

A Comparative Study of Foam Dressings And Conventional Gauze Dressings In The Management Of Chronic Non-Healing Ulcers

*Dr. R K Shastri¹, Dr Kodali Gopi², Dr Manoj Kumar Sistu³

¹Dr R K Shastri, MS, General Surgery, Professor, Department Of General Surgery, Dr Pinnamaneni Siddhartha Institute Of Medical Sciences And Research Foundation, Chinaoutpalli, Vijaywada, Krishna, Andhra Pradesh, India. ²Dr Kodali Gopi and ³Dr Manoj Kumar Sistu, Post Graduate Students Of General Surgery, Dr.Pinnamaneni Siddhartha Institute Of Medical Sciences & Research Foundation, Chinnaoutapalli, Krishna, Andhra Pradesh, India.

Corresponding author: *Dr.R.K.Shastri

Abstract: Management of chronic ulcers is a considerable medical burden associated with large expenditures. Out of several types of wound dressings that have been developed, effectiveness of various types of wound dressings is limited. In this scenario the ideal and cost effective one needs to be selected. Chronic ulcers most commonly we come across are venous leg ulcers, diabetic foot ulcers, pressure sores and other complex mixed ulcers. Selecting an appropriate dressing plays a vital role in promoting and maintaining an environment that is conducive to healing. Conventional dressings means saline gauze, paraffin gauze dressing. Foam dressing is done with a semipermeable polyurethane foam.

Keywords: Ulcers, wounds, burn ulcers, foam, polyurethane, hydrocolloid, clinical evaluation

Date of Submission: 12 -09-2017

Date of acceptance: 22-09-2017

I. Introduction

Leg ulcer cases are very frequently admitted in this Hospital, is a major cause of morbidity and long hospital stay. Increase bed occupancy by ulcer cases, ultimately resulting in a rise in number of lower limb amputations is a cause of concern. An early debridement, proper wound dressings and prompt grafting once the ulcer bed is ready to accept a graft, is obviously a welcome step. The etiopathogenesis of ulcer formation and healing process is complex and extensive. The concepts of moist wound healing came to light in 1960s and several studies have been conducted since then. Varieties of wound dressings have been devised but the cost factor of various wound dressings varies greatly. The management of chronic ulcers is expensive and the economic burden it throws on our expanding geriatric population is tremendous. Thus it is paramount to carefully evaluate the efficacy of different wound dressings and a cost-benefit analysis to optimize health care spending. The ultimate choice of wound dressing in this randomized trial group was considered by affordability and a consensus willingness.

Wound healing is a process of repair of a skin defect by re-epithelialization and scar formation. It has three overlapping stages: inflammation, granulation and maturation. In the inflammation stage, the immunity is activated by release of cytokines, and presence of inflammatory cells at the wound site. Due to increased capillary permeability, exudate accumulates in the wound bed. The exudate contains cytokines, plasma components, growth factors, proteases and protease inhibitors to promote tissue debridement and clearing of infection. The wound bed is prepared for re-epithelialization by formation of provisional matrix and the healing process progresses.[1] Exudates from chronic ulcers decrease the proliferation of keratinocytes, fibroblasts, and endothelial cells, while exudate from active wounds stimulate proliferation. Thus optimal management of the exudate plays an important role in stimulating the progression from the inflammatory stage to the granulation stage of chronic wounds.

Chronic ulcers are associated with edema. Edema inhibits healing and increases the risk of wound infection. Application of circular compression bandages in limbs, correction of hypoproteinemia and anemia reduces the edema. More complicated states of edema may benefit from sustained or intermittent pneumatic compression. In patients with venous ulcers, a venous doppler is advised to find out the status of the veins and to plan out a surgical intervention at a later stage. In diabetic foot ulcers optimal blood sugar regulation, wound therapy and off loading footwear is planned. Pressure ulcers require meticulous care to shift bodyweight to relieve pressure from the ulcer along with wound care. Factors such as anemia, malnutrition, vitamin and mineral deficiencies, infection is taken care of.

Lister started antiseptic dressing by carbolic acid soaked lint and gauze in 1867. Since then several products have been devised. Readymade wound dressings are now available in the market for instant use. So clinicians must have a broad idea of the properties of different dressing types and healing process of different ulcers in order to select a particular product up to maximum benefit of their patients. From different categories of available dressings, the two maximum used moist wound dressings are hydrocolloids and foams that account for over half of the global moist wound dressings market. [2] Hydrocolloids introduced in 1980s are now available in sheet, paste and powder forms. Polyurethane foam dressings were launched due to their absorbent property, now available in sheet form and extensively used in management of different chronic ulcers.

