A comparison of three primary non-adherent dressings applied to hand surgery wounds

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This study reports the results of a prospective randomised controlled trial that compared three non-adherent wound dressings applied to hand surgery wounds. Paraffin-impregnated gauze (Jelonet) was compared with a cellulose, acetate fibre dressing coated with a petrolatum emulsion (Adaptic) and a polyamide net dressing impregnated with silicone gel (Mepitel). The dressings were assessed for their ease of application and removal, pain on removal and wound appearance.

Results from 99 patients were available for analysis. Adaptic was significantly easier to remove (p<0.01), required less soaking (p<0.05), was less painful to remove (p<0.05) and caused less wound maceration (p<0.05) than Jelonet, but was significantly more difficult to apply (p<0.05). Mepitel was also easier to remove but this did not reach statistical significance. It was also more difficult to apply than Jelonet (p<0.05).

We recommend that Adaptic should be used routinely as the non-adherent dressing for incisions or traumatic wounds on the hand. The slight increased difficulty in applying the dressing is outweighed by the major advantages associated with its removal.

Removing dressings in the immediate postoperative period following hand surgery is often painful for the patient and time-consuming for the surgeon and nurse. In operating theatres hand wounds or incisions are usually dressed with paraffin-impregnated gauze, the ‘non-adherent layer’, and covered with an absorbent layer of wet or dry gauze, crepe and, when required, a plaster of Paris (PoP) slab to aid immobilisation. This dressing is usually left intact until the first follow-up appointment, usually seven to 10 days later. By this time it has adhered to the wound and surrounding skin, making it necessary to soak the digit or hand in saline until the dressing can be removed. Despite this, dressing removal may still cause the patient significant pain (Fig 1).

This article describes a prospective randomised controlled trial which examined the ease of application and removal of three primary, ‘non-adherent’ dressings applied to hand surgery wounds in the immediate postoperative period. No attempt was made to measure healing times as most of the wounds were simple suture lines. The traditional paraffin-impregnated gauze (Jelonet: Johnson and Johnson) and Mepitel (Molnlycke). The study was instituted and monitored by the Wound Management Committee at Frankston Hospital, Melbourne, Australia.

The dressings

Adaptic consists of an open mesh of cellulose acetate fibres coated with a petrolatum emulsion containing a surfactant that reduces surface tension and allows the easier passage of exudate. It has been used on skin-graft wounds and granulating tissue, as well as on fingertip injuries in the form of a combined dressing of Adaptic and a knitted fabric tubular bandage, the Adaptic Non-adherent Digit Dressing.2

Mepitel consists of a net of polyamide impregnated with a silicone gel. It has an open mesh structure, allowing exudate to pass into a secondary absorbent dressing. It does not adhere to the wound but to the surrounding healthy adjacent skin, and can be left in place for seven to 14 days. Its use in burns,7,8 the fixation of skin grafts,9,10 irradiation burns,11 epidermolysis bullosa12 and cavity wounds13,14 has been reported. Although case reports describe its use on problem hand wounds several weeks following surgery, its use on the acute hand wound has not been described.
A total of 108 consecutive patients undergoing hand surgery, either elective or emergency, were randomly enrolled into the study using a randomisation chart. The inclusion criteria were that the wound or incision had to be distal to the wrist crease and the patient aged two years or more. Children were included in the study because hand injuries are fairly common among this age group and their acceptance of the dressing used will reduce distress both among themselves and their parents.

At the initial assessment a record was made of the wound type (elective or traumatic), the wound site, whether any raw, exposed tissue still remained after the wound had been sutured (such as a raw nail bed or an incompletely sutured wound), and whether or not the tourniquet had been released before the wound was sutured or after the dressing was applied.

