Comparison Among Op-site, Polyvinyl Chloride Film and Tulle Gauze in the Treatment of Skin Graft Donor Site†

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Abstract

A prospective analytic study was performed at the Division of Plastic and Reconstructive Surgery, Department of Surgery, King Chulalongkorn Memorial University Hospital and the Department of Surgery, Chiang Mai University Hospital to compare among Polyvinyl chloride film (PVC film), Op-site and tulle gauze in the treatment of skin graft donor site. From October 1998 to January 2000, 81 donor sites in the same number of patients were treated by three different methods; tulle gauze (26 patients), Op-site (27 patients) and PVC film (28 patients). Each wound was followed until it was completely healed and visual analogue scale was used for pain evaluation. Donor site dressed with PVC film had a healing time of 10.44 days which was not different from Op-site (10.54 days) but significantly faster ($p<0.001$) than tulle gauze (17.84 days). Pain as measured with visual analogue scale in the group of PVC film (1.48) was not different from Op-site (1.34) but significantly less than ($p<0.001$) tulle gauze (5.45). There was no difference in the rate of infection between each group. In conclusion, the authors found no difference between Op-site and PVC film in healing time and pain. Both of them were better than tulle gauze. The results demonstrate the usefulness of PVC film as a donor site dressing as it promises relatively rapid healing, less pain and is inexpensive.

Key word : PVC Film, Op-Site, Skin Graft Donor Site Dressing

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Split-thickness skin grafting is an operative technique frequently used for covering skin defects. While the knowledge of wound healing has advanced considerably, there is no consensus on the optimal donor site dressing. Nowadays, there are so many different types of dressings used by surgeons. The optimal dressing should be ideally easy to use, provide the best environment for re-epithelialization, be pain free and relatively inexpensive[1].

Current dressings for split thickness skin graft donor sites can be categorized into four groups: open, semi-open, occlusive and semi occlusive. The open technique of leaving the wound uncovered is quite painful and associated with a prolonged healing time, therefore, it is infrequently used nowadays. The semi-open technique of fine mesh gauze impregnated with various substances is a useful technique but very painful on the second post-operative day. After many studies had found that a moist wound provides faster epithelialization than a dry wound, the occlusive and semi occlusive techniques (such as film, Duoderm, Algenate) for donor site wound dressing became much more popular.

Op-site[2], the most frequently used film dressing, is a thin transparent elastic adhesive coated with polyurethane film. It is permeable to water vapor, oxygen and carbon dioxide but not to liquid water or bacteria[3]. The film creates a moist microenvironment and is more comfortable than conventional techniques when used for a partial thickness skin wound[4-8]. However, one disadvantage that the authors surgeons have encountered is the formation of seroma or hematoma that often leaks and requires a drainage procedure such as aspiration or catheter drainage[9].

Plasticised polyvinyl chloride film (PVC film), originally produced for wrapping food stuff, is permeable to oxygen, carbondioxide and water vapour. For clinical application, it has been used as a dressing for burns, temporary dressing of a wound and post-operative care in dermabrasion. It has been reported to be useful for covering donor sites[10-14].

A prospective study was undertaken to compare PVC film with tulle-gauze and Op-site as a split thickness skin graft (STSG) donor site dressing regarding time of complete healing (100% reepithelialization), pain, complications and cost.

MATERIAL AND METHOD

A prospective study was undertaken between October 1998 and January 2000 at the Division of Plastic and Reconstructive Surgery, Department of Surgery, King Chulalongkorn Memorial University Hospital and Department of Surgery, Chiang Mai University Hospital. Eighty-four patients, between the age of 12 and 60, who had been admitted for a skin graft coverage operation were recruited for the study. All patients were in good health, had donor site wounds between 100 and 625 cm^2 and could be followed-up for more than 2 weeks. Candidates were excluded from this study if they had one of these conditions, including steroid-dependents, immunocompromised hosts, presence of skin infection near the donor sites, recently on anticoagulant or antiplatelet drugs, reported to have psychological problems, neurological diseases and any condition of malnutrition.