Moist gauze dressing should be damp with saline to keep the wound moist. Too-wet gauze can weaken surrounding tissue. Fine mesh gauze with paraffin or vaseline is for protection and moist environment, allows drainage of discharge to overlying padding layers. Wide mesh gauze is used for wound debridement. Normal saline soaked gauze dressing removes necrotic tissue.[1] Polyurethane foam dressings are hydrophilic and are highly absorbent. They are useful when ulcer discharge is copious. Self-adhesive polyurethane foam and silicone adhesive are least traumatic to the stratum corneum, while acrylic adhesive is more traumatic. If drainage is little, foam is soaked in saline and changed daily to prevent a drying effect causing damage to the underlying budding granulation. Negative pressure wound therapy (NPWT) removes exudates, helps reduce bacterial growth, and promotes blood flow and granulation formation. A foam dressing is placed in the wound and the wound is covered with an occlusive dressing. Then tubing is attached to a pump, which creates sub-atmospheric pressure in the wound.

Hydrocolloids are microgranular polymers such as gelatin, pectin or sodium carboxymethyl cellulose in an adhesive matrix like polyisobutylene. They absorb exudate, forming a non-adhesive gel, protect the wound from water and bacteria and promote autolytic debridement.[3] They maintain moisture in the ulcer and enhance growth of capillary buds. So it is preferred for ulcers with minimal discharge and with necrotic and slough tissue. Dressing can be changed every alternate day. For treating diabetic foot ulcers, hydrogels are more efficacious.[4] If discharge is more, it pools in the ulcer and causes maceration of surrounding skin and deters the healing process. Foams provide a moist environment, absorptive, give cushioning effect against mechanical forces, promote autolytic debridement and can be used in combination with topical agents. They are non-adherent and ideal for high exudates ulcers. Alginates are polysaccharide fibres from sea weeds, form a hydrophilic gel with exudates. Collagens absorb exudates and help maintain a moist wound environment also promote new tissue growth. Biologic homograft like cadaver skin or pig skin act as temporary dressing. Amnion skin substitute is also used for a biologic dressing. Creams or ointments containing iodine, silver nitrate, silver sulphadiazine – are toxic to fibroblasts. Topical antiseptics inhibit epithelial growth.[5] Neomycin, bacitracin, polymyxin B enhance re-epithelization. Pepsin from papaya digests denatured collagens. Urea enhances its enzymatic action.[1]

The principle of moist wound healing is strictly followed as it is the most suitable environment for the regeneration process. Foam forms a bacterial barrier, maintain hydration, provide an ideal temperature, and can be easily removed from the affected site without further damaging the ulcer. Foam dressings are easier to use and manage, comfortable, cost effective compared to hydrocolloids, and with an enhanced patient compliance in domiciliary care. More attention is paid to healing and a moist environment is maintained forgetting the concern of the patient, like wound-related trauma and pain, management of exudates and malodour.[2] Removal of dressings that is stuck to the ulcer bed, stripping of the surrounding skin caused by frequent change of adhesive dressings, and maceration and excoriation of the peri-wound skin due to improper management of exudates aggravates wound pain and affects the quality of life of patients.[6,7] Wound-related pain can cause psychological stress which, in turn, can delay the healing process .[8,9]



Fig.1. After foam dressing for one week **Fig.2.** Split thickness skin graft

Objectives:

This study is a prospective randomized clinical trial undertaken in 184 patients of different age groups with leg ulcers, pressure sores, burn ulcers and other chronic non-healing ulcers admitted in the Department of General surgery, Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation from October 2014 to September 2017. The patients were taken up after their comorbid conditions like diabetes, hypertension, anemia, hypoproteinemia if present, are controlled and randomly selected for different types of dressings as suitable to them as per their willingness. Ulcers were debrided and made free from slough and necrotic tissue. Patients with vascular and neurogenic ulcers were excluded from this study. Also patients with uncontrolled T₂DM and renal failure were not included. Data was compiled in the form of type of dressing, number of dressings needed, ulcer status, duration of Hospital stay and expenditure incurred.

