Comparison of two dressings in the management of partial-thickness donor sites

L. Martini,[1] MD, Plastic Surgeon;
U.M. Reali,[1] MD, Professor of Plastic Surgery;
L. Borgognoni,[1] MD, Plastic Surgeon;
P. Brandani,[1] MD, Plastic Surgeon;
A. Andriessen,[2] RN, MA, CNS, International Clinical Specialist;
1. Plastic Surgery Division, University of Florence, Florence, Italy
2. Smith & Nephew Medical Ltd.

This study evaluated and compared the performance of an adhesive hydrocellular dressing with that of a paraffin gauze dressing in the treatment of partial-thickness skin-graft donor site wounds. Fifty patients were included in the study, each acting as his/her own control. Donor site area ranged from 20cm^2 to 71cm^2; half the area of each patient's donor site was treated with the trial dressing, the other half with paraffin gauze. Outcome measures assessed were: time to complete epithelialisation; ease of dressing removal; pain on removal; and appearance of the wound bed. The trial dressing demonstrated a significantly faster healing time ($p < 10^{-6}$) and enhanced patient comfort.

Hydrocellular dressings; Skin grafts

Wounds caused by skin graft harvesting differ from other wounds in that they have uniform edges, wound bed and wound environment. Partial-thickness skin grafts are usually 300-375mμ in depth. Re-epithelialisation occurs from the epithelial cells in the sebaceous glands and hair follicles that remain in the wound bed.

Donor sites are usually dressed with a paraffin gauze dressing and postoperative bleeding is reduced by application of a light-compression bandage. Healing times range from seven to 12 days.[1] The disadvantages of this regimen are adherence of the dressing to the wound bed due to the formation of blood clots, and pain and damage to the re-epithelialisation tissue on dressing removal or trauma due to friction.[2-4]

The effectiveness of hydrocellular dressings in the treatment of various wound types suggests that they might be of use in the treatment of donor site wounds.[5,6] These dressings are easy to use and have low adherence to the wound bed, reducing pain and trauma on dressing removal.[7,8]

The purpose of this study was to evaluate the performance of a hydrocellular dressing (Allevyn Adhesive) and compare it with that of a paraffin gauze dressing in the treatment of partial-thickness skin-graft donor sites.

Method

The hydrocellular dressing used in this study consists of three layers. The external layer, a vapour-permeable polyurethane film, creates a bacterial barrier and prevents fluid from leaking.[7] The hydrophilic core accounts for the high absorbency of the dressing (10 times its weight) and for its structural integrity; the dressing can be left on the wound for more than four days. The third layer, a polyurethane hypoallergenic adhesive film which adheres to the surrounding skin, offers good protection from trauma due to friction.[6] The paraffin gauze dressing consists of a bleached cotton gauze, impregnated with 175g of paraffin per square metre.

Fifty patients were recruited who fulfilled the following inclusion criteria: patients of either sex, aged at least 18 years, who required partial-thickness skin grafts, were compliant with medical treatment and able to give consent. Exclusion criteria were: pregnant women, patients with plasma proteins < 6mg/100mL, Hb < 10mg/100mL, or those with clinically infected wounds.

Grafts were harvested manually with a dermatome. This procedure was carried out by one plastic surgeon in all subjects. After harvesting, the donor site was prepared with saline soaks approximately 10 minutes before the dressing was applied (Fig 1). Each patient acted as his/her own control (Fig 2). Half of the donor site area was treated with the trial dressing, the other half with paraffin gauze (Fig 3).

The trial dressing was changed after four days, if required. The paraffin gauze dressing was changed after seven days, according to normal practice. The treatment lasted seven days or until one of the following endpoints had

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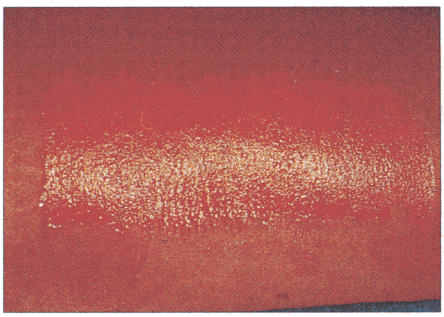

Fig 1. Example of a donor site after harvesting for a partial-thickness skin graft

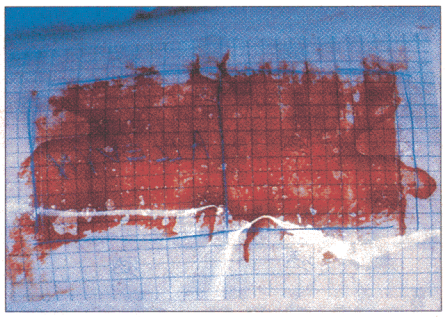

Fig 2. Tracing of the wound, showing division into two areas for application of control and trial dressings

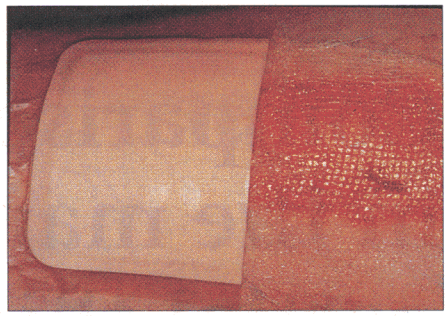

Fig 3. The two dressings in place, each on half of the wound area. (Left) Trial dressing. (Right) Paraffin gauze dressing

been reached: re-epithelialisation; an adverse incident; patient withdrawn for other reasons. At each dressing change a clinical evaluation of the wound was carried out by a plastic surgeon, using the assessments described below and data were recorded in response to specific questions relating to the assessments.

