

A prospective descriptive study of Cutimed Sorbact® used as a skin substitute for the treatment of partial thickness burn wounds

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Abstract

Introduction: We used Cutimed Sorbact® as a skin substitute based on earlier observations that partial thickness burns seemed to heal underneath it without problems.

Material and Methods: Twenty-seven patients with superficial and mid-partial thickness burns were included. Deep partial thickness and full-thickness burns were excluded. Wound assessment was done twice a week by the first author in conjunction with the co-authors. The factors assessed included wound bed appearance, slough, pus, biofilm, granulation, epithelium, smoothness and colour.

Results: Most wounds appeared clean (59%), dry (51%) and pink (51%). About a third (27%) appeared healed and there was depth progression in two patients (< 10%). The dressing was not associated with any subjective noticeable pain. Complication related to the dressing at removal was minor punctate bleeding points in five patients (5/27; 18.5%).

Conclusion: Cutimed Sorbact® is a very cost-effective addition to the available skin substitutes in our teaching hospital. It can be classified as a bio-synthetic skin substitute with antibacterial and antiviral properties.

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Introduction

Infection in the management of burn wounds may not only impair healing, but can lead to a rapidly spreading infection potentially increasing morbidity and prolonging hospitalization.¹ The first goal of surgical management is therefore removal of devitalized tissue by surgical debridement followed by the promotion of wound healing by early wound closure and the control of secondary wound infection.

Advances in the management of wound infection suggest that removal of bacterial infection reduces the prevalence of wound bioburden by topical antimicrobial dressings.² The majority of such products have a broad range of antimicrobial activity which may provide a barrier to microorganisms in wounds at high risk of infection or re-infection as well as being advantageous for localized wound infection in conjunction with systemic antibiotics.³

The alternative to these antimicrobial dressings containing antimicrobial agents, such as silver, honey, and iodine and wound dressings impregnated with polyhexamethylene biguanide (PHMB), is the development of non-medicated antibacterial dressings such as dialkylcarbonylchloride (DACC) -coated dressings (Cutimed Sorbact) which reduce the wound bacterial load by a unique bacterial binding action using the principle of hydrophobicity to remove bacteria and fungi from a wound. Cutimed Sorbact® is

marketed as a dressing containing antibacterial activity with a lipophilic active molecule, DACC, that binds to bacterial cell walls. By binding bacteria and fungi to the dressing, there is no disruption to the cell wall and no systemic absorption, the microorganisms are removed with the dressing and there is no cell debris left in the wound. As such it provides an attractive and viable alternative to silver, iodine, PHMB and other antimicrobial agents in wound care.⁴ Cutimed Sorbact® provides a rapid and effective mode of action, where 1 cm² of dressing binds 100 000 bacteria in 30 seconds, is a broad spectrum antibacterial and antifungal, including methicillin-resistant *Staphylococcus Aureus* (MRSA) and Vancomycin-resistant *Enterococci* (VRE), with no bacterial or fungal resistance, and provides no risk of allergies, cytotoxicity and contra-indications.⁵

One of the accidental findings of a previous pilot study was that the dressing was effective on early partial thickness burns, suggesting an additional role for Cutimed as a skin substitute.⁶ Based on this, it was decided to test Cutimed Sorbact's® clinical efficacy in a larger number of patients, on partial thickness burns as a skin substitute, without controls. No reports were found by an online search and company representative consults of the dressing being used previously as a skin substitute.⁷⁻¹⁹

The definition of a skin substitute is a temporary or permanent cover for the skin that replicates certain functions of the skin and allows the underlying wound to heal.²⁰ Skin substitutes can also be used as temporary cover over deeper wounds that won't heal spontaneously and later require a skin graft. There are other uses for skin substitutes, like cover over skin grafts, and some have also been used as a matrix for skin culturing.

Material & Methods

Twenty-seven patients with partial thickness burns were included in this study. Deep partial thickness and full-thickness burns were excluded.

Partial thickness burns were cleaned with Chlorhexidine and water (Hibitane®) and blisters and loose skin removed. The Cutimed Sorbact® was applied as a wound dressing. Cutimed Sorbact® was applied alone in the facial sites or fingers but secondary dressings (e.g. Telfa®/Melolin®) were applied with soft Cling® bandages to other body parts .

Wound Assessment: A photograph using a 5-megapixel camera was taken before each dressing and after removal of the dressing by the first author in all cases.