The objective of this study is to compare the efficacy of foam dressings with simple gauze wound dressings in the treatment of chronic ulcers, and to assess in terms of time required for growth of granulation tissue, quality of graft bed and graft up take, effect on bacterial load, cost effectiveness, ease of use and comfort levels of patients. The trial was on a variety of ulcer types and clinical data relating to the two dressing types were compared and evaluated doing a cost-benefit analysis to optimize the spending. Comfort zone of the patients with the dressings, patient preferences, and financial considerations was also taken in to account. Convenience of dressing use, as determined by adherence properties, pain during the healing process, number of dressings used and state of perilesional skin. For pressure sores changes in position, use of pressure-relieving support surfaces, skin care and good nutritional state was maintained. Irrigation of the wound bed with saline is done to remove detritus but antiseptic skin cleaners are avoided because they are cytotoxic to new granulating tissue, can cause trauma to wound bed, increasing the risk of infection and interfering with the healing process. Wound edges were kept dry and clean and wound bed moist. Damaging healthy tissue during cleansing and dressing procedures was avoided.



Fig.3. Pressure sore



Fig.4. After 4 days of NPWT

II. Discussion

Foam dressing provides many of the characteristics expected of modern ideal dressings. Dressing-related trauma and pain is minimal and wound malodour is almost nil. There is a significant difference between the two dressing types, wound healing rates being better in foam dressings. The majority of the studies indicate that, in exuding wounds, foam dressing is superior to the conventional dressing and ease of use is an added advantage. Foam is nonadherent and nonlinting and semipermeable polyurethane that creates a moist environment conducive to wound healing, keep the bacteria and other contaminants out. In pressure sores it takes the pressure off the area, keeps the periwound skin clean and dry. A healthy diet with enough protein helps in the healing. For Stage II pressure sores saline irrigation and removal of dead tissue is done. Antiseptic cleansers such as povidone-iodine and hydrogen peroxide are avoided and wounds are cleansed with plain saline spray.[5]

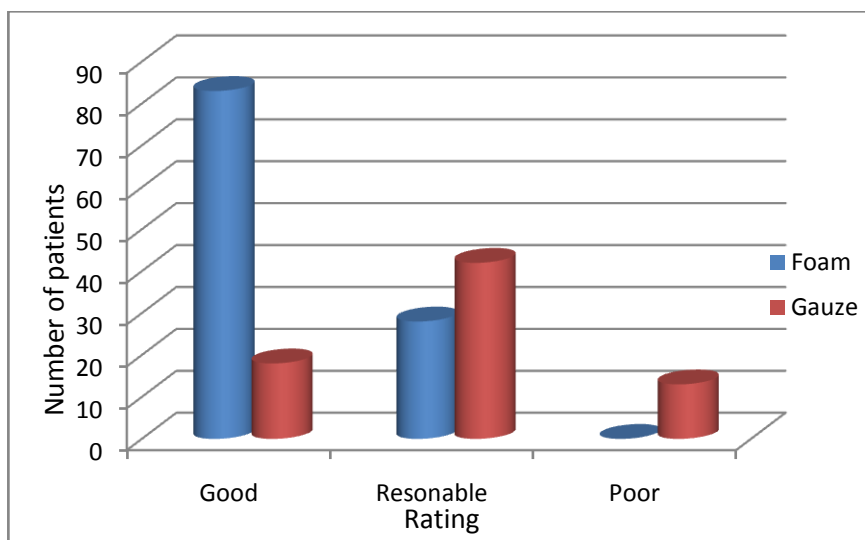


Fig 5. Absorbency of foam versus gauze dressing

Chronic ulcers have a prevalence of 1% in the general population and up to 3–5% in the senior age group i.e. 65 years and older. The duration of the ulcers may span from weeks to several years, Complex wounds do not heal after a period of 3 months or more [10], while some chronic ulcers may never heal. They cause social isolation, psychological sickness, pain, impaired mobility, disturbed sleep, reduced work ability, and restricted leisure activities. Most common chronic ulcers were diabetic foot ulcers, venous leg ulcers and pressure sores, resulting in considerable loss of quality of life and huge health care costs. Pressure sores are ischemic ulcers in the skin and underlying tissues due to long-standing pressure over an external bone or cartilaginous surface, caused by poor quality nursing care.[11] Long-standing pressure reduces capillary blood flow and lead to cell death, necrosis and broken tissue. Foam dressings act as a barrier against bacteria, absorb excess wound fluid, reduce pain during the healing process and create the right environment for growth of granulation tissue and more effective than any other moistened conventional dressings in healing pressure ulcers.[12]

