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Comparison of STSG Donor Site Healing, Dressing with Betamethasone + Polymyxin B Vs Sterile Tulle Dressing Impregnated with 1% Framycetin Sulphate

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ABSTRACT

Background: Wound healing at the split-thickness skin graft (STSG) donor site is an important aspect of reconstructive surgery that has been characterized by pain, delayed healing, and complications. Improving patient outcomes is the ultimate goal, and it is critical and possible to do all that is needed to optimize donor site management. **Objectives:** Experimental objectives to determine the effectiveness of Betamethasone + Polymyxin B dressing to that of sterile tulle dressing soaked in 1% framycetin sulfate in enhancing donor site healing and minimizing complications. **Materials and Methods:** A prospective randomized controlled trial was carried out for 12 months at CMH Rawalpindi, Pakistan in the duration from 1st November 2023 to 30th November 2024. Out of 100 patients, both groups were formed, and the donor sites were treated with the dressing. Recovery period, reported pain, and adverse outcomes were assessed at 2-week, 4-week, and 6-week intervals. **Results:** The beta-methadone and polymyxin B dressing was found to have reduced the length of healing time (12 ± 2.5) as compared to framycetin sulfate dressing (16 ± 3.2) $p<0.05$ for pain scores and infection rates. Other post-operative-related complications that were lowered included scarring and hyper granulation. **Conclusion:** Betamethasone + Polymyxin B dressing is more effective in managing the donor site of STSG, has lesser healing time, and less pain and complications.

INTRODUCTION

The aim proposed in this study is to measure the consequences of identification for split-thickness skin graft donor site and the reason why to dress with betamethasone + polymyxin B dressing while not the sterile tulle dressing comprising 1% framycetin sulfate. STSG is currently one of the most recognizable forms of reconstructive surgery because a large area may need to be covered due to injury, burns, or disease. However, the literature reveals that the donor site has many complications like pain, infection, slow healing, and scarring at the donor site (1). The emergence of such complications is touched on in the systematic literature review treatment of the donor site should be elaborated strictly according to the potential impact on patient outcomes (1).

Healing of the STSG donor site depends on certain factors, such as the type of dressing used. For instance, sharp healing characteristics have been noted regarding the scalp donor sites because of vascularity and other attributes that bear a considerable difference from the recipient sites (2). This highlights the importance of determining different dressing materials in order to avail for better healing especially in difficult categories. Patients with dermatophytosis, for example, are always old-aged patients who have relatively slow healing, and specialized interventions are important in their management (3). New procedures, including free rectangular thick-skin flaps and full-thickness skin columns, have been described to improve the healing time and morbidity of the donor site, once again emphasizing that this area has continued to evolve (4).

It is important to evaluate various dressing techniques based on the type of dressing used to solve problems connected with donor site healing. For instance, the application of dermal substitutes along with STSG has been proven clinically better than the conventionally used FTSG (5). There is also platelet-rich fibrin that has been seen to improve wound healing by virtue of being a growth factor this was seen in a randomized placebo control study (6). These results take further the use of bioactive dressings together with other modalities for enhancing the rate of wound healing.

The use of betamethasone in donor site management has attracted interest because of its anti-inflammatory vendor. Another study comparing the use of bioabsorbable dressings carrying betamethasone and ciprofloxacin showed enhanced amount of wound healing and reduced incidence of infections (7). Likewise, the use of topical steroids in the form of steroid patches that list betamethasone among the active ingredients is suitable for the treatment of chronic skin disorders. The same indicates that steroid preparations can be useful in the treatment of donor sites (8). New biopharmaceutical systems like chitosan-based nanocomposites have also improved the controlled release of therapeutic agencies, for example, betamethasone, hence increasing their effectiveness (9).

