

# Comprehensive treatment, including topical care, for severe facial burn

## ABSTRACT

**Background** The face is the area central to a person's identity that provides our most expressive means of communication. Facial burns are extremely serious medical problems. Topical interventions are currently the cornerstone of treatment of facial burns.

**Case** The authors report a 45-year-old woman who presented with a 1-hour old, 90% total body surface area (TBSA), including a mixture of deep II° and III° burns to her face. A silver impregnated dressing was used to care for the facial burn wounds.

**Conclusion** The silver impregnated dressing AQUACEL® Ag Hydrofiber® was found to be useful in nursing the facial burn wounds in this case.

**Keywords** burn, wound care, dressing, Aquacel Ag

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## INTRODUCTION

Burn injuries are an important health problem worldwide. In the USA, burns result in 45,000 admissions per year, of which more than 25,000 admissions are to hospitals with specialised burn centres<sup>1</sup>.

The head and neck area has been identified as the site most frequently affected by thermal injuries<sup>1</sup>. Facial burns are extremely serious due to the abundance of nerves and

blood vessels<sup>2</sup>. In addition, complications such as facial scar hyperplasia, minor mouth deformity, upper eyelid ectropion and reduced or total lack of facial expressions can occur, resulting in psychological trauma and increased treatment costs<sup>3</sup>. Adequate facial burn care can improve the physical function and burned tissue recovery and relieve the psychological burden of patients<sup>4</sup>. A wide variety of agents are available for treatment of burn wounds, including ointments, creams and biological and non-biological dressings<sup>5</sup>.

Currently, there is no consensus on the optimal topical interventions for burn wound coverage to prevent or control infection or to enhance wound healing and minimise life-long scarring. Here, the authors report the case of a 45-year-old female case with a 1-hour old, 90% total body surface area (TBSA), including a mixture of deep II° and III° flame burns, cared for with a silver impregnated dressing with a satisfactory effect.

## BACKGROUND

The patient suffered flame burns due to ignition of a gas leakage. She stayed at home alone for 1 hour post-injury, refusing treatment, although there was no evidence of altered mental status at the time of injury. On arrival at her home, her family called emergency services, and she was sent to hospital.

Physical examination showed a body temperature of 36.2°C, a heart rate of 90 beats/min, a respiratory rate of 20 breaths/min, and a blood pressure of 168/104mmHg. The medical history

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surrounding the current facial burn wound was presented by the patient herself. The pain in burn wounds reached a score of 0–3/10 on the Visual Analogue Scale<sup>6</sup>. The Generalized Anxiety Disorder 7-Item (GAD-7) Scale<sup>7</sup> showed a score of 18, which meant the patient exhibited signs of severe anxiety. She had slightly fidgety and cold extremities and was thirsty, yet no fever or tachycardia or confusion. Her current and past medical history found no heart disease or lung disease or epidemiological history of COVID-19.

The overall percentage of burnt skin on the patient's body was estimated by the Rule of 9s<sup>8</sup>. Burns spanned the face (4% II°) (upper row, Figure 1 shows the facial wound image on admission), neck (3% II°), anterior trunk (12% II°), posterior trunk (13% II°), bilateral upper arms (4% II°, 3% III°), bilateral forearms (3% II°, 3% III°), bilateral hands (2% II°, 1% III°), buttocks (4% II°), bilateral thighs (11% II°, 10% III°), bilateral legs (13% III°), and feet (4% III°), a total of 56% II° and 34% III°. The only unburned area seen was genitalia skin. There were small amounts of purulent secretions near the eyes, and the left auricle skin was intact; however, there was crust inside the auricle. The skin of the right auricle was ruptured, and there was blood and purulent secretions in the auricle and ear canal. Though the skin condition around both eyes was poor, the eyeballs were not injured.

Further intensive examination showed burns of varying degree with the epidermal layer; these were moist, mostly hyperaemic and blanching with significant swelling. Vibrissa and hair on the scalp were partially scorched. Besides deep II° to III° burns, the patient was also diagnosed with inhalation injury and (hypovolaemic) burn shock.

## CLINICAL MANAGEMENT

Upon the diagnoses, the patient was placed on a suspended bed, with a room temperature of 25°C and humidity 60%. The standard wound care regimen for burn wounds in the authors' hospital of broad-spectrum intravenous antibiotics was implemented for all burn wounds sustained. On day 1 (the next day after admission), and on days 4, 7, 11 and 18, the patient received excision, debridement and allografts to affected burn tissue with the exception of the face.

## ASSESSMENT AND MANAGEMENT OF FACIAL BURN WOUNDS

Regarding the facial burns, the patient received initial treatment in the form of a thorough face wash with sterile 0.9% saline and removal of debris. The face was then dried with sterile gauze. Hair in the burned area was shaved off with electric clippers to facilitate wound assessment and management.