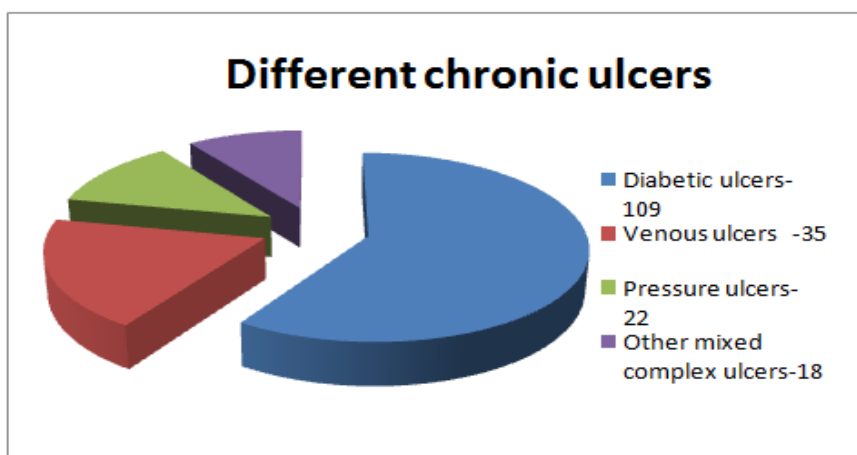


Fig.6. Number of different ulcer cases treated

Our aim was to assess the comparative efficacy of polyurethane foam and gauze dressings in terms of healed ulcer after 8 weeks of follow-up. In certain clinical trials foam dressings have established a poorly and scarcely evidence of their effectiveness. But the present study has shown considerable benefits of polyurethane dressings as an increased percentage of wounds healed within 8 weeks. Factors taken in to consideration are wound adherence to dressing; ease of applying and ease of removing the dressing; pain at dressing removal, absorption by the dressing; perilesional skin condition as assessed by erythema and maceration; overall comfort and time taken for healing process. Little is known about the relative efficacy of these two types of dressings.



Fig.7. Trolley for foam dressing



Fig.8. Simple gauze for dressing

An ideal dressing should be nontoxic, nonirritant, an effective bacterial barrier, able to protect surrounding skin and easy application and removal without causing skin stripping, maintain a moist environment and optimum temperature and pH and should be comfortable and acceptable to patients. If easy to apply and remove, then it takes less time for change of dressing. A foam dressing was significantly easier to use than a gauze dressings. Difficulty at removal may cause trauma to the wound and surrounding skin with wound-related pain, reduced quality of life and delayed healing. Foam dressing was associated with significantly less pain at dressing change. The proportion of patients experiencing pain-free dressing removal was 82% in the foam-treated group and 44% in the group treated with the conventional dressing. In this series dressing removal was easy in 88.3% of cases (98 out of 111) in the foam group compared to 43.8% (32 out of 73) in the saline gauze group.

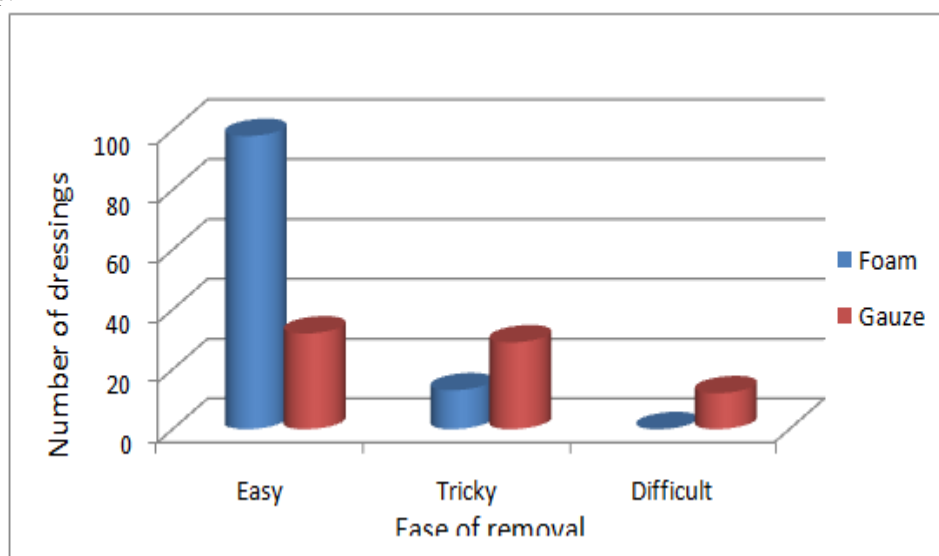


Fig.9. Ease of removal - foam versus gauze dressing

Comfort level of patients was assessed by asking the patients to score on a scale of 0 to 10 (where 0 = uncomfortable and 10 = very comfortable). The mean score for the foam dressing was 8.72 compared with 6.18 for the saline gauze dressing. Wound odour during dressing change in patients was significantly less with foam dressing. Dressing-related trauma also was minimal in a foam dressings.

