pISSN 2349-3305 | eISSN 2349-2902

Original Research Article

DOI: https://dx.doi.org/10.18203/2349-2902.isj20211440

A comparative study of negative pressure dressing and conventional dressing in lower limb ulcers

Vishal S. Shah*, Narendra K. Prajapati, Dhruven H. Ponkiya

Department of Surgery, Gujarat Adani Institute of Medical Sciences and G. K. General Hospital, Bhuj, Gujarat, India

Received: 27 March 2021 Revised: 03 April 2021 Accepted: 08 April 2021

*Correspondence: Dr. Vishal S. Shah,

E-mail: drvishal 2007@yahoo.co.in

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Lower limb ulcer is a common disease among the Indian population with a prevalence of approximately 1% to 2% which is slightly higher in the older population. There are various modalities of treatment with the main aim being early wound healing. This study is done to compare the results of negative pressure dressing and conventional dressing in lower limb ulcers.

Methods: This study, done at the Department of Surgery, G. K. General Hospital and Gujarat Adani Institute of Medical Sciences, Bhuj, from October 2017 to September 2018 is a prospective study. A total of 120 patients were randomly divided in two group comprising of 60 patients each. The patients in Group A were treated with negative pressure dressing while those in Group B were treated with conventional dressing. The patients were assessed, in both test and control groups, with parameters like appearance of granulation tissue, bacterial clearance and wound healing. Results: 80% of the patients belonged to the age group of 41-60 years while others were less than 40 years. We observed that in Group A majority of the patients had wound healing in 11-40 days while in Group B majority patients took 31-60 days for their wounds to be healed.

Conclusions: We conclude that negative pressure dressing is more efficient as compared to conventional dressing for healing of lower limb ulcers, enabling a shorter hospital stay and early resumption of daily activities to the patient.

Keywords: Negative pressure dressing, Conventional dressing, Ulcers, Granulation tissue

INTRODUCTION

Ulcers of the lower extremities, particularly in individuals older than 45 years, are a common cause for visits to the podiatrist.1 The incidence of ulceration is rising as a result of the ageing population and increased risk factors for atherosclerotic occlusion such as smoking, obesity, and diabetes. Leg ulcers are reported to have impact on virtually every aspect of daily life: pain is common, sleep is often impaired, mobility and work capacity tends to be restricted, and personal finances are often adversely affected. Wound healing is a complex and dynamic process that includes an immediate sequence of cell migration leading to repair and closure. This sequence

begins with removal of debris, control of infection, clearance of inflammation, angiogenesis, deposition of granulation tissue, contraction, remodelling of the connective tissue matrix, and maturation. When wound fails to undergo this sequence of events, a chronic open wound without anatomical or functional integrity results.²

Although wound dressing have been used for centuries, there exists no ideal dressing. Surgical dressing of both open and closed wounds is based mainly on tradition, training and the surgeon's own philosophy. The present study is done to compare the response between negative pressure dressing, which is a newer modality and conventional dressing in lower limb ulcers. Dressings can be classified as primary or secondary. A primary dressing is placed directly on the wound and may provide absorption of fluids and prevent desiccation, infection, and adhesion of a secondary dressing. A secondary dressing is one that is placed on the primary dressing for further protection, absorption, compression, and occlusion. Many types of dressings exist and are designed to achieve certain clinically desired endpoints.

Negative-pressure wound therapy (NPWT) is an innovative technique in managing complex wounds. It was first described by Charikar as an experimental technique for treating subcutaneous fistulas.³ However, it was the clinical work by Argenta and Morykwas a decade later that allowed NPWT to gain recognition as a useful clinical tool for managing complex and difficult wounds.4-6 Today, NPWT is well established for treating trauma wounds, general surgical wounds, and diabetic foot wounds. NPWT is proposed to bring the following changes in the wound environment to promote a faster healing- macro deformation, micro deformation, fluid removal, alteration of wound environment, modulation of inflammation, cellular responses, angiogenesis, granulation tissue formation and alteration in bio burden.

