

## ORIGINAL ARTICLE

# Associated use of silicone–vitamin E gauzes and $\alpha$ -tocopherol acetate oil in healing of skin graft donor sites

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**Key words**Silicone gauze; Skin graft donor site; Wound healing;  $\alpha$ -Tocopherol acetate**Correspondence to**

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**Abstract**

Split-thickness skin graft is one of the most used procedures in plastic surgery. This procedure involves numerous painful dressings at the donor site.  $\alpha$ -Tocopherol acetate has anti-oxidative and anti-inflammatory properties and it can reduce the local bacterial growth, thereby promoting wound healing. We designed a prospective study to evaluate the effects of two different kinds of dressings at skin graft donor sites. A total of 30 patients were subjected to daily dressings with  $\alpha$ -tocopherol acetate oil and traditional moist gauzes (group 1). Another 30 patients were subjected to dressings every 4 days with  $\alpha$ -tocopherol acetate oil and silicone–vitamin E gauzes (group 2). Healing time, infection rate, patient's pain perception and costs were evaluated in both the groups. No statistically significant difference was found in terms of healing time. The infection rate was slightly different in the two groups. Significant reduction of pain perception was detected in group 2. In the same group, significant reduction in the total cost of the treatment was also observed.  $\alpha$ -Tocopherol acetate oil and silicone–vitamin E gauzes may represent a safe, simple, painless and inexpensive method for improving skin graft donor site healing.

**Introduction**

Split-thickness skin graft (STSG) is one of the most used procedures in plastic surgery. One of the disadvantages of this procedure is the need for numerous and painful dressings at the donor site during the healing process. In literature, various dressing techniques and materials have been used at STSG donor sites, but there is still no consensus on their most appropriate management (1–3). An ideal dressing should promote epidermal healing and should have antibacterial and haemostatic properties, and it should maintain suitable wound moisture and be non-adherent, painless and inexpensive in order to improve patient compliance (4–7).

Vitamin E maintains the integrity and stability of intracellular membrane and has anti-oxidative and anti-inflammatory properties; however, only the acetate form is stable for topical use.

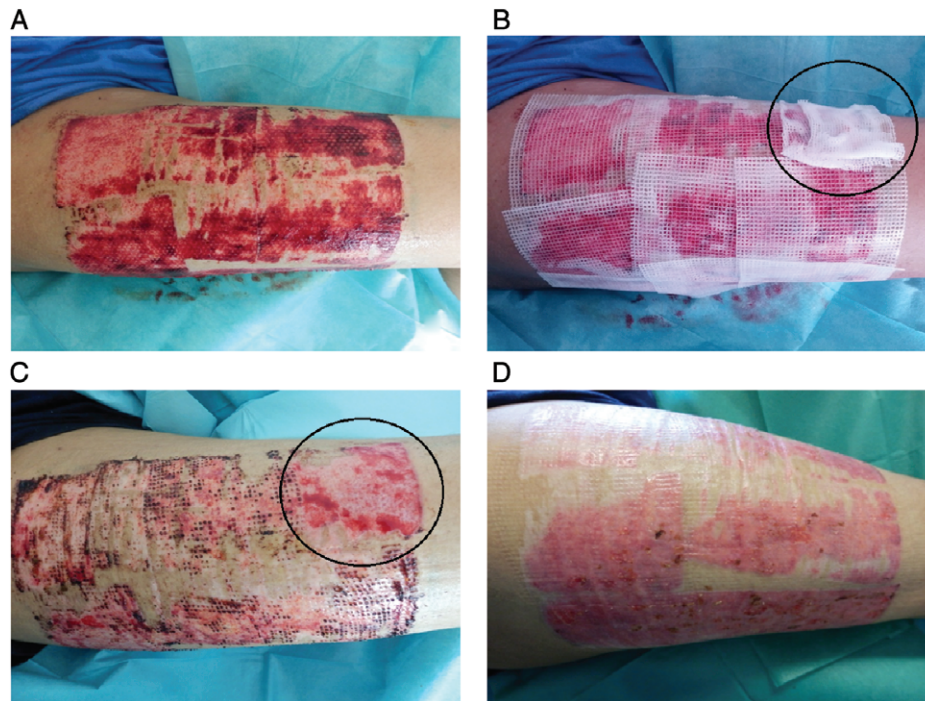
In addition,  $\alpha$ -tocopherol acetate ( $\alpha$ -TA) can reduce local bacterial growth by lowering the pH by creating an anhydrous environment and due to the disjunction of acetic acid by epidermal esterases (8,9). For several years we have used topical  $\alpha$ -TA and moist gauze on different types of

wounds with delayed healing with good results in terms of healing time and infection rate, but often the patients reported pain and discomfort because of the adherence of the moist gauze to the wound despite the daily changing of dressing.

