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The Prospective Study of Split Skin Grafting In Rural Hospital

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Abstract
Introduction: *The split-thickness skin grafting (STSG) is the most common performed procedures to close defects unable to be closed with the simple approximation of the wound edges. The healing of a STSG donor site involves re-epithelialization from the epithelial appendages that are embedded in the dermis and subcutaneous fat. Skin grafts are used to heal a gap in the*
Objective: *To study the factors responsible for acceptance of split skin graft and study of different etiological factors and there relation to acceptance of split skin graft.*
Methods: *Special designed performa was used to collect data for split skin grafting patients. The data were expressed in number and percentage.*
Results: *Among 200 cases studied, commonest type of ulcer was traumatic ulcer accounting for 109 patients (54.5%), Lower limb ulcers were most common ulcers in all etiologies. In traumatic, infective and diabetic ulcers 78(39%). In traumatic, infective, diabetic foot and burns ulcer graft was accepted in 95(87.1%), 31(81.5%), 25(89.3%) and 10(83.3%) patients respectively. No graft was accepted in patients with malignant and venous ulcers etiology. Total percentage of male and female patients in whom graft was accepted was same i.e.85%. Hence gender of patient was not associated with graft acceptance. In the group of patients with area of ulcer < 60 cm^2 graft was accepted in 132(83.5%) patients, whereas graft was partially accepted in 23(14.5%) patients and was rejected in 3(2%) patients. The patients who had history of tobacco chewing had 3(3.9%) patients in whom graft was rejected, 10(13.1%) patients in whom graft was partially accepted while 64(83%) patients in whom graft was accepted.*
Conclusion *The split graft is a straight forward technique to learn without need for complete instrumentation. It is conclude that no age limit for skin grafting. It can be done for all age groups and is considered as standard for treatment of ulcers.*
Kewwords: *Split grafting, Ulcer, Etiological factros*
Category: *General Surgery*

I. Introduction

Literal meaning of ulcer is raw area; it is a break in a continuity of an epithelial surface. It is characterized by progressive destruction of surface epithelium and healing by formation of granulation tissue at base.[1]

Lower limb ulcers are important clinical conditions which are often difficult to treat. Ulcers represent wide spectrum of etiology and pathology. Severity and morbidity associated with it leads to significant loss of work. Lower-extremity ulceration is a debilitating phenomenon not only affecting the patient directly but having a great impact on the economy, since a significant amount of resources are spent every year to treat, prevent, or decelerate the progression of the disease. Studies carried out earlier found that chronic leg ulceration affects about **1%** of the population at some point in their lives.[2]

The split-thickness skin grafting (STSG) is the most common performed procedures to close defects unable to be closed with the simple approximation of the wound edges. The healing of a STSG donor site involves re-epithelialization from the epithelial appendages that are embedded in the dermis and subcutaneous fat. Skin grafts are used to heal a gap in the skin. If one can join the edges of a wound together without too much tension by stitching or stapling, then so much the better, but the size of the wound is often so great that it is impossible to join the edges of the wound together and if left to heal by itself it would heal very slowly.

In rural area people are often ignorant of their health. Many times illiteracy remains a problem for them to seek the medical help. Not to forget about poverty, unawareness, false beliefs and homemade or quack's medicine practices in the rural area. People involved in farming are also tends to delay the medical help due to negligence and priority of work over health. A loss of a day work due to hospitalization equals loss of one time meal of whole family which leads people to avoid hospitalization and needs such modality of treatment which can lead them to early resume work. The above factors in rural area made us to take a study on common

problem in rural India where proper health facility is still a distant dream and hospitalization for ulcer leads to loss of considerable work days.

The Present study is designed in such a fashion to find the factors which are responsible for acceptance and rejection of skin graft. This study also deals with effect of intra operative techniques and post operative management in getting good graft acceptance. Hence ultimately this study can help us to gain better quality of skin grafting and minimize complications associated with it.

II. Objective

1. To study the factors responsible for acceptance of split skin graft.
2. To study different etiological factors and there relation to acceptance of split skin graft.

III. Material And Methods

Necessary approval from the Institutional Ethics Committee was obtained before initiating the study.

i. **Study site**

The Study conducted at the departments of Surgery, Swami Ramanand Teerth G.M.C Ambajogai.

ii. **Study design**

Prospective Observational study

iii. **Sample size:** 200 Sample

iv. **Patient selection**

- **Inclusion criteria:**

- Patients having raw area secondary to trauma, infection, diabetic foot venous, ischemic, spontaneous, burns and malignant after primary excision.
- Patients with raw areas post debridement with healthy granulation with serous discharge.
- Burn patients with 2^{nd} or 3^{rd} degree burns
- Patients having burn wounds 15 to 40% with sparing of donor area from thigh calf or buttocks
- Patients willing for surgery
- Patients fit for anaesthesia required.
- Patients with ulcers over upper, lower limbs, chest and back.

- **Exclusion criteria**

- Patients with ulcers with slough, with unhealthy granulation & pus discharge.
- Burn patients with less than15 % and more than 40 % burn.
- Patients with 1^{st} degree and 4^{th} degree burn.
- Patients who are not willing for surgery.
- Patients who are unfit for surgery.
- Patients with skin diseases.
- Patients with ulcers over face, neck, buttock, axilla, palm, abdomen, groin.

I. Study Methods

Patients and relatives were explained about the split skin grafting procedure and study and necessary approval was obtained from them prior to intervention.

Data regarding the name, age, sex, education, occupation address, chief complaint, treatment history before admission for present complaint, history regarding the mode of onset of disease, past medical and surgical history, personal history was collected from patient and accompanying relatives. Intra operative and post operative status of raw area and graft noted systematically.