Ease of dressing removal

If dressing removal was possible, the percentage of tissue damage or bleeding of the wound bed on dressing removal was monitored and indicated on the ulcer tracings/photographs at days 0, 4 and 7 and at the end of the study. (If the dressing had completely adhered to the wound it was left *in situ* as this indicates that epithelialisation had not been completed.)

Appearance of the wound bed

For assessment of the condition of the wound bed, a red/yellow/black colour classification model[9] was used. This indicates what is happening at tissue level, independent of aetiology. If dressing removal was possible, the three colours were documented for each wound and the percentages present were indicated on ulcer tracings/photographs at days 0, 4 and 7 and at the end of the study. Tracings were taken using a measuring grid (Opsite Flexigrid); the number of whole and half squares were counted. Photographs were taken using a standardised technique and equipment. Test and control areas were photographed on the same standard blue background (disposable surgical drape) and aperture, exposure time and subject distance were kept constant.

The colour and odour of the exudate in the dressing were used as parameters to assess possible clinical infection. The peri-wound skin condition was assessed for information on any increase in pain reported by the patient. In cases of pyrexia, a wound biopsy was performed and blood cultures taken.

Pain on dressing removal

To analyse pain, a 10cm visual scale was used. At each dressing removal, subjects were asked to put a single stroke on the line to indicate their level of pain (0 = no pain, 10 = unbearable pain). In order not to skew the pain assessment, dressings that did not adhere were removed first.

Method of analysis

Data from the completed and validated questionnaires were completed by the plastic surgeon and entered into a database written in Microsoft Access. A randomisation code was used to define the trial and control sites. Summary baseline statistics were compiled to help evaluate the validity of statistical assumptions. Discrete variables (for example, gender) were analysed using the chi-square statistic or Fisher's exact test where appropriate. Other variables were analysed using the student's t-test.

To evaluate the time to complete epithelialisation (percentage change in area, percentage change in condition of the wound bed) a repeated measure analysis of variance was used in which the effect of wound site (trial versus control), time (days 0 through 7 and end of study), and their interaction were assessed. To obtain comparable data on healing time for variance analysis, further measurements were made at days 10 and 12 if re-epithelialisation was not complete by day seven. Statistical analysis included the chi-square test and variance analysis (one-way Anova).

Results

Fifty patients, 28 female and 22 male, were enrolled in the study, 44 of whom were evaluated at the endpoint of the trial. Six were excluded because of signs of clinical infection in the control site. Patient age ranged from 18 to 88 years, (mean 59.6). All grafts were taken from the thigh and harvested as partial-thickness skin grafts. Donor site area ranged from 20cm^2 to 71cm^2 (mean 43.4 cm^2).

Ease of dressing removal

Trial site The hydrocellular dressing was easy to apply and after four days it was easy to remove, adhering only slightly to the wound bed. The complete dressing was saturated with

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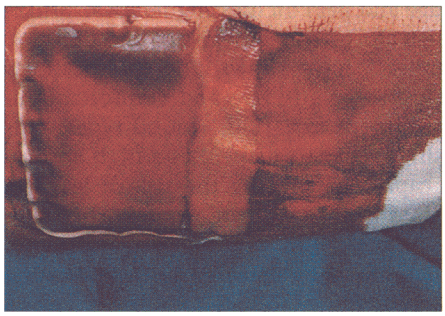

Fig 4. (Left) Dressing saturated with blood; no adherence of trial dressing. (Right) Adherence of paraffin gauze dressing

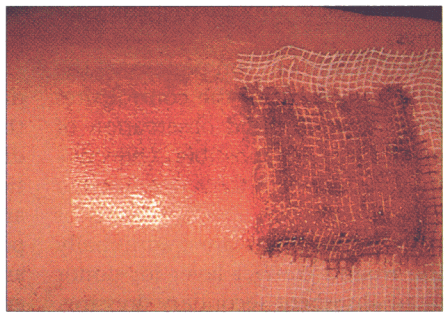

Fig 5. After seven days. (Left) Epithelialisation in trial area. (Right) Adherence of control dressing

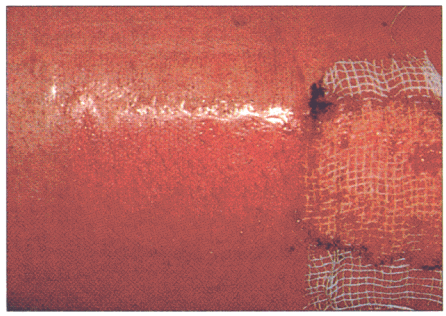

Fig 6. A different patient, after seven days of treatment. (Left) Epithelialisation in trial area. (Right) Adherence of control dressing

blood, even when the patient was at rest (Fig 4). This was predictable, because the bleeding from a skin-graft donor site is usually heavy during the first three to four days after harvesting. There was no leakage during wear time.

