Original Research Article

Cadaveric donor skin allograft as a temporary dressing material in the management of complicated wounds

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Abstract

Introduction: Wounds resulting from various causes are the most common health problem in developing countries like India. Management of these wound is very difficult, requiring longer hospital stay, loss of income, psychological problems like depression. In our study, we used cadaveric donor skin as a temporary dressing material for wound cover and see the outcome of definitive split-thickness skin graft following cadaveric donor skin application. Previously cadaveric skin was used for covering the burns wound. Only very few studies are available regarding the use of cadaveric donor skin in the management of complicated wounds.

Materials and methods: This was a prospective, non-randomized, uncontrolled study conducted in the Department of General Surgery, Government Stanley Medical College Hospital from October 2017 to September 2018. Once the wound scheduled for cadaveric grafting, the cadaveric skin was meshed in the laminar flow cabinet, the skin was washed in the normal saline, to ensure that all the preservative fluid had been removed. The skin is transported in a sterile container. The cadaveric graft was applied to the wound. No fixation done. Limb was immobilized using POP. Sterile was dressing done.

Results: In our study 44 patients underwent cadaveric donor skin grafting. In 40 out of 44 patients (90.9%), the cadaveric donor skin had good take. All 40 patients underwent definitive split-thickness skin grafting. The mean graft take was 90.35%, with maximum graft take was 96% and minimum graft take was 82%. The standard deviation was 3.512%. When reviewing the literature which showed the success rate of STSG was 78% at closing 90% of the wound by 8 weeks. In our study, the mean duration of hospital stay was 34.2 days, with maximum of 57 days and a minimum of 17 days. Most

of the wounds required only single cadaveric graft application, 37 (84.1%) out of 44 patients and 7 patients (15.9%) required more than one cadaveric donor skin grafting.

Conclusion: By this study, we can able to minimize the expenses by using the cadaveric skin to predict the success of definitive split-thickness skin grafting. We can also minimize the duration of hospital stay and prolonged use of antibiotics if the cadaveric skin take is successful.

Key words

Complicated wounds, Cadaveric donor, Skin allograft, Biological dressing material.

Introduction

Wounds resulting from various causes like diabetes mellitus, post traumatic raw area, post-infective raw area are the most common health problem in developing countries like India. Management of these wound is very difficult, requiring longer hospital stay, loss of income, psychological problems like depression. So, proper management of these wound is very important. Most of these wounds are initially managed with serial debridements, regular dressing and once the wound becomes well granulated covered with split-thickness skin graft. There are various types dressing material like collagen dressing, collagen powder, etc. but these materials are highly expensive. In my study I used cadaveric donor skin as a temporary dressing material for wound cover and see the outcome of definitive split-thickness skin graft following cadaveric donor skin application. Previously cadaveric skin was used for covering the burns wound. Only very few studies are available regarding the use of cadaveric donor skin in the management of complicated wounds [1-6].

Materials and methods

This was a prospective, non-randomized, uncontrolled study conducted in the Department of General Surgery, Government Stanley Medical College Hospital from October 2017 to September 2018.

All wound patients who met the inclusion criteria were included in the study. All patients were informed about the procedure and fully written informed consent obtained from each patient.

A culture swab was taken from each patient, once the culture became negative irrespective of condition of the wound whether exposing bone or tendon, wound scheduled for cadaveric donor skin grafting.

The cadaveric graft was obtained from the skin bank in the department of cosmetology, Govt. Stanley Medical College Hospital.

Once the wound scheduled for cadaveric grafting, the cadaveric skin was meshed in the laminar flow cabinet, the skin was washed in the normal saline, to ensure that all the preservative fluid had been removed. The skin is transported in a sterile container.

The cadaveric graft was applied to the wound. No fixation done. Limb was immobilized using POP. Sterile was dressing done.

After 72 hours patient was scheduled for follow up to evaluate the adherence of the cadaveric skin to the recipient wound bed.

