

Original Article

Acticoat versus biobrane: a retrospective review on the treatment of paediatric mid-dermal torso burns

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Abstract: Objectives: Scalds involving toddlers commonly involve the torso and are frequently mid-dermal in depth. Initial management of a mid-dermal burn is conservative, progressing to grafting if healing has not been achieved in 10-14 days. Historically Biobrane™ (UDL Laboratories, Inc., Sugar Land, TX) is thought to have more favourable clinical outcomes compared to Acticoat™ (Smith and Nephew, St. Petersburg, FL, USA). The Burns Unit at The Children's Hospital at Westmead (CHW) uses both dressings on a regular basis, providing the opportunity to compare the results of the dressings in a cohort of patients with mid-dermal torso burns. Method: A retrospective review was undertaken of all paediatric mid-dermal torso burns admitted to CHW between 2015 and 2017. The primary outcomes analysed were: time to complete healing and the need for grafting. Secondary outcomes included: operating theatre time, clinic visits, length of stay in hospital and positive wound swab colonisation. Results: 78 children met the study criteria, 64 (82%) in the Acticoat group and 14 (18%) in the Biobrane group. 36 out of 78 children (56%) in the Acticoat group had their burns spontaneously healed without the need of skin graft surgery, compared with 10 out of 14 children (71%) in the Biobrane group. The days to complete healing were quicker in the Acticoat group (13 days) compared to the Biobrane group (17 days), although this was not statistically significant ($P = 0.3$). Overall patients managed with the Biobrane dressing required more operative sessions under general anaesthesia, a longer hospital stay, more clinic visits and a higher number of positive wound swab colonisation with heavy growth compared to the Acticoat group. Conclusion: This study suggests that the use of the Biobrane dressing does not significantly improve the clinical outcomes of mid-dermal torso burns in children compared to the Acticoat dressing. Acticoat reduced healing time, decreased the requirements for a general anaesthesia, reduced inpatient hospital stay and risk of infection.

Keywords: Paediatric, mid dermal, primary dressing, complete healing

Introduction

Scald burns in toddlers commonly involve the torso and are frequently mid dermal in depth. In our burns unit (BU) initial management of mid-dermal burns is conservative with Acticoat™ (Smith and Nephew, St. Petersburg, FL, USA) or Biobrane™ (UDL Laboratories, Inc., Sugar Land, TX) dressings, progressing to skin graft surgery if they remained unhealed by day 10-14 post injury [1, 2].

Acticoat is synthetic, antimicrobial nano-crystalline silver dressing, which has been available for the last 20 years to treat burn wounds as well as other acute and chronic wounds [3-7].

The nano-crystalline silver particles within the dressing are delivered to the wound bed over several days imparting antimicrobial benefit, and can be left intact for up to 7 days [4, 5]. Acticoat as a primary dressing has been widely used in several burns units across Australia, especially in view of its antimicrobial properties [3]. One disadvantage of silver based dressings remains the potential cytotoxic effects of silver ions on newly growing keratinocytes which can inhibit wound epithelisation and therefore delay wound healing [4-8].

Biobrane is biological in nature, consisting of nylon mesh integrated with elements of porcine collagen [9, 10]. Previous studies have shown it

to offer significant advantages over the more conventional therapy as it is thought to facilitate more rapid wound healing and decrease hospital stay [9, 10]. Generally the Biobrane dressing can be left intact for up to 14 days, however depending on the clinical picture and surgeon specific preference the overlying secondary dressings may need to be reviewed earlier [10]. In the paediatric population the application of Biobrane usually requires a general anaesthetic and an inpatient hospital stay. In contrast, most applications of the Acticoat dressing in a paediatric population are usually achieved without the need for a general anaesthesia or an inpatient stay. Hence the costs of operating theatre time, anaesthetics and the Biobrane dressing itself makes this dressing significantly costly in comparison to Acticoat.

Biobrane also contains porcine collagen, which makes it an unacceptable dressing choice in some religions [10], further adding to challenges in its use at some centres.