Control site In all 44 patients, the paraffin gauze dressing had adhered completely to the wound bed by day four and was therefore left in place (Fig 4). At day seven, the paraffin gauze was still adhering to the wound bed and dressing removal was not possible without causing pain and damage to the wound bed.

Appearance of wound bed

At Day 0, after harvesting, the partial-thickness grafts were on average 300-375mμ thick. Elements of epidermal tissue remained in the base of sebaceous glands and hair follicles. Healing times for both sites are summarised in Table 1.

Trial site A total of 23 patients had complete epithelialisation of the trial site at Day 4, a further 18 at Day 7 (Figs 5 and 6), and a further three at Day 10. Thus, at the end point of the study (Day 7), 41/44 patients using the trial dressing had complete epithelialisation. The mean value was 5.64 days (s.d. ±1.88 days).

Control site In all 44 patients, the paraffin gauze dressing adhered completely to the wound bed at Day 4 and was therefore left in place. At Day 7 this was still the case in 28 patients, and at the end point of the study (Day 7), only 16 out of 44 patients had complete epithelialisation of the control site. Epithelialisation was complete in a further 26 patients by Day 10, and in the remaining two by Day 12. Mean value was 9.0 days (s.d. ±1.58 days)

Table 1. Time to complete epithelialisation (trial site and control site)

Assessment point	Number of patients (N = 44) Trial site	Control site
Day 4	23	0
Day 7	41	16
Day 10	44	26
Day 12		28*

*Epithelialisation was not complete in 16/44 control sites at 12 days

Pain assessment

The hydrocellular dressing caused significantly less pain on removal than the paraffin gauze dressing.

Trial site Pain was experienced by only three patients, who all scored 2 (slight pain) on removal of the dressing; 41 patients scored 0 (no pain).

Control site In all 44 patients, the removal of the paraffin gauze dressing induced unbearable pain (score = 10).

Analysis

Comparing the number of donor sites healed at seven days (41 trial sites, 16 control sites), the chi-square value was $< 10^{-6}$. Complete epithelialisation at seven days in the trial site is 85% (estimate); treatment difference: 25%; significance: 5%; power: 80%. Dressing adherence was taken as a clinically accepted parameter that healing is not complete. The fact that the paraffin gauze dressing could not be removed did not prevent wound assessment at days 0, 4 and 7, and at the end of the evaluation. The adherence of the dressing is a clinically accepted parameter for confirming that the wound has not healed.

In comparing the overall healing times, the variance analysis showed a significant difference in favour of the trial sites ($p < 10^{-6}$).

Discussion

When traditional dressings are used, healing time for donor sites ranges from seven to 12 days. Partial-thickness skin graft donor sites may vary in depth depending on the technique used and the experience and skills of the person harvesting the graft. In the present study the grafts were harvested by one person using a manual dermatome, in order to standardise wound depth as much as possible. A further measure to avoid bias was the use of a

randomisation code to allocate trial and control dressings.

One trained plastic surgeon performed the assessments. As in most of the control sites the dressing adhered, blind observation of the donor site was not possible. Objective quantitative measurement tools were used to minimise the effect of bias.

Paraffin gauze dressings are traditionally used as the wound contact layer for donor sites, with an absorbent secondary dressing. Typical disadvantages observed with this regimen are adherence of the dressing due to coagulation, damage and frictional trauma to the wound bed. Patients have reported donor sites to be very painful. Frictional trauma can also result in hypertrophic scarring. In patients with extensive deep burns this could limit the possibility of using autologous grafts.

The absorbent capacity of the paraffin gauze dressing and absorbent secondary dressing is limited. When saturated with blood it becomes hard and may stick to the wound bed, causing damage and pain on dressing removal. Strike-through also increases the risk of infection.

Studies[6-8] have shown the hydrocellular dressing to be effective and comfortable in the treatment of various wound types. This dressing is easy to shape, has a high absorption capacity, reducing the risk of leakage, and does not stick to the wound. The outer polyurethane film prevents strike-through and helps to maintain a moist wound-healing environment.

Conclusion

The hydrocellular dressing, when compared to paraffin gauze, demonstrated a significantly faster healing time ($p < 10^{-6}$). It provided a clean moist wound environment, beneficial to healing, was easy to apply and remove, without causing mechanical trauma to the wound bed, thus encouraging faster more comfortable wound healing. Patients reported slight or no pain on removal of the trial dressing but, with the control dressing, they reported unbearable pain. ■