In order to reduce patient distress, we designed and performed a prospective study to evaluate the effects of non-adhesive silicone and  $\alpha$ -TA soaked gauze (Vea Sil; Hulka srl, Rovigo, Italy), in addition to effects of  $\alpha$ -TA oil on STSG donor site healing, comparing it with moist gauze and  $\alpha$ -TA oil.

**Key Messages**

- silicone–vitamin E gauzes are useful in reducing pain at skin graft donor site improve healing
- a group of 30 patients were treated and the results were compared with a second group of 30 patients, in which traditional moist gauzes were used
- the result of this study showed a consistent reduction in pain during dressings, less number of dressing for healing and, importantly, a reduction in cost



**Figure 1** (A) Split-thickness skin graft (STSG) donor site (right thigh) 4 days post-operation after the removal of polyurethane dressing. (B) STSG donor site dressing with  $\alpha$ -tocopherol acetate (TA) oil (Vea Oil; Hulka, Rovigo, Italy). Four layers of moist gauze (Fitostimoline gauze; Farmaceutici Damor Spa, Napoli, Italy) were placed in a small area (circled). A single layer of silicone--vitamin E gauze with  $\alpha$ -TA oil (Vea Sil; Hulka) was placed on the remaining part of the wound. Vea Sil gauzes were left on-site for 4 days, while Fitostimoline gauzes were changed daily during this period. (C) STSG donor site 8 days post-operation. The part of the wound dressed with Fitostimoline (circled area) is still bleeding after removal, while the remaining part of the wound, dressed with Vea Sil, appears to have a more advanced healing. After this dressing, the patient, comparing the pain between the two kinds of dressings, refused to use traditional moist gauzes. (D) STSG donor site 15 days post-operation. The healing was completed using Vea Oil and Vea Sil, changed every 4 days, on the whole area.

## Materials and methods

A total of 60 patients requiring STSG for any reconstructive purpose were included in our prospective study. The purpose was to evaluate the effects of two different kinds of  $\alpha$ -TA based dressing on STSG donor site healing.

The STSGs were harvested using an electric dermatome, with uniform thickness of 0.3 mm, from the anterior or the anterolateral thigh region. Exclusion criteria were represented by sepsis or local infection with necrosis, vasculitis, uncontrolled diabetes, neuropathies or immunological disorders, treatment with immunosuppressant or systemic corticosteroids and very poor patient compliance. The presence of contamination or local infection of the wounds, without necrosis or sepsis, has not been considered as exclusion criteria, but in those cases we modified the frequency of the dressings.

Initially the study proposed the use of both techniques by dividing each STSG donor site into two parts, in order to compare better the two different types of dressing. Unfortunately it was not possible to maintain that design because the initially included patients, comparing the different levels of pain at the dressing change, agreed to the use of the less painful dressing (silicone gauzes) and refused the one with moist gauzes (Figure 1A–D).

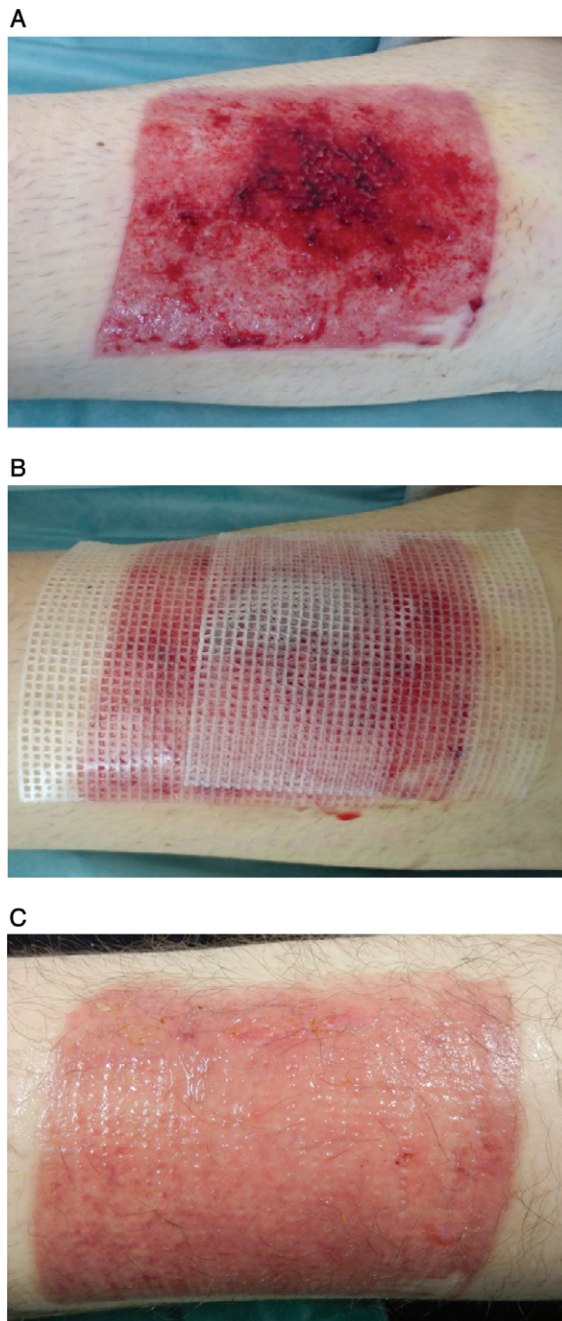
The study group included 36 female and 24 male patients aged between 9 and 82 years, and they were randomly divided into two groups of 30 patients each (group 1 and group 2).