A recently published small pilot study from our burns unit last year demonstrated that the use of Biobrane for the treatment of mid dermal burns in paediatric patients may be associated with an increased risk of infection, however appeared to expedite healing time and therefore reduced the need for skin graft surgery compared to the Acticoat dressing [2]. This study expanded the comparison of these dressings to a larger patient cohort.

There appears no clearly superior dressing for the treatment of mid dermal torso burns, hence there is currently no uniform standard of care, policies or procedures to direct treatment or best practice. This study compared Acticoat to Biobrane in the treatment of mid dermal torso burns to determine which dressing is superior in practice. The clinical outcomes of Acticoat are hypothesized to be closely comparable to that of Biobrane, and given its pragmatic qualities makes it a better dressing in the paediatric population.

Methods

A retrospective 2 year review was undertaken from January 2015-January 2017 of all children treated at The Children's Hospital Westmead (CHW) burns unit with a mid-dermal torso burn.

Inclusion criteria defined children aged 16 years or younger with a clinical diagnosis of a mid-dermal torso burn made by a burns registrar or consultant on presentation and subsequently dressed with either Acticoat or Biobrane as a definitive dressing. Exclusion criteria defined patients with epidermal, superficial dermal, deep dermal and full thickness burns and those dressed in dressings other than Acticoat or Biobrane.

The choice of dressings was consultant dependent. The day to complete epithelialization was determined by clinical assessment of the burn by an experienced burns clinician.

Data was collected from the Agency of Clinical Innovation (ACI) and hospital electronic medical records. A statistical analysis of the ungrafted patients alone was undertaken using the Fisher exact and Student's t-test. A p -value of < 0.05 was considered to be statistically significant. We then analysed the grafted and ungrafted patients' data together using the R Studio Version 1.1.383 and generalized linear modeling in collaboration with the statistician.

Age and sex was modeled using a binomial distribution to determine if these factors could influence the clinical outcomes between the two groups. The difference in the number of clinic visits between the two groups was modeled using the Poisson distribution. The difference in the number of operating sessions requiring general anaesthesia between the two groups was modeled using the Negative Binomial distribution.

The Sydney Children's Hospital Network Human Ethics Research Committee approved this study.

Results

78 children met the study criteria, 64 (82%) in the Acticoat group and 14 (18%) in the Biobrane group. The mean age in the Acticoat group was 3.4 years and 3.9 years in the Biobrane group. There were 34 boys in the Acticoat group and 9 boys in the Biobrane group. There was no significant difference in both the age or sex parameters between the two groups ($P = 0.54$ and $P = 0.27$). In both groups the most common cause of burn injury were scalds.