Figure 1. Face wound images

**Upper: images before and after the 1st dressing change**

**Middle: images before and after the 2nd dressing change**

**Lower: images before and after the 3rd dressing change**



The wound care specialty team, including enterostomal therapists (ETs) and wound care nurses, collectively assessed the patient's facial burns and identified several salient issues as indicated in Table 1. The wound care specialty team confirmed that the priorities of nursing care for this case were improving the skin integrity of burned skin through the application of an appropriate dressing to facilitate wound healing and minimise scarring, decreasing wound exudate and associated burn pain, and liaising with allied health professionals to assist in preventing malnutrition from hypermetabolism and trauma-induced anxiety. ET/wound care nurses alone would not be able to address pain, hypermetabolism or anxiety. The management of burn wounds is multidisciplinary.

The first facial dressing was on day 0 (admission). The aim was to debride all non-viable burned tissue, to control the infection, and to implement effective exudate management. Before commencing the dressing procedure the patient was informed of the purpose of the facial wound care and the processes involved. Sterile gauze soaked in sterile water for injection was used to apply wet compresses to the face to moisten and clean the wound and facilitate easy removal of the gauze from the face to reduce the patient's pain and discomfort. Conservative sharp wound debridement with sterile sharp instruments and forceps was then undertaken to clear facial eschar and necrotic tissue. Next, gauze was used to re-clean the facial wound. Finally, a silver dressing (AQUACEL® Ag Hydrofiber®, ConvaTec Ltd., UK) was chosen as the primary interface dressing. In order to permit eyelid movement, the eyelids were not covered with Aquacel® Ag sheets. The next day the patient's facial wound dressings were fixed to the wound without displacement. A small amount of black exudate on the dressing was found. The patient had no complaints (upper row, Figure 1). The dressings were checked every day.

The second dressing change occurred on day 5. We found the wound bed had less necrotic tissue, exudate and odour were less, and the periwound skin had improved as per Table 1. The facial contour was more discernible because there was less swelling. The dressings were slowly removed to enable

reassessment of the facial wound. The nursing regimen was repeated as for the first dressing. On day 6, the patient's facial wound was observed, and only a small amount of exudate was found in the auricle. A sterile dry cotton ball was placed in the auricle. The patient was inspected and the dressing replaced as needed (middle row, Figure 1). The dressings were checked every day.

The clinical characteristics and improved condition of the facial wounds before the third dressing change on day 12 are listed in Table 1. The wound management regimen was assessed as being effective as the burn wounds continued to improve. Less dressing product was being applied, thereby exposing more of the face (lower row, Figure 1). The wound management goals of care remained the same: debriding to the maximum extent, controlling the infection, and implementing effective exudate management. The dressing regimen remained unchanged. There was a small amount of dry scab in the auricle, therefore the sterile dry cotton ball was not needed. The dressings were checked every day.

After the three facial wound dressing changes, the patient's facial wounds had healed significantly (Figure 2).

## DISCUSSION

Approximately two-thirds of communication is non-verbal, mediated principally by facial expression that also allows for individual identity. The healing of facial wounds is of great significance to patients, and effective intervention can reduce the chance of disfigurement. It is necessary to customise a personalised nursing plan according to the specific injury and condition of the patient's wound.

Facial wound healing is affected by patient-related factors, the characteristics of the wound, and associated cellular repair processes with overlapping problems of microcirculation, local immunity, and dressing methods. The desired result is healing with minimal scarring and no functional defects<sup>2</sup>.

In this case, most facial tissue was lost from heat coagulation of the protein within the tissue from the gas explosion and

Table 1. Assessment of patient's facial wound

Assessment	1 hour post-burn	After the 1st dressing change	After the 2nd dressing change
Size	3% flame burn	1% flame burn	<1% flame burn
Tissue	50% red, 25% yellow, 25% black	100% red	100% red
Secretions	Great amount of fishy smelling exudate	Moderate amount of fishy smelling exudate	Small amount of fishy smelling exudate
Wound edge	No undermining	No undermining	No undermining
Surrounding skin	All burn wound	Wound healing	Wound healing
Visual Analogue Scale Score	Wounds of facial features: 3 scores Other facial wounds: 2 scores	Wounds of facial features: 3 scores Other facial wounds: 1 score	Wounds of facial features: 2 scores Other facial wounds: 1 score
Psychological compliance	Expressed understanding and willingness to cooperate	Expressed understanding and willingness to cooperate	Expressed understanding and willingness to cooperate

resultant flames. The extent of tissue loss, however, was progressive and resulted from the release of local mediators, changes in blood flow, tissue oedema, and infection. Multiple difficulties for wound care were observed. First, assessment of facial wounds with cultures found Gram-positive bacterial (*Staphylococcus aureus* and extensively drug-resistant *Acinetobacter baumannii*) infections. Second, the patient on admission was in a period of extensive tissue dissolution. The necrotic tissue was dissolving, and there was massive amounts of bloody and purulent exudate on the local area. The exudate spread to the concave parts of the face, and the eyes and ears of the patient were likely to be further compromised. Third, facial blood vessels and nerves are richer than other areas of the body. Carelessness during the administration of wound healing interventions can easily result in severe sequelae such as scar hyperplasia, decreased or loss of facial features. Fourth, the newly deposited granulation tissue was friable and prone to bleeding when touched. Fifth, the TBSA was large and deep and, in response, the body was hypermetabolic which resulted in prolonged wound healing. And last, in this accident, her son was also injured. The patient was less worried about her own condition and more about her son's.