Outcome Parameters: Wound assessment was done twice a week by the first author in conjunction with the co-authors. The factors assessed included wound bed appearance, slough, pus, biofilm, granulation, epithelium, smoothness and colour. Biofilm was assessed subjectively by macroscopic appearance of the wound as shiny and slimy.

Ethics: The research was conducted in line with the Helsinki Ethical guidelines. All patients consented to the use of their photos for research purposes.

Results

The demographic data of 27 patients included in this study is presented in Table 1. The average age of the patients was 34 years old. The youngest patient was 2 years old and the oldest 65 years old. The average total body surface area (TBSA) was 13.59%. The number of females was 10 and the males 17 as shown in Figure 1.

The commonest mechanism of injury was hot water, then flame burns followed by chemical burns shown in Figure 2.

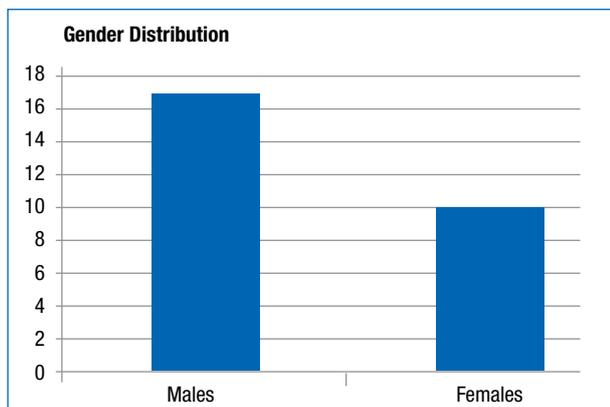


Figure 1: Gender distribution of patients

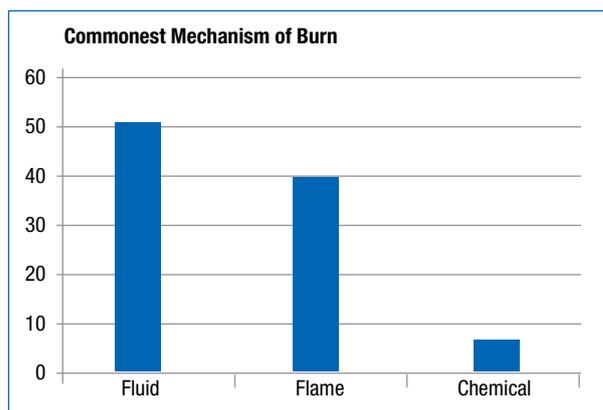


Figure 2: The commonest mechanisms of burns sustained

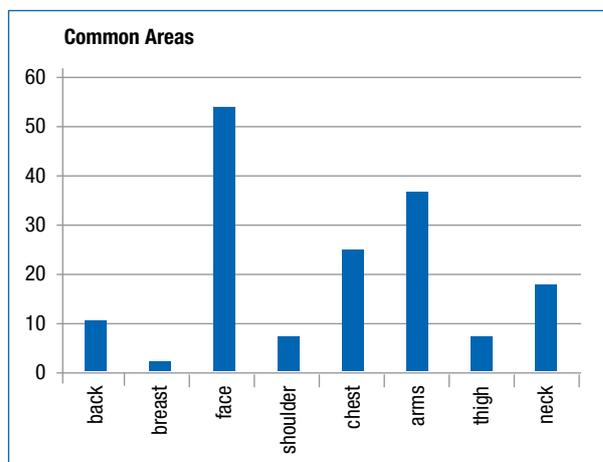


Figure 3: The commonest areas that were treated in the study showed the face, followed by arms then chest, neck, back, thigh and shoulder

The average time to application of the dressing was less than one day after the burn (17/27 = 0.7 days). The commonest sites chosen were the face, neck and forearms or hands shown in Figure 3.

The clinical assessment data for the application of the dressing are presented in Table 2. The assessment included the recording of pain for which patients were interviewed. The following pain assessment score was used: no pain = 0; pain requiring non-opiates like paracetamol = 1; pain requiring opiates = 2. Another factor assessed was the need for a pus swab by visual site inspection. The number of days before a dressing change was required was also noted. Any wound complications were noted. At the final assessment of the wound the following was checked: cleanliness of the wound, dryness of the wound, progression of the depth of the burn, colour of the wound and the resulting healing of the wound.