All patients were randomly assigned to receive one of the three dressings. Their wounds were dressed in the operating theatre by one of five surgeons or the registrar and then covered with gauze, crepe and a PoP splint if appropriate. Ease of application was noted. The dressing was left intact until the first follow-up appointment, where the patients and their dressings were assessed independently by one of three nurses in the outpatient clinic. Factors included in the assessment were:

- Ease of removal: ‘very easy’; ‘quite easy’; ‘not very easy’; ‘difficult’ (nurse assessment)
- Dressing removal: ‘removed dry’; ‘required application of a small amount of saline’; ‘required soaking for more than one minute’
- Degree of blood staining on the secondary gauze dressing: ‘small amount’ (stain <2cm); ‘medium amount’ (most of one piece of gauze

### Table 1. Demographic data

<table>
<thead>
<tr>
<th></th>
<th>Jelonet (n=36)</th>
<th>Adaptic (n=35)</th>
<th>Mepitel (n=37)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median (range)</td>
<td>40 (2–82)</td>
<td>33 (2–73)</td>
<td>38 (2–72)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male patients (%)</td>
<td>27 (75)</td>
<td>23 (66)</td>
<td>23 (62)</td>
</tr>
<tr>
<td>Female patients (%)</td>
<td>9 (25)</td>
<td>12 (34)</td>
<td>14 (38)</td>
</tr>
<tr>
<td><strong>Wound site</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palm/dorsum (%)</td>
<td>10 (28)</td>
<td>15 (43)</td>
<td>9 (24)</td>
</tr>
<tr>
<td>Fingers (%)</td>
<td>20 (56)</td>
<td>17 (49)</td>
<td>25 (68)</td>
</tr>
<tr>
<td>Palm/dorsum and fingers (%)</td>
<td>6 (16)</td>
<td>3 (8)</td>
<td>3 (8)</td>
</tr>
<tr>
<td><strong>Other wound site details</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nail bed involved/raw tissue (%)</td>
<td>7 (19)</td>
<td>7 (20)</td>
<td>7 (19)</td>
</tr>
<tr>
<td>Tourniquet released before suturing (%)</td>
<td>22 (59)</td>
<td>16 (47)</td>
<td>15 (52)</td>
</tr>
<tr>
<td><strong>Wound type</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incised (%)</td>
<td>17 (47)</td>
<td>16 (46)</td>
<td>22 (59)</td>
</tr>
<tr>
<td>Traumatic (%)</td>
<td>19 (53)</td>
<td>19 (54)</td>
<td>15 (41)</td>
</tr>
<tr>
<td><strong>Duration dressing left intact (days)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (range)</td>
<td>9 (2–17)</td>
<td>11 (3–19)</td>
<td>10 (3–18)</td>
</tr>
</tbody>
</table>
was stained); ‘large amount’ (gauze was heavily encrusted with blood)

- Appearance of the wound: dry, moist or macerated
- Condition of the wound: clean, inflamed or infected
- Pain experienced during dressing removal: a linear analogue scale ranging from 0 (pain-free) to 10 (extreme) was used (patient assessment).

Data were analysed using the Anova single factor. All patients undergoing hand surgery who met the inclusion criteria were enrolled into the study.

Results

Of the 108 patients enrolled into the study, 73 were men and 35 women (mean age: 37 years; range: 2–82 years). Fifty-five wounds were clean incised and 53 traumatic; 34 were located on the palm and/or dorsum and 62 on the finger(s), while 12 involved both the finger(s) and the palm and/or dorsum. Demographic details are given in Table 1.

Dressing application

Results relating to five of the 108 patients were not recorded on the data sheet (two Adaptic and three Mepitel). Those for the remaining 103 patients are given below.

Adaptic and Mepitel were more difficult to apply than Jelonet. Ninety-four percent (34/36) of the Jelonet dressings were reported to be ‘very easy’ to apply compared with 79% (26/33) of the Adaptic and 76% (26/34) of the Mepitel dressings (p<0.05). The rest were described as ‘quite easy’ to apply. A learning curve was encountered in the application of both Adaptic and Mepitel — for example, respondents found it easier to apply Mepitel with moistened gloves and Adaptic by placing it on simultaneously with the gauze or by moistening it first in sterile water or saline.

Dressing removal

Nine of the 108 patients did not attend for follow-up assessment or had their dressings changed before returning to the clinic (Jelonet: one patient; Adaptic: three patients; Mepitel: five patients). Reasons for this included patients being unable to attend the hospital at the appointed time; patients were concerned about their wound; the dressing got wet. The analysis on dressing removal therefore is based on the data relating to 99 patients.