The 84 patients were randomly divided into 3 groups by sequence of time of operation. Skin graft was performed by using a Brown-type dermatome (0.010 to 0.014 inch depth) and an epinephrine soaked gauze was placed over the donor sites immediately after harvesting until the different types of dressing were applied.

In group 1, the tulle gauze dressings (Sofra-Tulle) were applied to donor sites and covered with gauze sheaths. Heat lamp treatment was then applied four times a day to dry the soaked gauze. When complete reepithelialization had occured, the dressing would be spontaneously lifted off.

In group 2, Op-site films (polyurethane films) were applied to donor site wounds. For adhesion of dressing, a minimum skin area of 2 inches surrounding the donor site should be available. The wounds would then be covered with gauze and wrapped with elastic bandages to stop bleeding. These bandages were removed after 2 days and the dressing was left exposed to the air. The dressings either lifted off spontaneously or were removed when epithelialization was completed as viewed through the dressing. Collection was a common problem of wounds dressed by Op-site. If there was a moderate collection (2 - 20 ml), the fluid could be aspirated and[9] the defect of dressing was covered with a small piece of Op-site film. If there was a large collection or leakage appeared, the dressing would be changed under aseptic techniques or one side of the film would be left open for drainage.

In group 3, the donor site wounds were dressed with polyvinylchloride films (PVC films). To prepare for dressing, the films were divided into sizes of 1 ft x 2 ft, rolled on a paper and steriled

by gas sterilization. A minimum skin area of 1.5-2 inches surrounding the donor site should be available for sealing with sterile adhesive tapes. The wounds were then covered with gauze and an elastic bandage to decrease and absorb collections. On day 3 and day 5, the elastic bandages were removed to visualize the wound. The absorptive gauze might be changed if it was soaked. The dressing was removed when epithelialization had been completed as viewed through the dressing.

All patients were evaluated for pain[5] by visual analog scale (0-10) on the 1st and 2nd post-operative day. The authors evaluated pain at rest and scale 0 meant no pain while 10 meant maximum pain. When the epithelialization was completed, the healing time was recorded. After the dressings were applied, the patients were followed-up for any complications. Cost of each dressing was calculated for comparison.

RESULT

84 patients who underwent STSG were enrolled in the study. 3 patients were lost to follow-up. 81 patients were thoroughly followed until complete healing was achieved. The characteristics of the studied population are shown in Table 1. In this group, 26 patients were allocated to tulle-gauze, 27 to Op-site and 28 to PVC film. Analysis of age, sex, site and size of donor, as given in Table 2, revealed the three groups of patients to be similar. The complete epithelialization was determined by only one surgeon. In the tulle-gauze group, complete healing was determined by spontaneous lifting off of the dressing.

The study revealed that the mean healing time of donor sites dressed with PVC film was 10.44 days, Op-site was 10.54 days and tulle gauze was 17.84 days. From the statistical test using ANOVA, the authors found that the healing time of donor sites dressed with PVC film, as shown in the Fig. 1, was not different from Op-site but significantly faster (ANOVA, $p<0.001$) than tulle gauze.

Table 1. Characteristic of studied population.

Sex	
Male	53 (65%)
Female	28 (35%)
Age	12 - 60 year (mean 30 ± 15 year)
Wound depth	0.012 ± 0.004 inch
Donor size	325 ± 172 cm^2

Assessment of pain in the 3 groups revealed Op-site and PVC film to be comfortable dressings. (Fig. 2) The average pain score of the donor site of PVC film was 1.48, Op-site was 1. 34 and tulle gauze was 5.45. When compared by ANOVA test, the authors found that the pain score of donor sites dressed with PVC film, as shown in Fig. 2, was not different from Op-site but significantly faster (ANOVA, $p<0.001$) than tulle gauze.

The rate of infection among each group was not significantly different. After following the patients treated with the three dressing, it was found that one of each group got infected at the donor site. (Fig. 3) However, Op-site seemed to have more problem with hematoma than the others.

