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A comparison between banana leaf dressing and Vaseline gauze dressing for split-thickness skin graft donor sites at a Ugandan hospital

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Abstract

Introduction: This study compared the effectiveness of Banana Leaf Dressing (BLD) to the commonly used Vaseline Gauze Dressing (VGD) on Split thickness skin graft donor sites. VGD is not completely non-adherent and is associated with pain on removal. BLD is smooth, non-adherent, pain-free and available.

Methods: In this prospective study (PACTR202002762137087), consecutive patients were dressed with either BLD or VGD. Ease of dressing application and removal were scored. Pain scores were taken on postoperative days 3, 5, 7, 9 and 10. On day 10, dressing change was done, epithelialization recorded and a swab taken for microbial culture. Average cost of each dressing was calculated.

Results: There was no significant difference between postoperative pain scores with either dressing (p=0.992). BLD Patients had less pain on dressing change (p=0.006). Both dressings were easy to apply; BLD was easier to remove (p=0.000). Wounds with BLD re-epithelialized faster (p=0.0158). 40% of wounds grew no organism on microbial culture, 25% grew Staphylococcus aureus and 35% grew unusual organisms (p=0.482). VGD was 4 times more expensive than BLD (p=0.000).

Conclusion: Banana Leaf Dressing is effective and highly recommended for dressing SSG donor sites.

Keywords: SSG donor sites, Banana leaf dressing, Vaseline gauze dressing.

Introduction

Use of split thickness skin grafts (SSG) is common in plastic and reconstructive surgery for coverage of a wide range of defects (1). This is mainly because of the availability of donor sites (2).

The pain experienced at SSG donor wounds is significant (3), however, it reduces as the wounds heal. The healing of the donor wound depends on rapid re-epithelialisation under a moist dressing. The ideal dressing for the SSG donor site should be moist, allow gaseous exchange and remove exudate. It should also be sterile, resistant to infection, comfortable for the patient, easily applied and removed from the wound and cost effective. (1). Such a dressing is yet to be developed.

Worldwide, practitioners use familiar dressings for SSG donor sites regardless of performance (1). Vaseline gauze dressing (VGD) or petrolatum impregnated gauze is the commonest used dressing however, it is not completely non-adherent and is associated with pain on removal (2).

Banana leaf dressing (BLD) has been used as a dressing for surgical wounds in India for 3 decades now. It is non adherent, pain-free dressing. (3). It offers a large smooth surface, is cheap and readily available in Uganda throughout the year (4). It has also been found to be a good alternative dressing for surgical wounds in Uganda, in terms of efficiency and cost (5).

Methods

Study design

A prospective quasi-randomized controlled study (PACTR202002762137087). Patient selection: This study included all patients 10 years and older who underwent harvest of SGG from the thigh. Patients with comorbidities known to impede normal wound healing like diabetes mellitus, peripheral vascular disease, venous insufficiency among others; and patients with history of substance abuse or long-term pain medication were excluded.

Materials and Techniques

BLD was prepared by removal of the midrib, washed with clean water and disinfected with 0.12% Chlorhexidine solution. They were then divided into 20cm by 10cm rectangular pieces along the edge of the midrib, packed piece by piece, separately into transparent sterilisable pouches and also in Stainless steel Holloware® sterilisation drums and autoclaved at 1350 Celsius for 15 minutes and then stored in their respective drums or pouches ready for use. Sterility was confirmed using 3M Comply™ SteriGage™ strips placed into each pouch or drum containing the BLD according hospital policy. The VGD was prepared by resizing the gauze and impregnation with Vaseline, packaging in a drum and sterilisation for 2 hours at 1350C. BLD was re-autoclaved every other day while VGD was re-autoclaved daily as per hospital protocol.

Enrolment of participants

Eligible patients were identified preoperatively, consent and assent were obtained. The first participant was selected by the tossing of a coin and subsequent participants were alternated between each arm of the study. Participants were blinded to the type of dressing applied to their SSG donor site wound.