Acticoat versus biobrane

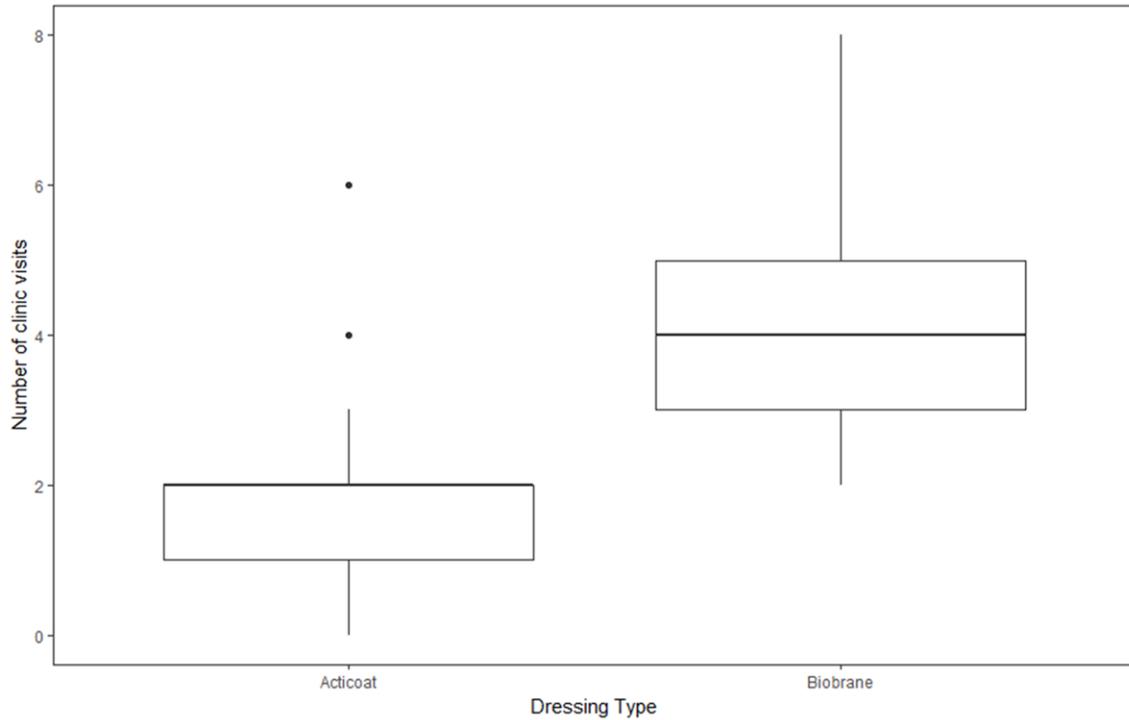


Figure 1. Comparison of the number of clinic visits between the two dressing groups.

36 out of 78 children (56%) in the Acticoat group had their burns spontaneously healed within 14 days without the need of skin graft surgery, compared with 10 out of 14 children (71%) in the Biobrane group.

The median number of days to complete healing were less in the Acticoat group (13 days) compared to the Biobrane group (17 days), although this was not statistically significant ($P = 0.3$).

In those patients who spontaneously healed without the need for grafting, the median number of clinic visits was higher in the Biobrane group $n = 4$ compared to the Acticoat group $n = 2$. This was statistically significant $P = 0.001$. This pattern was also observed when both the grafted and ungrafted patients were analysed together using the Poisson distribution (**Figure 1**), with the Biobrane group of patients having an expected 2.3 higher number of clinic visits than the Acticoat group of patients and this was statistically significant ($P < 0.001$).

The average length of stay in hospital in the ungrafted patients was prolonged in the Biobrane group (mean = 5.08 days) compared

to the Acticoat group (mean = 0.88 days) and this was also noted to be statistically significant ($P = 0.004$). Similarly this pattern was seen when both the grafted and ungrafted patients were analysed together using the gamma distribution (**Figure 2**)- the regression showed an increased length of stay in the Biobrane group compared to Acticoat (average length of stay as 5.5 and 2.7 days respectively), however this was not statistically significant ($P = 0.07$).

The average number of operating sessions in the ungrafted patients was higher in the Biobrane group (mean = 1.6 days) than the Acticoat group (mean = 0.36 days) and this was statistically significant ($P < 0.001$). This pattern was observed again when both the ungrafted and grafted patients were analysed together using the negative binomial distribution. The total number of operating sessions was statistically significant ($P = 0.008$), with the Biobrane group of patients having an expected 1.9 times higher number of operating sessions compared to the Acticoat group of patients (**Figure 3**).

The proportion of children with a positive burn wound swab in the Biobrane group 64% (9/14) was higher than in the Acticoat group 39%