Comparing the cost of the three dressings, the price for a standard unit of each dressing (20 x 20 cm) was obtained. During the time of this study, the cost of dressing by PVC film was 104 baht, Op-site was 273 baht and tulle gauze was 197 baht. Clearly, PVC film was the least expensive of the three dressings and Op-site was the most expensive. (Fig. 4)

DISCUSSION

The donor site, following split thickness skin graft harvested, represents a wound with loss of epidermis and variable thickness of dermis. An

Table 2. Characteristic of studied population of each group.

	Tulle gauze	Op-site	PVC film	significant
Sex				
Male	17 (65%)	17 (63%)	19 (68%)	NS
Female	9 (35%)	10 (37%)	9 (32%)	NS
Age	23 ± 15	32 ± 17	30 ± 14	NS
Size	304 ± 158	320 ± 208	302 ± 169	NS
Thickness	0.0122	0.012	0.012	NS

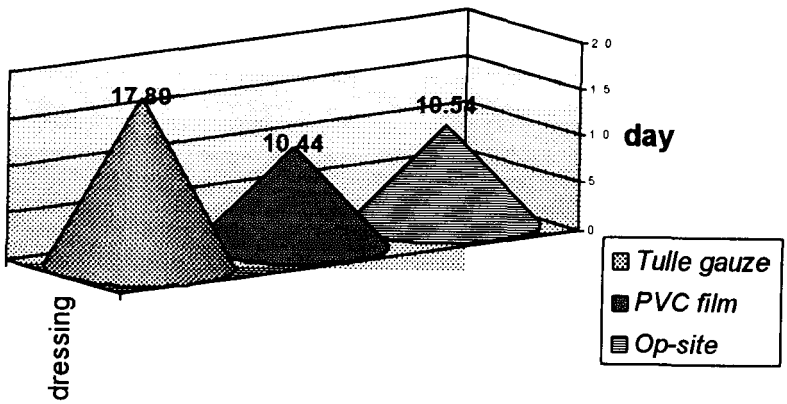

Fig. 1. Mean healing time of the wounds dressed by each technique.

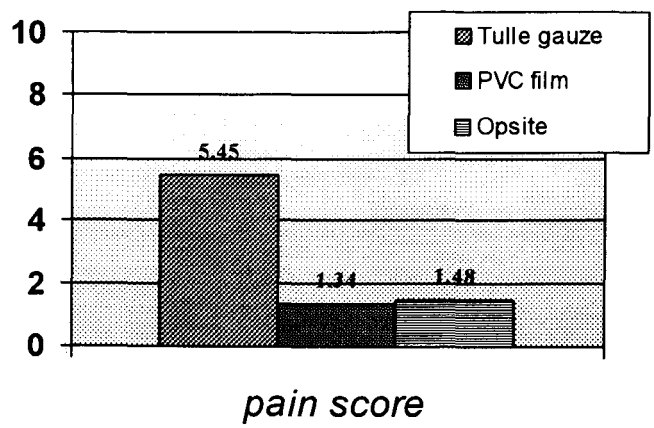

Fig. 2. Mean pain score of the wounds dressed by each technique.

ideal dressing will theoretically perform the protective function of epidermis while the underlying epithelial layer regenerates. Dressing should maintain a moist environment without maceration in order to allow optimal epithelial migration. The dressing should not adhere to the wound to avoid damaging the regenerating epithelium upon removal[1,4].

Tulle gauze is the most frequently used donor site dressing in Thailand. It allows blood and serum to escape which will prevent maceration and it can be applied easily. However, since it is a semi open technique, it does not prevent contamination which can cause infection in some circumstances. Also a moist environment can sometimes not be achieved, which will delay the epithelialization and cause slow healing. Moreover, this technique causes more pain than the other techniques.