Intraoperative procedure

The SSG was harvested under general anesthesia or under spinal anesthesia using either a Zimmer® Air dermatome or a Humby knife set between 0.5mm-1.0mm. The choice of SSG donor sites dressing was made alternately between BLD and VGD for subsequent patients. The dressings were covered with a layer of gauze or Gamgee dressing and crepe bandage. Ease of application of BLD and VGD was scored on a scale of 1-10 and recorded by the nurse or surgeon who applied the dressing.

Postoperative assessment

Post operatively all patients were given Ibuprofen and Paracetamol or drug combinations containing both drugs eight hourly for 5 days as per hospital protocol. Subjective scoring of the donor site pain was done by the patient on days 3, 5, 7 and 9 using the 0-10 Numerical Pain rating scale (6). On day 10, dressing change was done and participants scored their donor site pain on dressing change. The ease of dressing removal was recorded by the dressing nurse on a scale of 1-10. Pictures of the donor site wound were taken using a Canon Powershot SX710 HS digital camera. The percentage surface area of epithelialized wound was recorded as a percentage of the total wound surface area. Two other study-blinded surgeons assessed the photographs of the wound for percentage epithelialisation. An average of the three values of percentage epithelialisation was then calculated and taken. A wound swab was taken for microbiology culture the wound according to the wound swabbing techniques describe by Rose Copper (7). The wound was then re-dressed until complete healing.

Cost Assessment for BLD and VGD

The cost of production of each material was calculated from the total cost of materials used, labor and time. The unit cost of production was calculated from the total cost divided by the number of

pieces of each dressing prepared. The cost of dressing material used for each patient was calculated. A cost analysis was then done to compare the cost of using VGD to that of BLD.

Data management and analysis

Data management and statistical analysis was performed in Epidata 3.1 and STATA11.2.

Ethical approval

Requisite approval for the study was obtained from CoRSU Hospital, Mbarara University of Science and Technology Research and Ethics Committee (MUREC 1/7), National Drug Authority and the Uganda National Council of Science and Technology.

Results

Participant Baseline Characteristics

A total of 95 participants were enrolled into the study. 86 of these completed the study period successfully while 9 patients were lost to follow up during the study period. Among the 86 participants who completed the study period, 52 (60%) were male and 34(40%) were female. The age of participants ranged from 10 years to 46 years with an average of 18 years. 45 (52%) participants had their donor sites dressed with BLD, while 41(48%) were dressed with VGD. Participants enrolled into the study had various indications for SSG harvest, the commonest being post burn contracture release (26), followed by flap donor site cover (22) and then post traumatic ulcers (12) among other reason

Postoperative pain

Pain scores showed a progressive reduction in pain on SSG donor site wounds with time, using the pain score on Day 3 as the baseline. Graph 1 above illustrates no significant relationship between the rates of reduction of pain with the type of dressing used on the wound. Pain was graded as mild (0-3), moderate (4-6) or severe (7-10) pain. Table 3 above shows the level of pain participants had upon dressing change on postoperative day 10. Fewer participants with BLD (n=11, 24%) experienced severe pain while more participants with VGD experienced severe pain (n=24, 59%) p=0.006.

Percentage epithelialisation of SSG donor site wounds on Postoperative Day10

Wounds dressed using BLD epithelialized faster than those dressed using VGD with an average percentage epithelialisation of 81% by Day 10 on wounds dressed with BLD, compared to 69% for wounds dressed with VGD (p=0.0158) as shown in Table 2.

Microbial characteristics of SSG donor site wounds

Microbial culture of wound swabs taken from donor site wounds were done. 40% of the participants had no organism grown on microbial culture. Staphylococcus aureus was the commonest organism grown on culture (29%) for both participant groups. 19 other types organisms were isolated including Staphylococcus epidermidis, Staphylococcus haemolyticus, Staphylococcus microti, Streptococcus pyogenes, Pseudomonas aeruginosa, Pseudomonas acidovorans, Enterobacter aerogenes, Enterobacter cloacae, Proteus mirabilis, Proteus vulgaris, Morganella morganii, Kluyvera ascorbata, Rahnella aquatilis, Escherichia coli, Erwinia persicina, Hafnia alvei, Yersinia mollaneti, Citrobacter koseri, Photorhabdus asymbiotica, Photorhabdus luminesce but none had any significant correlation to the type of dressing used.

