

Comparison of Conventional Technique versus Serial Tangential Excision of Raw Area and Split Skin Grafting

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ABSTRACT

BACKGROUND

In patients with chronic wound (raw area) skin grafting is a simple and common procedure for achieving wound closure. The split skin graft can be applied on wound after scraping or after serial tangential excision of granulation tissue. This is a prospective comparative study between the two methods.

METHODS

This is a longitudinal study of follow up and comparative study and was carried out in the department of General Surgery of GSVM Medical College, Kanpur, and LLR Hospital, Kanpur, from January 2017 to October 2018. 172 patients were included in the study and divided in to two groups- group A (105 patients) and group B (67 patients). In group A, skin grafting was done after serial tangential excision of granulation tissue. In group B, skin grafting was done after scraping of granulation tissue with scoop. Percentage of graft uptake, duration of hospital stay, number of post op dressing, comorbid conditions and duration of disease were assessed.

RESULTS

In group A in 91 (86.6%) patients had skin take between 95-100% and 4 (3.8%) patients had a take-rate between 90-95%. 10 (9.5%) patients had take-rate in 80-90% range. No patient had a take of <80%. In group B 12(17.9%) patient had take-rate between 95 and 100%. 13 (19.4%) patients had take-rate of 90-95%. 39 (58.2%) patients had take-rate between 80 and 89%. 3 (4.4%) patients had take-rate of less than 80%. This was statistically significant.

CONCLUSIONS

After serial tangential excision of granulation tissue, the split skin graft uptake is increased as compared with only scraping of the wound. The factor associated with this was removal of infection, less hematoma and less seroma formation.

KEYWORDS

Tangential Excision

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BACKGROUND

Chronic wound is defined as wound that is not healing for more than 30 days.¹ In our set up there are number of patients belonging from lower socioeconomic status with chronic non healing wound. The primary objective of any wound treatment is to achieve a secure primary epithelial coverage of the defect rapidly and completely either by suturing or by application of a graft or a flap. A considerable portion of the patient load in our Government Hospital are with chronic wounds.

Moreover most of the patients have a low general health condition. Often they present late with grossly infected wound and a considerable amount of time has to be spent in preparing these patients in respect of improving the general health and wound management. Medical conditions like Diabetes Mellitus, arterial insufficiency, venous disease, lymph oedema, steroid use, connective tissue disease and radiation injury inhibit wound healing. In general they have a fibrotic margin and a bed of granulation tissue which may include areas of slough.² These wounds are either due to trauma, infection, burn, pressure sore, malnutrition, chronic dermatologic disease or to some metabolic condition.¹ However, despite optimal condition for wound healing these wounds frequently does not heal and surgical intervention is required. In most of the patients with chronic granulating wounds split skin grafting is the preferred option for coverage of the wounds.³ The problem or the question now remains as how to approach while applying skin grafts on these chronic granulating wounds. Some surgeons favoured application of skin graft on the granulation tissue after scraping with scoop.^{3,4} This technique is conventionally used by them. The author is using new technique that is usually used in burn-patients. In this technique fist necrotic and Escher of burnt skin is tangentially excised until fresh punctuate bleeding. Then the area is a covered with split thickness graft. Author is now this technique in the chronic wound (raw area). The granulation tissue is excised in layers by serial tangential excision. The superficial layer is believed to contain the superficial colonizing bacteria. Deep layer is believed almost identical with bed area from where the skin graft has been taken (donor site). Very little has been written in the literature, comparison of skin grafting by these two methods.

We wanted to study the graft uptake, number of post op dressings, duration of hospital stay, duration of disease, and comorbid conditions (DM, HTN, necrotizing fasciitis) in both groups (conventional technique and tangential excision with skin grafting).

METHODS

This is a longitudinal type of follow up and comparative study and was carried out in the Department of Surgery of GSVM Medical College Hospital during the period of January 2017 up to October 2018. The study population included the

patients with chronic (raw area) wounds attending the Department of Surgery of GSVM Medical College Hospital. A total of 172 patients were taken for the study. Inclusion criteria were the patient with age group 6-70 year with chronic wound at different site of body following trauma, infection or burn. Exclusion criteria were patients with coagulopathy, peripheral vascular disease, filarial leg ulcer and chronic wound due to radiation. The patient that fulfilled the inclusion and exclusion criteria are selected allocated into groups. In the first group (B) the procedure of skin grafting is done on the healthy chronic wound after scraping with scoop. In second group (B) serial tangential excision with split thickness grafting done in healthy chronic wound. Co morbid condition like Necrotizing fasciitis, DM. Hypertension were noted in both group. In group B after preparation of wound swab culture of superficial layer was sent. In group a two tissue culture from superficial a deep layer were sent. In group B the first dressing was done on 3rd post-operative period. Then subsequent dressing was done on basis of soakage of dressing.