METHODS

The study was carried out in the Surgery Department of G. K. General Hospital and Gujarat Adani Institute of Medical Science, Bhuj, Gujarat from October 2017 to September 2018. The study was prospective, observational and longitudinal. Study protocol of the procedure was formed along with pro forma, patient information sheet and informed consent form. A total of 120 patients admitted in surgery ward were allotted into two groups - negative pressure dressing (Group A) and conventional dressing (Group B) on random basis.

Negative pressure dressing includes prior wound cleaning with beta dine, followed by application of polyurethane foam of the size of the ulcer with Ryle's tube with multiple holes placed in between. A plastic drape will be used to cover the dressing which will be secured by a transpore. The dressing is then checked for air leakage.

0

A standard negative pressure of -125 mmHg was applied to the wound, either continuously or intermittently (5 minutes "on", 2 minutes "off").7 Dressing will be changed after 72 hours till required. Conventional dressing will consist of prior cleaning of the wound with beta dine and application of EUSOL (Edinburgh University solution of lime) or mercurochrome as and when required. Dressing will be changed everyday. Injectable antibiotics were started empirically initially and then according to the culture and sensitivity report of swab taken from the wound. Necessary debridement and wound toilet were done before application of dressings. The patients were assessed with the following parameters at the time of changing the dressing- appearance of granulation tissue, bacterial clearance from the ulcer as suggested by culture report time taken for healing of the wound and duration of hospital stay.

RESULTS

We observed that 80.83% of patients in our study belonged to the age group of 41 to 60 years. The mean age of the patient in Group A was 47.56±8.98 years while that in Group B was 48.80±7.73 years. In Group A, 66.66% were males and 33.33% were females while in Group B, 68.33% were males and 31.66% were females. The most common type of ulcer in Group A and Group B was diabetic ulcer (70% and 66.66% respectively) followed by ischemic ulcer (18.33% and 18.33% respectively) followed by varicose ulcer (11.66% and 15% respectively). Thus, as per the Chi-square test, there were no significant differences in the groups with respect to age, sex and aetiology of the ulcer (p>0.05). The results of the different parameters which were used to assess the patients in the both the groups are described in Table 1.

Mean duration to achieve 100% granulation tissue was 25.95 days with a SD of ± 8.13 in group A while it was 32.7 days with a SD of ± 7.58 in group B. As there is significant difference between the 2 groups under study, appearance of 100% granulation tissue was earlier in Group A than group B. Mean number of dressing required in Group A was 9.85 with SD ± 2.53 while it was 35.25 in group B with SD ± 6.47 .

51-60 days 11-20 days 21-30 days 31-40 days 41-50 days **Parameters** Group 1-10 days 22 31 0 Appearance of A 7 0 0 granulation tissue В 24 23 9 3 1 0 14 27 0 13 5 A 1 **Bacterial clearance** В 0 5 14 31 10 0 0 4 29 21 0 A 6 Wound healing В 0 0 9 32 18 1 32 14 **Duration of hospital** A 0 0 11 3

0

Table 1: Results of parameters.

31

11

17

There was significant difference between both groups. Mechanical re-debridement was required in 6 patients in Group A and 15 patients in group B. Thus there was a significant difference in the two groups as per the Chisquare test (p<0.05) which shows that requirement of redebridement was more in patients in Group B.

DISCUSSION

The main purpose of wound dressings is to provide the ideal environment for wound healing. The dressing should facilitate the major changes taking place during healing to produce an optimally healed wound. Although the ideal dressing still is not a clinical reality, technological advances are promising. Covering a wound with a dressing mimics the barrier role of epithelium and prevents further damage. In addition, application of compression provides haemostasis and limits oedema. Occlusion of a wound with dressing material helps healing by controlling the level of hydration and oxygen tension within the wound. It also allows transfer of gases and water vapour from the wound surface to the atmosphere. Occlusion affects both the dermis and epidermis, and it has been shown that exposed wounds are more inflamed and develop more necrosis than covered wounds. Occlusion also helps in dermal collagen synthesis and epithelial cell migration and limits tissue desiccation.