II. Split skin grafting:-

It was done for ulcer having large size (in most of the cases with ulcer area more than 5 cm^2), Grafting used in our study was delayed primary grafting, which was done on ulcer which initially derided thoroughly and waited till healthy granulation tissue appeared.

This study included ulcers with different etiologies. Ulcers which begin with history of trauma included in traumatic ulcers and which begin with infection (boil, carbuncle) included in infective.

III. Statistical Analysis:

Data was analyzed using percentage, chi square test, Fisher exact test and ANOVA with the help of OPEN EPI version 2.3 and EPI INFO 7.0 statistical software.

IV. Results

In our study percentage of male patients was higher than that of female patients in each age group. It was 20% for 61-75 years, 48% for 46-60 years, 19% 31-45 years & 3 % for 15-30 years of male patients.

While female patient's percentage for age group 61-75 were 8.5 %, for 45-60 years were 9.5%, for 30-45 years were 7 % & for 15-30 years were 9 %.

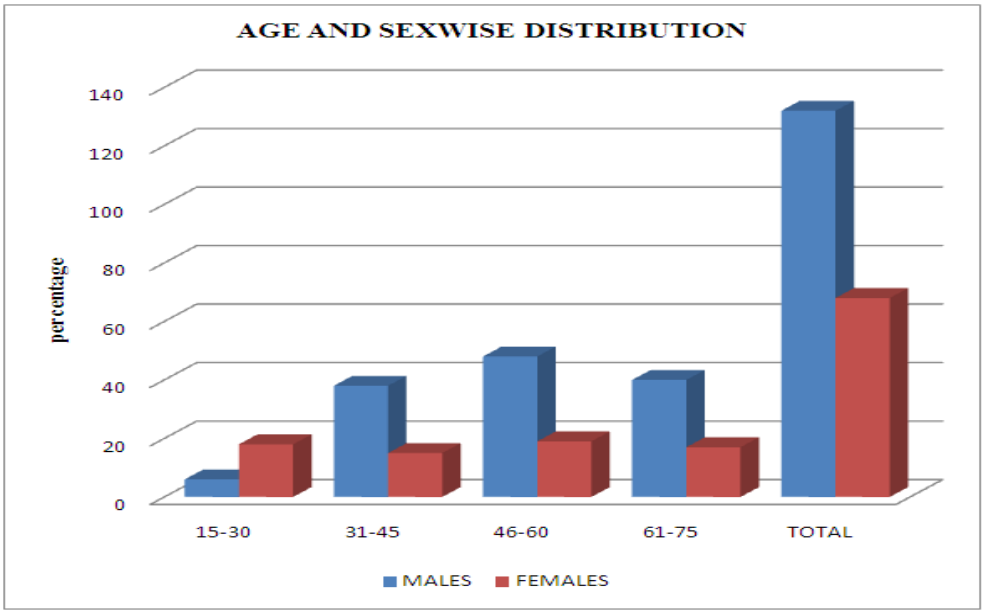

Fig 1 Shows: Age and Sex wise distribution of patients

Among 200 cases studied, commonest type of ulcer was traumatic ulcer accounting for 109 patients (54.5%), of which 73 patients were male and 36 patients were female. Infective, diabetic foot, burns ulcer patients were 38 (19%) , 28 (14%) and 12(6%) respectively. Ischemic, malignant and venous ulcers were less 2(1%) , 2(1%) and 1(0.5%) respectively. Spontaneous and ulcers with etiology were 4(2%) each. In burn ulcers females 8(4%) were more than men 4(2%).

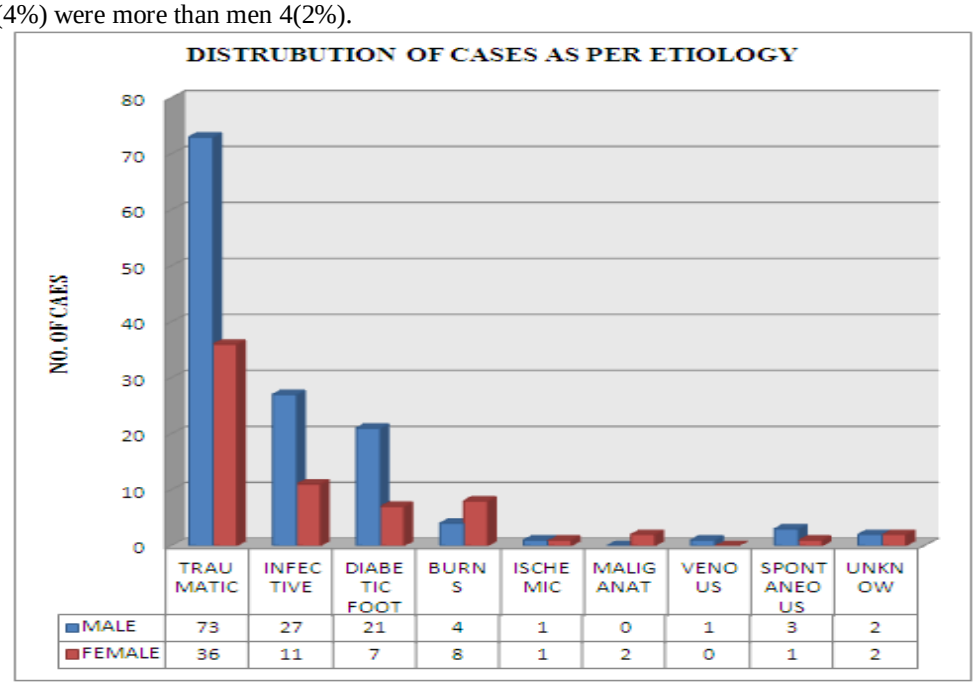

Fig 2 Shows: Distribution of cases per etiology

Lower limb ulcers were most common ulcers in all etiologies. In traumatic, infective and diabetic ulcers 78(39%), 27(13.5%) and 28(14%) of all ulcers were involving lower limb respectively. Chest involvement was more common in burns and malignant ulcers i.e. 5(2.5%) and 1(o.5%) of all cases respectively.

