



A COMPARITIVE STUDY BETWEEN USE OF LIMITED ACCESS DRESSING AND CONVENTIONAL DRESSING IN THE MANAGEMENT OF FOOT ULCERS

General Surgery

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ABSTRACT

Aim:

- The effect of limited access dressing (LAD) is compared with that of conventional dressing in management of foot ulcers.

Objectives: The effectiveness of LAD in wound healing was analyzed in comparison with conventional dressing for various types of foot ulcers. The evaluation was made in terms of the difference in the number of dressings required, granulation tissue formation, duration of hospital stay, and the outcomes between the two groups as mentioned. **Methods:** I divided the patients into two groups A and B, each having 19 individuals. Group A included patients with ulcers, on whom conventional dressing was applied, and Group B included patients on whom LAD was applied. Daily dressing was done in the conventional dressing group, whereas daily wash was provided to the LAD group; the LAD was applied for 10 days and changed thereafter. **Results:** My prospective comparative observational study was conducted at AJ Medical College and Hospital, on 38 patients with foot ulcers, who fulfilled the inclusion criteria. I found that the most common type of ulcer was venous ulcer, with a prevalence rate of 42.11%, followed by diabetic ulcers, which saw a prevalence rate of 34.21%. In the group in which LAD was applied, I noted a reduction in the need for repeated dressings and debridement, and improved granulation tissue. Extensive measures, such as amputation, were not required in the LAD group. **Conclusion:** LAD dressing was proven to be more effective than conventional dressing for the treatment of foot ulcers, both in terms of pain owing to the lack of repetitive dressings and debridement and better quality of granulation tissue. LAD application was easy, and it retained all the advantages of both moist wound healing and negative pressure dressing, while avoiding their respective disadvantages. The study is expected to aid in the development and application of LAD in the field of wound healing and repair.

KEYWORDS

LAD, foot ulcer, wound healing, conventional dressing, comparative study

INTRODUCTION

AIMS AND STUDY OBJECTIVES

I compared the effect of LAD with that of conventional dressing in the treatment of foot ulcers. The specific study objectives were to evaluate the effectiveness of LAD from the following aspects:

- Wound healing
- Eradication of infection
- Pain relief
- Nature of granulation tissue formed
- Duration of hospital stay

LAD Designs

The LAD wound interface may be made up of two different types of material:

- Hydrocolloid material contacts the wound
- Polythene sheet contacts the wound

There may be some evident doubts as to whether the damage or negative tension

(LAD. I) has any impact on a hydrocolloid substance. Two unforeseen problems are the obstruction of the tubing used by melted hydrocolloid materials and the loss of floor vision for the next few days until the condensed material are eradicated by suction.

Physiologists as a whole are convinced that true interstitial liquid force in free subcutaneous tissue is only little lower from the external tension (normal worth of this force is negative corresponding to barometrical tension and is roughly -3 mmHg)

Without a protective layer of skin above an injury, the pressure within the body quickly rises to 0 mmHg (i.e., equivalent to environmental tension itself). As the pressure in the interstitium rises from -3 mmHg to 0 mmHg, the lymphatic system responds by increasing its flow by a factor of 20 fold and vascular reabsorption of fluid increases in proportion. When edema increases tension in the interstitial tissue or results in a new injury that isn't patched, it increases the risk of bacterial invasion and absorption of toxic substances accumulated via the venules and lymphatics.

When the interstitial tissue pressure is lower than -6 mmHg, lymph flow is minimal, making interstitial fluid retention unnecessary. The risk of sepsis due to bacterial invasion and the risk of fundamental aggravation condition (SIRS) due to absorption of pro inflammatory cytokines both drop dramatically below 6 mmHg.