Acticoat versus biobrane

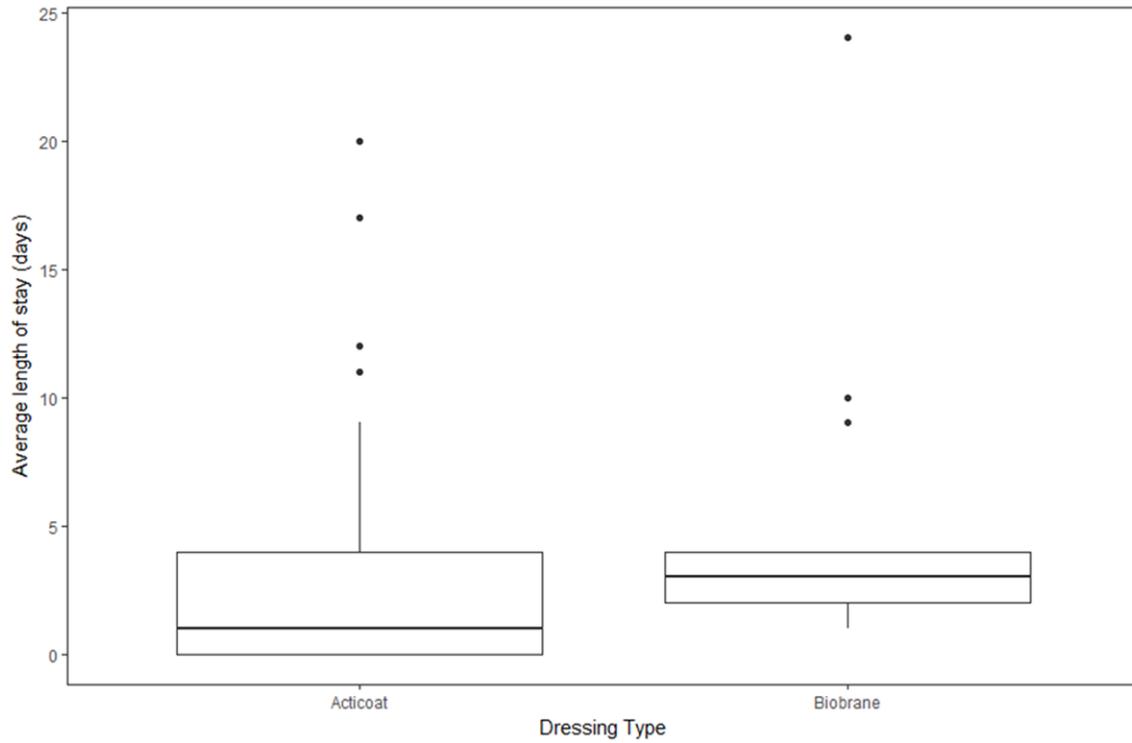


Figure 2. Comparison of the average length of stay between the Acticoat and Biobrane groups.

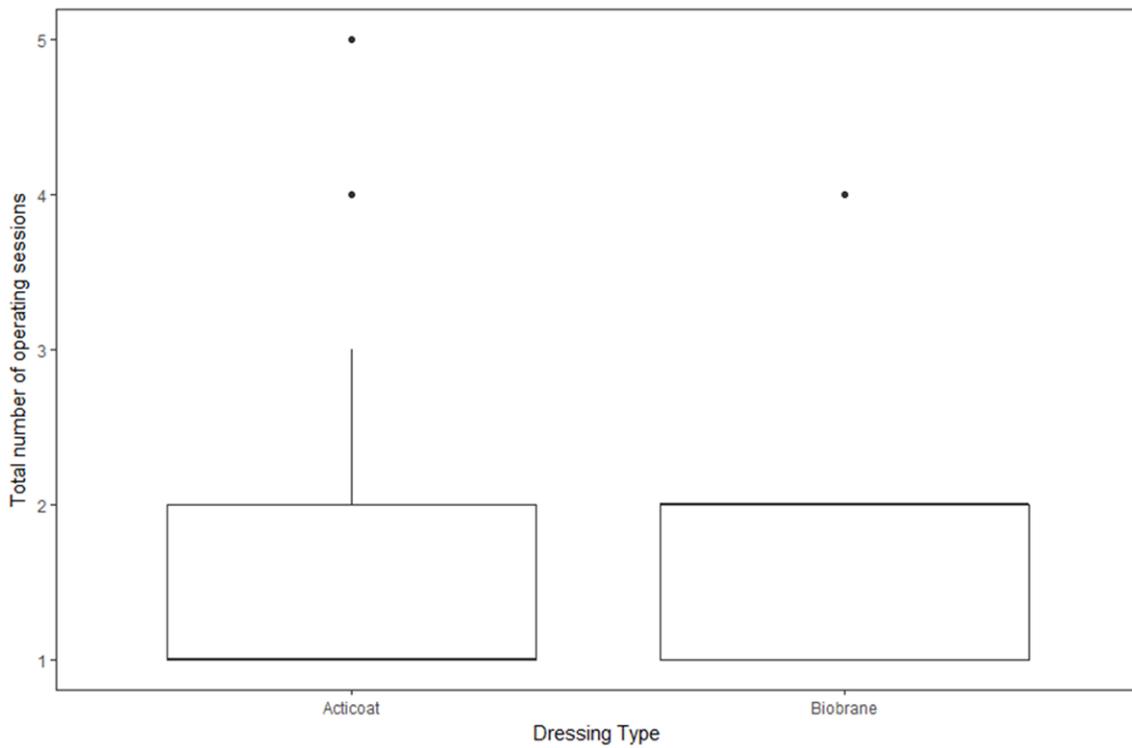


Figure 3. Comparison on the total number of operating sessions between the two dressing groups.

