

Comparison of Negative Pressure Wound Dressing with Betadine based Dressing and Saline-based Dressing - A Three-Armed Randomized Control Trial in a Tertiary Care Center

Dr. R. Ashok Reddy¹, Dr. R. Rohit Reddy², Dr. G. Sreegayathri³, Dr. G. Sagar Reddy⁴

¹Professor and HOD, Department of General Surgery, Great eastern medical school and hospital, Srikakulam, Andhra Pradesh, India
Ph: 9848454045

Email: gemsashok9779[at]gmail.com

²Assistant Professor, Department of General Surgery, Great eastern medical school and hospital, Srikakulam, Andhra Pradesh, India
Ph: 9966257197

Email: rohitreddy77[at]gmail.com

³Postgraduate, Department of general surgery, Great eastern medical school and hospital, Srikakulam, Andhra Pradesh, India
Ph: 7386182815

Email: sreegaya32495[at]gmail.com

⁴Assistant Professor, Department of General Surgery, Great Eastern Medical School and Hospital, Srikakulam, Andhra Pradesh, India
Ph: 9441664221

Corresponding Author Email ID: sagar36[at]gmail.com

Abstract: *Negative pressure wound therapy is a growing trend for beneficial healing of chronic non healing ulcers. Conventional dressings though serve the purpose require lot of time to achieve satisfactory results. Vacuum assisted closure of the wounds is a suitable alternative in early healing, better outcome of chronic wounds. In our study a total of 60 patients were taken and compared with negative pressure dressing, betadine dressing and saline dressings in three groups namely a, b, c respectively. In our study 80% are females out of which 40% are diabetic on medication. Reduction in depth of ulcer which signifies growth of granulation tissue was measured in millimeters. In our study it was found that the application of negative pressure wound dressing increased the rate of formation of granulation tissue and had better graft up take than the patients who underwent betadine dressing or saline dressings. The patient in the study group had better patient compliance and had a shorter duration of hospital stay and is cost effective when compared to other two groups.*

Keywords: Vacuum dressing, negative pressure wound therapy, chronic ulcer, type of ulcer dressing, diabetic wound, surgical site infection, granulation tissue

1. Introduction

A wound by correct definition is disintegration in the defensive function of the skin⁽⁴⁾. The loss of cohesiveness of the epithelium, with or without loss of elemental connective tissue, is a direct result of thermal or physical damage to the skin. The wound is classified as acute and chronic according to the process and duration of wound healing. Acute wounds result from unexpected accidents or surgical injury and heal at a predictable time generally between 8 and 12 weeks. The healing period depends on the extent of injury in different layers of the skin⁽⁴⁾.

The restoration of wounds with variable thickness and intensity is one of the most vital, interactive, and arduous processes occurring during human life⁽⁴⁾. Different parts of the human body (i. e., extracellular matrix molecules, mediators, fibroblasts and keratinocytes, and infiltrating leukocyte subtypes) are involved in a complex interaction to repair the integrity of the damaged tissue and regenerate the lost one⁽⁴⁾. For this purpose, wound healing includes three continuous stages of inflammation, proliferation, and maturation⁽⁴⁾.

In negative pressure wound therapy (NPWT), the wound is covered, and negative pressure is applied. Expert consensus has suggested NPWT as an alternative to the gold standard treatment of traumatic wounds⁽¹⁾.

According to the recent developments in science and technology, suitable materials for wound dressings are available for different wounds. To achieve proper wound healing, the true preference among various materials for a specific wound is crucial⁽⁴⁾. Recent studies have shown that the application of negative pressure wound dressings by a sub-atmospheric pressure in a controlled manner to the wound site has got importance in wound healing⁽⁷⁾. The present study was conducted to assess the efficacy of negative pressure wound dressings as compared to betadine-based dressings and saline-based dressings to improve the healing process.

Vacuum-assisted closure sometimes referred to as microdeformational wound therapy or most commonly negative pressure wound therapy (NPWT), has significantly improved wound care over the past two decades⁽⁵⁾. NPWT is known to affect wound healing through four primary mechanisms: (macrodeformation, microdeformation, fluid

Volume 12 Issue 3, March 2023

www.ijsr.net

Licensed Under Creative Commons Attribution CC BY

removal, and alteration of the wound environment) and various secondary mechanisms (including neurogenesis, angiogenesis, modulation of inflammation, and alterations in bioburden).^[5]

NPWT is a non-invasive therapy system that uses controlled negative pressure using a vacuum device to promote wound healing by removing fluid from open wounds through a sealed dressing or a foam dressing connected to a collection container using sub-atmospheric pressure.^[6]

NPWT promotes a moist environment, reduces edema, creates a positive wound environment by removing healing inhibitors, increases blood flow, stimulates angiogenesis and granulation tissue, and causes mechanical stress in the bed of the wound promoting cell proliferation.^[6]

Regular wound swabs were sent for culture and sensitivity every 5 days and antibiotics were changed accordingly.

