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Original Research Article

A Randomized controlled trial Comparing Vacuum-Assisted Dressing and Conventional Dressing in the Management of Complicated Skin and Soft Tissue Infections

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Abstract:

Complicated skin and soft tissue infections (SSTIs) are associated with delayed wound healing, prolonged hospital stay, and Increased morbidity. Conventional dressings have traditionally been used for wound management. However, vacuum assisted dressing, also known as negative pressure wound therapy (NPWT) has emerged as an effective modality that promotes granulation tissue formation and enhances wound healing.

Objectives: To compare the efficacy of vacuum-assisted dressing vs conventional dressing in the treatment of Complicated skin and soft tissue infections.

This prospective randomized controlled study was conducted in Department of General Surgery at Deen Dayal Upadhyay Hospital, New Delhi. Forty patients with complicated skin and soft tissue infections were randomly allocated into two groups: vacuum-assisted dressing (n = 20) and conventional dressing (n = 20). The primary outcome was the rate of granulation tissue formation expressed as percentage of ulcer surface area. Secondary outcomes included time required for wound bed preparation and duration of hospital stay. Statistical analysis was performed using SPSS version 23.

Results: Granulation tissue formation was significantly higher in the NPWT group compared to the conventional dressing group. Mean granulation tissue growth at day 4 was 7.88% in the NPWT group compared to 5.00% in the conventional group ($p < 0.001$). At day 8, granulation formation increased to 37.72% in NPWT versus 23.96% in the conventional group ($p=0.001$). By day 12, granulation tissue formation reached 69.24% in NPWT compared to 48.28% in the conventional group ($p =0.003$). At day 16, NPWT demonstrated 83.72% granulation compared to 62.76% in conventional dressing ($p =0.011$).

Conclusion: Negative pressure wound therapy significantly enhances granulation tissue formation and accelerates wound bed preparation compared to conventional saline dressing in complicated SSTIs

Keywords: Negative pressure wound therapy; vacuum-assisted dressing; conventional dressing; skin and soft tissue infection; wound healing

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Introduction

Complicated skin and soft tissue infections constitute a major clinical problem in surgical practice and are associated with significant morbidity, healthcare expenditure, and prolonged hospital stay [1]. These infections frequently lead to extensive tissue destruction, increased bacterial burden, and impaired wound healing, particularly in patients with comorbid conditions such as diabetes mellitus and peripheral vascular disease [2].

Conventional wound management typically involves regular dressing changes aimed at controlling infection and promoting wound healing. Although widely practiced, this approach often requires frequent dressing changes, prolonged hospital care, and intensive wound monitoring [3]. Delayed granulation tissue formation and persistent wound exudate further complicate wound management in these patients [4].

Negative pressure wound therapy (NPWT), commonly referred to as vacuum-assisted dressing, has gained widespread acceptance as an effective adjunct in wound management. The technique involves the application of controlled sub-atmospheric pressure to the wound surface, which helps reduce edema, improve local perfusion, decrease bacterial load, and stimulate granulation tissue formation [5,6].

Several studies have demonstrated the beneficial effects of NPWT in managing chronic wounds, traumatic wounds, and postoperative infections [7–9]. Despite increasing evidence supporting its use, comparative studies evaluating vacuum-assisted dressing against conventional dressing in complicated SSTIs remain limited, particularly in resource-constrained healthcare settings [10].

Therefore, the present randomized controlled study was undertaken to compare vacuum- assisted dressing with conventional dressing in terms of wound healing parameters and early clinical outcomes among patients with complicated skin and soft tissue infections.

Study Design

Randomized controlled trial

Study Setting

The study was conducted in the Department of General Surgery at Deen Dayal Upadhyay Hospital, New Delhi.

Sample Size

A total of 40 patients diagnosed with complicated skin and soft tissue infections were included in the study.

Study Groups

Eligible patients were randomized into two study groups using sealed envelope technique.

Group A: Vacuum-assisted dressing (n = 20)

Group B: Conventional dressing (n = 20)

Inclusion Criteria

- Patients aged 18 years and above
- Diagnosed with complicated skin and soft tissue infections
- Patients who provided informed consent for participation

Exclusion Criteria

- Wounds associated with malignancy
- Severe peripheral vascular disease
- Immunocompromised patients

Randomization

Eligible patients were randomly allocated into the two study groups using a sealed envelope randomization technique.

Intervention

Patients in Group A received vacuum-assisted dressing with controlled negative pressure therapy.