Dressing removal was reported to be ‘very easy’ for 88% (28/32) of the wounds covered with Adaptic and 84% (27/32) of those with Mepitel, compared with only 57% (20/35) of those covered with Jelonet (Fig 2). This reached significance for Adaptic (p<0.01) but not for Mepitel (p=0.061).

Application of saline or soaking was required in two cases (6%) to remove the Adaptic/gauze dressing, compared with three (9%) with the Mepitel/gauze dressing and 10 (28%) with the Jelonet/gauze dressing (Fig 3). This reached significance for Jelonet versus Adaptic (p<0.05) but not for Jelonet versus Mepitel (p=0.055). There was no significant difference between the groups in the degree of strikethrough to the secondary dressing. Therefore, the difference related to the primary non-adherent dressing material and not the amount of bleeding from the wound.

Less pain was experienced during dressing removing among the Adaptic group (of whom 75% experienced no pain) compared with the Mepitel (56% experienced no pain) and Jelonet groups (51% no pain). The mean pain scores for the dressings were:

- Adaptic 0.50 ± 0.17 (95% CI: 0.14, 0.85)
- Jelonet: 1.37 ± 0.34 (95% CI: 0.67, 2.07)
- Mepitel: 1.28 ± 0.38 (95% CI: 0.50, 2.06).

Significantly less pain was associated with the removal of Adaptic than Jelonet (p<0.05).
Mepitel was not significantly different to Jelonet in this regard (p=0.86) (Fig 4).

Other factors that influenced the ease of dressing removal included the site and aetiology of the wound, when the tourniquet was released and the amount of bleeding from the wound. Dressing removal was ‘difficult’ or ‘not very easy’ in 25% of the cases where the wound was on the fingers compared with 19% of those where it was on the palm and/or dorsum. It was also more difficult in wounds caused by trauma (33%) as opposed to clean incised wounds (16%).

All dressings were more difficult to remove when raw exposed tissues were present. As there were only seven patients with raw tissue in each group, no analysis was possible. However, feedback from the nurses indicated that Mepitel was considerably easier to remove, even on young children, than Jelonet as it did not adhere to the raw tissue. Adaptic also performed well in this regard.

Dressings were more difficult to remove if the tourniquet was released before the wound was sutured (25% versus 20%). Overall, the more blood present in the secondary dressing, the more difficult it was to remove.

The suture line
This was dry in 91% (29/32) of the wounds in the Adaptic group compared with 84% (27/32) of those in the Mepitel and 71% (24/34) in the Jelonet groups (Jelonet versus Adaptic: p<0.05). The rest of the suture lines were reported as moist, with the exception of two in the Jelonet and one in the Mepitel group, which were macerated.

Adaptic and Mepitel showed less evidence of wound inflammation and infection along the suture lines. In the Jelonet group nine patients (26%) had signs of inflammation and two (5%) of infection. In contrast, only two (6%) developed an inflammation and none an infection in the Adaptic group (p=0.052) and two (6%) an inflammation and one (3%) an infection in the Mepitel group (p=0.25).

Cost
Prices varied depending on whether the dressing was purchased by the hospital or through a medical supply company, but overall the price relationship was constant (Table 2).

Discussion
These results demonstrate that Adaptic was significantly easier to remove, required less soaking and caused less maceration and pain during removal than Jelonet. Its only disadvantage was that it was more difficult to apply. Respondents found it most effective to place pieces of gauze between the fingers and then apply the dressing and gauze together, or to moisten the Adaptic dressing with saline or water so that it would adhere to the skin during application. Nevertheless, this minor disadvantage was outweighed by the advantages cited above. There was no difference between the two dressings in terms of cost.

