Hydrogel-impregnated dressings for graft fixation: a case series

- **Objective**: Infection is the second most common cause of graft loss after skin grafting. Cutimed Sorbact is a range of dressings coated with a hydrophobic fatty acid that irreversibly binds to the bacterial surface and mechanically removes bacteria from the wound. The dressing is a hydrogel-impregnated material, which prevents wounds from drying. Here, we report on cases in which we used the gel instead of the widely used petrolatum gauze or paraffin gauze in a tie-over dressing for the fixation of grafted skin.

- **Method**: Patients treated for skin grafting between March 2013 and July 2013 were treated with the hydrogel-impregnated dressings and a tie over dressing. The wounds were opened five days after treatment.

- **Results**: In total seven patients were treated with an age range of 23–86 years old. No infections were seen and the method was effective regardless of wound size, the thickness of the skin harvested and condition of the defect.

- **Conclusion**: Using this hydrogel-impregnated dressings, provide antibacterial and moisturising effects simultaneously, which a petrolatum or paraffin gauze cannot provide.

- **Declaration of interest**: There were no external sources of funding for this study. The authors have no conflicts of interest to declare.

sorbact, skin graft, sorbact gel, petrolatum, parafin, infection

Skin grafting is a common operative method widely used in the field of plastic surgery. Numerous authors have proposed different techniques to achieve graft immobility. A classic, and the most popular, method is the placement of a bolster dressing wrapped with a large gauze and tied over onto the grafted bed itself with the attached peripheral sutures. Petrolatum or paraffin gauze are most frequently used in contact to the skin graft because of their moisturising potential. These are widely accepted as a feasible method because it provides firm fixation and moisturising. However, three conditions are needed for a stable graft take:

- Immobilisation of the harvested skin during the revascularisation period
- Appropriate moisturisation and
- Minimal infection is absolutely required to achieve a stable take of the harvested skin.

The described method does not provide any antimicrobial action, which means that it only satisfies two of the three conditions for a successful graft take. However, if infection is not prevented or controlled adequately, the wound will not heal and the graft will be lost eventually. As this situation is not unusual, we thought of a dressing that satisfies all the three conditions required for graft taking.

Cutimed Sorbact (BSN Medical: hydrogel-impregnated dressing) is a range of non-medicated dressings with a unique bacterial binding action. The dialkyl carbamoyl chloride (DACC) coating provides irreversible binding of pathogenic microorganisms because most organisms that are pathogenic or impede wound healing have hydrophobic properties. Therefore, when they come into contact with DACC, which is also hydrophobic, the microorganisms are irreversibly bound to the DACC by excluding the water molecules around them. This mechanism of action can prevent or reduce treatment duration with antibiotics, avoiding several drug drawbacks such as antibiotic resistance. In the literature, the most common microorganisms isolated in an engrafted wound are *Streptococcus pyogenes*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, other staphylococci, and Enterobacteriaceae species. Quantitative decreases in bacterial strains such as *Staphylococcus aureus*, *Pseudomonas aeruginosa*, Streptococci and, *Escherichia coli* were observed in clinical trials of hydrogel-impregnated dressing.

Hydrogel-impregnated dressing, which is a derivative product of Sorbact, contains hydrogel for a moisturising effect. The original material is immersed in a gel-like substance that provides moisture and antimicrobial activity to the wound bed. Our objective was to use of hydrogel-impregnated dressing in a tie-over dressing instead of petrolatum or paraffin gauze.

**Methods**

Between March 2013 and July 2013, we used hydrogel-impregnated dressing in tie-over dressings for patients who were treated with skin grafting.

Ethical approval was obtained from by the institutional review board (IRB) of Catholic University of Korea (IRB approval number: HC15ZISE0026).
Patients requiring a skin graft who gave informed consent were included in the study.

**Surgical procedure**

The surgical process was carried out as normal until the graft was attached by using peripheral sutures (Fig 1a). Following this, we applied a hydrogel-impregnated dressing instead of petrolatum or paraffin gauze (Fig 1b). Finally, a bolster of fine cotton gauze was placed on the first layer and sutured face-to-face over the second layer (Fig 1c). The second layer provided mild pressure onto the graft, stabilising the graft, and to allow fluid to be absorbed into the bolster dressing. We opened
the wound 5 days after the operation (Fig 1d).

When the wound was thought to be stable on the first open dressing, we applied mupirocin ointment and foam dressing until the stitches were removed because the well-taken skin was kept stable without further compressive dressing. A systemic antibiotics (Cephalexin) covering was used preoperatively and continued until the removal of stitches. IV-antibiotics were used for 3 days after surgery and oral antibiotics for a further 3 days. The average follow-up period was 3.5 months.