Usability of Dressings

The usability of dressing was scored subjectively by the surgeons and nurses who applied the dressings considering ease of application and removal. This was scored as easy, moderately easy or difficult. Table 6 shows that most of the users of both dressings found them easy to apply (n=84, 98%). Ease of removal of dressings was assessed likewise and showed that, 96% of BLD users found it easy to remove with only 4% being moderately easy to remove. No BLD user found the dressing difficult to remove from the SSG donor site wound. VGD users, in comparison, found the dressing mostly difficult to remove (41%) although some users found it moderately easy (29.3%) or easy (29.3%) to remove. Table 4 shows the comparison of ease of removal of dressings by type, with p=0.000.

Cost of dressings

Cost of BLD and VGD was analyzed using two sample t-tests and showed that VGD was 4 times more expensive to use than BLD. Table 5 shows the comparison of the mean cost in Uganda shillings of the two types of dressing.

Discussion

86 patients were enrolled in the study. 52 males and 34 females. 45 patients were dressed with BLD and 41 with VGD. The discrepancies in the numbers enrolled for each arm of the study were due to loss to follow-up in a study where sampling was alternate.

Postoperative pain

Subjective postoperative pain scores revealed a reduction in pain on the SSG donor sites as the days went by as is expected in any wound that is undergoing normal healing. The postoperative pain trend was the same for both participants with BLD and VGD. Gore and Akolekar showed that BLD had a cooling effect on partial thickness burn wounds (8); similarly, in our study, patients dressed with BLD were generally more comfortable and reported verbally that they had significant reduction in donor site pain in comparison to those with VGD. Patients who had the chance to undergo both dressings at different times either from repeated surgeries or staged operations, reported higher pain scores on the VGD sites than the BLD sites.

Analysis of the postoperative pain scores however did not reveal any significant relationship between the dressing applied and the pain scores. Therefore the pain experienced by the patients during the postoperative period might not have been necessarily influenced by the type of dressing applied to their SSG donor site wound but rather by other factors including, age, sex, individual pain thresholds, among others, whose influence was not part of the objectives of this study. Severity of pain experienced upon dressing change on the 10th postoperative day revealed that

patients dressed with BLD had only mild to moderate pain compared to those dressed with VGD who reported severe pain. These pain scores can be attributed to the nature of the two dressings. As described by Gore and Akolekar(8), BLD has a large waxy non-adherent surface that does not integrate with underlying dermal and epithelial cells of the healing wound. VGD on the other hand, in addition to allowing the wound to dry out, integrates with the underlying epidermis leading to trauma to the underlying epidermis during dressing change hence increasing pain and bleeding. This is similar to what was found in studies done by Queen and colleagues (9) and Jones (10). The patients who had BLD in this study only experienced severe pain if the BLD slipped off the wound, bringing the wound in direct contact with the overlying dressing or exposing it to air. This was seen in 3 patients with BLD in our study, in which case dressings had to be adjusted to cover the raw area of the wound.

Wound re-epithelialization

The rate of wound re-epithelialization was used as a measure of the rate of healing and was shown to be faster with BLD than VGD, similar to what Gore and Akolekar found (3). This may be attributed to certain properties of BLD that give it a better propensity for re-epithelialization. In our study, BLD was found to have a large smooth surface that provided occlusive dressing to the SSG donor site wounds and preserved moisture on the wound bed in addition to providing sufficient coverage for nearly all sizes of SSG donor site wound. The ridged contour of BLD also allows drainage of excess exudate from the wound surface into the surrounding absorbent dressing without letting the wound dry out. In contrast, VGD allowed the wound surface to dry out both through evaporation and also through capillary absorbance of exudate from the wound into the overlying absorbent dressings.