III. Conclusion

General consideration for chronic ulcer management is proper identification and treatment of underlying conditions like complicating metabolic factors and optimization of the local wound environment. Proper dressings improves quality of life of the patient and decreases treatment costs. Optimal healing of ulcer is based on the principal of a moist wound environment, requiring a prompt debridement, control of exudates, infection edema and a proper periwound skin care. An occlusive dressing retains moisture. Exudates production is high during the inflammatory stages needs dressing with high absorptive capacity but wound bed is kept sufficiently hydrated. Polyurethane foam dressing was found to be ideal and much better than the conventional gauze dressing. Statistically significant differences were observed in favor of the foam dressings with respect to the number of patients who experienced less pain at dressing change and pain-free dressing removal was > 85% in the foam-treated group and 40% in the group treated with the simple gauze dressing. Since last three decades, polyurethane foam has become one of the most commonly used ulcer dressings for exudates management in moist wound healing. Foam consists of a porous structure that is able to absorb fluids into air-filled spaces by capillary action. An overlaying compression bandage increases the absorption rate further due to better wound bed contact. It has a high capacity of autolytic debridement without leaving residue. In addition it avoids leakages, stains and odours, reduces frictional forces and cause no trauma when removed. Foam dressings are available with variable thickness and permeability for water evaporation and gas exchange. Foam prevents exudates from traveling along the skin thereby prevents skin irritation and maceration. NPWT is a technique with application of negative pressure to the wound bed through an occluded polyurethane foam and is an active approach to exudates handling and wound healing. The choice of ulcer dressing should be based on clinical evaluation of the ulcer and the periulcer skin health.[13]

Foam closely complies with all tuner criteria for ideal ulcer dressing which includes the ability to maintain moisture in wound bed, easy to remove, protect the periwound skin, act as bacteria barrier, maintains wound temperature, provides mechanical protection, cushioning, and conforms to body shape even fits to deep cavities,[5] being nontoxic and non-allergic, easy to use, having a long shelf life and most economical.

References

- [1]. Sabiston Text Book of Surgery, 20th Ed, First South Asian Edition- 2017, Wound healing, Vol.I, Chapter- 6, pg. 148-151.
- [2]. Thomas S. The role of dressings in the treatment of moisture-related skin damage. *World Wide Wounds* March 2008.
- [3]. Fletcher J, Moore Z, Anderson I, Matsuzaki K. Hydrocolloids and pressure ulcers Made Easy. *Wounds International* 2011; 2(4):
- [4]. Saco Michael, Tampa Howe Nicole, Tampa Nathoo Rajiv, Comparing the efficacies of alginate, foam, hydrocolloid, hydrofiber, and hydrogel dressings in the management of diabetic foot ulcers and venous leg ulcers: a systematic : 2016, *Dermatology Online Journal*, 22(8)
- [5]. Bailey & Love's Short Practice of Surgery, 26th Edition- 2016, Surgical infection, pg.59-60
- [6]. Morris C. Foreward. In: *Evidence Review: The clinical benefits of Safetac technology in wound care*. London: MA Healthcare, 2008; 3.
- [7]. Hollinworth H, White R. The clinical significance of wound pain. In: White R, Harding K, editors. *Trauma and Pain in Wound Care*. Aberdeen: Wounds UK, 2006; 3-16.
- [8]. Rippon M, White R, Davies P. Skin adhesives and their role in wound dressings. *Wounds UK* 2007; 3(4): 76-86.
- [9]. Soon K, Acton C. Pain-induced stress: a barrier to wound healing. *Wounds UK* 2006; 2(4): 92-101.
- [10]. Andrea C Tricco, Elise Cogo et al, A systematic review of cost-effectiveness analyses of complex wound interventions reveals optimal treatments for specific wound types, *BMC Med*. 2015; 13: 90.
- [11]. Guillén-Solà et al.; A multi-center, randomized, clinical trial comparing adhesive polyurethane foam dressing and adhesive hydrocolloid dressing in patients with grade II pressure ulcers in primary care and nursing homes licensee BioMed Central Family Practice 2013, 14:196
- [12]. Bouza C, Saz Z, Munoz A, Amate JM. Efficacy of advanced dressings in the treatment of pressure ulcers: a systematic review. *J Wound Care*. 2005;14(5):193-199
- [13]. Jakob Nielsen, Karsten Fogh, Clinical utility of foam dressings in wound management: a review, 2015 , Altmetric, Volume 2015:2 Pages 31-38

*Dr. R K Shastri. "A Comparative Study of Foam Dressings And Conventional Gauze Dressings In The Management Of Chronic Non-Healing Ulcers." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* 16.9 (2017): 76-81