Objectives

To compare the efficacy of negative pressure wound dressing with betadine based wound dressing and saline based wound dressing in wound healing in terms of:

- 1) Rate of granulation tissue formation over ulcer bed.
- 2) Rate of reduction in mean ulcer surface area.
- 3) To assess the bacterial load on the ulcer.

2. Materials and Methodology

Study design: Three armed Randomised control trial, prospective study.

Study Sample: 60

Source of sample: Patients presenting to general surgery opd, gems

Method: Our study will be conducted on 60 patients will be randomly divided into 3 groups of 20 each to compare negative pressure wound dressing with betadine-based and saline-based wound dressings.

Patients are divided in to three groups randomly as groups A, B & C.

20 patients in group A will be treated with negative pressure dressing over the ulcer.

20 patients in group B will be treated with betadine dressings once daily and 20 patients in group C will be treated with saline dressings once daily.

After the debridement, negative pressure dressing was done over the wounds of the study group-A under aseptic conditions. A sterile sponge was trimmed according to size of the wound and placed over the wound. Sterile sponge was later covered with an adhesive airtight seal [iodinised polypropylene sheet]. A suction catheter tube of size 14F is embedded in the sponge which was connected to wall mounted suction. Negative pressure was applied with a

range of 100mmHg-125mmHg continuously for 8hrs, then intermittently released for 30mins, then dressing changed once in two to three days.

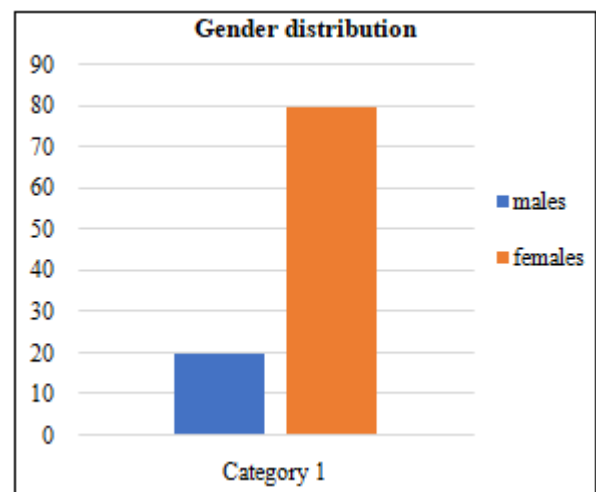
For patients in group-B, after wound debridement, betadine soaked gauze was placed over the ulcer and dressing is done. Dressing is changed every day.

For patients in group-C, after wound debridement, saline soaked gauze was used for dressing. Dressing is changed every day.

Time duration for wound healing, the rate at which granulation tissue forms, chance of secondary infections will be compared between the three groups at regular intervals, and results will be compiled.

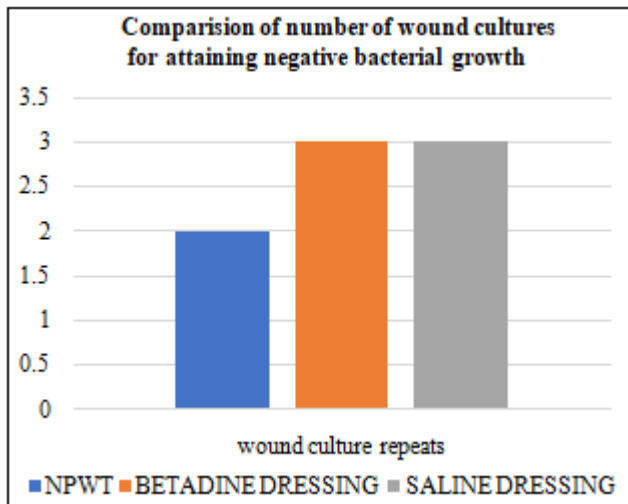
3. Results

In our study a total of 60 patients were taken and compared with negative pressure dressing, betadine dressing and saline dressings in three groups namely a, b, c respectively. In our study 80% are females out of which 40% are diabetic on medication.

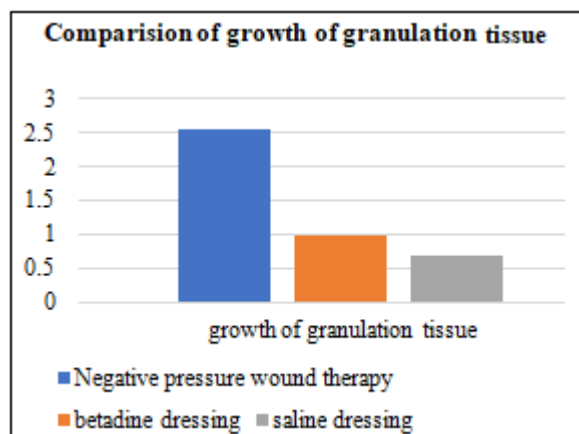


Wound cultures at admission revealed most common organism causing infection to be staphylococcus aureus, followed by e. coli, klebsiella. Out of 60 patients 7 patients had MRSA infection and 8 patients had pseudomonas infection. Cultures were repeated regularly every 5 days till negative for bacterial growth.