### Results

The demographic data of the patients are presented in Table 1. Patients ages ranged from 23–86 with an average age of 64.7 years old, four were male and three female and the most common reason for skin grafting was after the removal of a basal cell carcinoma. The wound size varied from 1.5 x 1.5 cm to 12 x 12cm.

The wounds were checked for infection 5 days after the surgery when the bolster dressing was removed 14 days after surgery when the wound was opened, 14 days after the surgery when the bolster dressing was removed and one month after surgery. No wound infection was observed and there was no desiccation of the skin in all cases. The method was effective regardless of the thickness of the harvested skin. In addition, the condition of the defect, such as depth or size, did not have an influence on graft taking.

### Discussion

Since its first introduction in 1962, the technique of tie-over dressing after skin grafting has been commonly used to this day. It provides firm fixation and appropriate pressure for graft taking. However, skin grafts may occasionally be lost because of infection during the tie-over period or the early postoperative days after a successful take. In the literature, there are no large prospective studies evaluating skin graft losses due to infection. Unal et al. reported that the rate of graft loss due to infection in full-thickness and split-thickness skin grafts was 15.9% and 40.0%, respectively. In our experience following the same protocol without using the hydrogel-impregnated dressing infection did sometimes occur at the site of the graft. On the other hand, there was no infection case among the seven patients in this report; however, the number of cases was small. We believe that the antibacterial dressing contributed to it although antibiotic therapy is thought to play a main role in preventing infection.

The three leading pathogens leading to infection after skin grafting are *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Streptococcus pyogenes*. Hydrogel-impregnated dressing can bind to all these pathogens, especially *Pseudomonas aeruginosa*. Petrolatum or paraffin does not provide any antimicrobial activity, hence making the graft prone to infection.

### Limitations and future work

Although the hydrogel-impregnated dressing has many merits, its use can be limited owing to its cost (approximately 20 times more than petrolatum or paraffin gauze dressing). Therefore, its use in specific conditions such as a previously infected wound would be reasonable. Moreover, because the number of cases is small, the superiority of hydrogel-impregnated dressing over petrolatum or paraffin gauze in preventing infection still needs to be confirmed.

Comparing infection rates and cost-effectiveness between various dressing methods after skin grafting can be an interesting suggestion for future studies. Therefore, dressings that have a positive effect of reducing bacterial burden in wounds without the need for systemic antibiotics are an important part of wound treatment.

### Conclusion

The use of hydrogel-impregnated dressings instead of petrolatum or paraffin gauze is advantageous in that this material satisfies the required conditions for a successful graft take. We suggest using this dressing as a superior alternative in tie-over dressings.

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### Table 1. Patient demographics and wound characteristics

<table>
<thead>
<tr>
<th>Patient</th>
<th>Sex</th>
<th>Age (years)</th>
<th>Diagnosis</th>
<th>Location of lesion</th>
<th>Thickness of harvested skin</th>
<th>Size of harvested skin (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female</td>
<td>86</td>
<td>SCC</td>
<td>Scalp</td>
<td>Split-thickness</td>
<td>12 × 12</td>
</tr>
<tr>
<td>2</td>
<td>Male</td>
<td>68</td>
<td>BCC</td>
<td>Left cheek</td>
<td>Full-thickness</td>
<td>1.5 × 1.5</td>
</tr>
<tr>
<td>3</td>
<td>Male</td>
<td>23</td>
<td>Giant hairy nevus</td>
<td>Right shoulder</td>
<td>Full-thickness</td>
<td>10 × 10</td>
</tr>
<tr>
<td>4</td>
<td>Female</td>
<td>70</td>
<td>BCC</td>
<td>Scalp</td>
<td>Split-thickness</td>
<td>2.5 × 2.5</td>
</tr>
<tr>
<td>5</td>
<td>Female</td>
<td>76</td>
<td>BCC</td>
<td>Scalp</td>
<td>Split-thickness</td>
<td>1.5 × 1.5</td>
</tr>
<tr>
<td>6</td>
<td>Female</td>
<td>75</td>
<td>BCC</td>
<td>Nose</td>
<td>Full-thickness</td>
<td>2 × 2</td>
</tr>
<tr>
<td>7</td>
<td>Male</td>
<td>55</td>
<td>Malignant melanoma</td>
<td>Left great toe</td>
<td>Split-thickness</td>
<td>6 × 6</td>
</tr>
</tbody>
</table>

*SCC – squamous cell carcinoma; BCC – basal cell carcinoma*