Clinical effectiveness of alginate silver dressing in outpatient management of partial-thickness burns

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ABSTRACT

Askina Calgitrol Ag® (B. Braun Hospicare Ltd, Collooney Co. Sligo, Ireland), alginate silver wound dressing, is an advanced wound dressing which combines the potent broad-spectrum antimicrobial action of silver with enhanced exudate management properties of calcium alginate and polyurethane foam. The purpose of this study was to compare the efficacy of Askina Calgitrol Ag® and 1% silver sulfadiazine (1% AgSD) in the outpatient management of partial-thickness burn wounds at Burn Unit, Siriraj Hospital. A prospective descriptive study was conducted between January 2008 and January 2009 in Burn Unit, Division of Trauma Surgery, Siriraj Hospital, Mahidol University, Thailand. The 65 patients with partial-thickness burn wounds, less than 24 hours post-burn injury, had a total body surface area (TBSA%) less than 15% were treated at Siriraj Outpatient Burn Clinic. All patients were divided into Askina Calgitrol Ag® treated group (30 patients) and 1% AgSD treated group (35 patients). The data were compared by the demographics including age, gender, % TBSA burn, pain score, number of wound dressing change, nursing time and time of wound healing. Patients included in both groups were comparable with no significant differences in demographic data of age, gender, location of burn and type of burn injury ($P > 0{\cdot}05$ evaluated by paired Student's *t*-test) between both group. The present results showed that average pain scores in the Askina Calgitrol Ag® treated group were significantly lower than the 1% AgSD treated group ($2{\cdot}23 \pm 1{\cdot}87$ versus $6{\cdot}08 \pm 2{\cdot}33$, respectively) between both groups ($P < 0{\cdot}02$). Patients treated with Askina Calgitrol Ag® had significantly lower number of wound dressing change ($P < 0{\cdot}02$) and nursing time ($P < 0{\cdot}02$) compared with 1% AgSD treated group. The Askina Calgitrol Ag® group needed less frequent wound dressing. Healing time was $7 \pm 3{\cdot}51$ days after the application of Askina Calgitrol Ag®. This was significantly shorter than that of control wounds ($14 \pm 4{\cdot}18$ days). Application of Askina Calgitrol Ag® leads to a good burn wound outcome. The present study confirms the effectiveness of Askina Calgitrol Ag® in the outpatient management of partial-thickness burn wounds.

Key words: Alginate silver dressing • Askina Calgitrol Ag® • Burn • Silver sulfadiazine

INTRODUCTION

Since 1970s, the use of topical antimicrobial agents such as silver sulfadiazine (AgSD), which is also quite inexpensive, has reduced the risk of infection (1). AgSD is a broad-spectrum topical antimicrobial agent which is active against gram-positive cocci, *Staphylococcus aureus* and gram-negative bacilli, particularly *Pseudomonas aeruginosa* (2,3). Therefore, it is used widely in burn wound care at outpatient clinic. However, one of its disadvantages is that it needs multiple sessions of wound dressing daily, especially in wounds

Key Points

- AgSD is a broad-spectrum topical antimicrobial agent which is active against gram-positive cocci, *Staphylococcus aureus* and gram-negative bacilli, particularly *Pseudomonas aeruginosa*
- *however*, one of its disadvantages is that it needs multiple sessions of wound dressing daily, especially in wounds with heavy exudates

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Key Points

- Askina Calgitrol Ag®, alginate silver wound dressing, is a technologically advanced wound dressing that incorporates the barrier effectiveness of ionic silver with the absorbency capabilities of calcium alginate and polyurethane foam
- the purpose of the current study was to compare the use of Askina Calgitrol Ag® and 1% AgSD on the management of partial thickness burn wounds at Siriraj Outpatient Burn Clinic, Thailand
- sixty-five patients with partial-thickness burn wounds who were treated at Siriraj Outpatient Burn Clinic were eligible for enrollment between January 2008 and January 2009

with heavy exudates. The patient has to come for follow-up repeatedly. Pain during wound cleansing is still the main problem resulting in reduced compliance on the side of the patient (4). In recent years, calcium alginate dressings have been replaced by other products for the treatment of more heavily exudating wounds.