Age, systemic disorders and other factors were considered such that the patients had approximately the same characteristics in each group. In all patients, the first dressing of the STSG donor site was performed intra-operatively with polyurethane foam, kept in situ for 4 days or until the bleeding was reduced.

The subsequent dressings were applied in different ways in the following two groups:

- In group 1, patients were subjected to daily dressings, after wound irrigation with saline solution, with  $\alpha$ -TA applied in the form of oil (Vea Oil; Hulka srl) and traditional moist gauzes (Fitostimoline gauze; Farmaceutici Damor spa, Napoli, Italy) (9).
- In group 2, dressings were changed every 4 days, after irrigation with saline, with application of Vea Oil and silicone gauze soaked with  $\alpha$ -TA (Vea Sil; Hulka srl) (Figure 2A–C). In case of clinical signs of wound infection, the same protocol of dressings was followed every 2 days or daily (Table 1).

The first control visit was carried out 4 days after surgery, while subsequent control visits were carried out every 4–5 days until wound healing.



**Figure 2** (A) Split-thickness skin graft donor site (left thigh) of patient recruited in group 2 after the removal of the polyurethane foam. (B) Four days post-operation. First dressing with Vea Oil and Vea Sil changed every 4 days in the following period. (C) 21 days post-operation. Healing completed.

At each follow-up visit, healing time, infection and patients' pain perception were evaluated.

To evaluate the quality and the evolution of pain during dressings, the patients completed a visual analogic scale (VAS) at each follow-up visit and answered questions related to the presence of pain and its interference with their normal activities. The patients scored their level of pain during each dressing on a scale ranging from 0 (no pain) to 10 (unbearable pain).

**Table 1** Protocol and timing of dressing

	Group 1 Traditional gauze	Group 2 Silicone- $\alpha$ -tocopherol acetate gauze
Clean wounds	Daily	Every 4–5 days
Contaminated wounds	Daily	Every 2 days
Highly exudative wounds	Daily	Daily

**Table 2** Cost comparison between the two groups

	Traditional gauze	Silicone- $\alpha$ -tocopherol acetate gauze
Mean cost for single gauze*	€1.8*	€3*
Mean cost for single dressing	€3.6 (two layers)	€3 (single layer)
Mean cost for the whole treatment	€72 (daily dressing for 16 days)	€18 (6 dressings in 16 days)

\*Price in Italian chemistry.

Furthermore, at every control, the wounds were checked for any complications in healing, in particular for the presence of bacterial contamination. The presence of clinical signs of bacterial contamination, copious exudate or purulent secretion was found in two cases in group 1 and in three (10% of all patients) in group 2. In those cases the frequency of dressings was increased to daily or every 2 days in order to obtain exudate reduction and local bacterial load reduction through the increased cleansing.

## Results

A total of 60 patients, 36 females and 24 males, aged between 9 and 82 years, with STSG donor sites were included in the study and divided into two comparable groups of 30 patients each. None of the patient discontinued the study. None of the patients developed major complications in terms of healing process of STSG donor sites; neither sepsis nor significant bleeding, which required further treatment, were detected in the two groups.

