A basic introduction to minor burns

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Abstract
This article aims to discuss the management of the burn injury focusing on the aetiology, depth of injury and local wound management of the minor burn

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Introduction

In South Africa almost half of the population reside in informal settlements and make use of paraffin stoves for cooking, heating and lighting. Due to the high number of informal settlements in South Africa, approximately 40 000 households are affected by burns every year (National Injury Mortality Statistics, 2002).

The most common injury in the home is a burn, especially among children and the elderly. Most minor burns are the result of hot substances used in our homes every day: tea, coffee, boiling water and cooking oil. Should a burn occur, the type of burn needs to be assessed and then initial first aid applied. Treatment must be ongoing to the point of healing.

The first question that needs to be asked when a person presents with a burn injury is: what type of burn has the person sustained?

Burns can be classified into three general aetiological groups:

- Thermal (scald, flame, contact burns)
- Electrical (flash, high voltage)
- Chemical.

Thermal burns

The degree and severity of the burn is determined by the duration and temperature. The higher the temperature of the heat source the less time it takes to sustain a serious burn injury. The opposite is also true: the longer the duration of contact with the heat source the deeper the burn. Thermal burn injuries come under the following categories:

- Scald: burn sustained from exposure to hot liquids (this is the most prevalent type in children under the age of three)
- Flame: cigarettes, car accidents, flammable liquids, candles, fires (the latter is the commonest type in adolescents and young adults)
- Contact burns: heaters, irons, stoves

Electrical burns

Electrical burns can be divided into flash injuries and true high voltage electrical injuries. A flash injury occurs as a result of arcing as no electrical current passes through the individual. It is treated in the same manner as a flame injury.

In a true high voltage electrical injury (direct current transmission) an electrical current passes through the body. This type of electrical burn has been called the “grand masquerader” as albeit little visible damage might be apparent on the skin, there is often extensive muscle, nerve and bone involvement in the deeper tissues. This type of electrical burn is also often associated with cardiac arrhythmias.

Chemical burns

There are a wide variety of household chemicals that are capable of producing a chemical burn. Alkalis and acids are commonly found in household cleaning materials. Chemical burns are considered a “speciality burn” because they are an evolving injury and require specialist management.

Depth of injury

When managing burn patients it is important to assess the depth of injury. This will ultimately have an impact on the decision regarding the choice of wound care treatment both in the short (what dressings to use) and long term (need for grafting, functional and cosmetic outcomes).
The depth of a burn injury is classified according to what structures of the skin have been damaged.

First-degree (superficial) burns are defined as burn injuries where the epidermis and perhaps the very superficial part of the dermis have been damaged. Characteristically, this type of burn occurs when there has been momentary exposure to a heat source. The burn is wet, painful, oedematous and blanches to pressure. Blisters may or may not be present. If managed correctly these burns should heal with no scarring in approximately seven days (Figure 1).

Second-degree (partial-thickness) burns are classified as a burn injury involving the entire epidermis and part of the dermis. Some viable dermis with dermal appendages is preserved. Characteristically this type of burn is painful, oedematous and drains serous fluid from the burn injury. Blisters may or may not be present and the wound bed will blanch to pressure. If managed correctly, these burns should heal within 14-21 days with minimal to no scarring and no loss of function (Figure 2).

First and second degree burns are characteristically red/pink, wet/exuding, painful wounds, as a result of the intact vascular and nerve supply of the remaining viable dermal tissue.

Third degree (full thickness) burns involve the entire epidermis and dermis. No viable dermal tissue remains and there is a complete destruction of all viable cutaneous tissue. This type of burn generally has a waxy/white or tan, leathery appearance owing to the loss of vascular supply. The burn wound therefore feels dry in comparison to first and second degree burns and there is little or no sensation in this area as the nerves have also been destroyed. If a blanching to pressure test is done there will be no refill. Third degree burns will very rarely heal spontaneously and will very often require skin grafts to achieve wound closure. Third degree burns will heal with (often hypertrophic) scarring and may lead to disfigurement (Figure 3).

Table I provides a summary of the aetiology and characteristics of burns according to depth of involvement.

**Predicting the healing of burn wounds**

Whether or not a burn wound will heal spontaneously is directly related to the depth of injury and the skin structures involved.

To be able to estimate the healing of burn injuries, the concept of repair vs. regeneration needs to be considered in the context of wound healing.

When a first-degree burn injury is sustained, the superficial layer of skin (epidermis) is damaged. As the outermost protective layer of skin has been destroyed, a wound develops and serous fluid leaks from it. As only the superficial layer of the skin is involved, spontaneous wound closure will occur. This is because the dermal appendages (hair follicles and sebaceous glands) remain intact and can be the source of re-epithelialisation. This enables the epidermis to regenerate without scarring or functional disturbances (contractures; Figure 4).