The importance of moisture in wound healing has been emphasized by Jones who stated that moisture allows epithelial migration (10), similarly, Sagray and colleagues stated on the need for moisture in the optimal healing of SSG donor sites (11). Another study by Bryan et al, stated that moist wounds had a higher concentration of macrophages by day 3, fewer inflammatory cells by day 5 and were re-epithelialized by day 7 (12). Many studies alluding to the ideal wound dressing material have emphasized the need for maintenance of moisture balance at the wound-primary dressing interface (13), a property which is provided for by BLD.

Microbial culture

In our study, 40% of all patients had no organism grown on microbial culture, similar to what Rakel and colleagues concluded in their study, stating that SSG donor site infection was rare, occurring among only 5% of cases (14). A myriad of organisms however, were isolated among the other 60% of the patients, the commonest being Staphylococcus aureus, a gram-positive coccus, which exists as normal flora on skin. The other organisms isolated occurred so rarely and could be attributed to wound contamination or sample contamination during inoculation in the laboratory. One patient with BLD and one patient with VGD had signs of inflammation on their wounds on dressing change, which included erythema, swelling of surrounding skin and pus discharge. These could be attributed to infection, enhanced by individual patient factors but occurred too rarely to be significant.

Usability of dressings

The use of the BLD and VGD were compared in terms of the ease of application during intraoperative wound dressing and ease of removal during dressing change on 10th postoperative day. Subjective scores of ease of application indicated that both BLD and VGD were easy to apply. Application of BLD however, required a steady placement of absorbent dressings over the primary

BLD dressing, taking caution to ensure the BLD does not slip and expose any part of the SSG donor site wound. The BLD dressing also needed to be trimmed to only allow slight overlap the SSG donor site wound edges, otherwise, excess dressing covering normal skin wound cause friction between the BLD and skin on movement, causing friction burns and blistering of the normal skin and pain. This phenomenon was observed in 2 patients in this study.

Ease of removal however showed that BLD was easier to remove than VGD. This is attributed to the smooth non adherent surface of BLD, similar to what Gore and Akolekar found in their study (3). On the other hand, VGD undergoes progressive desiccation, adheres to the wound surface and may have epithelial cells growing over the gauze, causing integration between the gauze and the underlying the wound bed and increasing the difficulty of dressing removal (9). Queen also alluded to the pain and bleeding associated with VGD removal due to damage caused to the epithelium and these properties of VGD are exactly similar to what was found in our study.

Cost of dressings

BLD was found to be up to 4 times cheaper than VGD, making it a cheaper dressing suitable for regular use in a developing country as recommended by Atiyeh et al (15).

Conclusion

Banana Leaf Dressing, once placed and secured correctly, is an effective dressing for SSG donor sites as it is associated with less pain on dressing change, quickens epithelialisation, does not predispose patients to any infection and is relatively cheap in comparison to the traditional Vaseline gauze dressing.

Limitations

1. It was difficult to keep some participants admitted for the 10-day period of the study as there were cost implications hence the loss to follow up of some patients.
2. Scales used for estimation of pain and for ease of use of dressings were subjective hence compromising accuracy of results.

Recommendations

We would recommend:

1. That banana leaf dressings be adopted as dressing for more regular use on split thickness donor site wounds, burn wounds and perhaps for general surgical wounds like laceration and abrasions as well because it is easy to remove.
2. That banana leaf dressing be adopted by every hospital in Uganda and other low-income countries which have a great availability of bananas because it is cheap.
3. Another study to compare the use of Banana leaf dressing to more recent dressing like Alginate dressings.
4. Another study to examine the chemical components of Banana leaf that may enhance its properties in hastening wound healing.