Adherence was evaluated by removing the donor skin using forceps; if the donor skin was removed without any resistance it was recorded as ‘no take’, meaning that it was not adhered to the underlying wound. For these patients another cadaveric graft was applied 1 week later, after negative wound swab culture. When the culture was positive, they were treated with sensitive antibiotic for 1 week. The process of applying cadaveric graft was continued till the full take was achieved. In between the periods patient received only local treatment.

In patients with 'good take', patient was scheduled for split thickness skin grafting in the next week. During the split-thickness skin grafting the graft was anchored to the wound bed using 3'0 prolene. Sterile dressing was done. Limb immobilized using POP.

First look examination was done 48 hours after split-thickness skin grafting then 4th and 6th post-operative day and one month later.

Inclusion criteria

- All patients with wounds resulting from trauma, diabetes, post-surgical infection at our hospital were included in the study.

Exclusion criteria

Ulcer resulting from Malignancy, Arterial ulcer, Venous ulcer were excluded from the study.

Sample size

Success rate of definitive split-thickness skin graft following cadaveric donor skin grafting from the previous study was 91%. So the P value was 91

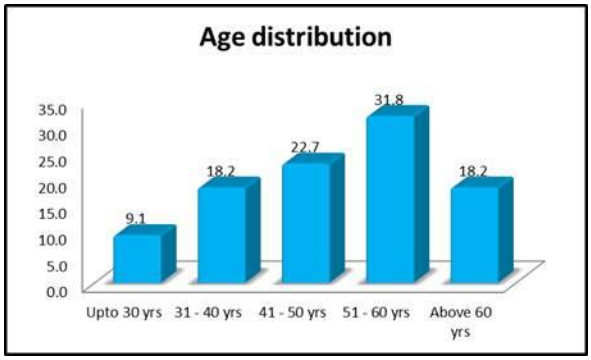
Sample size = $4pq/d^2$ where d is precision
Where p was 91, q was 9
Precision = 10%

When applying this formula the sample size was 40.
Considering the non-response rate of 10%
The final sample size = 40 + 4 = 44

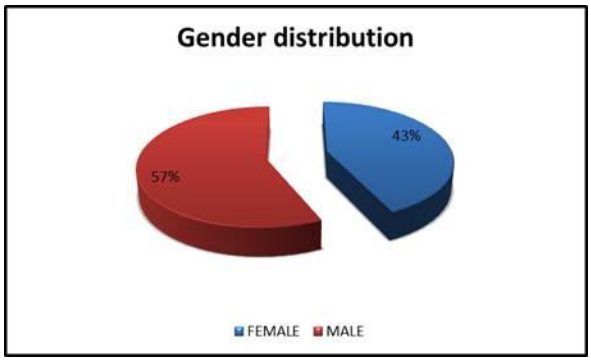
Results and Discussion

In our study 44 patients underwent cadaveric donor skin grafting. In 40 out of 44 patients (90.9%), the cadaveric donor skin had good take. All 40 patients underwent definitive split-thickness skin grafting. The mean graft take was 90.35%, with maximum graft take was 96% and minimum graft take was 82%. The standard deviation was 3.512%. When reviewing the literature which showed the success rate of STSG was 78% at closing 90% of the wound by 8 weeks. Age distribution was as per **Graph – 1** and gender distribution was as per **Graph – 2**.

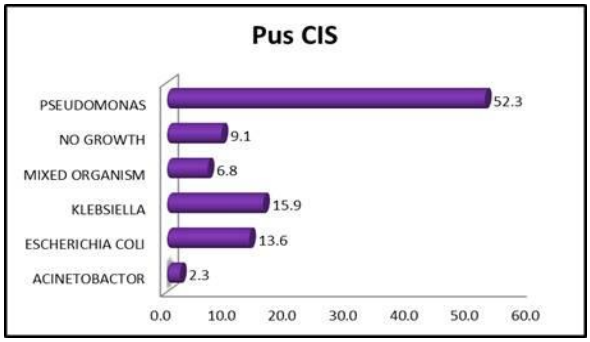
Graph – 1: Age distribution.