A summary of the wound factors assessed after application and removal, of the dressing and their incidence (as a %) is shown in Figure 4. In Figure 4, it can be observed that most wounds appeared clean (59%), dry (51%) and pink (51%). About a third (27%) appeared healed and there was depth progression in 2 patients (< 10%). The dressing was not associated with any subjective noticeable pain and therefore the pain assessment was stopped after 12 patients. The average days after application for removal of the Cutimed Sorbact® dressing was day 4 (112/26) as shown in Figure 5. The only

Table 2: Clinical data assessment

Age	Sex	TBSA%	Mechanism	Injury date	Dressing date	Days after injury	Areas
24	F	15	Hot H2O	08-01-2014	09-01-2014	1	back, shoulder
32	F	12	Hot H2O	10-01-2014	10-01-2014	0	back, chest, breast
28	F	13	Hot H2O	12-01-2014	13-01-2014	1	arm, chest, thigh
56	M	2	Hot H2O	26-01-2014	27-01-2014	1	face
36	M	2	Flame Explosion	25-01-2014	27-01-2014	2	forearm
65	M	8	Hot H2O	30-01-2014	31-01-2014	1	face, neck, arms
27	M	7	Hot H2O	17-02-2014	17-02-2014	0	forearms
23	F	8	Hot H2O	19-02-2014	20-02-2014	1	face, chest, neck, shoulder
26	M	7	Flames	26-02-2014	28-02-2014	2	forearm
39	M	1	Chemical	24-02-2014	28-02-2014	4	hand
25	M	18	Hot H2O	09-02-2014	12-02-2014	3	forearm
33	F	20	Flame	28-04-2014	28-04-2014	0	face, chest, forearm
16	M	13	Flame	02-05-2014	02-05-2014	0	face
47	M	20	Hot Fluid	03-05-2014	03-05-2014	0	face, hest
29	M	45	Flame	02-05-2014	02-05-2014	0	face
26	F	55	Flame	05-05-2014	05-05-2014	0	face
59	M	11	Flame	04-05-2014	04-05-2014	0	forehead, forearm
37	M	6	Chemical	18-05-2014	18-05-2014	0	face, neck
15	M	8	Hot H2O	15-05-2014	15-05-2014	0	thighs, leg, abdomen
21	F	10	Hot H2O	01-06-2014	02-06-2014	1	face, chest , neck
55	F	10	Hot H2O	01-06-2014	02-06-2014	1	face, neck
24	F	15	Flame			0	face
63	M	20	Flame	09-07-2014	10-07-2014	1	face, hands
28	M	7	Flame	13-07-2014	13-07-2014	0	face, chest
22	M	13	Flame	08-07-2014	08-07-2014	0	face, hands

complications related to the dressing were at removal where there were punctate minor bleeding points in 5 patients (5/27; 18.5%) It also appeared that in 2 patients there was progression of depth of the burn from partial to full-thickness areas (2/26; 7.6%). One patient developed an otitis externa unrelated to the dressing.

The average days after application for removal of the Cutimed Sorbact® dressing initially was early (3.5 days) and as confidence grew, it was left on longer (average days for the last patients increased to 4.5 days). The longest duration for leaving it on a partial

thickness burn was not known because a psychiatric patient was lost to follow-up with the dressing in place for longer than 11 days.

Clinical results before and after are shown in Figure 6 and Figure 7.

Discussion

Based on the initial 2013 findings of the Cutimed Sorbact® pilot study, it seemed possible that Cutimed Sorbact® could be used as a skin substitute.⁶ The appearance of the Cutimed Sorbact® wounds

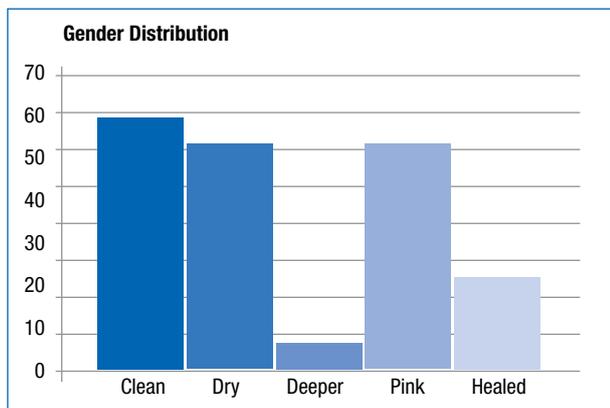


Figure 4: The wound factors assessed and their incidence (%) is shown after dressing removal