When a patient sustains a second-degree burn wound, the epidermis is destroyed, as well as part of the dermis. Some viable dermis and dermal appendages remain. It is for this reason that spontaneous closure of the burn wound can be achieved. Unlike a first-degree burn where only the epidermis has been damaged, in a second-degree burn part of the dermis has been destroyed. While dermal tissue cannot regenerate, it can and will repair. The lost dermal tissue will be replaced with granulating tissue and

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**Table I**

<table>
<thead>
<tr>
<th>Depth of Burn</th>
<th>Aetiology</th>
<th>Characteristics</th>
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<tbody>
<tr>
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<td>Partial-thickness burns involved the entire epidermis and part of the dermis. Some viable dermis with dermal appendages is preserved. Characteristically this type of burn is painful, oedematous and drains serous fluid from the burn injury. Blisters may or may not be present and the wound bed will blanch to pressure. If managed correctly, these burns should heal within 14-21 days with minimal to no scarring and no loss of function (Figure 2).</td>
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<td>Second-degree</td>
<td>Full thickness burns involve the entire epidermis and dermis. No viable dermal tissue remains and there is a complete destruction of all viable cutaneous tissue. This type of burn generally has a waxy/white or tan, leathery appearance owing to the loss of vascular supply. The burn wound therefore feels dry in comparison to first and second degree burns and there is little or no sensation in this area as the nerves have also been destroyed. If a blanching to pressure test is done there will be no refill. Third degree burns will very rarely heal spontaneously and will very often require skin grafts to achieve wound closure. Third degree burns will heal with (often hypertrophic) scarring and may lead to disfigurement (Figure 3).</td>
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**Figure 1:** First-degree burn

**Figure 2:** Second-degree burn

**Figure 3:** Third-degree burn
In regeneration the original state is restored. This occurs with the healing of the epidermis.

Tissue is destroyed by an injury and substance is lost.

Table 1: Aetiology and characteristics of burns according to depth of involvement (Adapted from: Demling and DeSanti, 2000)

<table>
<thead>
<tr>
<th>Cause</th>
<th>Appearance</th>
<th>Pain</th>
<th>Healing</th>
<th>Scar</th>
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<tr>
<td>Superficial</td>
<td>Hot liquid Short exposure</td>
<td>Wet, pink and blisters</td>
<td>Severe</td>
<td>10-14 days</td>
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<tr>
<td>Mid-dermal</td>
<td>Hot liquid Short exposure</td>
<td>Less wet and red Sometimes blisters</td>
<td>Moderate</td>
<td>2-4 weeks</td>
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<tr>
<td>Indeterminate (mid or deep)</td>
<td>Hot liquid Longer exposure</td>
<td>Red with patchy white areas</td>
<td>Moderate</td>
<td>2-6 weeks</td>
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<tr>
<td>Deep dermal</td>
<td>Chemicals Direct contact with flames</td>
<td>Dry and white</td>
<td>Minimal</td>
<td>3-8 weeks</td>
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<tr>
<td>Indeterminate (mid or deep)</td>
<td>Chemicals Flames</td>
<td>Dry and white</td>
<td>None</td>
<td>Unknown</td>
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<td>Full thickness</td>
<td>Chemicals Flames Explosion with very high temperature</td>
<td>Dry and white with char</td>
<td>None</td>
<td>Needs graft</td>
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Figure 4: Healing of first-degree burns

Tissue is destroyed by an injury and substance is lost.

During the repair process, the gap is closed by unspecified elements. The structure of the tissue differs from that of healthy tissue.

Figure 5: Regenerating epidermal islands in the wound bed

Figure 6: Healing of second-degree burns

Figure 7: An example of a third-degree burn to the hand. The burn wound is debrided and closed surgically using a free flap so as to maintain function.

When a third-degree burn is sustained, the epidermis and dermis as well as all of the dermal appendages (hair follicles and sebaceous glands) are destroyed. It is for this reason that spontaneous wound closure cannot be achieved. The dermal tissue gives the skin its characteristic strength and elasticity. With the loss of all viable dermis, third-degree burn defects will need to be repaired. This is done by allowing the burn wound to granulate. However, granulation tissue does not fully recapitulate dermal tissue and will ultimately become avascular scar tissue leading to formation and

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Figure 7: An example of a third-degree burn to the hand. The burn wound is debrided and closed surgically using a free flap so as to maintain function.
potentially contractures, especially if the burn wound is located in an area of function, e.g. over a joint. It is for this reason that surgical intervention is required to close a full thickness burn wound in a manner which minimises wound contraction and loss of function (Figure 6).