The dressing of wounds is time old art and has gone through wide variety of changes. Starting from the ancient herbal dressing to the modern dressing materials, the aim has always been to deliver the best healing of the wounds. There have been constant efforts to develop newer therapies for dressing of the wounds. Anti-septic solutions like beta dine, savlon, hydrogen peroxide, mercurochrome, etc. have been used for decades. Newer advance like the hydrocolloid, hydrogel, alginate and collagen dressings are showing promising results. Negative-pressure wound therapy (NPWT) is a newer and innovative technique which assists in wound closure by applying localized negative pressure to the surface and margins of the wound. It augments and improves on certain functions of dressings, in particular the absorption of exudates and control of odour.

In the present study of comparing negative pressure dressing (Group A) and the conventional dressing (Group B), the mean age of the patients In Group A is 47.56±8.98 years with maximum being 60 years and minimum age being 24 years, while the mean age of the patients in Group B is 48.80±7.73 years with maximum of 60 years and minimum of 27 years.

Out of total 120 patients studied (n=120), in group A, 66.66 % were males and 33.33 % were females. In group B, 68.33 % were males and 31.66 % were females. There was no significant difference between the groups as per Chi square test (p>0.05). Hemant et al in a randomized control trial showed that in vacuum assisted closure

56.7% were males and 43.3% were females. In conventional dressing for wound closure 60% were males and 40% were females. The results are comparable with our result.⁸

The most common type of ulcer in Group A and Group B was diabetic ulcer (70% and 66.66% respectively) followed by ischemic ulcer (18.33% and 18.33% respectively) followed by venous ulcer (11.66% and 15% respectively). There was no significant difference between the groups as per Chi-Square test (p>0.05). Janugade et al showed that most common type of ulcer in (Vaccum Assisted Closure) Group Conventional dressing was diabetic ulcer (43.3% and 40% respectively) followed by bedsore (26.7% and 33.3% respectively).8 Priyatham et al showed type of ulcer in VAC and Conventional dressing as diabetic ulcer (33.33 and 35% respectively) followed by bedsore (18.33% and 26.66%), vascular ulcer (36.66% and 23.33%) and traumatic ulcer (11.66% and 15%) respectively which are comparable to our result.⁷

This clearly justifies that India is the diabetes capital and with rampant poverty and nutrition with poor glycaemic control diabetic ulcers are common. Mean time of first appearance of granulation tissue was found to be 14.4 days with SD of ± 6.24 in group A while it was found to be 17.1 days with a SD of ± 8.56 in Group B. As there is significant difference between the two groups, first appearance of granulation tissue was earlier in Group A than group B. Mean duration to achieve 100% granulation tissue is 25.95 days with SD of ± 8.13 in group A while it is 32.7 days with a SD of ± 7.58 in group B.

Colonization of a wound, corresponding to a level of >10⁵ colonies of bacteria per gram of tissue, has been recognized as a detrimental factor in the process of wound healing. VAC therapy enhances bacterial clearance, which may account for the wound healing effects. Mean duration for culture to become negative in days was found to be 28.05 with SD of ± 8.30 in group A while it was found to be 33.9 with a SD of ± 7.47 in group B. There was a significant difference between 2 groups with unpaired t test which showed early clearance of bacteria in group A compared to group B. In the study performed by Morykwas et al, VAC therapy achieved a clinically significant reduction in bacterial load of chronic wounds inflicted on a swine model by the fifth day. A similar reduction, however, took 11 days in control wounds which were untreated.9