Patients in Group B were managed using standard conventional saline-based wound dressings with regular dressing changes.

Outcome Measures

The following parameters were assessed:

- Time to appearance of healthy granulation tissue
- Duration of hospital stay
- Progression of wound healing
- Incidence of complications

Results

Table 1: Demographic Profile of Patients

Variable	Vacuum-Assisted (n=20)	Conventional (n=20)
Mean age (years)	49.96 ± 11.72	41.80± 15.78
Male	14	13
Female	6	7

Both the groups were comparable in terms of demographic characteristics.

Table 2: Granulation tissue formation

TIME	NPWT %	CONVENTIONAL	p- value
Day -4	7.88	5.00	<0.001
Day -8	37.72	23.96	0.001
Day -12	69.24	48.28	0.003
Day -16	83.72	62.72	0.011

Table 3: Time to develop Healthy Granulation Tissue

Dressing Type	Mean Duration (days)
Vacuum- assisted	8.4 ± 2.1
Conventional	14.6 ± 3.4

Table 4: Duration of Hospital Stay

Dressing Type	Mean Duration (days)
Vacuum- assisted	12.2 ± 3.5
Conventional	18.9 ± 4.1

Table 5: Complications

Complication	Vacuum-assisted	Conventional
Persistent infection	2	6
Delayed healing	1	5

The vacuum-assisted group experienced faster wound healing, less hospitalization and fewer complications compared to conventional dressing group.

Discussion

Complicated skin and soft tissue infections (SSTIs) remain a significant challenge in surgical practice due to delayed healing, risk of systemic complications, and prolonged hospitalization. Effective wound management strategies are therefore essential to improve clinical outcomes and reduce healthcare burden. The present study compared vacuum- assisted dressing with conventional dressing in the management of complicated SSTIs and demonstrated superior outcomes with negative pressure wound therapy.

Patients treated with vacuum-assisted dressing showed earlier formation of healthy granulation tissue compared with those receiving conventional dressings. Granulation tissue development is a key indicator of wound healing progression.

Previous studies have demonstrated that negative pressure wound therapy promotes wound healing by inducing micro-deformation at the cellular level, enhancing angiogenesis, and stimulating cellular proliferation. [12-14] These mechanisms improve tissue perfusion and support faster tissue regeneration.

The incidence of complications was also lower in the vacuum-assisted dressing group. Negative pressure therapy reduces tissue edema, improves microcirculation, and decreases bacterial burden within the wound bed, thereby creating a favourable environment for healing. [15] These effects likely contributed to the reduced incidence of persistent infection and delayed healing observed in the present study.

An additional important finding was the shorter duration of hospital stay among patients treated with vacuum-assisted dressing. Reduced hospitalization improves patient recovery and decreases the overall burden on healthcare systems. Economic analyses have suggested that although NPWT may have higher initial costs, it can ultimately be cost-effective due to faster healing and fewer complications. [16] Conventional dressings often require frequent changes and prolonged wound care, which may extend hospitalization. [17]

Our findings are consistent with previous studies demonstrating the effectiveness of NPWT in complex wound management. Clinical trials and systematic reviews have reported improved granulation tissue formation, reduced bacterial load, and faster wound healing with negative pressure therapy compared with traditional wound care methods. [18-20] Economic evaluations also support the long-term benefits of NPWT due to improved treatment efficiency and reduced complications.[21] Current consensus guidelines further recommend NPWT as an effective adjunct in the management of complicated wounds. [22-25]

Limitations:

The present study has certain limitations. The sample size was relatively small and the study was conducted at a single centre, which may limit the generalizability of the findings.

Additionally, long-term wound outcomes and cost-effectiveness analysis were not evaluated.

Clinical Implications:

Despite these limitations, the study supports the clinical utility of vacuum-assisted dressing as an effective modality for managing complicated SSTIs. Its ability to accelerate wound healing and reduce hospital stay may improve patient outcomes and optimize healthcare resource utilization.

Future Directions:

Further multicenter studies with larger sample sizes and longer follow-up periods are required to validate these findings and assess the long-term cost-effectiveness and clinical benefits of vacuum-assisted wound therapy.

Conclusion

Vacuum-assisted dressing is superior to conventional dressing in the management of complicated skin and soft tissue infections. It promotes faster granulation, reduces hospital stay, and lowers complication rates. Vacuum-assisted therapy should be considered a preferred modality in appropriately selected patients.

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