Cell Suspension for Accelerating Reepithelialization of Split-Thickness Donor Sites. IJSS Journal of Surgery 2019;5(6):13-15.

Source of Support: Nil, **Conflict of Interest:** None declared.