Mean duration of wound healing in days was found to be 32.16 with SD of ± 7.52 in group A while it was found to be 38.9 with a SD of ± 6.56 . Healing was achieved in minimum of 19 days and maximum of 49 days in group A and minimum of 21 days and maximum of 51 days in group B. Mean duration of wound healing in the two groups (A and B) was compared using student t test. It was found that wound healing was achieved earlier in

group A with a p value of 0.000 which is highly significant. So it can be concluded that significant number of patients in group A achieved wound healing earlier in comparison to group B. Armstrong et al observed that median time to complete closure was 56 days in VAC therapy group against 77 days in the conventional saline dressing group.¹⁰

In the present study mean duration of hospital stay in days was found to be 35.50 days with a SD of ± 7.63 in group A while it was found to be 42.42 days with a SD of ± 6.73 . Healing was achieved in minimum of 21 days and maximum of 53 days in group A and minimum of 24 days and maximum of 55 days in group B. Mean duration of wound healing in the two groups (A and B) was compared using student t test which suggested that duration of hospital stay is less in group A than group B. This shows that negative pressure dressing decreases the overall patient morbidity.

Priyatham et al in a prospective study assessing the efficacy of vacuum assisted closure as compared to conventional moist wound dressings in improving the healing process in chronic wounds found that shorter duration of hospital stay was observed in the vacuum dressing group.⁷

CONCLUSION

There was a significant reduction in the number of days for granulation tissue to appear, number of dressings required, healing time and hospital stay in patients who were subjected to negative pressure dressing. Thus negative pressure dressing is superior and better than conventional dressing for healing of lower limb ulcers of various aetiologies. Overall negative pressure dressing was associated with more patient satisfaction and decreased patient morbidity. Though the resources needed were more and there is a slight compromise in the availability of equipment required for negative pressure dressing, the outcome was fruitful.

ACKNOWLEDGEMENTS

Authors would like to thank, Dr. Jagdish Dave, Dr. Gyaneshwar Rao and Dr. Prakash Galani for their kind support, guidance and encouragement.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

REFERENCES

- 1. Frykberg RG, Banks J. Challenges in the treatment of chronic wounds. Adv Wound Care. 2015;4(9):560-82.
- 2. Joseph E, Hamori CA, Bergman S. A prospective randomized trial of vacuum-assisted closure versus standard therapy of chronic non healing wounds. Wounds. 2000;12(3):60-7.
- 3. Chariker ME, Jeter KF, Tintle TE, Bottsford JE. Effective management of incisional and cutaneous fistulae with closed suction wound drainage. Contemp Surg. 1989;34:59-63.
- 4. Argenta LC, Morykwas MJ. Vacuum-assisted closure: a new method for wound control and treatment: clinical experience. Ann Plast Surg. 1997;38:563-76.
- 5. Morykwas MJ, Argenta LC. Nonsurgical modalities to enhance healing and care of soft tissue wounds. J South Orthop Assoc. 1997;6:279-88.
- Morykwas MJ, Argenta LC, Shelton-Brown EI, McGuirt W. Vacuum-assisted closure: a new method for wound control and treatment: animal studies and basic foundation. Ann Plast Surg. 1997;38:553–60.
- 7. Priyatham K, Rao YP, Satyanavamani DG, Poornima D. Comparison of vacuum assisted closure vs conventional moist dressing in the management of chronic wounds. IOSR-JDMS. 2016;15(2):35-49.
- 8. Janugade HB, Chabbra RS, Das AG, Surushe A, Saygaonkar H. Outcomes of VAC versus conventional dressings in patients with lower limb ulcer. Int Surg J. 2018;5(5):1792-6.
- 9. Morykwas MJ, Argenta LC, Brown EI, McGuirt W. Vacuum assisted closure: a new method for wound control and treatment: animal studies and basic foundation. Ann Plast Surg. 1997;38:553-62.
- 10. Armstrong DG, Lavery LA, Diabetic foot study consortium negative pressure wound therapy after partial diabetic foot amputation: a multicenter randomized controlled trial. Lancet. 2005;366:1704-10.

Cite this article as: Shah VS, Prajapati NK, Ponkiya DH. A comparative study of negative pressure dressing and conventional dressing in lower limb ulcers. Int Surg J 2021;8:1424-7.