



A CLINICAL STUDY DEMONSTRATING THE EFFECTIVENESS OF NEGATIVE PRESSURE WOUND THERAPY (NPWT) ON POST OPERATIVE IMMOBILIZATION OF SKIN GRAFTS

General Surgery

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ABSTRACT

Background: Skin grafting being a commonly performed procedure comes with it's challenges regarding uptake and immobilization especially in areas requiring early mobility. The use of NPWT in such cases not only helps in reducing complications but also in reducing the hospital stay and requirement for regrafting. **Methods:** This is a prospective observational study conducted in Narayana medical college and hospital, Nellore. 20 cases admitted for skin grafting with negative culture report were enrolled in the study after obtaining consent. The status of graft was assessed on 4th and 6th postoperative day for complications. **Results:** The number of cases presenting with complications were 2 at the end of study requiring regrafting. The average length of hospital stay from application of graft to discharge was 7days. Mobility was not completely restricted in cases with NPWT in the post operative period increasing compliance of therapy by the patient. **Conclusion:** NPWT usage in post operative immobilization of skin grafts is shown to increase the chances of uptake and reducing complications and requirement for regrafting.

KEYWORDS

Skin graft, NPWT, Adherence, Immobilisation

INTRODUCTION:

Skin grafting is a procedure performed to cover cutaneous defects and involves transfer of cutaneous tissue from one site of body to another. Depending on the thickness of dermis of graft that is harvested, skin grafts are defined as full thickness or split thickness skin grafts (STSG). STSG consists of epidermis and varying amount of dermis, on the basis of which it is classified as thick or thin. Skin wounds extending through dermis heal through mechanisms of scarring and wound contraction. The risk of infection increases with increasing surface area of defect.^{2,4} Application of skin graft in such cases helps in preventing infection, wound contracture and proper healing. The indications for STSG are many and include raw areas created iatrogenically or following burns, trauma, during reconstruction, non healing ulcers etc.³

The post operative wound care involves immobilisation of graft for atleast 5-7 days to enhance uptake & revascularization, appropriate antibiotic cover etc. The most common causes of graft failure include hematoma, seroma, infection and improper immobilization.^{5,6}

The conventional methods for immobilization include application of antibiotic and paraffin coated gauze over the grafted area followed by tie over/regular dressing supplemented by POP cast or crepe bandage.⁸ In difficult areas like sacrum, back and in wounds over joint regions or lower extremities where early mobilization is required, conventional methods might pose a challenge.⁹ Application of vacuum assisted pressure devices in such areas might provide proper immobilization of graft and has the advantage of preventing fluid and debris accumulation, reducing oedema, stimulation of angiogenesis, increasing circulation and lymphatic drainage, uniform application of pressure etc.⁷

The current study aims at demonstrating the effectiveness of NPWT in immobilization of skin graft.

MATERIAL AND METHODS:

This is a prospective observational study conducted in Narayana medical college, Nellore. 25 patients admitted for skin grafting were included in study after obtaining consent and the final study sample was 20, eliminating the five patients with positive culture for micro organisms and drop outs. Wound bed was thoroughly prepared prior to procedure and appropriate antibiotic cover and sterile precautions were maintained. Sterile antibiotic coated paraffin gauze was placed

over grafted area after fixing and 2 layers of thin poly urethane foam cut in the shape of wound with perforated tubing in between is placed over the graft. The foam is then sealed over by a transparent drape to provide a closed airtight system. The device is then left in place for 4 days and later dressing is opened to assess status of graft. The NPWT was re-applied for another 48 hrs and checked on 6th post operative day. The parameters assessed on removal of dressing were presence of seroma, infection, adherence of graft, vascularity etc. Additional parameters assessed are length of hospital stay and time for mobilization.

RESULTS:

In the final study population (n=20) there were 8 females and 12 males. The mean age was 41 y with the highest population in age group 36-45 y.

The indications for STSG in patients in descending order are post debridement wounds (n=9), post traumatic (n=5), post burn (n=4) and grade 2 bedsores (n=2).

The grafted site was checked for status on 4th and 6th post operative days for seroma, infection, reduced vascularity and adherence.

Patients were considered for discharge depending on the status of graft on 6th post operative day and absence of fever. They were advised wound dressing at home and were advised follow up after 1 week.

The average length of hospital stay was measured from the time of application of skin graft to discharge.

Number of cases presenting with seroma are 0. 2 cases presented with infection of graft on 4th and one on 6th day and the indications for grafting were debridement and burn wound. The adherence and vascularity of graft (no oedema or congestion) were uniform and satisfactory in the rest of the cases.