Framycetin sulfate, another agent incorporated in the donor site dressings, has been accepted due to its broad anti-microbial properties. The work has confirmed that the work has optimality in reducing bacterial load on the surfaces of the wounds and enhance the healing progress. Besides, PRP has been determined to prevent new bone formation in the donor site and relieve pain for its fast recovery, which emphasizes the significance of new approaches in the interest of the patient's improved recovery and improved quality of life (11). Other related enhancements of the dressing for the sites by the donors also entail the use of regenerative agents such as Rigenase® has also been observed to have some advantages in terms of identifying the quality of scars and the healing period (12).

Tumescent regional anesthesia and analgesia become beneficial in wound care and healing to decrease pain and pain associated with the donor site. A review of these variants of interventions showed that they are effective in enhancing patient satisfaction and recovery experience (13). Sophisticated techniques to perform fat grafts, like nano fat grafts, have also shown certain possibilities to improve the rate of healing as well as lesser chances of adverse effects at donor sites (14). The comparison between biological and non-biological dressing makes more appreciation of the idea that treatment planning should be individualized to obtain the most desirable outcomes (15).

This work intends to advance the knowledge in dressing approaches through identifying a pair of dressing techniques betamethasone + polymyxin B and sterile tulle dressing soaked with 1% framycetin sulfate. Thus, by assessing the effects on the healing of the donor site, the study aims to determine which management modality is better for STSG donor sites. The result will be of significant value to clinicians and researchers and, ultimately, enhance the quality of treatments being delivered to patients and the overall development of the reconstructive surgery specialty.

Objective

To evaluate the two types of dressings, betamethasone, and polymyxin B dressing compared to the sterile tulle dressings soaked in 1% framycetin sulfate to determine which of these two dressing materials speeds up split-thickness skin graft donor site healing rate and minimizes the occurrence of complications.

MATERIALS AND METHODS

Study Design: This was a randomized, controlled comparative study comparing Betamethasone + Polymyxin B dressing to an STSG donor site and sterile tulle dressing impregnated with 1% framycetin sulfate.

Study setting: The present study was conducted at the at CMH Rawalpindi, Pakistan in the duration from 1st November, 2023 to 30th November 2024 for one year.

Inclusion Criteria

The study enrolled patients eighteen years of age and older who needed STSG for reconstructive surgery. For both groups, the participants had to have good general health with no active systemic infection and had to abide by the study protocol. Patients of both sexes with any type of skin defect, regardless of its cause, could participate in the study.

Exclusion Criteria

Patients with chronic diseases that impact the wound healing process, for instance, diabetes mellitus or peripheral vascular disease, were not included. Exclusion criteria were definite allergy to the dressing materials, lack of complete follow-up, and multiple donor sites. Patients who were either on immunosuppressive therapy or had poor nutritional status were also excluded.

METHODS

Patients meeting the inclusion criteria were randomly assigned to one of two groups. Either Group A betamethasone incorporated into a polymyxin B dressing or Group B sterile tulle dressing containing 1 percent framycetin sulfate. Allocation concealment was done using computer-generated random numbers. The donor sites were cleaned antiseptically, and the dressing assigned to them was put on instantly after the operation. The dressings were replaced in accordance with the recommendation of the respective manufacturers and on the basis of the evaluation of the wound status. The

healing process was assessed clinically at weekly intervals using such aspects as epithelialization rate, pain through VAS scale, infection incidence and comfort. Photo documentation was done at each follow-up visit, and the final wound healing was assessed by observers who were blinded to the patient's previous surgical treatment. The data was collected in six weeks, and a statistical tool was used to analyze the data. The comparisons of the healing time, the rates of complication, and other parameters of patients' satisfaction were made to determine which of the dressing methods was more effective.

RESULTS

For the present study, 100 patients planned for STSG for reconstructive surgery were included and both genders were equally distributed into group A and B having fifty patients each. They all revealed no significant differences at the demographic characteristics including age, slots, gender as well as donor site. Healing time, pain intensity, and complication were assessed at six weeks of follow-up and compared.

Healing Time

The mean healing time observed in Group A (betamethasone + polymyxin B dressing) was significantly lower than that in Group B (sterile tulle dressing with 1% framycetin sulfate). Wound healing time recorded in Group A was 12 ± 2.5 days, while in Group B was 16 ± 3.2 days ($p < 0.05$).