Askina Calgitrol Ag® (B. Braun Hospicare Ltd, Collooney, Co. Sligo, Ireland), alginate silver wound dressing, is a technologically advanced wound dressing that incorporates the barrier effectiveness of ionic silver with the absorbency capabilities of calcium alginate and polyurethane foam (5). Highly absorbent, biodegradable alginate dressings are derived from seaweed (6). Furthermore, polyurethane foam component has been successfully applied to cleanse a wide variety of secretion. In addition, it has recently been introduced as an effective antimicrobial barrier dressing managing highly exudate wounds including partial-thickness burn wounds. Askina Calgitrol Ag® is able to be left in situ for treatment of partial-thickness burn wounds up to 3–5 days (2). The purpose of the current study was to compare the use of Askina Calgitrol Ag® and 1% AgSD on the management of partial-thickness burn wounds at Siriraj Outpatient Burn Clinic, Thailand.

MATERIALS AND METHODS

Patient population

Sixty-five patients with partial-thickness burn wounds who were treated at Siriraj Outpatient Burn Clinic were eligible for enrollment between January 2008 and January 2009. Staffs at Siriraj Burn Unit did the medical and nursing follow-up. The patients were prospectively evaluated data to determine the effectiveness of treatment. Each patient was treated with Askina Calgitrol Ag® dressing until complete wound closure defined as complete epithelialisation. The inclusion criteria were including partial-thickness burn wounds, less than 24 hours post-burn injury and total body surface area (TBSA) less than 15%. Exclusion criteria included full thickness burns, pregnancy, immunocompromised patient and patient with known hypersensitivity to alginate silver dressing or AgSD. The present study was approved by the Ethic Committee of Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand.

The study dressing

Askina Calgitrol Ag® (B. Braun Hospicare Ltd) comprises patented silver alginate matrix that incorporates the barrier effectiveness of ionic silver with the absorbency capabilities of calcium alginate and polyurethane foam, thus helping prevent contamination from external bacteria. Silver is readily available in ionic state over the entire dressing surface area. It sustained antimicrobial effectiveness for up to 5 days. Askina Calgitrol Ag® is used to provide an antimicrobial effectiveness while enhancing a moist wound environment.

Wound dressing protocol

In Askina Calgitrol Ag® treated group, the treatment consisted of the application of an Askina Calgitrol Ag®. The Askina Calgitrol Ag® dressings were changed every 5 days until complete wound closure. Day of complete wound healing was considered when all areas of initial injury had fully re-epithelialisation. The other treatment consisted of the application of 1% AgSD. Dressings were changed every day and dry gauze dressings until wound closure.

Evaluation and assessment criteria

Demographics including age, gender, type of burn injury, location of burn and TBSA burn% were collected. The clinical assessment was evaluated by two experienced burn surgeons each time patients came to Siriraj Outpatient Burn Clinic. The surgeon's medical records were type of burn wound, location of wound, size (length *x* width in centimetre), depth of wound, and amount of wound exudate. The photographic records were performed for all of burn wounds. The pain scores were obtained during dressing changes between both groups. The pain score was assessed and reported by the patients to determine if there was any difference between the two methods using the visual analog pain scale 1–10; 0 being no pain, 5 being moderate pain, and 10, the severe pain (Figure 1). Healing progression was assessed in terms of time to healing.

Study design

Sixty-five burn patients were identified and randomised into two groups and given burn wound treatment with 1% AgSD (35 patients) or Askina Calgitrol Ag® (30 patients). Both groups were compared with regard to the

patient demographic data. Patients were also evaluated the efficacy of treatment including pain scores, number of wound dressing change, nursing time and time of burn wound healing between both groups.

The SPSS 14.0 software package was used for statistical data analysis (SPSS, Chicago, IL). Difference of means was analysed using Student's *t*-test. The chi-square test was performed to determine the relationship between parameters. All *P* values were two-sided in tests and *P* values <0·05 were considered significant.

