Authors' objectives
To determine the best available evidence related to the post harvest management of split thickness skin graft (STSG) donor sites. The specific review questions addressed were:

1. What interventions or dressings used in the management of the STSG donor site are most effective in reducing time to healing; in reducing the rates of infection; and in reducing pain levels and promoting comfort?

2. What interventions or dressings are most effective in managing delayed healing or infection in the split skin graft donor site?

3. What interventions are most effective in managing the healed split skin donor site?

Searching
The databases searched included CINAHL, MEDLINE, PREMEDLINE, the Cochrane Library, Current Contents, HealthSTAR, EMBASE, Expanded Academic ASAP, and Dissertation Abstracts International. The search terms included 'skin', 'graft' and 'donor'. The years of the search were not specified. Studies were also identified from the reference lists of the retrieved studies. The database searches commenced in May 1999 and were repeated at 4 months.

Study selection
Study designs of evaluations included in the review
The review primarily considered any intra-individual trials (IITs) and prospective randomised controlled trials (RCTs). In the absence of RCTs and IITs, other designs such as controlled clinical trials were considered for inclusion. In the absence of studies that provided objective measures of healing and morbidity of STSG donor site, other studies were considered for the purpose of a narrative summary of current approaches.

Specific interventions included in the review
The interventions related to the post harvest management of the STSG donor site included: primary wound dressings of any type; secondary dressings and comparison therapy; dressing regimens; and non-dressing topical applications. The interventions related to the management of delayed healing or infected STSG donor site included: wound dressings of any type; and non-dressing topical applications such as antibiotics and antiseptics. The interventions related to the management of healed split STSG donor sites included: types of moisturisers; cleansing and moisturising regimens; and strategies to protect the donor site from UV radiation.

Participants included in the review
Patients of any age with STSG donor sites were included.

Outcomes assessed in the review
The primary outcomes were objective measures of healing, such as the proportion of donors healed within the study period; time to complete healing; rate of infection; rate of breakdown following complete healing and pain scores.

How were decisions on the relevance of primary studies made?
All studies identified from the database searches were assessed for relevance based on the information provided in the title, abstract, and MeSH terms. The studies identified from the searches of the reference lists were assessed for relevance based on the study title. The number of reviewers involved in this process was not stated.

Assessment of study quality
Methodological quality was assessed using a checklist developed by the author, which was based on the work of the
The Cochrane Collaboration and Centre for Reviews and Dissemination (CRD), and further refined by the staff of the Joanna Briggs Institute for Evidence Based Nursing and Midwifery. The quality checklist included the following criteria: randomisation; intervention groups treated the same apart from intervention; outcomes measured in the same manner for all participants; comparability at baseline; allocation concealment; blinded outcome assessment; and adequate follow-up. Criteria 1 to 4 had to be met for studies to be included in the meta-analyses. Studies which failed to meet criteria 5 to 7 were only included in the review if no other high-quality studies were identified. The author does not state how the papers were assessed for quality, or how many of the reviewers performed the quality assessment.

**Data extraction**

Data were extracted using a data extraction tool developed specifically for the review.

The author does not state how many of the reviewers performed the data extraction.

The data extracted included: author; journal; year; methods; setting; gender and the number of participants; interventions; outcome measures; results, i.e. odds ratios (ORs) for categorical outcome data, and weighted mean differences (WMDs) for continuous data, along with their 95% confidence intervals (CIs); author's conclusions and comments.

**Methods of synthesis**

**How were the studies combined?**

A meta-analysis was carried out where possible using either a fixed-effect or random-effects model. Where pooling was not possible, the findings were presented in a narrative format.

**How were differences between studies investigated?**

Heterogeneity was assessed using a standard chi-squared test with a significance level of $p$ less than 0.01.

**Results of the review**

A total of 58 RCTs and IITs were included in the review. The total number of participants was not stated.

Interventions relating to the post harvest management of STSG donor sites. A total of 37 comparisons were specified.

Moist versus non-moist wound healing products.

The analyses for this comparison revealed that moist wound healing products were significantly superior to non-moist products in terms of healing, infection rates, and pain. A total of 13 comparisons were carried out.