Ischemic, venous, spontaneous and ulcers with unknown etiology had less cases i.e. 2(1%), 1(0.5%), 2(1%) and 2(1%) cases involving lower limb respectively.

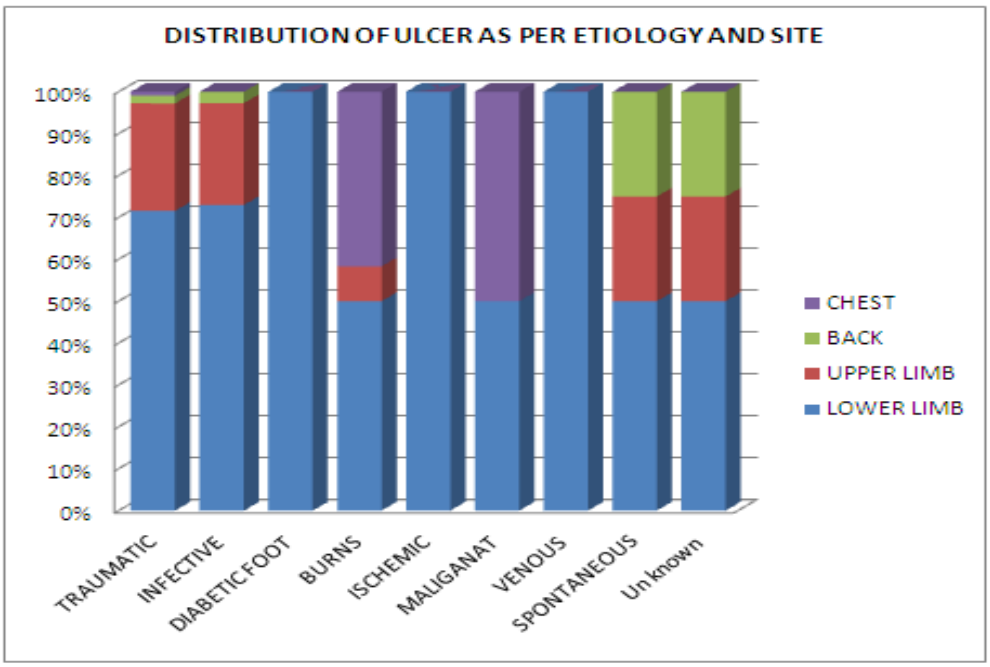

Fig 3 Shows: Distribution of ulcer per etiology and site

In traumatic, infective, diabetic foot and burns ulcer graft was accepted in 95(87.1%), 31(81.5%), 25(89.3%) and 10(83.3%) patients respectively. In all patients with Spontaneous ulcers 4(100%) and ulcers with unknown etiology 4(100%) grafts were accepted. Ischemic ulcer patients had 1(50%) of each accepted and partially accepted graft.

No graft was accepted in patients with malignant and venous ulcers etiology. Ischemic, malignant and venous ulcer had 1(50%), 2(100%) and 1(100%) patients with partially accepted grafts. It was observed that etiology was statistically associated with graft acceptance ($p < 0.05$).

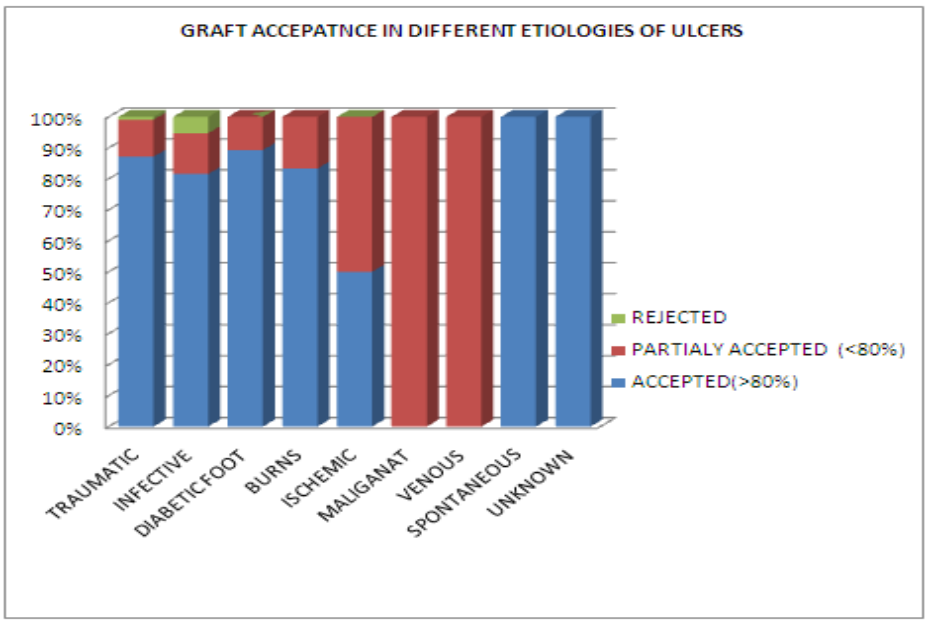

Fig 4 shows: Graft acceptance in different etiology of ulcer

Total percentage of male and female patients in whom graft was accepted was same i.e.85%. Hence gender of patient was not associated with graft acceptance. It was observed that gender was not statistically associated with graft acceptance (p >0.05)