Leech Effect of LAD

Parasite effect is provided by the discontinuous negative tension (pattern of 30 minutes suction/ pump exhaust and 4 h pause). The results of the siphon are useful in the following situations:

- LAD's discontinuous negative tension may maintain local, beneficial cytokine effects (inflammatory, fibroplasia) during the rest period, but drains them during the exhaust period; as a result, the leech effect mitigates the deleterious, underlying effects of proinflammatory cytokines (SIRS). It also definitely removes synthetics producing micro thrombi in the capillary, which reduces the likelihood of moderate necrosis necessitating repetitive debridement in the event of, say, a crush injury.
- The release of cytokines, toxins, and other byproducts of damage, as well as the prevention of bacterial invasion, may all be attributed to the application of discontinuous negative tension.
- Tissue oxygenation is increased, and venous congestion is relieved due to discontinuous negative tension, which mimics the action of a parasitic effect like in case of leech.

Effect On Renal Failure

- Acute renal failure due to systemic inflammatory response syndrome (SIRS) may be treated by LAD dressing.
- Before reapplying 2nd LAD, hot air blower is used to dry the skin if needed.

Disadvantages:

- LAD LEAK – in case of minor leak – resealed, if major leak – reapplied
- Hemorrhage/Ulceration – tubes are placed such a way there is no direct pressure, and placed in between the plastic folds.

Materials Used

1. Polyurethane Film

Polyurethane film 0.15 mm in thickness was taken, sealed using semi-automatic sealing machine to produce LAD bag according to patient's foot size after taking the measurements. Once the bag was ready, it was sterilized by immersing it in 2.45% glutaraldehyde solution for 20 min or by using ethylene oxide prior to application.

Case Study

Source Of Data

The research was done at the A.J. Institute of Medical Sciences and Research Centre in Mangalore, specifically in the Department of General Surgery.

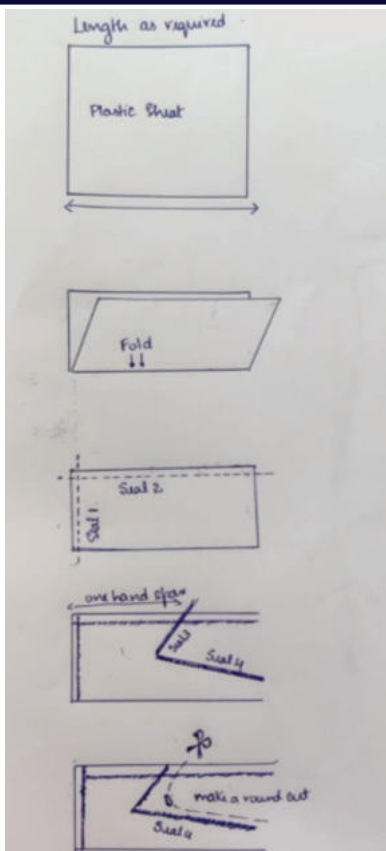


Fig. 1 (a) Preparation of LAD bag

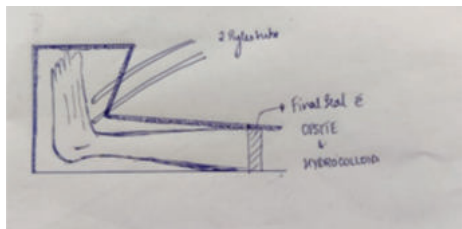


Fig. 1 (b) Schematic of the application of LAD bag

2. Two Ryle's tube: One of the tubes is connected to the suction machine while the other is used to wash the wound.



Fig. 2 Ryle's tubes

2. Hydrocolloid for sealing



Fig. 3 Image of hydrocolloid used for sealing wounds

4. Opsite



Fig. 4 Highly extensible and conformable transparent film: Opsite

Applications of LAD In Foot Ulcers



Fig. 5 (a) LAD application day 0, and



(b) LAD removal on day 10



Fig. 6 (a) LAD application day 10, and



(b) LAD removal on day 10

Data Collection Method

Study Design - Observational study

Period of Study - 2 years, from January 2021 to January 2023.