For days to complete healing (6 trials, $n=348$), the WMD was $-3.97$ (95% CI: $-5.91$, $-2.02$) and chi-squared was $96.65$ (d.f.=5, $p=0.00$); statistically-significant results were also demonstrated in other healing categories. For dressing rated as more painful than alternative dressings (3 trials), the OR was $0.08$ (95% CI: $0.01$, $1.25$) and chi-squared was $10.37$ (d.f.=2, $p=0.01$). For overall pain on an analogue scale of 1 to 10, 10 being the most painful (3 trials), the OR was $-1.75$ (95% CI: $-2.94$, $-0.56$) and chi-squared was $10.37$ (d.f.=2, $p=0.01$). For the presence of clinical infection (9 trials), the OR was $0.33$ (95% CI: $0.12$, $0.96$) and chi-squared was $10.15$ (d.f.=8 $p=0.25$).

Calcium alginites.

There were no studies of sufficient quality to make a judgement between the performance of calcium alginites and other moist wound healing products, or between specific products within the calcium alginate group. When comparing calcium alginites with non-moist wound healing products, there was only one outcome in relation to healing, i.e. not healed at day 8 (1 trial), that demonstrated statistical significance between the treatment and control (OR $0.07$, 95% CI: $0.03$, $0.20$). In considering the outcomes of pain and infection, no conclusion can be drawn as there were insufficient studies to make a judgement.

Hydrocolloids.
Hydrocolloids were found to be superior to non-moist wound products in relation to healing, pain and infection.

For days to complete healing (2 trials), the WMD was -2.19 (95% CI: -2.89, -1.49) and chi-squared was 10.60 (d.f.=1, p=0.00); statistically-significant results were also demonstrated in other healing categories. For dressing rated as more painful than alternative dressings (1 trial), the OR was 0.18 (95% CI: 0.03, 1.11). For overall pain on an analogue scale of 1 to 5, 5 being the most painful (1 trial), the OR was -0.63 (95% CI: -1.25, -0.01). For the presence of clinical infection (4 trials), the OR was 0.21 (95% CI: 0.07, 0.65) and chi-squared was 4.56 (d.f.=3, p=0.34).

In the studies comparing hydrocolloids with other moist products, it was not possible to assess whether they were superior to the other products in relation to healing. When considering the outcomes of pain and infection, there was no evidence to suggest that hydrocolloids performed any better than other moist products. There was little evidence to indicate that one hydrocolloid was superior to another.

Polyurethane semi-permeable transparent films.

The results for polyurethane films compared with non-moist products were mixed in relation to the outcome of healing. Polyurethane films fared better with regard to pain and infection, suggesting that they are superior to non-moist products.

For dressing rated as more painful (1 trial), the OR was 0.30 (95% CI: 0.05, 1.99). For overall pain on an analogue scale of 1 to 10, 10 being the most painful (1 trial), the OR was -3.10 (95% CI: -4.28, -1.92); statistically-significant results were also demonstrated in other pain categories. For the presence of clinical infection (4 trials), the OR was 0.28 (95% CI: 0.09, 0.91) and chi-squared was 6.17 (d.f.=3, p=0.19). When compared with other moist wound products, on balance, there was no strong evidence to suggest that one group was superior to another for any of the outcome categories.

Only one study that compared two polyurethane films was of sufficient quality; this study found no significant difference between the products in terms of healing, pain or infection.

Polyurethane foams.

Only two studies meeting the inclusion criteria were found that compared polyurethane foams and non-moist wound healing products. The small number of studies and small sample size prevented strong conclusions being drawn. No studies of sufficient quality were found that compared polyurethane foam dressings with other moist products or other polyurethane foam dressings.

Hydrogels.

Only one trial compared hydrogel sheet dressings with other wound dressings. In relation to healing at 10 days, the result significantly favoured the hydrogel (OR 6.43, 95% CI: 1.47, 28.25). There were insufficient data to make a comparison in relation to pain and infection. No studies of sufficient quality were found that compared hydrogel sheet dressings with non-moist wound products, or that compared different hydrogel dressings.

Scarlet Red.

This product was analysed separately to other non-moist wound products. Of all the non-moist products analysed, the results relating to Scarlet Red did hold some promise although they were not convincing.

Porcine bovine-derived dressings.

Two trials combined in a meta-analysis demonstrated the superiority of porcine or bovine products in relation to healing, compared with non-moist products. This was in part balanced by a number of individual studies that showed no significant difference between the product groups. In one study, there were a considerable number of patients who had severe and persistent irritation where the bovine product was used.