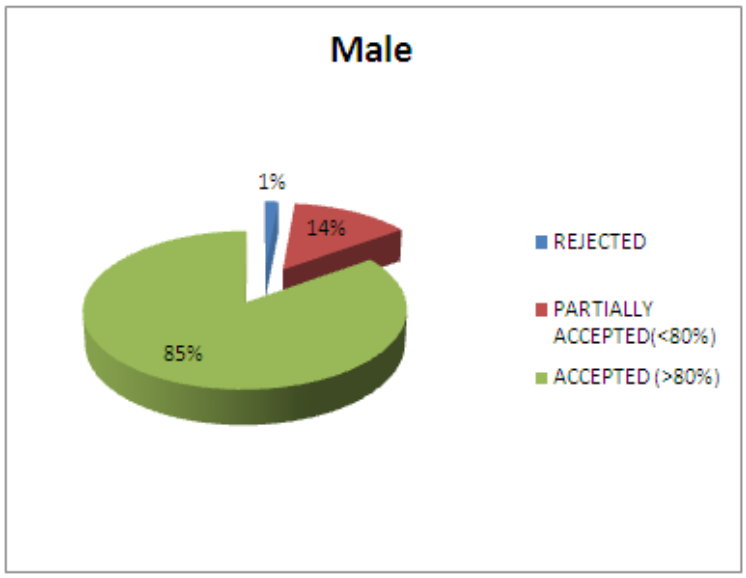

Fig 5 shows: Graft acceptance rate in Male

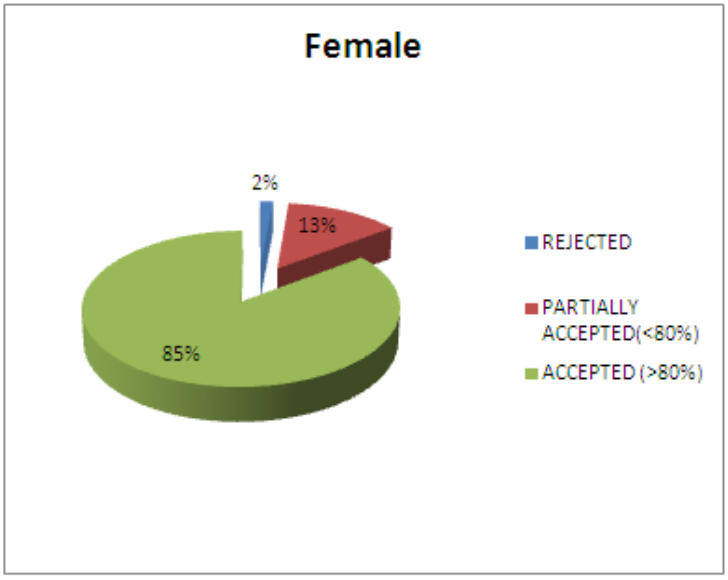

Fig 6 shows :Graft acceptance rate in female

In the all patients of age group 15-30 years graft was accepted, while in only 46(80.7%) patients of age group 61-75 years graft was accepted. Partially accepted grafts in age group 31-45 , 46-60 and 61-75 years were 8(15.3%) , 9(13.1%) and 10(17.6%) in respective groups. If for statistical purpose if we divide age groups as < 30 yrs and >30 yrs the association with graft acceptance was found to be statistically significant (p<0.05).

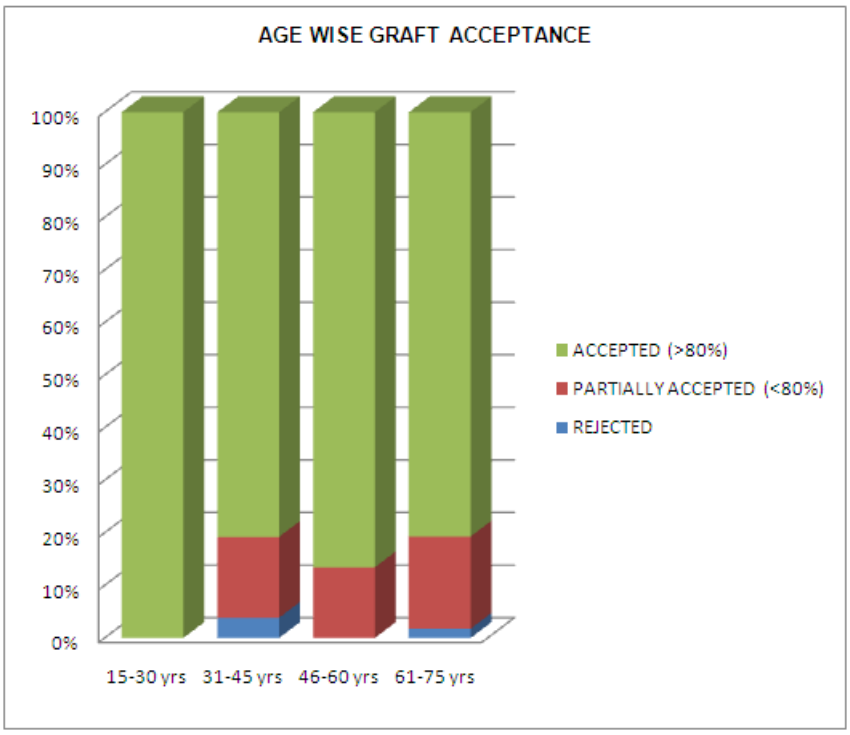

Fig 7 shows: Age wise graft acceptance

Among the patients of Lower limb ulcers, in 127(86.4%) patients grafts was accepted, where as in 19(12.9%)patients graft was partially accepted and in 1(0.7%)patients it was rejected. In patients of Upper limb ulcers grafted acceptance, partial graft acceptance and graft rejection was seen in 33(80.5%) 6(14.6%) and 2(4.9%) patients respectively. Patients of Chest ulcer had least chances of graft acceptance 5(71.4%) while in these patients partial graft acceptance was maximum i.e. 2(28.6%) patients.Site of grafting was not significantly associated with graft acceptance (p>0.05) which was proved statistically.