Place of Study: A. J. Institute of Medical Science and Research Centre, Mangalore

Sampling Technique: Convenience sampling

Inclusion Criteria:

- Patients of age 18 years and above.
- Patients having foot ulcers diabetic / traumatic / venous / pressure)
- Patients who have given consent.
- Grade 0, Grade 1, Grade 2 of Wagner system

Exclusion Criteria:

- X ray showing features of osteomyelitis
- Pregnant patients
- Malignant ulcers
- Grade 3, Grade 4, Grade 5 of Wagner System
- PVD

METHODOLOGY

Two groups with 19 individuals each were assigned. Group A included patients with ulcers, on whom conventional dressing was applied. Group B included patients subjected to LAD dressing. Daily dressing was done in case of conventional dressing whereas LAD was changed once in 10 days while wash was given daily. The surface area of the ulcer was noted before dressing. After 10 days of dressing, the ulcer areas were measured in millimeters square using calipers, and compared with the ulcers in the case of conventional dressing. Granulation tissue and wound culture sensitivity were noted on day 0 and day 10. Doppler study was done routinely to rule out DVT.

Sample Size Estimation

Based on the study conducted by Kasaranemi (2016), to detect a difference of 21.2 in the outcome (wound size, hospital stay, and granulation tissue) between the groups, I assumed a 95% confidence interval at 90% power with a pooled SD of 19. The sample size estimated for the study was 17.3. Further assuming a 10% loss to follow up, the final sample size was estimated to be 19 for each group. Thus, a total of 38 patients were included in the study.

The Following Parameters Were Used:

- Age of the patient
- Indication of dressing - venous, diabetic, traumatic, or pressure ulcers.
- Number of dressings required to reduce slough, malodor, edema, infection and improve wound healing rate in terms of size of the ulcers
- Wound debridement frequency
- Culture on Day 0, Day 10
- Granulation tissue

Aesthetic Results In The Form Of

- Appearance
- Hypertrophy
- Pigmentation of the surrounding skin
- Amputation

Statistical Analysis:

Collected data were analyzed by frequency, percentage, mean, standard deviation, *t*-test, and Chi-square test.

CONCLUSIONS:

Among the various conditions encountered in the surgical field on a daily basis, wounds are the most prevalent. Wounds can be acute or chronic. My study was conducted at the AJ Institute of Medical College and Research Centre on 38 patients, who were divided into two groups, each containing 19 individuals. One group underwent conventional dressing, while the other underwent LAD. The patients were aged between 21 and 80 years. Indications for dressing were venous ulcer > diabetic ulcer > traumatic ulcer. In the group which underwent conventional dressing, ulcers healed in 36.84% of the patients, but 10.53% underwent amputation, whereas in the LAD group, ulcers healed in 57.89%, and none of the patients underwent amputation. Slough was noted on day 1 and day 10 and compared;

LAD showed a better outcome. Granulation tissue formation was better in the LAD group. Patients with LAD required fewer wound debridement. Culture was taken on day 1 and day 10, and the LAD group showed growth only in 10.53% of the cases, while it was as high as 31.58% in the conventional group.

The two groups had predominantly females: 57.89% were females, and 42.11% were males. The most common type of ulcer was venous ulcer, i.e., 42.11%, followed by diabetic ulcers, which was 34.21%. In the LAD group, 57.89% of the patients had their wound healed without requiring other interventions, whereas it was 36.84% in the conventional group. In the LAD group, I noted that once the LAD was applied, the need for dressings was reduced. This could be attributed to the reduction in the amount of soakage and slough and lower production of medical waste, as fewer dressings were required. As LAD was efficient in slough removal, I noted a significant decrease in the number of washes required and in the use of surgical debridement. The overall need for extensive measures, such as amputation, was lesser in the LAD group. I noted that the rate and quality of the granulation tissue formation was much better in the LAD group. I also noted better aesthetic results in the form of lesser pigmentation and hypertrophy.