In group A on 8th post-operative day the dressing was opened and graft uptake was assed. It was measured by graph paper method by subtracting the area of graft loss from estimated pre-operative area wound area on both groups. Further dressing was done if needed.

RESULTS

Total of 172 cases were selected for skin grafting according to the inclusion and exclusion criteria. In group B 67 patients were taken and in group A 105 patients were taken. The age patient ranged between 5 to 70 years. The mean age of group B population was 28.86 years with standard deviation of 14.69. The mean age of group A population was 29.46 years with standard deviation 15.9. The highest incidence was found between 20-40 year both in B and A group 43 and 42 percent respectively.

Age Years	Group B	Group A
1-20	22 (32.8%)	38 (38.1%)
20-40	29 (43.2%)	42 (40%)
40-60	14 (20.8%)	16 (16.1%)
60-80	2 (2.9%)	9 (9.1%)
Total	67	105

Table 1. Age Distribution in Both Group

Age	Group B	Group A
Male	56 (83.5%)	70 (66.6%)
Female	11 (16.4%)	35 (33.3%)
Total	67	105

Table 2. Sex Distribution

Comorbid Condition	Group B	Case A
Diabetes mellitus	07(10.4%)	7(6.6%)
Necrotizing fasciitis	19(28.3%)	18(17.14%)
Hypertension	3(4.4%)	4(3.8%)

Table 3. Comorbid Conditions in Both Group

	Group B Sq. cm	Group A Sq. cm
Mean	116.10	121.20

Table 4. Wound Surface Area

Among 67 operated 56 were male to 11 were female in group B. In group A it was 70 to 35 out of 105. Necrotizing fasciitis was major co morbid condition in both groups. In group B it was 28 percent and in group A it was 18 percent. Diabetes mellitus was found in group B 11 percent and 7 percent in group A. Hypertension was found 4.4 and 3.8 percent respectively. The mean surface area of wound in control group was 124 square cm and that of case group was 115.96 square cm. The mean duration of hospital stay was 18.43 days with standard deviation of 4.21 days in control group. The mean duration of hospital stay was 9.22 days with standard deviation 1.33 days in case group. The duration was calculated from time of injury to the day of time of skin grafting. In group B it was 69.35 days and group A 83.3 days mean. Pre-op haemoglobin level in group B was mean Hb 11.086 gm/dL with SD 1.59 gm/dL and post op Hb 10.7 gm/dL with S.D.= 1.54 gm/dL. Mean Pre-op HB level in group A was 11.70 gm/dL with SD 1.866 gm/dL and post op was 11.16 gm/dL with SD 2.12 gm/dL.

Duration of Hospital Stay in Day	Group B	Group A
8 - 10	2	95
11-13	8	8
14-16	17	2
17-19	12	0
>20	28	0
Total	67	105

t = 19.42, p<0.001 (significant)

Table 5. Hospital Stay (in Days)

	Group B	Group A
Mean	69.35	81.26

Table 6. Duration of Disease (in Days)

Hb gm/dL	Group B (Pre-Op)	Group A (Pre-Op)
Mean	11.70	10.78
S.D.	1.84	1.44

Table 7. Blood Loss (Pre-Op and Post-Op Hb level)

Hb gm/dL	Group B (Post Op)	Group A (Post Op)
Mean	11.19	10.4
S.D.	2.10	1.4
T	10.60	6.28
p	>0.001	0.0018
If	Significant	Significant

Table 7. Blood Loss (Pre-Op and Post-Op Hb Level)

t = 2.11, p <0.05, if = significant

Organism	Group B	Group A Superficial Layer
No growth	42 (62.6%)	73 (69.5%)
<i>Pseudomonas</i>	12 (18%)	17(16.1%)
<i>Proteus</i>	3 (4.4%)	2(1.9%)
<i>Staph. aureus</i>	2(3%)	2(1.9)
<i>E. coli</i>	7(10.4%)	10(9.5%)
<i>Citrobacter</i>	1(1.4%)	1(0.9%)
Total	67	105

