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NEGATIVE PRESSURE WOUND THERAPY VERSUS CONVENTIONAL DRESSING IN TREATMENT OF INFECTED CHRONIC WOUNDS IN RURAL HOSPITAL: A PROSPECTIVE CASE CONTROL STUDY

General Surgery

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ABSTRACT

Background: Chronic infected wounds remain a major challenge in surgical practice, especially in rural settings where resources are limited. Negative Pressure Wound Therapy (NPWT) has been reported to accelerate healing, but its high cost limits accessibility. **Aim:** To compare the effectiveness of an economical modification of NPWT with conventional dressing in the management of infected chronic wounds. **Methods:** This prospective case–control study was conducted at a rural hospital between 2018 and 2021. Fifty patients with infected chronic wounds were enrolled and divided into two groups: NPWT (n = 25) and conventional dressing (n = 25). Parameters assessed included healing time (days to achieve healthy granulation tissue), wound contraction rate, granulation tissue appearance, wound surface area reduction, hospital stay, type of wound closure, and treatment cost. **Results:** NPWT significantly reduced mean healing time (12.4 ± 2.3 vs 21.6 ± 3.7 days, $p < 0.001$) and hospital stay (14.2 ± 2.9 vs 24.1 ± 4.1 days, $p < 0.001$) compared to conventional dressing. Wound contraction rate and granulation tissue formation were faster in the NPWT group. Though the initial cost per session of NPWT was higher, the overall cost was lower due to shorter hospital stay and fewer dressing changes. **Conclusion:** An economical modification of NPWT is more effective than conventional dressing in achieving early wound healing and reducing hospital stay in patients with infected chronic wounds, making it a viable option in resource-limited rural hospitals.

KEYWORDS

Negative pressure wound therapy, Vacuum-assisted closure, Chronic infected wounds, Conventional dressing, Rural hospital

INTRODUCTION

Chronic wounds represent a persistent burden to healthcare systems, particularly in resource-limited rural settings. Their management requires cost-effective strategies that promote faster healing and reduce hospital stay. Conventional dressings, including povidone-iodine, EUSOL, acetic acid, and silver sulfadiazine, have long been standard; however, they often result in prolonged healing and frequent dressing changes (Atiyeh et al., 2005).

Negative Pressure Wound Therapy (NPWT), also known as vacuum-assisted closure (VAC), has emerged as an effective alternative. By applying sub-atmospheric pressure (80–125 mmHg) through polyurethane or polyvinyl alcohol foam sealed with an occlusive dressing, NPWT promotes angiogenesis, reduces bacterial colonization, removes exudate, and accelerates granulation tissue formation (Argenta & Morykwas, 1997). Studies have demonstrated NPWT's efficacy in diabetic foot ulcers, pressure ulcers, traumatic wounds, and post-surgical infections (Peinemann & Sauerland, 2011).

Despite proven benefits, the cost of branded NPWT systems (~₹3000 per session) limits their use in rural hospitals. Recognizing this gap, our study employed an economical modification of NPWT using locally available materials (sofa foam, sterile plastic drape, Ryle's tube, and central suction), reducing the cost to approximately 300 per session.

AIM

To compare the effectiveness of modified NPWT versus conventional dressings in the healing of infected chronic wounds in a rural hospital setting.

OBJECTIVES

Primary-

Number of days necessary to achieve a "ready for surgery condition" which is defined as a wound bed with healthy granulation tissue without necrosis or purulent secretion (Healing time).

Secondary-

Comparison of wound bed area contraction, granulation tissue growth and the direct costs of the dressings between negative pressure wound therapy and conventional dressing.

MATERIALS AND METHODS

Study Design And Setting:

A prospective case–control study was conducted between 2018 and 2021 at a rural tertiary hospital in Maharashtra, India.

Participants:

Fifty patients with infected chronic wounds (>6 weeks duration, non-healing) were enrolled. Patients with malignant ulcers, osteomyelitis, or systemic immunosuppression were excluded.