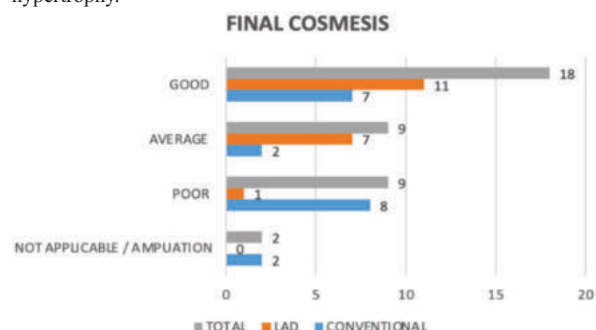


Fig. 7 Final Cosmesis

The following conclusions can be drawn from this study on LAD:

- Apparent reduction in the infection rate in the case of LAD-treated wounds.
- Lesser pain associated with repeated dressing change.
- Better quality of granulation tissue
- Ease of application of LAD, while retaining all the advantages of both wet wound healing and negative pressure dressing and avoiding their respective drawbacks. This was achieved by regulating the wounded environment and limiting access through tubes.

REFERENCES:

1. Ovington Lg. The Evolution Of Wound Management: Ancient Origins And Advances Of The Past 20 Years. wound Health Nurse 2002; 20:652-656.
2. Blair VP, BROWN JB. The use and uses of large split skin grafts of intermediate thickness. Plastic and Reconstructive Surgery. 1968 Jul 1;42(1):65-75.
3. Robson M, Smith P. Topical use of growth factors to enhance healing. In Cutaneous Wound Healing pp 379-398, Edited by V Falanga, Martin Dunitz Ltd, London, 2001
4. Hunt TK, Hopf H, Hussain Z. Physiology of wound healing. Advances in skin & wound care. 2000 May 1;13:16.
5. Vanwijck R. Surgical biology of wound healing. Bulletin et memoires de l'Academie royale de medecine de Belgique. 2001 Jan 1;156(3-4):175-184.
6. Wysocki AB. Skin anatomy, physiology, and pathophysiology. The Nursing Clinics of North America. 1999 Dec 1;34(4):777-797.
7. Abraham J, Mathew S. Merkel cells: a collective review of current concepts. International Journal of Applied and Basic Medical Research. 2019 Jan;9(1):9.
8. Ortonne JP, Petchot-Bacque JP, Verrando P, Pisani A, Pautrat G, Bernerd F. Normal Merkel cells express a synaptophysin-like immunoreactivity. Dermatology. 1988;177(1):1-0.
9. Petruzzelli GJ, Johnson JT. Skin grafts. Otolaryngologic Clinics of North America. 1994 Feb 1;27(1):25-37.
10. Vestita M, Tedeschi P, Bonamonte D. Anatomy and Physiology of the Skin. In Textbook of Plastic and Reconstructive Surgery 2022 (pp. 3-13). Springer, Cham.
11. Wong R, Geyer S, Weninger W, Guimberteau JC, Wong JK. The dynamic anatomy and patterning of skin. Experimental dermatology. 2016 Feb;25(2):92-98.
12. Karim PL, Aryani IA. Anatomy and histologic of intrinsic aging skin. Bioscientia Medicina: Journal of Biomedicine and Translational Research. 2021 Oct 25;5(11):1065-77.
13. Kumar P. Limited access dressing and maggots. Wounds. 2009 Jun 1;21(6):150-2.
14. Kumar PP. Limited access dressing. Wounds. 2008 Feb;20(2):49-59. PMID: 25941965.
15. Honnegowda TM, Kumar P, Prabhu K, Kumar A, Rao P, Udupa EGP, Kamath S, Souza ASD, Mahato KK. A comparative study to evaluate the effect of limited access dressing on diabetic ulcers. Plast Aesthet Res 2015;2:266-71.