Op-site film dressing is a semiocclusive technique that maintains a moist environment which facilitates epithelial migration. Practically, a collection is commom and leakage of transudate around the dressing is often found. This study revealed that

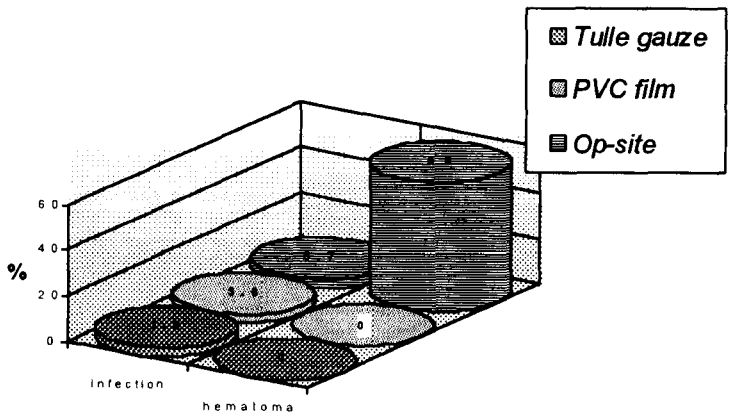

Fig. 3. Rate of infection and hematoma of the wounds dressed by each technique.

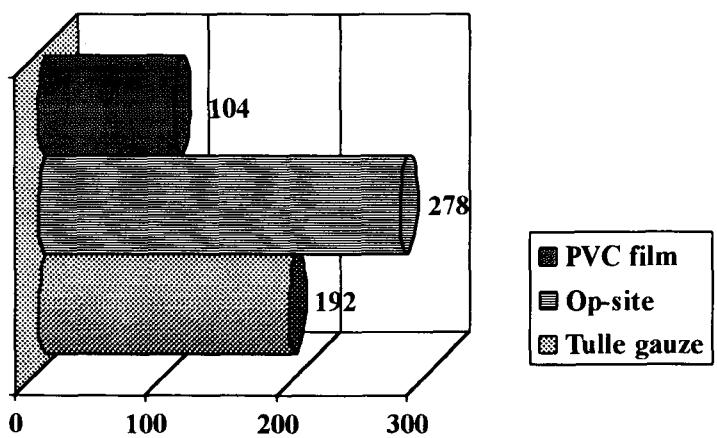

Fig. 4. Cost of dressing by each technique (baht). US$ is equivalent to baht 44.-

Op-site achieved rapid wound healing but a drainage procedure is required and it was also rather expensive.

From October 1998 to November 1998, a pilot study was conducted to find a cheaper and more effective film dressing. By modifying the Op-site technique and focusing on the expense, the authors came to another conclusion. Polyvinylchloride film is a clear film that is much less expensive and available in many supermarkets. The property of PVC is quite similar to Op-site. Clinically the film has been used for more than 20 years to wrap burn wounds during transportation to hospitals or as a temporary dressing. From the pilot study it was found that using PVC film as a dressing had an advantage over donor dressing. However, since the film is designed for food wrapping, it is not sterile and is manufactured as one long piece rolled on a cylinder tube. The authors had to prepare the film before using it as a dressing. To make it a single sterile unit it was

divided into small strips (1ft x 2ft), rolled on to hard paper, put in a bag and made sterile by gas sterilization. The edge of the film was sealed by sterile adhesive tapes. To drain seroma and hematoma, one side of the film was left open and the serum was absorbed by gauze sheaths. Dressing on top of the film was changed if it was soaked (usually every 2 days). From the study, it was found that the PVC film achieved rapid wound healing. It maintained a moist environment of semi-occlusive condition. The problem of any collection can be avoided by leaving one side of the dressing open for drainage. Moreover, PVC is much cheaper than Op-site film.

SUMMARY

Based on the result of the study, the authors found no difference between Op-site and PVC film in healing time and pain. They were both better than tulle gauze. Despite the fact that it caused more pain, it may be too early to conclude that the healing time in the tulle-gauze group is not compatible with the other two groups. Complete healing in this group may be achieved before the dressing was spontaneously lifted off. It was also found that the PVC film dressing was significantly less expensive than the others. This study demonstrated the usefulness of PVC film as a donor site dressing as it promises relatively rapid healing, is pain free and inexpensive.