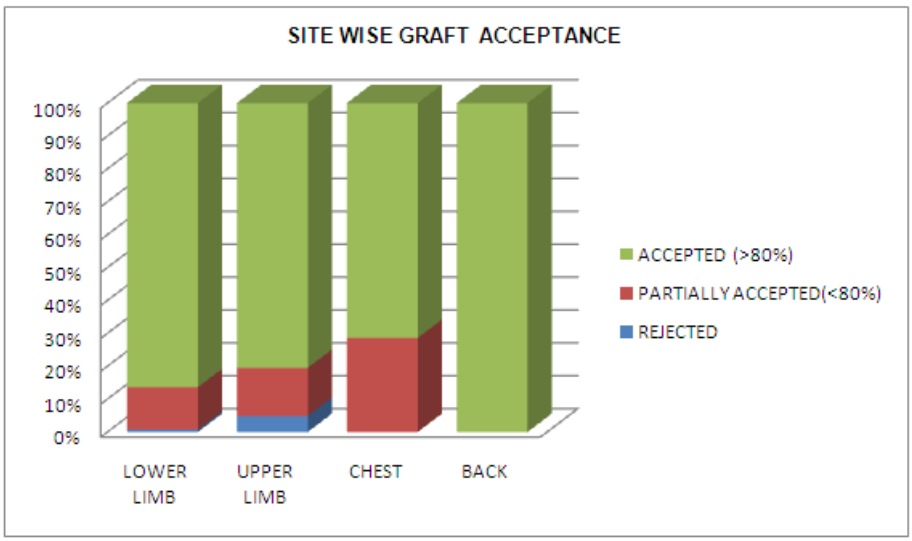

Fig 8 shows: Site wise graft acceptance

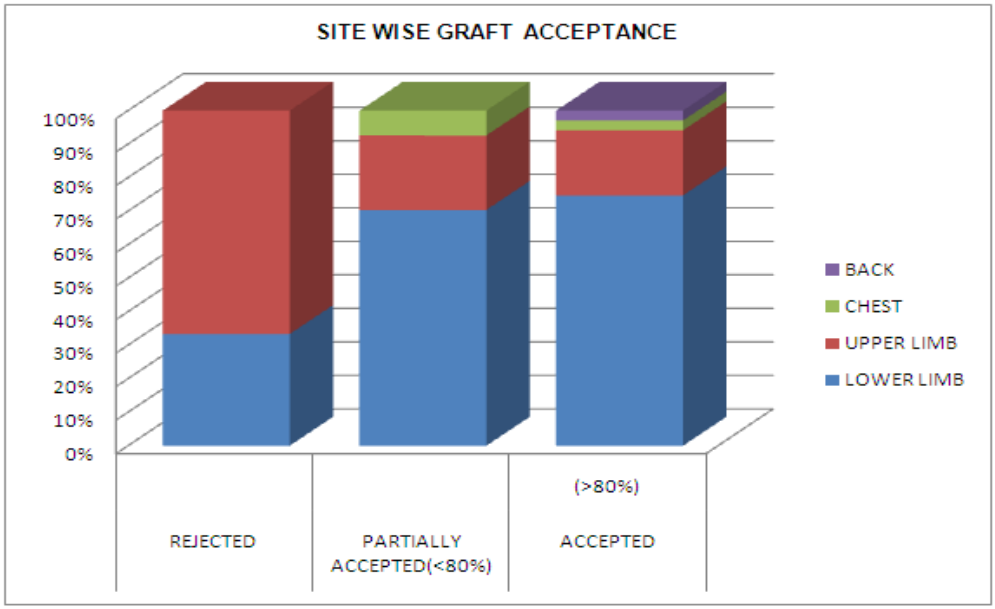

Fig 9 Shows: Site wise graft acceptance

In the group of patients with area of ulcer < 60 cm^2 graft was accepted in 132(83.5%) patients, whereas graft was partially accepted in 23(14.5%) patients and was rejected in 3(2%) patients. The graft was accepted i.e. 27(90%), 6(100%) and 2(100%) in the group of patients with area of ulcer 61-120 cm^2, 121-180 cm^2, and 181-240 cm^2 respectively. Among patients with graft area >240 cm^2 graft was accepted in 03(75%) patients and was partially accepted in 01(25%) patient.Area of ulcer was not statistically associated with graft acceptance (p>0.05).