RESULTS

Sixty-five patients were recruited: 21 male and 9 female in the Askina Calgitrol Ag® treated group, and 15 male and 20 female in the 1% AgSD treated group ($P = 0{\cdot}75$). Demographic data of the patients in both groups were shown in Table 1. The mean age of patients in Askina Calgitrol Ag® group was $31{\cdot}03 \pm 19{\cdot}76$ years while in 1% AgSD group mean age was $42{\cdot}31 \pm 23{\cdot}49$ ($P = 0{\cdot}05$). The area of burn treated was significantly higher in Askina Calgitrol Ag® group ($7{\cdot}93 \pm 1{\cdot}18\%$ and $2{\cdot}77 \pm 0{\cdot}41\%$, $P < 0{\cdot}02$). Location of burn did not differ between both groups ($P = 0{\cdot}40$).

Data regarding results of treatment were shown in Table 2. The Askina Calgitrol Ag® treated group had manifested significantly lower pain scores than the 1% AgSD treated group ($2{\cdot}23 \pm 1{\cdot}87$ versus $6{\cdot}08 \pm 2{\cdot}33$, $P < 0{\cdot}02$). The number of wound dressing changes to treat the wound was significantly lower in Askina Calgitrol Ag® treated group with average of $2{\cdot}93 \pm 1{\cdot}17$ times while in control group numbers of dressing was $13{\cdot}29 \pm 4{\cdot}19$ times ($P < 0{\cdot}02$). Nursing time was also significantly reduced in Askina Calgitrol Ag® treated group ($8{\cdot}47 \pm 6{\cdot}16$ minutes) compared with 1% AgSD treated group ($13{\cdot}29 \pm 4{\cdot}19$ minutes, $P < 0{\cdot}02$). The time to healing in Askina Calgitrol Ag® group was $7 \pm 3{\cdot}51$ significant shorter than in control group ($14 \pm 4{\cdot}18$, $P < 0{\cdot}02$).

DISCUSSION

Partial-thickness burn wounds are challenging to manage. It faces many problems. The main problems are having to deal with wound infection, amount of exudates, high levels of pain and delay wound healing which lead to loss wastefulness.

As in the previous study, AgSD, being inexpensive, had been used to reduce the risk of infection. AgSD was a broad-spectrum topical antimicrobial agent which was active against gram-positive cocci, *S. aureus* and

Key Points

- partial-thickness burn wounds are challenging to manage
- the main problems are having to deal with wound infection, amount of exudates, high levels of pain and delayed wound healing

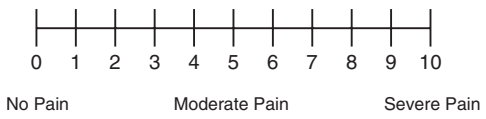

Figure 1. Pain scores were evaluated using the visual analogue pain scale.

Table 1 Demographic data of the patients in both groups

	1% Silver sulfadiazine treated group ($N = 35$)	Askina Calgitrol Ag® treated group ($N = 30$)	*P* value
Age (years)	$42{\cdot}31 \pm 23{\cdot}49$	$31{\cdot}03 \pm 19{\cdot}76$	0·05
TBSA burn (%)	$2{\cdot}77 \pm 0{\cdot}41$	$7{\cdot}93 \pm 1{\cdot}18$	<0·02
Location of burn			0·40
Upper limb	31%	53%	
Lower limb	46%	33%	
Hand	11%	3%	
Other	12%	11%	
Type of burn injury			0·17
Flame	23% (8)	60% (18)	
Scald	77% (27)	33% (10)	
Other (chemical burn, contact burn)	0% (0)	7% (2)	

Expressed as mean ± standard error.

Table 2 Characteristics of patients in both groups

	1% Silver sulfadiazine treated group ($N = 35$)	Askina Calgitrol Ag® treated group ($N = 30$)	P value
Pain scores	6·08 ± 2·33	2·23 ± 1·87	<0·02
Number of wound dressing change	14·00 ± 4·18	2·93 ± 1·17	<0·02
Nursing time (minutes)	13·29 ± 4·19	8·47 ± 6·16	<0·02
Healing time (days)	14·00 ± 4·18	7·00 ± 3·51	<0·02

Expressed as mean ± standard error.