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การศึกษาเปรียบเทียบการใช้ Op-site, Polyvinyl chloride film และ Tulle gauze ในการรักษาแผล Donor ของการทำ Skin Graft

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การศึกษาครั้งนี้ผู้วิจัยได้ทำ การศึกษาเปรียบเทียบการใช้ PVC film กับ tulle gauze และ Op-site ในการทำแผล donor siteระหว่างเดือน ตุลาคม 2541ถึง เดือนมกราคม 2543 ที่ โรงพยาบาลจุฬาลงกรณ์ และโรงพยาบาลมหาราชนครเชียงใหม่ โดยเทียบในเรื่อง ระยะเวลาการหายของแผล, ความเจ็บปวด และภาวะแทรกซ้อน โดยผู้ป่วย 81 ราย (อายุ 12-60 ปี เฉลี่ย 31±3.5 ปี) ที่ทำการผ่าตัด STSG โดยที่มี donor site ระหว่าง 100 cm^2 - 625cm^2 (315±39) ได้รับการแบ่งเป็น 3 กลุ่ม ในกลุ่มที่ 1 (26 ราย) ปิดแผล donor site โดยใช้ tulle gauze (sofratulle) กลุ่มที่ 2 (27 ราย) ทำแผลโดยใช้ Op-site (polyurethane film) และกลุ่มที่ 3 (28 ราย) ทำแผลโดยใช้ Polyvinyl chloride film (PVC film) ผู้ป่วยที่ได้รับการทำแผลทั้ง 3 วิธี จะถูกติดตามจนแผลหาย และแต่ละรายจะได้รับการประเมินความเจ็บปวด โดยใช้ visual analog score หลังจากทราบผลการศึกษาแล้วจะนำผลของระยะเวลาการหายของแผล, ความเจ็บปวด และภาวะแทรกซ้อนมาเปรียบเทียบกัน

ผลการศึกษาเปรียบเทียบในเรื่องระยะเวลาการหายของแผลพบว่า tulle gauze มีระยะเวลาหายเฉลี่ย 17.89 วัน Op-site 10.54 วัน และ PVC film 10.44 วัน พบว่าระยะเวลาการหายของแผล ของ PVC film ไม่มีความแตกต่างจาก Op-site (p=0.987) แต่มีความแตกต่างจาก tulle gauze อย่างมีนัยสำคัญ(p<0.001) pain score ของกลุ่ม tulle gauze =5.45, PVC film=1.34 และOp-site=1.48 เมื่อนำ pain score ของแต่ละกลุ่มมาเปรียบเทียบกันพบว่า PVC film ไม่มีความแตกต่างจาก Op-site แต่มีความแตกต่างจาก tulle gauze อย่างมีนัยสำคัญ (p<0.001) ในเรื่องภาวะแทรกซ้อน พบว่าในแต่ละกลุ่มมีผู้ป่วยที่มีปัญหาการติดเชื้อกลุ่มละ 1 ราย ซึ่งไม่มีความแตกต่างกัน จึงสรุปได้ว่า การใช้ PVC film ในการทำแผล donor site พบว่ามี ระยะเวลาการหายของแผลลดลง และความเจ็บปวด น้อยลงกว่า tulle guaze ในขณะที่ภาวะแทรกซ้อนไม่มีความแตกต่างกัน และเมื่อเปรียบเทียบกับ Op-site PVC film มีระยะเวลาการหายของแผลเทียบได้กับ Op-site ในขณะที่มีปัญหาเรื่องการดูแลแผลน้อยกว่า สรุปได้ว่า PVC film dressing เป็นวิธีการหนึ่งที่ได้ผลดีในการทำแผล donor

คำสำคัญ : PVC film, Op-site, การรักษาแผล Donor ของ Skin Graft

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