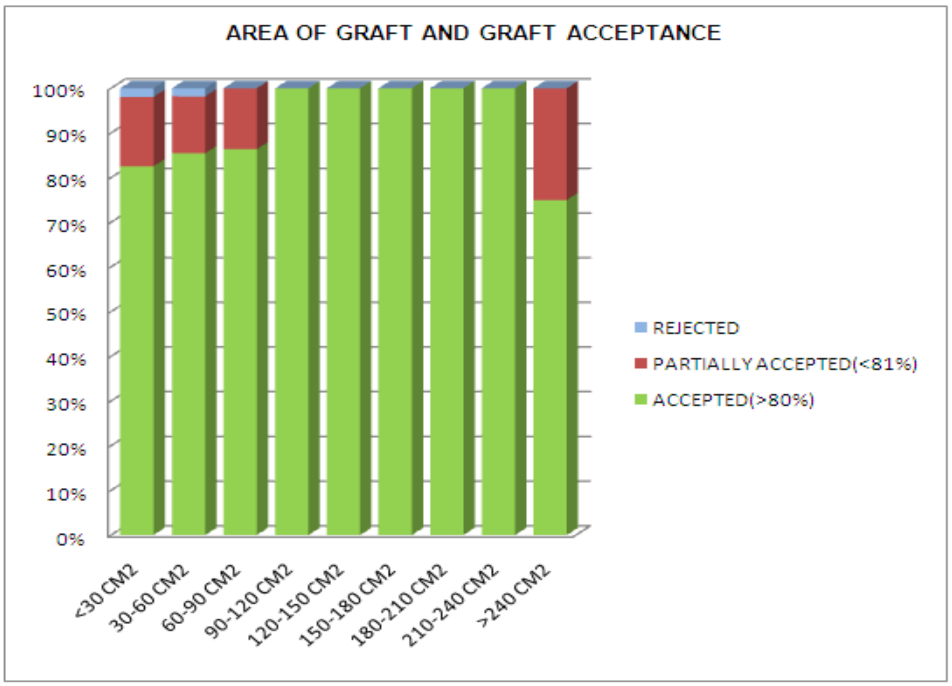

Fig 10 Shows : Area of Graft and rate of acceptance

The patients who had history of tobacco chewing had 3(3.9%) patients in whom graft was rejected, 10(13.1%) patients in whom graft was partially accepted while 64(83%) patients in whom graft was accepted. Among the patients with history of smoking and alcoholism in 41(82%) and 97(88.9%) patients the graft was accepted respectively. Not a single graft rejected in patients who had no history of any of the above addictions.Statistically there was no association was found between tobacco, smoking and alcoholism with graft acceptance (p>0.05).

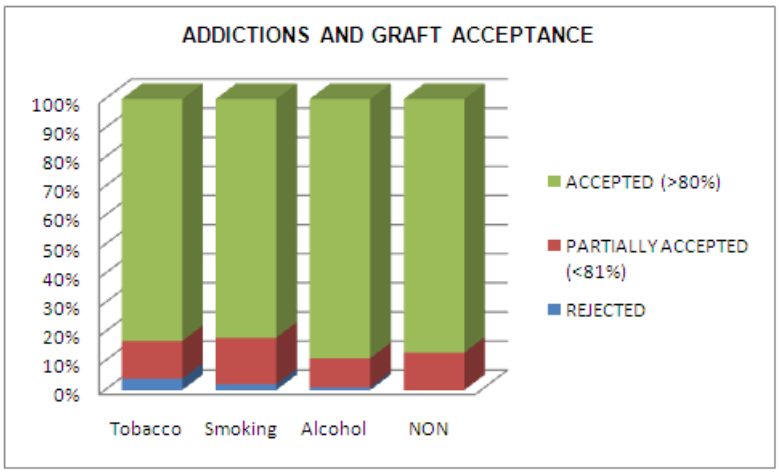

Fig 11 Shows : Rate of addiction and graft acceptance

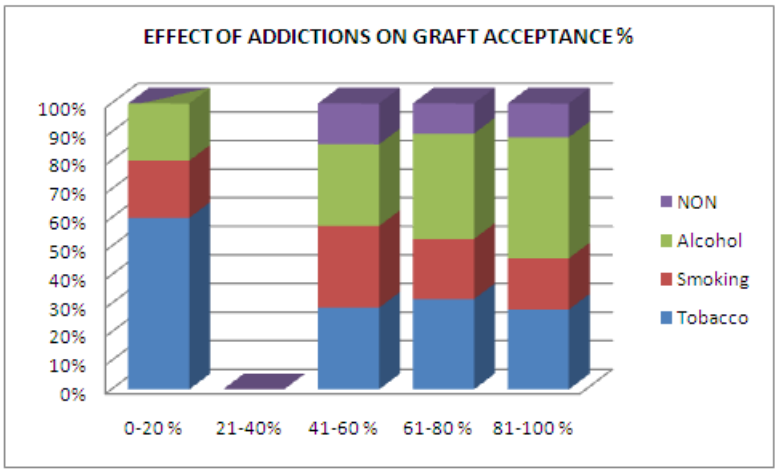

Fig 12 Shows : Effect of addiction and graft acceptance

V. Discussion

This was prospective study of split skin grafting in management of raw areas in rural setup, carried during the period of November 2011 to November 2013.

In our study overall percentage of male patients was higher than that of female patients in all age groups. Highest percentage of male patients was 24% in age group 46-60 years and of female patients 9.5% in age group of 46-60 years. Percentage of ulcer patients increased from lower age groups to higher age groups. Percentages of male patients were more as compared to female patients in all age groups except of 15-30 years.

Cornwall et al [3] found in their study 70% of patients were over the age of 70 years. In this study, 55% of patients were aged above 50 years and 45% of the patients were aged below 50 years. But according to study done by Callam MJ[2], the elderly are not the only population at risk; in their study ulceration began before the age of 40 years in 22% of the population studied. In our study, ulceration began before the age of 46 years in 38% of the patients. Sundresh NJ et al[4] in their study in 2012 found that 64% ulcer patients were above 40 years who underwent spilt skin grafting.