Graph – 2: Gender distribution.



Graph – 3: Pus CIS.

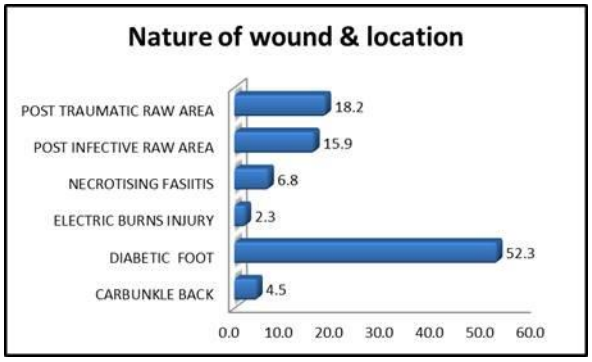


In 4 out of 44 patients (9.1%), the cadaveric had no take. 2 out of 4 patients had diabetic foot with exposed tendons and bones even after cadaveric skin grafting, so they underwent flap cover, one patient on pre-operative evaluation was diagnosed to have carcinoma of lung, so STSG was not done, another one patient had carbuncle back with exposed bones and tendons, STSG was not done for that patient.

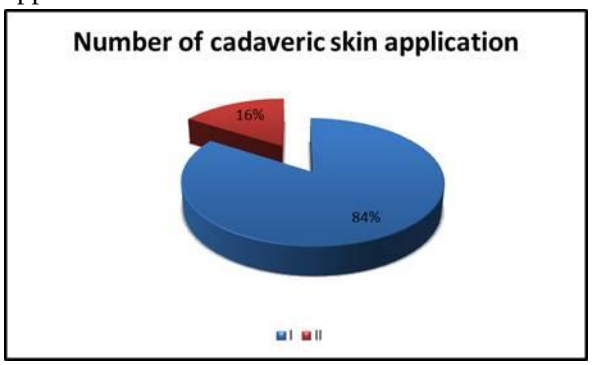
Of all the 44 patients, culture swab was taken before applying cadaveric donor skin grafting.

The most common species isolated was Pseudomonas (52.3), Klebsiella (15.9%) and Escherichia coli (13.6%). Some patients had more than one growth (6.8%) as per **Graph – 3**.

Graph – 4: Nature of wound and location.



Graph – 5: Number of cadaveric skin application.



In our study out of 44 patients, 23 patients (52.3%) had diabetic foot, 8 patients (18.2%) had post traumatic raw area, 7 patients (15.9%) had post infective raw area, 3 patients (6.8%) had necrotising fasciitis, 2 patients (4.5%) had carbuncle back, one patient (2.3%) had electric burns injury as per **Graph - 4**.

In our study, the mean duration of hospital stay was 34.2 days, with maximum of 57 days and a minimum of 17 days.

The average wound size in our study was 13.02X7.95 cm, with maximum of 32X20 cm and a minimum of 4X4 cm.

Most of the wounds required only single cadaveric graft application, 37 (84.1%) out of 44 patients and 7 patients (15.9%) required more than one cadaveric donor skin grafting (**Graph – 5**). The average number of cadaveric donor skin grafting for necrotising fasciitis was 1.5±0.1, in a study conducted by Yuvan-Sheng Tzeng, Taiwan [7].

In a study conducted by Sylvia A. Stageman, Rijinland Hospital (Leiderdorp, The Netherlands), evaluated the cadaveric donor skin to predict the outcome of definitive split-thickness skin grafting. In his study he applied cadaveric donor skin to 35 consecutive patients, 25 out of 35 patients (71%) the cadaveric donor skin had a good take. Out of the 25 cases 22 patients underwent split-thickness skin grafting, 3 patients were not grafted because of various reasons. In 20 out of 22 cases (91%) the STSG was successful after 3-4 days. Despite good take of initial cadaveric skin in two cases definitive STSG failed, because of the problems with wound bed itself. This study concluded that cadaveric skin graft increases the success of definitive split-thickness skin graft [6].