Why did Adaptic perform better than Jelonet? The researchers tested the dressings by dropping 1ml of blood onto each one. None of the blood on the Jelonet dressing seeped into the underlying gauze, whereas the blood ‘siphoned’ through the Adaptic dressing within approximately 20 seconds. Clinically, with the

<table>
<thead>
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<th>Dressing</th>
<th>Cost per sheet</th>
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<tbody>
<tr>
<td>Jelonet (10 x 10cm)</td>
<td>AU$0.48</td>
</tr>
<tr>
<td>Adaptic (7.6 x 7.6cm)</td>
<td>AU$0.48</td>
</tr>
<tr>
<td>Mepitel (5 x 7.5cm)</td>
<td>AU$5.87</td>
</tr>
</tbody>
</table>

**Fig 5.** (a) Jelonet and gauze dressing before removal (b) Adherence of Jelonet to the underlying wound bed

**Fig 6.** (a) Adaptic dressing before removal (b) Adaptic does not adhere to the wound bed


Acknowledgement
Our thanks to Johnson and Johnson, and Molnlycke for the supply of initial samples.

Box 1. Summary of the main outcomes

Adaptic was significantly easier to remove from hand surgery wounds than Jelonet (p<0.01). This may be because its surfactant coating enables the easier passage of blood into the secondary dressing, minimising the risk of adherence.

Mepitel was also rated by the nurses as easier to remove than Jelonet but this did not reach significance. However, there was little difference between the two dressings in terms of pain experienced at dressing removal. This may be because Mepitel adheres to the intact skin surrounding the wound, which in hand surgery is elevated as tender skin flaps.

The one disadvantage found with Adaptic — its difficulty with application — is outweighed by its advantages, and the researchers recommend it be used routinely for hand dressings.


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Fig 7. (a) Mepitel dressing before removal (b) Mepitel does not adhere to the wound bed

Jelonet dressing some of the blood remained between the wound bed and the dressing, clotting and forming a ‘glue’. This caused the dressing to adhere to the wound bed, leading to pain on and difficulty with removal (Fig 5). In contrast, with the Adaptic dressing the blood passed freely into the secondary gauze dressing into the secondary gauze dressing. On removal there was very little blood between the wound and the dressing and no adherence to the wound bed (Fig 6). The manufacturer’s claim that Adaptic’s surfactant coating allows the easier passage of exudate or, as in the above situation, of blood seems to be supported.

Whittaker, in her paper on the digit dressing in which Adaptic forms the non-adherent layer, demonstrated a similar improvement in performance compared with a paraffin gauze. However, the digit dressing is only useful for more simple lacerations involving the distal half of the finger.

Why was Mepitel rated by the nurses as easy to remove but by the patients as more painful in this regard than Adaptic? Mepitel allows blood to flow freely through the dressing without clotting and therefore, like Adaptic, does not adhere to the suture line or to raw, unsutured areas (Fig 7). However, it does adhere to adjacent, intact skin. In most hand surgery the adjacent skin is elevated as skin flaps, and dressing removal usually requires a slight pull on this intact but injured skin of the hand. The dressing therefore comes away easily from the wound, but pulls on the adjacent bruised and tender skin, resulting in pain. Despite the plethora of new materials on the market, most hand surgeons in Australia still use Jelonet and gauze dressings for hand wounds despite the obvious difficulties that are associated with their removal.

Dressings for hand wounds in the immediate postoperative period have several different requirements to those of typical acute wounds:

- They must be able to conform to the convex, irregular surfaces of the digits and hand
- Maceration is frequently a problem due to the large glabrous surface, and higher moisture vapour permeability is needed than many moist wound healing dressings allow
- The design of dressings for use in the immediate postoperative period must reflect the fact that they absorb blood, not exudate
- It must be possible to leave the dressing intact for up to seven to 10 days. It must also be easy to apply and remove, and non-adherent.
- Most moist wound healing products do not fulfil these requirements. The researchers have examined over 40 dressing materials, focusing on their flexibility and ability to absorb blood and avoid skin maceration. This will form the basis of the next two phases of this study.

Conclusion
Adaptic has a significant advantage over Jelonet in terms of performance and cost, and we recommend that it be used routinely for hand dressings. It is easier to remove, requires less soaking, causes less wound maceration and results in little or no pain to the patient on removal. Its only disadvantage is that it is slightly more difficult to apply. Mepitel is slightly easier to remove than Jelonet but is significantly more expensive and had no significant advantage in relation to pain on removal or wound maceration. However, its use on raw nail beds may be one area of benefit.

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