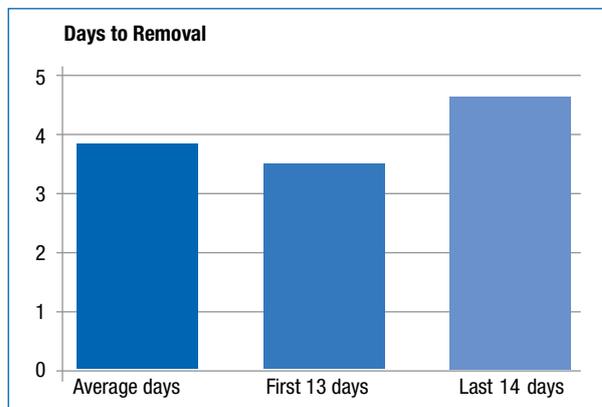


Figure 5: The average days for removal of the dressings (blue); the average in the first 13 days of the study (red) and the last 14 days (green) is also shown



Figure 6: Patients with Cutimed Sorbact® before complete removal of the dressing



Figure 7: Patient one week later after removal of the Sorbact

of clean (59%) was a relatively consistent finding. The dryness (51%) upon removal of the dressing was probably related to the hydrophobicity of the dressing and the fact that in many patients it was the only dressing on the area (mostly in faces where it was left open) allowing it to dry out more. The pink (51%) appearance, which was also a common finding, was an encouraging observation showing good early epithelialization. The depth progression in 2 patients (< 10%) cannot be directly related to the use of the Cutimed Sorbact®, because of the relatively small incidence and the multiple factors that do affect depth progression.

Depth progression of the burn wound could have happened as a result of contributing factors like latent heat in the tissue, local edema or constriction with bandages. The Cutimed Sorbact® dressing upon application and during its use was not associated with any subjective noticeable pain and therefore the pain assessment was stopped after 12 patients (and previous 13 patients in the pilot study). It is possible that with a more sensitive and elaborate pain scoring system low levels of discomfort could be recorded as lower levels of pain. There was some minor discomfort, not perceived as pain by the patients, associated with the removal of the dressing,

if it was very dry. Other authors have also described some minor discomfort with removal of the dressing in some patients.¹⁷

There were no significant complications. The minor bleeding points in 5 patients (5/27; 18.5%) were of no serious clinical consequence because it only required temporary pressure and cleaning of the wound.

It has been demonstrated in an in vitro wound healing model that Cutimed Sorbact® has some paracrine effects that help cell differentiation and accelerate wound healing.¹⁸ Even though it looks like a simple green piece of gauze, it is an advanced wound care product. The first author had a lot of experience using Suprathel® and therefore decided to compare that experience with Cutimed Sorbact®.

Cutimed Sorbact® has some similarity to Suprathel® which has antibacterial properties. Upon removal of the dressing, most of the exudate and surface bacteria are stuck to the dressing and the wound bed is clean.²¹⁻²³ Suprathel® is a lactic acid polymer skin substitute for the treatment of dermal wounds. It is used especially with the wound care of scalds and burns, abrasions, as well as split-thickness skin graft donor sites. It represents an absorbable, synthetic wound dressing with properties of natural epithelium.

Some of the differences of Cutimed Sorbact® in comparison to Suprathel® would be the exact mechanism of action. Cutimed Sorbact® is a bacterial adhesive via the lipophilic DACC molecule versus Suprathel's® bactericidal effect associated with its low pH of 5, 5 in vivo.²⁴ Cutimed Sorbact® doesn't stick to itself and it is extremely cheap and therefore highly cost-effective. The characteristics for the ideal skin substitute were described as:

- Able to resist infection
- Able to prevent water loss
- Able to withstand the shear forces
- Cost effective
- Widely available
- Long shelf life and easy to store
- Lack of antigenicity
- Flexible in thickness
- Durable with long-term wound stability
- Can be conformed to irregular wound surfaces and
- Easy to be secured and applied.¹⁹

Cutimed Sorbact® fits the above criteria with the added benefit of being a low-maintenance dressing. This means that it is the best skin substitute in our hands based on the above criteria for an ideal skin substitute.

Since the cost of skin substitutes has been high and we have had to use them sparingly considering budget sizes, it has been a welcome relief to have found an affordable and cost-effective skin substitute. Most burns occur in third world countries or poor societies where the cost of modern skin substitutes are not affordable and thus these people may suffer even more suboptimal outcomes. Cutimed Sorbact® would be a welcome tool to have in those poorer communities where an affordable skin substitute may be invaluable.

Conclusion

Cutimed Sorbact® is a very cost-effective addition to the available skin substitutes we use in our teaching hospital. It can be classified as a bio-synthetic skin substitute with antibacterial and antiviral properties. If it remains cost-effective, it will revolutionize the primary care of burns, especially in resource limited third world countries.

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