In rural area, male and female both are engaged in outdoor work equally. However number of female patients is less than male patients. This might be because of associated number of pregnancy, ante-natal, postnatal period and additional responsibility of raring kids with resultant restriction of outdoor activity.

In older age group (>45 years of age) number of ulcer patients are more than the younger age group (1.5 to 2 times more). The reason could be poor financial condition, generalized debility, illiteracy, low socio-economic condition causing vicious cycle of less earning and poor nutritious diet resulting into decreased immunity and more prone for infection and poor wound healing.

The commonest type of ulcer was traumatic type, accounted maximum 109 patients (73 male and 36 female) followed by infective type of ulcer with 38 patients (27 male and 11 female). Diabetic ulcers were 28 of which 21 were males and 7 were females who underwent split skin grafting. Ulcers due to Burn which were secondarily grafted were 12% of total study participants. Malignant, ischemic and venous ulcers were 2%, 2% and 1% respectively. The number of patients who were grafted with these etiologies was less as compared to

others because ulcer with these etiologies could never meet inclusion criteria of this study. Patients with spontaneous and unknown etiology were 4 % each. Sundresh NJ[4] et al in their study grafted 26% traumatic, 38% healing, 14% burn, 8% diabetic, 6 % scar ulcers and 2 % each of infective (cellulites) and bed sore ulcer patients. According to study done by Gilliland[5], 95% of leg ulcers were due to vascular etiology and among all chronic wounds in the lower extremity, venous ulcer dominated the differential diagnosis, accounting for up to 90% of the cases 2. Arterial diseases account for 5% to 10%, most others are due to neuropathy or a combination of both 49.In our study traumatic ulcer were accounted for 54.5% patients, infective etiology ulcers 38%, diabetic ulcer were accounted for 28% and venous ulcer accounted for 1% of total patients. This difference is because all above mentioned studies were done in western population and of chronic leg ulceration. However our study has been carried in rural area of our country and we have considered both acute as well chronic ulcers. In our study we included only those ulcer patients who underwent split skin grafting. Hence our study doesn't present the actual incidence of ulcers with different etiology but the distribution of ulcers of different etiologies which undergo split skin grafting.

This gives idea about patients with ulcers of different etiology and their distribution as per site. All the different etiological ulcers had most ulcers on extremities i.e. upper and lower limbs, except patients with burn and malignant etiology who had chest as common site. Over all lower limb being most common site as for obvious reason being most exposed, easy to get traumatized, most neglected area and region with hampered peripheral arterial as well as venous system. Sundresh NJ et al[4] in their study also found lower limb being most common site for skin grafting i.e. 62%. In our study we found 74.5% of patients undergoing split skin grafting for lower limb ulcers being the most common site and it is consistent with the above mentioned study.

Ulcers with burns and malignant etiology had chest involvement more commonly than other ulcers. Most of the burn patients were females with suicidal or accidental burns and trunk was the most common site involvement. Among cases with malignant etiology, one of the patients was female, who had raw area left over chest region post mastectomy done for carcinoma breast.

In this study we reviewed mean hospital stay of patients with different etiological factors. Pre grafting hospital stay was variable but variability in post grafting hospital stay was less variable. mean duration of hospital stay was higher for ulcer with diabetic (46.5), burn (48.5), ischemic (45.5), venous (120) and ulcers with unknown etiology (71.5). When postoperative stay was compared in all etiology it was observed that it was not statistical significant (ANOVA, p value >0.05). It shows that mean hospital stay was almost similar in all etiological groups. But when we compared Pre grafting hospital stay in all etiological group it was found to statically different in all group (ANOVA (p value < 0.05)).

The present study shows etiology wise differences in number of patients having graft acceptance. We found that there was not much difference in % of patients who had graft accepted in traumatic, infective, diabetic, burn, spontaneous and ulcers with unknown etiology. But patients with malignant, venous and ischemic ulcers had lesser % of patients in whom graft was accepted i.e. 0, 0, and 50% respectively.

Jones JE[6] in 2000 assessed the effectiveness of skin grafts in the treatment of venous leg ulcers. They studied Seven RCTs of skin grafts for venous leg ulcers were identified. In 6 trials patients also received compression bandaging. Two trials (98 patients) evaluated split thickness autograft, three trials (92 patients) evaluated cultured keratinocytes allograft, one compared tissue engineered skin (artificial skin) with a dressing (309 patients) and one compared it with a split thickness skin graft (7 patients, 13 ulcers). The trials comparing artificial skin with a dressing reported a significantly higher proportion of ulcers healing with artificial skin. There was insufficient evidence from the remaining trials to determine whether other types of skin grafting increased the healing of venous ulcers.

Arterial ulceration is due to a reduced arterial blood supply to the lower limb. The most common cause is atherosclerotic disease of the medium and large sized arteries. Arterial or ischemic ulcers are most commonly due to atherosclerosis and hence encountered in older adults. They can be also seen in younger adults and here usually peripheral arterial disease like Thromboangiitis Obliterans is the cause. Arterial or arteriolar occlusion due to any cause can result in ischemia of the skin and subcutaneous tissues which might lead to ulceration[5.]

Quaba et al[7]. described the treatment of 32 patients with venous ulcers by split skin grafting after layered shaving of the ulcer with a dermatome. All of these ulcers were healed after a mean postoperative hospital stay of 18.3 days. In a small series of 14 patients with advanced venous ulceration, treated by ulcer excision, decompression of the leg and split skin grafting, the mean postoperative hospital stay was 38.4 days and 8 out of 14 grafts were intact 4 years after surgery. In a recent personal series of operations (unpublished), 26 ulcerated legs in 21 patients were treated by ulcer excision and split skin grafting. Of these patients 15 would have been considered to be unsuitable for Thiersch grafting, by the criteria given at the conclusion of Mr. Gilliland et al.'s paper. The mean postoperative stay in hospital was 50 days; 20 patients left hospital with the ulcer healed.