Table 8. Comparison of Organism Cultured during Operation

Z= 1.42, p>0.05, if=non-significant

Organism	Group A Superficial Layer	Group A Deep Layer
No growth	73(69.5%)	97(92.3%)
<i>Pseudomonas</i>	17(16.1%)	6(5.7%)
<i>Proteus</i>	2(1.9%)	0
<i>Staph. aureus</i>	2(1.9%)	0
<i>E. coli</i>	10(9.5%)	2(1.9%)
<i>Citrobacter</i>	1(0.9%)	0
Total	105	105

Table 9. Comparison of Organism Cultured from Superficial and Deep Layer of Group A

Z= 4.60, p<0.05, if= significant

Post-Op Dressing (Number)	Group B	Group A
0-1	1	101
2-3	30	3
4-5	35	1
>6	1	0
Total	67	105
Mean	3.55	0.60
SD	0.81	0.66

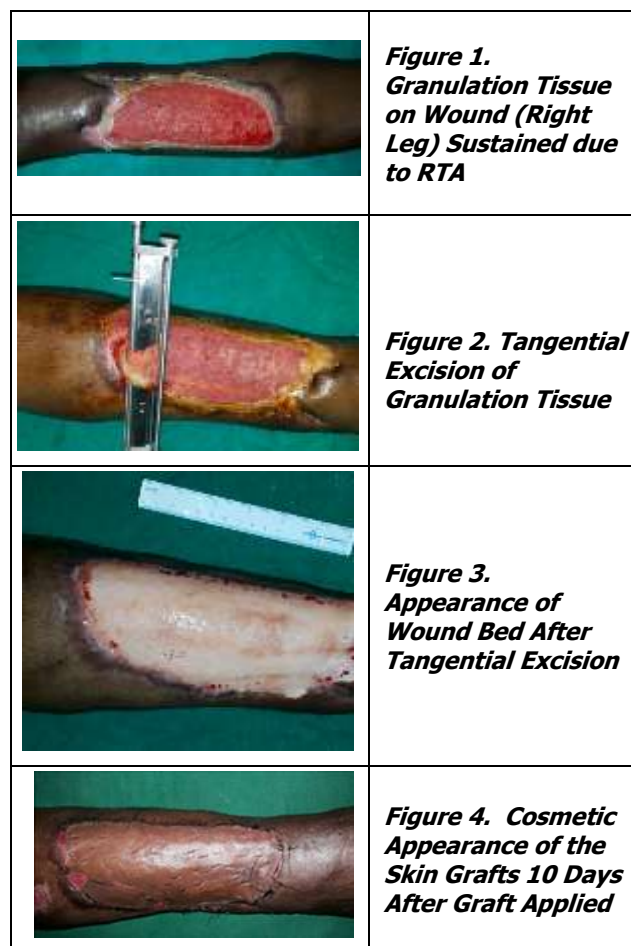
Table 10. Post-op Dressing

t = 26.13, p< 0.001, df = 1>0 (significant)

Skin Graft Take %	Group B	Group A
95-100%	12(17.9%)	91(86.6%)
90-95%	13(19.4%)	4(3.8%)
80-90%	39(58.2%)	10(9.5%)
<80	3(4.4%)	0
Total	67	105
Man	86.71	97.11
SD	6.36	3.91

Table 11. Percentage of Graft Uptake

t 13.28, p <0.001, if df=1>0 (significant)



DISCUSSION

Split skin grafting is an important surgical procedure practiced in many discipline of surgery. Few of important cause of skin graft failure are in interface between graft and the bed like hematoma, infection of recipient bed and improper immobilization. If these factors can be avoided then it can be expected to have successful skin graft take. In study two groups were created one group B and other group A. In the group B skin grafting was done following scraping of granulation tissue with the help of scoop. In