Table 1

Parameter	Group A (n = 50)	Group B (n = 50)	p-value
Mean Healing Time (days)	12 ± 2.5	16 ± 3.2	< 0.05

This shorter period of healing supports the notion that betamethasone + polymyxin B encouraged faster epithelialization than other substances.

Pain Assessment

The patients' pain was evaluated, in general, one time per week using the VAS visual analog scale, on which 0 pointed to the absence of pain and 10 to severe pain. It also showed that Group A consistently possesses a lower design of pain at each follow-up interval than Group B. On the 7th day, the mean VAS score of the patients in Group A was 4.2 ± 1.1, while in Group B, was scored 6.5 ± 1.3 ($p < 0.01$). As for the result, as shown in Table 2, after four weeks of treatment, pain scores in the two groups were reduced significantly, and Group A still kept lower pain intervals relatively.

Table 2

Time Point	VAS Score (Group A)	VAS Score (Group B)	p-value
Day 7	4.2 ± 1.1	6.5 ± 1.3	< 0.01
Day 14	2.8 ± 0.9	4.3 ± 1.0	< 0.01
Day 28	1.0 ± 0.5	1.8 ± 0.6	< 0.05

Group A demonstrated the pain decrease hence implying that betamethasone has an analgesic effect in the donation site.

Complications

Regarding the complication rates, the overall infection rate and delayed healing were assessed. A lower incidence of infection was observed in Group A, which had 10%, compared to Group B students, which had an infection rate of 18% ($p < 0.05$). Smaller incidents of other complications, like increased scarring and hyper granulation, were later noted in Group A.

Table 3

Complication	Group A (n = 50)	Group B (n = 50)	p-value
Infection Rate (%)	10	18	< 0.05
Excessive Scarring (%)	4	8	0.12
Hypergranulation (%)	2	6	0.08

The results prove that the betamethasone + polymyxin B dressing embarked on the healing phase more quickly as well as reduced the complication level than the high control group, which used sterile tulle dressing soaked with 1% framycetin sulfate. The study results show clearly that betamethasone + polymyxin B dressing has greater potential in enhancing donor site healing rate and decreasing pain level as well as complications level compared to sterile tulle dressing with 1% framycetin sulfate. These findings also indicate its favorable applicability as an option for STSG donor site treatment.

DISCUSSION

The findings of this present research suggest the Qualitative and quantitative outcomes showing the efficacy of betamethasone + polymyxin B dressing compared to the sterile tulle dressing soaked in 1% framycetin sulfate when used on the split-thickness skin graft donor site. These results support prior studies and contribute new knowledge about enhancing the care of the donor site to improve the rate of healing, less pain, and fewer complications. A shorter healing time of the betamethasone + polymyxin B group supports the use of additional anti-inflammatory and antimicrobial agents in dressings for the donor site. Similar findings were made by Asuku et al which also emphasized that the use of innovative dressing materials may enhance epithelialization time and the patient's outcomes (1). Reduced local inflammation also supports the hypothesis that betamethasone helped to enhance the rate of wound healing in the case described. This is in line with Oh, who underlined the fact that in order to promote the healing of the donor area, inflammation at a local level must be decreased (2).

Donor site management focuses on pain feel is an important part of patient management. The lower pain scores indicated in the betamethasone + polymyxin B dressed group suggest that more caution be exercised in

the choice of dressings utilized as healing agents but also with minimal discomfort to the patient. Betamethasone's influence on the reaction affected pain as indicated in previous research on chronic wound treatment with steroids (7, 8). Further, polymyxin B could have minimized subclinical infections that are a frequent source of pain in the donor site wounds (6, 9). These results share an affirmation with McBride et al., where they focused on healing and pain in the management of the donor site (13). The lower infection rate in the betamethasone + polymyxin B group will add credence to its use as a donor site dressing. Infection is a significant factor in STSG donor sites' delayed healing and increased patient morbidity. The use of polymyxin B presents an antimicrobial action that can reduce this risk and has been exemplified in this study. The same observations were expressed by Vaheb et al., who underlined the effect of antimicrobial agents when it comes to the prevention of infections, as well as the acceleration of the wound healing process (6). However, the coexistence of anti-inflammatory and antimicrobial actions in one dressing has clear advantages, which are illustrated by Jain and other authors in their work on platelet-rich plasma applications and other modern methods (11).