Mahmoud SM et al[8] in their study recorded 100% skin graft take in 84% of the patients on the fifth postoperative day and in 62% on weeks 3 and 8. All patients in the graft group healed completely, but 8% had an ulcer recurrence and 4% a superficial infection within the following year.

The present study showed the graft acceptance in male and female patients. There was no gender difference in percentage of patients in whom graft was accepted i.e. 85% in both male and female patients. We found that gender of patient had no impact on graft acceptance of patients. There was no association between gender and graft acceptance which was statistically proved. It also showed age wise graft acceptance of percentage of patients. Patients below 30 years had excellent graft acceptance. In our study in all the patients below 30 years graft was accepted. While patients in the age group 31-45, 46-60, 60- 75 years around 82.4, 86.5, 80.7 % of patients in whom graft was accepted respectively. This was found statistically significant.

In our literature search we could not find any study for comparison which would show relation of age of patients and graft acceptance. But according to schwatz[9] Most surgeons believe that aging produces intrinsic physiologic changes that result in delayed or impaired wound healing. Clinical experience with elderly patients tends to support this belief. Studies of hospitalized surgical patients show a direct correlation between older age and poor wound healing outcomes such as dehiscence and incisional hernia. However, these statistics fail to take into account underlying illnesses or diseases as a possible source of impaired wound healing in the elderly. The results of animal studies regarding the effects of aging on wound healing have yielded contradictory results. In healthy human volunteers there was a significant delay of 1.9 days in the epithelialization of superficial skin defects in those older than 70 years of age when compared to younger volunteers. However, more recent clinical experience suggests that major operative interventions can be accomplished safely in the elderly.

Elderly patients are more likely to sustain surgical wound rupture and delayed healing than younger patients are. With aging, collagen undergoes qualitative and quantitative changes. Dermal collagen content decreases with aging, and aging collagen fibers show distorted architecture and organization. Up-regulation of MMP-2 and MMP-9 was enhanced in elderly healthy subjects after experimental wounding as compared with young controls. Studies in aged animals have also demonstrated decreased re-epithelialization, depressed collagen synthesis, and impaired angiogenesis with decreased levels of multiple growth factors, including the proangiogenic factors FGF-2 and VEGF. Other studies have suggested that the early inflammatory period of wound healing is altered in the elderly, including impaired macrophage activity with reduced phagocytosis and delayed infiltration of macrophages and B lymphocytes into wounds.

The study also assessed site wise distribution of graft acceptance Among the patients of Lower limb ulcers, in 127(86.4%) patients grafts was accepted, where as in 19(12.9%)patients graft was partially accepted and in 1(0.7%)patients it was rejected. In patients of Upper limb ulcers grafted acceptance, partial graft acceptance and graft rejection was seen in 33(80.5%) 6(14.6%) and 2(4.9%) patients respectively. Patients of Chest ulcer had least chances of graft acceptance 5(71.4%) while in these patients partial graft acceptance was maximum i.e. 2(28.6%) patients. There was no significant association between site of ulcer and % of graft acceptance. This was statistically proved ($p>0.05\%$).

The study also show distribution of graft acceptance according to graft size. In the group of patients with area of ulcer < 60 cm^2 graft was accepted in 132(83.5%) patients, whereas graft was partially accepted in 23(14.5%) patients and was rejected in 3(2%) patients. The graft was accepted i.e. 27(90%), 6(100%) and 2(100%) in the group of patients with area of ulcer 61-120 cm^2, 121-180 cm^2, and 181-240 cm^2 respectively. Among patients with graft area >240 cm^2 graft was accepted in 03(75%) patients and was partially accepted in 01(25%) patient.

The present study also calculated graft acceptance in patients having history of tobacco, smoking and alcoholism. Among the patients who had history of tobacco chewing, there were 3(3.9%) patients in whom graft was rejected, 10(13.1%) patients in whom graft was partially accepted while 64(83%) patients in whom graft was accepted. Among the patients with history of smoking and alcoholism in 41(82%) and 97(88.9%) patients the graft was accepted respectively. Not a single graft rejected in patients who had no history of any of the above addictions. Although statistically there was no association was found between tobacco, smoking and alcoholism with graft acceptance ($p>0.05$) all the patients in whom graft was rejected had history of tobacco smoking while those patient who had no history of any addiction graft was not at rejected. This may be due to inadequate evaluation about dose and duration of these substances consumed by patients. It also depends on whether patients were continuing consumption of these materials or not during the study period. The results showed that rejection of the auto grafts was significantly more widespread and more common among cigarette smokers. The extent of rejection was 6.7±0.5% of the graft area as compared to 2,9+0,3% in the control group ($p<0,01$), The incidence of rejection and successful take was 66.6 and 28.7% respectively among the cigarette smoking group . The reason for the increase in rejection may be due to the toxic constituents in cigarette smoke. We recommend that smokers be encouraged to abstain from smoking prior to and post-burn grafting surgical procedures, which may be a useful preventive measure.

VI. Conclusion

The split graft is a straight forward technique to learn without need for complete instrumentation. Overall test costs can be best to a minimum without comprising the safety on long term success of the procedure. It is conclude that no age limit for skin grafting. It can be done for all age groups and is considered as standard for treatment of ulcers.

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