In patients with negative pressure wound therapy wound cultures were negative after a median of 2 times where as in patients with betadine dressings and saline dressings it was found to be 3 times. These results were comparable to study done by Chetter I etal².



Reduction in depth of ulcer which signifies growth of granulation tissue was measured in millimeters. In patients who were treated with negative pressure wound dressing mean reduction in depth after 7 days was found to be 2.55mm, where as in patients treated with betadine dressings, it was found to be 1.01mm and in patients treated with saline dressings it was found to be 0.72m. These results are similar to study done by karanvirsingh etal³.



Our study showed that negative pressure wound therapy can promote better development of granulation tissue as well as promotes graft acceptance when compared to betadine dressing and saline dressing.

4. Conclusion

In our study it was found that the application of negative pressure wound dressing increased the rate of formation of granulation tissue and had better graft up take than the patients who underwent betadine dressing or saline dressings. The patients in the study group had better patient compliance and had a shorter duration of hospital stay and is cost effective when compared to other two groups, but further studies with larger population will be needed in the future before the application of the negative pressure wound dressing can be added to the wide spectrum of treatment modalities.

Conflict of Interest: None

Ethical Approval: Approved

Funding: None

References:

- [1] Andreas Alga, Rawand Haweizy, Khaldoon Bashaireh et al. Negative pressure wound therapy versus standard treatment in patients with acute conflict-related extremity wounds: a pragmatic, multi-site, randomized controlled trial, *Lancet Glob Health*, 2020 Mar; 8 (3): e423-e429. DOI: 10.1016/S2214-109X (19) 30547-9. PMID: 32087175
- [2] Chetter I, Arundel C, Martin BC, Hewitt C, et al. Negative pressure wound therapy versus usual care for surgical wounds healing by secondary intention (SWHSI-2 trial): study protocol for a pragmatic, multicentre, cross surgical specialty, randomized controlled trial. *Trials*.2021 Oct 25; 22 (1): 739. DOI: 10.1186/s13063-021-05662-2. PMID: 34696784; PMCID: PMC8543414.
- [3] Karanvir Singh, Gurlal Singh Puar, Vikas Kakkar, et al. A comparative study of vacuum-assisted closure dressing with conventional dressings in the management of infected wounds, *Int Surg J*.2021 Jan; 8 (1): 97-102, DOI: <https://doi.org/10.18203/2349-2902.isj20205669>.
- [4] Erfanrezvanighomi, Shahla Khalili et al. WOUND DRESSINGS: Current advances and future directions. *Journal of applied polymer science*. DOI: 10.1002/app.47738.
- [5] Panayi AC, Leavitt T, Orgill DP. Evidence-based review of negative pressure wound therapy. *World J Dermatol* 2017; 6 (1): 1-16 URL: <https://www.wjgnet.com/2218-6190/full/v6/i1/1.htm> DOI: <https://doi.org/10.5314/wjd.v6.i1.1>
- [6] Panayi AC, Leavitt T, Orgill DP. Evidence-based review of negative pressure wound therapy. *World J Dermatol* 2017; 6 (1): 1-16 [DOI: 10.5314/wjd.v6.i1.1]
- [7] Meloni M, Izzo V, Vainieri E, Giurato L, Ruotolo V, Uccioli L. Management of negative pressure wound therapy in the treatment of diabetic foot ulcers. *World J Orthop*.2015 May 18; 6 (4): 387-93. DOI: 10.5312/wjo.v6.i4.387. PMID: 25992316; PMCID: PMC4436907.
- [8] Dr. S. Shivakumar, Dr. M. Sundararaj et al. A Study of comparison of vacuum-assisted closure vs normal saline dressing in the healing of diabetic wounds. *Indian journal of applied research*, 2017, August, volume_7, issue-8, DOI: 10.36106/ijar.
- [9] Thungathurthi SW, Thungathurthi SM, Kumar VG. Self care knowledge on diabetes among diabetic patients in Warangal region. *Int J Life Sci Pharma Res*.2012; 2 (2): 16-21.
- [10] Gautam A, Bhatta DN, Aryal UR. Diabetes related health knowledge, attitude and practice among diabetic patients in Nepal. *BMC Endocrine Disorders*.2015; 15 (1): 25.
- [11] Krug E, Berg L, Lee C, et al. Evidence-based recommendations for the use of negative pressure

wound therapy in traumatic wounds and reconstructive surgery: steps towards an international consensus. *Injury* 2011; **42**: S1–12.

1) Surgical site infection – post abdominal hernia repair:



Images:

Images of negative pressure wound therapy:

1) Left inguinal abscess and abdominal wall cellulitis.



2) Negative pressure wound therapy:



2) Vacuum dressing / Negative pressure wound therapy.



3) After negative pressure wound therapy:



3) After two sessions of negative pressure wound therapy.