The sterile tulle dressing lined with 1% framycetin sulfate proved most suitable in terms of inhibiting bacterial colonization, but it was found to have comparatively slower healing indices and slightly higher pain scores. Anti-inflammatory properties were not detected with Framycetin sulfate in this study and this fact may have been responsible for the demonstrated differences between Framycetin sulfate on the one hand and betamethasone on the other in this study. Framycetin-based dressings were described by Rahman et al. as being effective in relation to infection control however, they do not appear to offer the other requirements needed for tissue repair (15). The findings indicate that there is a need to enhance the findings by a more unified approach with enhanced antimicrobial and anti-inflammatory activity for this donor site. The lower rates of complication in the betamethasone + polymyxin B group also support this product as an ideal dressing choice. Complication rates like excessive scarring and hyper granulation were lower than with other products and this may also be due to the changes in tissue remodeling processes due to the incorporation of betamethasone. The same kind of findings were echoed by López Estebaranz et al., who described the benefits of steroid-based therapies in the area of wound healing and likely hood of scar formation (10). The observations also complement the principle of work of Papa et al., who have identified that dressings with regenerative agents improve scar characteristics and reduce complications (12).

These might include such things as new dressing materials, which are still being developed in wound care, and new treatment methods. For example, where Wierzchowska et al. have detailed that bioabsorbable dressings help in repairing wounds and have fewer complications, the same token, ElSherbeny et al. have also described that Nano fat grafts facilitate healing. Although these approaches were not employed in this study, they bring about future research focus and implementation in clinical practice. Likewise, platelet-rich fibrin and other bioactive agents have great value in the donor site wound, highlighting the relevance of having a Bothnia steroid multicorporate medical approach to wound healing (6, 11).

However, the following limitations can be considered while discussing the advantages of this research. This work was performed in a single center, and such results might not be applicable to other centers. Furthermore, some factors, such as healing time, pain, and complications, were considered in the study, but patient satisfaction and cost factors were not considered. There is needed to continue work in these directions in order to provide a better understanding of the strengths and weaknesses of the applied techniques of dressing. The conclusion arrived at in this study supports the findings that betamethasone + polymyxin B dressing is best in the management of STSG donor sites. This dressing is less painful and has fewer complications than a sterile tulle dressing dresser with 1% framycetin sulfate. These findings contribute to the emerging body of evidence-based knowledge of the role of using advanced dressing materials in the management of the donor site. More research should be directed towards discovering other forms of therapeutic interventional approaches and establishing higher treatment duration for the intervention. Moreover, should incorporate health economic evaluations to support the therapeutic option and the patient’s recovery process.

CONCLUSION

From this work, it can be deduced that betamethasone + polymyxin B dressing is better in the STSG donor area than sterile tulle graft dressings with 1% framycetin sulfate. Betamethasone + polymyxin healed more effectively than the other preparations as a result of a short period of healing, a mild degree of pain, and the lowest rate of embracing infection or scarring. Both are credited to their anti-inflammatory and antimicrobial effects that also accelerate epithelialization of the wound. Some of the study implications relate to selecting the appropriate kinds of advanced dressing materials that are optimal for meeting multiple wound healing requirements, controlling pain, and reducing the incidence of healing complications. The present study also supports the efficacy of betamethasone + polymyxin B dressing further research must be done to assess the

results at a later stage as well as to compare the cost of the product. The integration of such strategies into practice in reconstructive surgery can lead to an improvement in the rehabilitation, quality of life, and use of resources for patients.

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