group a skin grafting was done after serial tangential excision of granulation tissue. 105 patients were taken in group A and 67 patients taken in group B. The thickness of excision was arbitrary i.e. it is done until whitish base is obtained. The co morbid condition like DM HTN and Necrotizing fasciitis were almost same on the both group. The majority of the patients were in 20-40-years age group. Dhar S et al observed that scraped wounds were associated with more blood loss, less secure haemostasis, prolonged surgical duration and thus more cost of surgery as compared to wound that was not scraped.⁵ Cope et al popularized the concept of early excision and auto grafting burn wound after treating patient from coconut grove fire in Boston in 1942.⁶ Desai et al showed his review in 1662 paediatric burn patient that the blood loss is significantly reduced if burn are excised within 24 hr of injury when compared to 2-16 days after injury. Carl Thiersch described removing granulation tissue from wound before applying the graft dramatically improved the graft take.⁷ Ackman proposed that exuberant granulation tissue were an abortive attempt at wound healing and that has been unsatisfied by skin covering at appropriate time.³ Granulation tissue is the result of prolonged wound treatment and was not a serious contra indication to skin grafting. Brown and McDowell 1942 proposed that, if granulation were new, flat, non-oedematous and otherwise bright red and healthy graft may be placed right on them.⁴ But it was preferred granulation tissue should be carefully shaved down to smooth, yellow base with a large sharp knife and then graft were applied. McGregor and McGregor suggested grafting should be done in healthy granulation tissue with good marginal healing without delay.⁸ They also suggested that good marginal healing was presumptive evidence that granulation would accept the skin graft, for it can be assumed that infection virulent enough to destroy a graft would be inimical to the marginal epithelial growth. Fazli et al showed non-random distribution of *P. aeruginosa* and staph aureus where *P aeruginosa* was found deeper tissue than staph aeruginosa.⁹ Gilliland et al reported that the initial swab results (at admission) were not related to the outcome of skin grafting, it was only the presence of bacteria (*Pseudomonas* and *S. aureus*) in the immediate preoperative or postoperative periods that played a role.¹⁰ In our study pre-operative swab culture was sent in group B. In group A granulation tissue were serial tangentially excised. The superficial layer and deep layer were sent for culture. In group B and in superficial layer of group A the culture were almost same with *pseudomonas* 18% and 17% in B and A group respectively. *E coli* was found to be 10.4 percent in group B and 9.5 percent in group A respectively. In deep layer culture of group A, *pseudomonas* was only 7 percent and *e coli* was found to be 2 percent .Rest 91 percent were sterile culture. It is attributed that bacteria colonize in superficial layer of granulation tissue after tangential excision these superficial layer is excised then majority of bacterial flora is removed. The dressing was done on 3rd post-operative day and analysed in group B. The innermost layer (Bactigras) of dressing which was in contact with grafted skin was adhered

for which we had to wet the dressing with normal saline. More of the time there was shearing of graft while dressing. There was more pain in group B because there was more number of dressing, more soakage and more adherent dressing to skin. The dressing was opened at 8th post-operative day in group A and analysis of uptake was done. The dressing was reanalysed on 10th post op day if dressing was soaked in first dressing. There was minimal pain in majority of patient in group A. It was found that this group there were minimum soakage of dressing with serum. The dressing was relatively dry dressing i.e. innermost layer (Bactigras) of the dressing in contact with skin graft was not adhered with graft. So it was easily removed without application of normal saline. In group A it was found that in majority the patient felt minimum pain less distal extremity oedema. It was attributed to less post op dressing and less adherence of skin graft with the innermost layer of dressing. On 8th postoperative day the wound surface was completely epithelized and there was no raw area in most of the patients of group A. In our study it showed that skin graft take-rate was much better by applying graft after tangential excision of granulation tissue than applying skin graft after scrapping granulation tissue. In group B 12(17%) patient have skin take between 95-100% and 13(20%) had graft uptake between 90-95%. The 39(58%) patient have skin graft between 80-89%. In group A 91(87%) patient have skin take-rate between 95-100% and 4(4%) patient have skin take-rate between 90-95%. Skin take-rate was much better in tangential excision group because it removes a large number of microorganism and fresh bed for putting the graft. It is also presumed that after tangential excision the wound bed is almost identical to bed where skin graft is harvested. There was much more less post-operative dressing (mean 0.6) need in group A than group B. That indicate that in tangential excision group there was less oedema, exudates, hematoma in first dressing in case group. This also indicate cost effectiveness of treatment. Also in a few patients the underlying granulation tissue were seen protruding through the mesh hole of the skin cosmetically which was not accepted in control group. The mean hospital stay (18.43 days) of group B was two time than that of group A (9.22 days). This attributed to less number of post-operative dressing in excision group than control group with less oedema.

CONCLUSIONS

It is known that granulation tissue is heavily colonized with microorganism. So, whenever the granulation tissue is removed by sharp serial tangential excision of granulation tissue with Humby knife converting chronic primary wound bed into acute fresh secondary wound, it actually removes the microorganism from the wound. It also removes the uneven surface of the wound and provides smooth surface for graft resulting in better cosmesis. Then when the skin graft is placed on that wound it has a better chance of take as far as infection is concerned. But it must be ensured that

proper haemostasis is achieved before application of the graft. Recipient bed after removal of granulation tissue showed no growth in most cases. So it can be concluded that skin graft take is better when skin is applied after complete removal of granulation tissue than when the skin graft is applied after scraping the granulation tissue from the recipient bed.

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