An effective dressing should be cheap, alleviate pain, prevent infection, be easy to handle, permit easy and early mobilisation, have no toxicity, cause no allergic reactions, and facilitate wound healing with a cosmetically acceptable scar.

Sodium carboxymethyl cellulose, silver impregnated antimicrobial dressing is a soft, sterile, non-woven pad or ribbon dressing composed of sodium carboxymethylcellulose and 1.2% ionic silver which allows for a maximum of 12mg of silver for a 4x4 inch dressing. The silver in the dressing kills wound bacteria held in the dressing<sup>9</sup>. Caruso et al. compared the effect of Aquacel® Ag and that of silver sulphadiazine in the treatment of partial-thickness burns and observed that there was less pain and less anxiety during dressing changes with Aquacel® Ag and also that fewer analgesics and narcotics were used in patients treated with Aquacel® Ag<sup>10</sup>. Hindy<sup>11</sup> concluded that Aquacel® Ag was found to be comparable to moist exposed burn ointment (MEBO), particularly allowing more rapid healing, and was psychologically less traumatic for those who cannot tolerate strong odour of dressings.

In this case, the dressing facilitated facial wound healing. However, these dressings are expensive, and the cost of each dressing change was not cheap, however, Robinson et al.<sup>12</sup> reported that a cost-benefit study of the hydrofibre dressing demonstrated a significant saving of clinical time, owing to the fact that the largest component in the cost-benefit equation was staff time. The patient in this case attached great importance to family, had a high degree of compliance, and was willing to communicate so that pain and psychological problems could be identified and resolved in a timely manner.

A complication in this case was the amount of exudate from autolysing necrotic tissue which could not be estimated in advance, thereby limiting protective measures. Therefore, more

clinical factors and potential for such complications to arise should be considered in the assessment and ongoing evaluation of wound healing to allow for more proactive measures to facilitate wound healing and meet nursing goals. The cost of dressing for wounds is high, and the affordability of patients and their families should be considered in the subsequent nursing process.



Figure 2. After the three dressing changes

But still there are possible solutions. According to hospital policy, the manufacturer of the dressing is supposed to negotiate with medical insurance department to cover part of the fee. In practice, wound care nurses may be able to cut the dressings if this is in accordance with manufacturer guidelines. The cutting of the dressing into pieces instead of applying the dressing in one piece is mainly for two reasons. First, the facial contour is irregular, and cut dressings fit the size and shape of the burn wound better. Second, cutting the dressings reduces the fees for patients. In this case, it was identified that cutting the dressings did not incur any adverse effects or compromise wound healing of the facial burn.

Facial features are more sensitive to pain due to abundance of nerves<sup>2</sup>. In this case scenario, wound debridement and dressing changes caused pain which can easily cause poor coordination of patient care and place a heavy psychological burden on nursing staff, and slow down the process of facial wound care. By digitally assessing the location, nature and duration of wound pain, individualised pain care measures are formulated according to the characteristics of the patient, with psychological intervention as the mainstay. Before each dressing change, the authors discussed the procedure with the patient and told her the actions that indicated pain such as opening her mouth or nodding. During the dressing procedure, the patient was informed of the current dressing procedure steps, the site where debridement would be performed, and how much necrotic tissue was likely to be removed, so that the patient was psychologically prepared to cooperate with the dressing procedure. The dressing procedure was suspended when the patient sent a signal of pain.

The environment directly affects the psychological activities of patients, and creating a beautiful and comfortable environment has a good impact on the psychology of patients. The ward environment was clean and bright, with a temperature of 25°C and a humidity of 60%.

Establishing a good nurse-patient relationship is the key to the effectiveness of psychological care. Using polite language, being sincere, natural, gentle, calm, having friendly conversations yet being serious about the dressing process,

always being optimistic and having a cheerful mood, paying attention to the attitude of dealing with others and your appearance, having a good demeanour and posture are all conducive to building respect, trust and cooperation.

Psychological support was applied everyday, providing psychological comfort, persuasion and guidance to patients to achieve the purpose of treatment. The authors strived for the close cooperation of family members and friends.

## CONCLUSION

Burn injuries are an important health problem worldwide. Facial burns are extremely serious due to the abundance of nerves and blood vessels. This case study reports a case of a 45-year-old female case with a 1-hour old, 90% TBSA, including a mixture of deep II° and III° flame burns, cared for with a silver impregnated dressing, AQUACEL® Ag Hydrofiber®, with a satisfactory effect. Further studies are needed in order to find the ideal dressing for facial burn management.

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## CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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