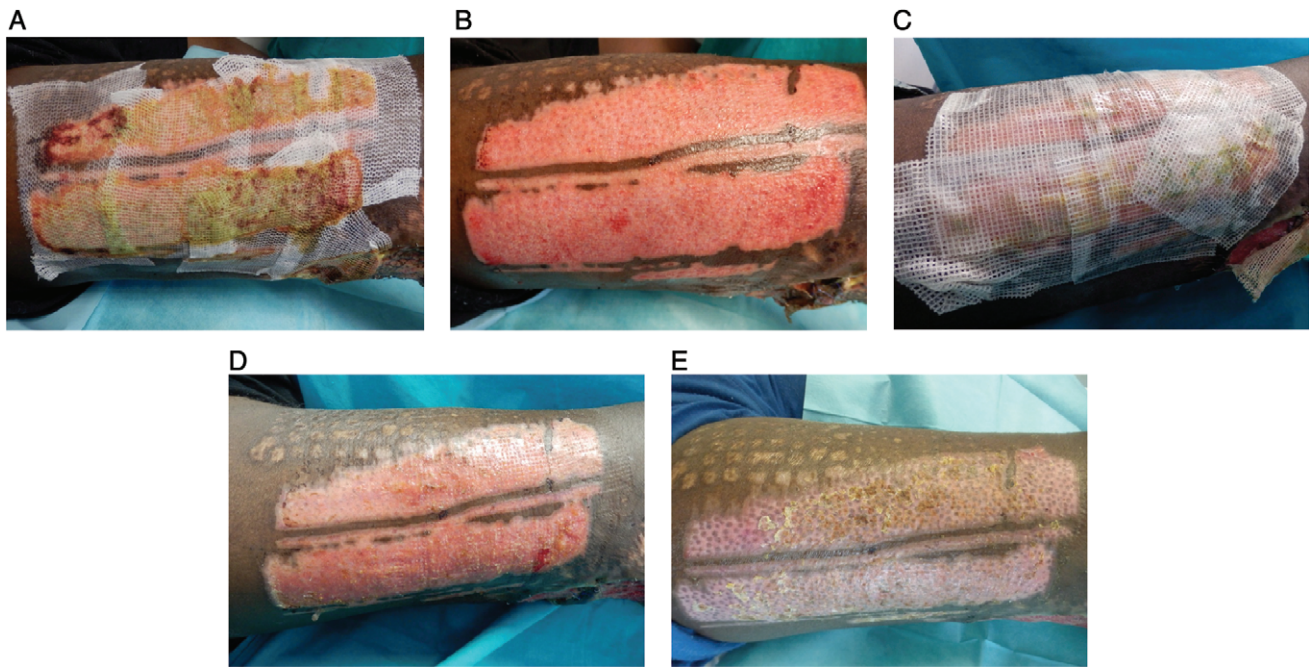
The mean STSG donor site area was approximately  $6 \times 8 \text{ cm}^2$ , ranging from  $3 \times 4 \text{ cm}^2$  to  $10 \times 14 \text{ cm}^2$ . The mean healing time was 20.1 days in group 1 (range 14–25 days) and 20.8 days in group 2 (range 15–25 days). Mean VAS score of pain evaluation was 6.63 in group 1 (range 5–9) and 2.43 in group 2 (range 1–4).

Three patients in the second group developed contamination of the STSG donor site and were treated by increasing the frequency of dressings (Table 1).

The comparison between the two groups of patients showed the following results:

- Healing time: No significant difference was detected between the two groups (20.1 in group 1 and 20.8 in group 2,  $P = 0.44$ ).
- Infection rate: In group 2, we observed three cases of wound infection (10% versus 0% of group 1). In these





**Figure 3** (A) 15 days post-operation. In this patient, during the first 2 weeks, the dressings were changed every day only with normal moist gauzes (Fitostimoline). There is an infection in the donor site with copious exudate. The patient reported high level of pain (visual analogic scale score: 9) during the dressing change because of the adhesion of the moist gauzes to the wound. (B) 15 days post-operation. Removing the normal moist gauzes shows the presence of bleeding. From now on, Vea Sil gauze replaced the moist gauzes. (C) 19 days post-operation. After 4 days of the treatment with Vea Oil and Vea Sil, the reduction of the exudate is appreciable. (D) 19 days post-operation. Change of the dressing after 4 days of treatment with Vea Oil and Vea Sil. Healing is in progress. (E) 30 days post-operation (15 days of treatment with Vea Oil and Vea Sil). Healing is completed.

cases, the dressings were changed every 2 days or daily, until exudate reduction was obtained. In these three patients, the healing time was about 1 week longer compared with the average healing time of group 2. However, a complete healing was usually obtained.