In a study conducted by Yuvan –Sheng Tzeng, Tri Service General Hospital, Taipei, Taiwan to evaluated the clinical experience using cadaveric skin for wound closure. 145 patients included in the study (51 had chronic ulcers, 26 had DFU, 16 had necrotising fasciitis and 52 had acute traumatic wounds). Patients with necrotising fasciitis exhibited significantly larger number of allograft (1.5 ± 0.1) than others. In all chronic ulcers only 1 skin allograft was required to achieve good wound bed preparation for skin grafting. The average number of days for each wound type to be ready for allo grafting was 7 days for chronic ulcer, 9.8 days for DFU, 10.5 days for necrotising fasciitis, 8.4 days for traumatic wounds. This study concluded that cadaveric graft increases the rate of wound healing and decreases the duration of hospital stay [7].

In a study conducted by Thomas C. Wilson, Pittsberg Medical Centre, Washington, PA to evaluate the effectiveness and safety of a biologically active cryopreserved skin allograft

for treating the wounds in the lower extremity exposing bones and tendons. 15 patients were included in the study. 14/15 patients (93.3 %) of wounds healed completely. Mean duration of coverage of bones or tendons was 36.4 (5.16 weeks), mean duration of complete healing of wound was 133 days (19 weeks). The mean number of graft applied was 2. This study concluded that cryopreserved skin allograft fastening the healing of chronic lower extremity wounds with exposed bones and tendons and decreasing the duration of hospital stay [8].

In a study conducted by Lawrence DiDomenico, prospectively compared the cryopreserved skin allograft with the bioengineered skin substitute in the management of diabetic foot ulcers, which showed 41.3% of the wounds treated with BSS closed within 12 weeks as compared to 66.7% of the wounds treated with SSA at 20 weeks, in a study conducted among 28 patients followed up for 20 weeks. This study concluded that skin allograft had better wound healing rate when compared to the bioengineered skin graft [9].

Figure – 1: Case - 1: Wound at the time of debridement.

Figure – 2, 3: Wound before cadaveric graft.

Figure – 4, 5: Cadaveric donor grafting.

Figure – 6, 7: First look after cadaveric grafting.

Brant McCartan and Thanh Dinh, Boston, USA in 2011 did metaanalysis to evaluate the use of split-thickness skin grafts on diabetic ulcerations which concluded that when used as a primary closure on optimized diabetic foot ulceration STSG are 78% successful at closing 90% of the wound by 8 weeks [10]. Cases are depicted as per **Figure – 1 to 16**.

Figure – 8, 9: Second look after cadaveric grafting.

Conclusion

Cadaveric donor skin grafting has the ability to function as predictor for take of definitive split-thickness skin grafting and thereby determine the readiness of a wound for receiving a definitive STSG. In 4 out of 44 patients treated with cadaveric donor skin, the wound did not accept the cadaveric donor skin grafting, which was probably due to various factors, including the problems with the wound bed or presence of bacteria. The high percentage of definitive STSG (90.35%) in those cases with positive swab culture result after cadaveric skin grafting may be due to the byproduct of antibiotic treatment. So by this study we can able to minimize the expenses by using the cadaveric skin to predict the success of definitive split-thickness skin grafting, so if the cadaveric graft had no take then the definitive STSG will not be done. We can also minimize the duration of hospital stay and prolonged use of antibiotics if the cadaveric skin take is successful.

Figure – 10, 11: Wound after definitive SSG.

Figure – 12: Case 2: Wound at the time of debridement.

Figure – 13, 14: One week after debridement.

Figure – 15: Wound after cadaveric graft.

Figure – 16: Wound after definitive SSG.

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