Groups:

- Group A (n = 25): Treated with modified NPWT (sofa foam, sterile drape, Ryle's tube, central suction).
- Group B (n = 25): Treated with conventional dressing (povidone-iodine, saline, or EUSOL dressings).

Procedure:

Wound dimensions were recorded using the clock technique. NPWT was applied at 100–125 mmHg continuous suction. Dressings were changed every 48–72 hours. Conventional dressings were changed daily.

Outcomes:

Primary – Healing time (days to achieve healthy granulation tissue suitable for closure). Secondary – Wound contraction rate, granulation tissue formation, wound surface area reduction, hospital stay, type of wound closure, and cost of treatment.

Statistical Analysis:

Continuous data were expressed as mean ± standard deviation and compared using Student's t-test. Categorical data were analyzed with Chi-square test. A p-value <0.05 was considered statistically significant.

RESULTS

Baseline characteristics were comparable between groups.

Table 1. Comparison Of Healing Time And Hospital Stay

Parameter	NPWT (n=25)	Conventional (n=25)	p-value
Healing time (days)	12.4 ± 2.3	21.6 ± 3.7	<0.001
Hospital stay (days)	14.2 ± 2.9	24.1 ± 4.1	<0.001

Table 2. Wound Healing Parameters

Parameter	NPWT Group	Conventional Group	p-value
Wound contraction (%)	78.5	52.3	<0.001
Granulation tissue appearance (days)	5.2 ± 1.1	9.6 ± 2.0	<0.001

Table 3. Cost Analysis

Cost Parameter	NPWT (₹)	Conventional (₹)
Average cost per patient	3,200	4,500

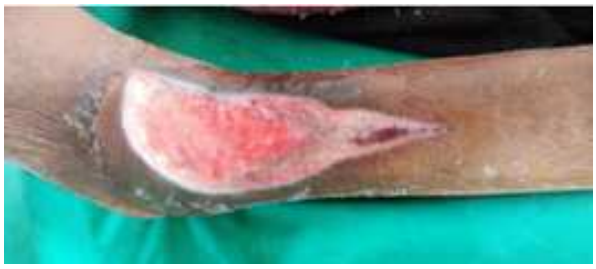

Image 1. Before Conventional Dressing

Image 2. After Conventional Dressing

Image 3. Before NPWT

Image 4. After NPWT

DISCUSSION

This study demonstrates that modified NPWT is significantly superior to conventional dressings in managing infected chronic wounds in a rural hospital. NPWT reduced healing time by nearly 50%, accelerated granulation tissue formation, and shortened hospital stay.

These findings are consistent with previous studies. Morykwas et al. (1997) reported enhanced angiogenesis and bacterial clearance with NPWT. Ali et al. (2010) found VAC therapy superior to saline dressings in diabetic ulcers. Similarly, a Cochrane review (Dumville et al., 2015) suggested NPWT may improve outcomes, though further high-quality trials were recommended.

The innovative aspect of our study is the low-cost modification of NPWT, making it accessible in rural hospitals. By replacing expensive proprietary systems with readily available materials, the cost was reduced by almost 90%, without compromising efficacy.

Strengths:

First prospective comparative study in a rural Indian hospital; demonstrated clinical and economic feasibility of low-cost NPWT.

Limitations:

Small sample size (n = 50); single-center study; limited follow-up (immediate healing outcomes only).

CONCLUSION

1. Modified NPWT significantly reduces healing time compared to conventional dressings.

2. It accelerates wound contraction and promotes earlier granulation tissue formation.

3. Hospital stay is shorter in patients treated with NPWT.

4. Although the per-session cost of NPWT is higher, the overall treatment cost is lower due to reduced hospital stay and fewer dressing changes.

5. Modified NPWT is a safe, effective, and economically viable alternative for managing infected chronic wounds in rural hospitals.

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