(25/64), but not significantly so ($P = 0.14$). Heavy organism growth was noted in 9% (6/64) of patients in the Acticoat group and 21% (3/14) of patients in the Biobrane group.

Discussion

Biobrane has been previously shown to decrease wound-healing time, reduce hospital length of stay, require fewer dressings and decrease the overall costs compared to more conventional dressings [9, 10].

In our study we in fact found no significant difference in healing time between the two groups. Every patient in the Biobrane group required a general anaesthesia for initial dressing application. In our burns unit Biobrane is applied in an aseptic environment and the burn wound surface is cleaned, and in many cases surgically debrided, to ensure proper adherence of the Biobrane dressing to the burn wound surface and decrease the likelihood of contamination [2]. These costs include the theatre time, which encompasses the costs of the dressing itself, consumables, anaesthetic labour, theatre time, theatre equipment and scrub scout.

In addition, when deciding to use the Biobrane dressing clinicians also need to take into consideration the potential risks associated with a general anaesthesia in the paediatric population.

An interesting trend noted in this study was the median number of dressing changes required in the clinic was noted to be higher in the Biobrane group compared to the Acticoat group. Theoretically Biobrane dressings can remain intact for up to 14 days [9], but depending on the consultant and clinical scenario the overlying secondary dressings are usually reviewed at a much earlier time frame. In contrast the Acticoat dressings can confidently remain untouched for up to 7 days [6], which may contribute to the reduced number of dressing changes noted for this group. This therefore aids in reducing patient trauma, reducing the risk of hospital acquired infections, decreasing cost and disruptions in family life and use of hospital resources.

Another important trend noted in this study was that Biobrane required a significantly longer length of inpatient stay compared to the Acticoat dressing group. Generally in our burns

unit, the application of Biobrane is achieved in the operating theatre and usually for significant surface area burns to the face and torso. However the logistics of having theatre availability during business hours and treating significant burns may inevitably prolong hospital stay. Yet the application of Acticoat in most cases can be achieved at a ward or emergency department level without the need of a general anaesthesia, which further reduces the chances of requiring a hospital bed.

We also found that there were more positive wound swab results, indicating wound colonization, in the Biobrane group compared to the Acticoat group, although this was not statistically significant. In addition to this the Biobrane group was noted to have more than double the quantity of heavy growth swabs compared to the Acticoat group.

This study is a retrospective, non-randomised study, which contributed to the sample size differences.

The assessment of the mid-dermal burn was also subjective and operator dependent.

Conclusion

Biobrane has been historically known to expedite burn wound healing [12]. However, this study demonstrated that the use of the Biobrane dressing does not significantly improve the outcomes of mid-dermal torso burns in patients compared to an Acticoat dressing.

Acticoat was found to reduce healing time, decrease the requirements for a general anaesthetic, inpatient hospital stay and decrease overall costs. It also had the benefit of requiring less follow up dressing changes, which contributed to decreased travel time and family unit disruption.

Further to our smaller pilot study [2], this more comprehensive study found no significant difference in the healing time between the two dressings, however Biobrane was noted to have a higher incidence of infections compared to the Acticoat group. Further, this study found the Acticoat group to have less clinic visits, general anaesthetic requirement, and length of stay in the hospital. Given the limitations of this study which may impact outcomes, we suggest pro-

Acticoat versus biobrane

gressing to a larger prospective randomised control trial.

Although Biobrane is popular and widely used in the paediatric population [13, 14], it is important to consider the risks associated with a general anesthetic if there is a proven better alternative.

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Disclosure of conflict of interest

None.

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