Key Points

- excellent exudate management capability of calcium alginate in Askina Calgitrol Ag® reduces the risk of surrounding wound maceration and provides a moist wound environment that leads to rapid granulation and re-epithelialisation
- the results of the present study suggest that the time to healing used to treat the burn wound was significantly shorter in Askina Calgitrol Ag® group (7 days) compared with 14 days of the 1%AgSD group

gram-negative bacilli, particularly *P. aeruginosa*. It is used as standard dressing in partial-thickness burn wounds. Therefore AgSD was selected to be a control dressing in our study.

Partial-thickness burn wounds can scar significantly because of the extended healing time, as burn wounds tend to hurt especially during dressing change and delay of wound healing time is a result of the frequency of dressing change. As a result, alginate silver dressing may speed healing with good patients' compliance.

Although there are many wound products that can be used in the management of partial-thickness burns, Askina Calgitrol Ag® (B. Braun Hospicare Ltd), alginate silver wound dressing, is an advanced wound dressing. Askina Calgitrol Ag® is a good combination dressing. Its composites of (1) ionic silver – is readily available for wound treatment and no activation needed, and non staining with broad antimicrobial spectrum, (2) alginate and polyurethane foam have excellent exudate management capability and provides a moist wound environment conducive to natural healing. Moreover, Askina Calgitrol Ag® reduces the risk of peri-wound maceration and has longer wear time for fewer dressing changes.

This new dressing combines the potent broad-spectrum antimicrobial action of silver with enhanced exudate management properties of calcium alginate and polyurethane foam. Silver is a powerful antimicrobial agent, highly active and penetrates bacterial membranes rapidly. To date, silver-containing wound dressings are well established for clinical wound care. Silver is readily available in ionic state which sustained antimicrobial effectiveness for up to 5 days.

Winter *et al*. (7,8) have described 'The idea of moist healing'. He discovered that healing would proceed twice as fast in a moist environment than under a scab. The principle aim of moist wound therapy is to create and maintain optimal moist conditions. Because of highly exudates may increase bacterial load and present infection (9). Moist wound treatment is accepted to prevent a scab formation. Therefore, epithelial cells can grow horizontally outwards through the thin layer of wound exudate to rapidly close the wound. Today, many products have already been developed for the healing of wounds via moist wound therapy. Excellent exudate management capability of calcium alginate in Askina Calgitrol Ag® reduces the risk of surrounding wound maceration and provides a moist wound environment that leads to rapid granulation and re-epithelialisation. Alginate converts the exudates into a gel. Reaction between the calcium in the dressing and the sodium in a wound exudates results in a chemical ion exchange, which forms a gel-like substance (10). Askina Calgitrol Ag® can easily be removed in one piece without adhering to the wound bed. It can help to protect regenerating tissue and minimises patients' pain and trauma during dressing changes (6,11,12). Patients report significant pain reduction. Moreover calcium alginate effects on cell proliferation. This result may improve wound healing (13). The results of the present study suggest that the time to healing used to treat the burn wound was significantly shorter in Askina Calgitrol Ag® group (7 days) compared with 14 days of the 1%AgSD group ($P < 0·02$). Askina Calgitrol Ag® is able to be left in situ for wound treatment up to 3–5 days. Therefore it decreases the frequency of dressing changes. This study suggests that nurses come out on top with fewer dressing changes. Askina Calgitrol Ag® should also provide clinicians with quicker and more convenient dressing changes. It was favoured by the nursing personnel because of its ease of care. Fewer required dressing changes mean

fewer nursing visits. Askina Calgitrol Ag® offers patients and nurses advantages that are safe, convenient and long lasting, including faster healing time and extended use.

CONCLUSION

Askina Calgitrol Ag®, advanced antimicrobial alginate wound dressing, is an effective barrier to microbial penetration for moderate to heavy exudating partial-thickness burn wounds. The results suggest that Askina Calgitrol Ag® significantly decreases the level of pain, the frequency of dressing changes and the healing time compared with 1% AgSD treated group. The presented data suggest that Askina Calgitrol Ag® is an effective dressing managing the partial-thickness burn wounds at the outpatient clinic.

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Key Points

- the results suggest that Askina Calgitrol Ag® significantly decreases the level of pain, the frequency of dressing changes and the healing time compared with 1% AgSD treated group