Growth factors.
The results suggested that recombinant human growth hormone (rHGH) is the most promising in relation to improved healing times for STSG donors. For days to complete healing (3 studies comparing 0.2 mg/kg per day rHGH with placebo, n=103), the WMD was -1.85 (95% CI: -2.52, -1.17).

Cultured epidermal allografts.

These technologies are not being suggested for routine use but in cases where conventional therapy is inadequate. For days to complete healing (1 trial), the WMD was -8.09 (95% CI: -9.00, -7.18).

Biobrane.

Due to the small number of studies, all with quite small samples, it was difficult to draw any firm conclusions on the comparisons between Biobrane dressings and moist or non-moist products.

Meshed split skin graft, retention dressings, beeswax, phenytoin, asiaticoside, amniotic membrane, live yeast cell derivative, and nobecutane spray.

No conclusions could be drawn due to the lack of evidence relating to these treatments.

Interventions relating to the management of infected STSG donor site.

No clinical trials that dealt specifically with the treatment of infected donor sites were found. A number of studies included in the analysis examined antimicrobial products, but these were used in non-infected wounds.

Interventions relating to the management of the STSG donor site following epithelial cover.

Very few studies were found that dealt with the management of the STSG donor site post healing. Management was directed at protecting the new epithelium from dehydration, physical trauma and UV damage. Only two studies examined the use of moisturisers when epithelial cover was achieved. Both compared bepanthen with placebo. For one study, all the measures favoured the treatment group. However, for the second study, the treated wounds were statistically significantly more hydrated than placebo at day 7. All the other measures reported in the second study showed no statistically-significant differences between the two groups. No trial reports were found that related to any other aspects of management.

Authors’ conclusions

Moist wound healing products have a distinct clinical advantage over non-moist products in the management of STSG donors. There is a strong case for head-to-head studies comparing products within the moist wound care group. Wounds with light to moderate exudate may best be managed with polyurethane films, wounds with moderate exudate with hydrocolloids, and heavily exudating wounds with calcium alginites. This has yet to be tested rigorously but should be considered.

CRD commentary

Elements of this review were well conducted. The aims were clearly stated, and the inclusion and exclusion criteria were specified in sufficient detail. The literature search was comprehensive and included sources of both published and unpublished studies. However, the years searched were not provided. No attempt was made to assess the possibility of publication bias.

It was not stated how many of the reviewers were included in selecting the studies for inclusion and extracting the data. The quality of most studies was assessed by one reviewer, with a small number being assessed by a second reviewer. A description of the individual studies was provided in the text, and in some cases insufficient information was given. For some dressing comparisons, the studies were pooled despite there being considerable heterogeneity between the studies (e.g. for outcome measure days to complete healing for the comparison of moist versus non-moist dressings, possibly due to the breadth of products being evaluated). This may not have been appropriate even though a random-effects model was used.
The author's conclusions follow from the results, although these included some economic comments despite the review not including any economic data.

**Implications of the review for practice and research**

**Practice:** The author states that hydrocolloids can be recommended for use in the management of STSG donor sites. Polyurethane films can be recommended for use in the management of STSG donor sites; it can be suggested that they are more suited to wounds with light to moderate amounts of exudate. Hydrocolloids are not recommended for use in the management of STSG donors when alternative moist products are available. Porcine bovine-derived dressings should not be recommended for use in the management of STSG donors. Cultured epidermal allografts are not suggested for routine use, except in cases where conventional therapy is inadequate.

Extrapolating the evidence relating to antimicrobials and their use in managing infected superficial burns, it can be recommended that certain topical antimicrobials may be used when clinical infection is confirmed. Silver sulphadiazine and iodine-based treatments are recommended with suitable precautions. For the management of the STSG donor site following epithelial cover, patient education and specific interventions should include the use of moisturisers applied frequently, the avoidance of UV exposure, and the use of strong sun creams.

**Research:** The author states that well-designed clinical trials should be conducted to compare calcium alginate with moist wound healing products. Further research is required to determine whether hydrocolloids have any clinical advantage over other moist wound products. It is recommended that polyurethane foams be subjected to further clinical trials in comparison with other moist wound products. Further clinical studies may clarify the potential of Scarlet Red, and this should be considered in light of its level of use. The cost or benefit of growth factors should be further investigated. A cost-utility analysis should be conducted to determine more accurately the overall effectiveness of cultured epidermal allografts. Interventions relating to the management of the STSG donor site following epithelial cover does not seem to be a priority for research, but considering the costs of many of these products and their extensive use, clinical trials should be attempted.

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