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Figure 1: Average pain scores by day for BLD and VGD participants

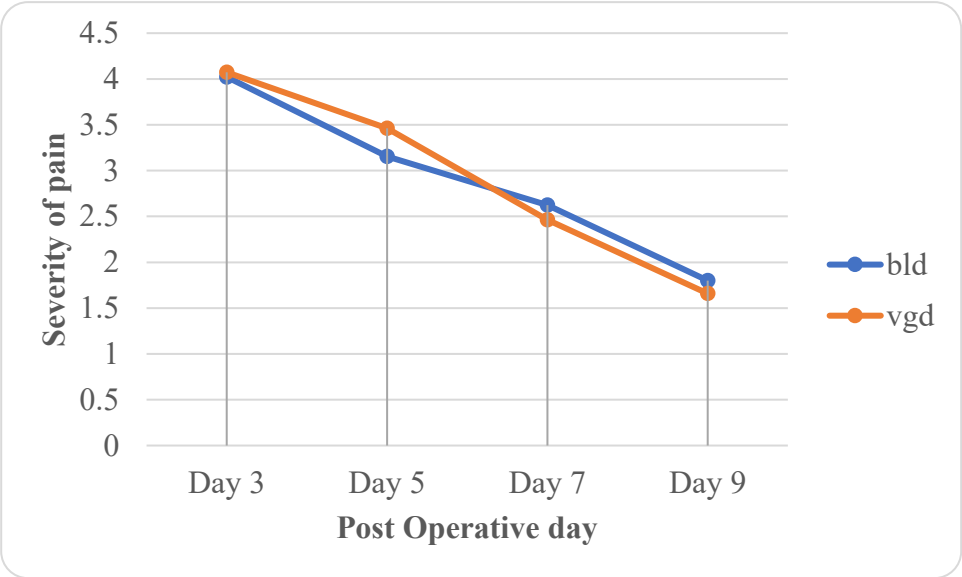

Table 1: Comparison of pain on dressing change with type of dressing

Pain on dressing change	BLD (%) n=45	VGD (%) n=41	Total (%)
Mild	17(37.78)	8 (19.51)	25(29.07)
Moderate	17(37.78)	9 (21.95)	26 (30.23)
Severe	11(24.44)	24(58.54)	35 (40.70)
Total	45(100.00)	41(100.00)	86 (100.00)

Pearson chi^2 (2) = 10.3665 p= 0.006

Table 2: Comparison of percentage epithelialisation with type of dressing

Type of dressing	Number	Mean	Std. Dev.	[95% CI]	P value
BLD	45	81.44	26.17	73.58-89.31	
VGD	41	68.98	26.67	60.56-77.39	
Total	86				p (T > t) = 0.0158

Table 3: Effect of dressing type on microbial culture

Organism identified	BLD (%)	VGD (%)	Total (%)
No organism	14 (31.11)	20 (48.78)	34 (39.53)
Staphylococcus aureus	12 (26.67)	13 (31.71)	25 (29.07)
Others	19 (42.22)	8 (19.51)	27 (31.40)
Total	45(100.00)	41(100.00)	86 (100.00)

Pearson chi^2 (21) = 20.6241 p= 0.482

Table 4: Usability of Dressings

Type of dressing	BLD (%)	VGD (%)	Total
Ease of application			
Easy	43 (95.56)	41(100.00)	84 (97.67)
Moderately easy	1(2.22)	0 (0.00)	1 (1.16)
Difficult	1(2.22)	0 (0.00)	1(1.16)
Ease of removal			
Easy	43 (95.56)	12 (29.27)	55
Moderately easy	2 (4.44)	12 (29.27)	14
Difficult	0 (0.00)	17 (41.46)	17

Pearson chi^2 (2) = 41.5194 p=0.000

Table 5: Comparison of cost of dressing for BLD and VGD

Type of dressing	Frequency	Mean cost in UGX	Std. Dev.	[95% Conf. Interval]	
BLD	45	56	28.79394	47.34934	64.65066
VGD	41	228.2	106.6748	194.622	261.9634
Total	86	138.14	115.22	113.4355	162.8435

Pr (T < t) = 0.0000