- Pain: The VAS score of group 2 was significantly lower than that of group 1 (2.43 versus 6.63,  $P < 0.01$ ). Few patients, in whom we could test both kinds of gauzes in the same donor site area, refused the traditional gauzes after they experienced reduction of pain in that part of the area treated with silicone gauzes.
- Costs: The moist gauze was required to be applied in more than one layer and had to be changed daily. The silicone gauze can be applied in a single layer and can be changed every 4 days. Although the silicone gauzes are slightly more expensive, considering the mean time of healing, it involves a reduction of cost of 75% (Table 2).

## Discussion and conclusions

For several years in our clinic,  $\alpha$ -TA has been used in its oil form (Vea Oil; Hulka srl) for wound healing by secondary intention. The protocol usually adopted in our clinic consisted of daily cleansing of wounds and subsequent application of Vea Oil and traditional moist gauze. The advantages obtained were faster re-epithelization, a better control of local infections, an easier management of the dressings and a reduction of costs compared with other types of advanced dressings (9).

Even in the presence of documented bacterial infection or contamination, the use of  $\alpha$ -TA has proved to be effective in avoiding the use of antibiotics in certain conditions (8,9). Furthermore, moist gauzes although applied daily or in multiple layers usually adhere to the wound, causing considerable pain during their replacement.

An ideal dressing should provide an optimal environment for moist wound healing, reduce exudate, and be non-adherent, easy to use and painless. According to this perspective, we looked for a dressing that could be replaced at longer intervals, would reduce the perception of pain during the dressing change and could be less expensive (Figure 3A–E) (4–7).

In this study, a silicone gauze dressing soaked with  $\alpha$ -TA (Vea Sil; Hulka srl) was used in the treatment of STSG donor site and compared, in terms of healing time, infection rate, pain and costs, with a traditional moist gauze dressing. A total of 60 patients were recruited for this study and divided into two groups with comparable ages and co-morbidities. When the skin graft was taken, the donor site was covered with polyurethane foam that was removed after 4 days in all patients. Later, patients of group 1 were subjected to daily dressings, wound cleaning and application of  $\alpha$ -TA in oil form (Vea Oil; Hulka srl) and thick gauze.

In group 2 patients, the dressings were changed every 4 days, after cleaning the wound and applying  $\alpha$ -TA oil (Vea Oil; Hulka srl) and silicone- $\alpha$ -TA gauze (Vea Sil; Hulka srl).

All patients presented for follow-up visits every 4 days. Healing time, infection and patients' pain perception were evaluated during the visits. No patient discontinued the study.

No major complications occurred. Healing was achieved in all cases. Three patients of group 2 (the infection rate was slightly higher than in group 1) developed clinically visible contamination of the treated wound, which was resolved by increasing the frequency of dressings.

The results obtained showed no statistically significant difference between the healing times of the two groups. Patients of group 2 reported much lower levels of pain during the dressing than those in group 1. The dressing of group 2 was much less expensive than that of group 1, considering only the cost of material.

Veal Sil gauzes demonstrated to be a non-adherent, easy to use and painless dressing that could be used in the treatment of wound healing by secondary intention. These dressings, not adhering to the wound, can be left in situ for several days with a drastic reduction of pain and with a better compliance by the patients. Moreover, pain-free dressings can be used in all kind of patients, especially in children. In addition, the reduction in the frequency of dressings can still provide appropriate healing. By reducing the frequency of dressings, we can reduce the time that the patient must lose from his/her social and working life, the employment of health personnel, the overcrowding of patients in health facilities and ultimately the health care spending.

In case of bacterial infection or contamination, it might be necessary to increase the number of weekly dressings: a more frequent cleaning of the wound helps to reduce the local bacterial load and the frequent application of oil maximises its antibacterial action. Even in these cases, excluding sepsis, healing can be achieved avoiding the use of antibiotics and with a substantial reduction of pain and costs.

In summary, according to the proposed protocol, Veal Sil dressing showed the following advantages:

- A significant reduction of pain perceived by the patient during dressings: This results in better patient compliance and satisfaction, particularly in paediatric patients.
- The possibility of reducing the frequency of dressings, with consequent reduction of the time spent by both the patient and health professionals.
- The reduction of the costs for the management of this type of wounds.
- The possibility of in-home dressings.

In our opinion, the disadvantages are limited to the need for closer monitoring of the wound, in order to prevent and avoid infections of the wounds and modulate the frequency of the dressings if necessary.

We have been applying this protocol of dressing also in wounds healing by secondary intention with different aetiologies such as burns, ulcers or post-traumatic injuries. The results, apparently similar, will be the subject of future publications.

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