The average length of hospital stay was 7 days. Full range of motion was advised for cases requiring mobilization 2 weeks from application of skin graft.

Table 1: Demographic data

Parameter	Number	Percentage
Total study sample	20	

Male	12	60%
Female	8	40%
Indication for surgery		
Post debridement	9	45%
Post traumatic	5	25%
Post burn	4	20%
Grade II bedsore	2	10%

Table 2: Results - No. of cases with complications

Complication	4th POD (n =)	6th POD (n =)
Seroma	0	0
Infection	2 (10%)	1 (5%)
Decreased Vascularity	1 (5%)	1 (5%)
Loss of Adherence	1 (5%)	2 (5%)

DISCUSSION

Skin grafting being a commonly performed procedure, requires optimal immobilization and at the same time adequate drainage to avoid complications like seroma, infection etc. Prolonged immobilization though aiding with the graft uptake is associated with an increased risk of venous thrombo embolism (VTE) and deconditioning.⁴

The standard immobilization techniques include the application of tie over dressing with supplementary POP or crepe bandage. This study aimed at demonstrating the effectiveness of NPWT in post operative immobilization of grafts, the advantages of which include early mobilization and uptake and reduced need for regrafting.⁷

San Antonio et al in 2010 published guidelines for the use of NPWT regarding the method of application and assessment of response and the principles were followed accordingly in the current study.⁵

A survey conducted by Lisa J Ellis et al in 2020 for plastic surgeons in Australia regarding the use of NPWT on SSG over lower limbs and it's use overall in immobilization and their experiences to assess whether the change was useful or not. Survey responses showed a reduction in the number of days for immobilization in NPWT group compared to the standard methods. A large proportion of doctors however continued to prescribe rest and limited mobilization of the grafted site.¹ A randomized control study was conducted by Mir Mohsin et al in 2017 using NPWT for immobilization in one group and conventional methods in the other group.² The mean graft uptake rate was 99.74% in the NPWT group when compared to non NPWT group where the uptake rate was 88.52% with six cases requiring regrafting. The current study showed similar outcomes where uptake rate was 90%, however there was no comparison over the use of standard immobilization techniques. The hospital stay duration was in the range of 6-10 days in our study.

In an RCT conducted by Sara fu yin hsiao et al in 2016, comparing the occlusive method of dressing for STSG using NPWT with conventional methods, they found no significant differences in graft uptake rates in both the groups (71.4% in NPWT vs 85.1% in non NPWT group). However, they did notice reduced pain complaints by patients while changing dressing in NPWT group and no hypertrophic scar formation in followup period. In the study, NPWT was handmade using polyurethane foam and a syringe and silicone penrose drain providing drainage through capillary action compared to the regular VAC equipment to make the use cost effective.³ This did not provide adequate pressure and led to the formation of organized clots beneath the graft in some cases.

A prospective observational study conducted by G Sposato et al in 2001 using mini VAC devices for grafts over lower limb in 7 patients showed nearly 100% uptake in 6 cases and 95% in 1 case and 80% in 1 case in one of the wounds. Patients were encouraged to mobilize in the early postoperative period due to occlusion dressing and status assessed every three days.⁸

S. Gupta et al in 2012 shared his case reports of 7 patients with varied etiologies indicated for STSG applying NPWT and concluded that the results were satisfactory and the graft was healthy and there was no requirement for regrafting in those cases.⁴

The factors for consideration for survival of a skin graft are adequate drainage & immobilization, avoiding dehydration of graft and adherence to dressing material which may result in tearing up of fragile

vessels and dislocation of graft during dressing.^{1,7,8} The provision of these characteristics along with the hydrocolloid nature of the polyurethane foam is known to provide moist environment for the graft & prevents adherence.⁸

CONCLUSION

The current study aimed at demonstrating effectiveness of NPWT on postoperative immobilization of skin graft. The traditional methods with tie over/regular dressing and supplementary use of POP or crepe bandage were associated with increased chances of exposure of graft to shearing forces during removal of dressing, reduced mobility resulting in complications and increased hospital stay for uniform adherence or infection or regrafting.

The application of NPWT for immobilization helps in not only uniform application of pressure & adherence but also in preventing seroma, infection, promoting angiogenesis and reducing hospital stay and time for immobilization favouring the patient.

NPWT in the form of bedside suction apparatus is readily available at institutions and is cost effective, useful for regular application.

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