**Determining total body surface area involved in the burn**

Once the depth of injury has been established, it is important to determine the total body surface area (TBSA) involved in the burn. It is important to do this as soon as possible after the person with the burn has presented as this allows the health care worker providing first aid to determine whether or not the patient will require fluid resuscitation and referral to a specialist unit for further management.

There are three commonly used methods to determine the percentage of TBSA involved. When calculating the TBSA percentage, it is important not to include areas of erythema as this may lead to overestimation of the TBSA. This may be difficult if the burn patient presents relatively soon after the burn has occurred.

**Palmar surface**

This method can be used effectively in estimating the TBSA in relatively small and/or patchy burns. The surface area of the patient’s hand, with the fingers extended is equal to approximately 1% of the TBSA.

**The Wallace rule of nines**

This is a quick and easy way for a quick estimation of the burned TBSA percentage of patients who suffered a medium to large extent of burn injuries. In this method each part of the body is divided into areas and each area is assigned a percentage which is a multiple of nine. The rule of nines applies to adults and children above the age of 15 years. In order to use the rule of nines to calculate TBSA in children it requires modification. This is due to the fact that children under the age of 15 years have a different weight to surface area ratio.

Up to and including one year of age the head and neck account for 18% of the TBSA and each leg accounts for 14%. For each year after the first, 1% must be subtracted from the head and 0.5% needs to be added to each leg.

**The Lund-Browder chart**

This method can be used in medium to large burns and is generally accepted as the most accurate way to determine TBSA percentage, owing to the fact that the Lund-Browder chart allows for the variations in body shape and size in relation to the burn patients age.

Illustrations of the Wallace rule of nines and the Lund-Browder charts may be found in the excellent article by Hettiarratchy and Papini (Initial management of a major burn: II: assessment and resuscitation, in the British Medical Journal, available online from http://www.bmj.com/content/329/7457/101.full).

**Initial management of the minor burn wound**

A minor burn is classified as any first or second degree burn involving less than 10% of the TBSA in an adult, less than 5% of the TBSA in a child and any third degree burn involving less than 1% of the TBSA.

Primary health care workers need to be able to identify burn cases that require fluid resuscitation and referral to a specialist burn centre or hospital for more definitive management. However, it is important to take into consideration that each unit may have their own criteria for accepting burn referrals.

The American Burn Association and the American College of Surgeons identified the following clinical scenarios that usually require referral to a burn center:

- Partial-thickness and full-thickness burns greater than 10% of the TBSA in patients under 10 years or over 50 years of age
- Partial-thickness and full-thickness burns involving greater than 20% of the TBSA in other age groups
- Partial-thickness and full-thickness burns involving the face, eyes, ears, hands, feet, genitalia or perineum, or those that involve skin overlying major joints
- Full-thickness burns greater than 5% of the TBSA in any age group
- Electrical burns, including lightning injury (significant volumes of tissue beneath the surface may be injured and result in acute renal failure and other complications)
- Significant chemical burns
- Inhalation injury
- Burn injury in patients with a pre-existing illness that could complicate management, prolong recovery or affect mortality
- Any burn patient in whom concomitant trauma poses an increased risk or morbidity or mortality may be treated initially in a trauma centre until stable before transfer to a burn centre
- Children with burns seen in hospitals without qualified personnel or equipment for their care should be transferred to a burn centre with these capabilities
- Burn injury in patients who will require special social and emotional or long-term rehabilitative support, including cases involving suspected child abuse and neglect

Initial first-aid management of the burn can have a significant impact of the eventual outcome of the burn wound.

Basic first aid of the burn patient involves stopping the burning process by removing the person from the heat source. Clothing has the ability to retain heat and should be removed as soon as
possible. Any adherent material should be left in place and cooling of the burn commenced, as removal of the adherent material could potentially result in unnecessary trauma and extension of the existing injury. If the aetiology of the burn is chemical in nature, remove clothing that may have come into contact with the chemical source before continuing with treatment.

The most important thing to do is cooling the burn wound. This has proven to be most beneficial within the first three hours of sustaining the burn. Cooling the burn limits the degree of cellular destruction, improves wound healing and ultimately limits the depth of injury.

The most effective way to cool a minor burn is to place it under cool running water (16-18 °C) for 20-30 minutes. Alternatively cold compresses, burnshield or a hydrogel can be applied to cool the burn wound. Clinical as well as histological analysis of burn wound tissue at 21 post-burn days have shown a more rapid rate of healing when the burn wound is cooled using tap water or hydrogel compared with no cooling of the burn wound. Ice should never be used to cool a burn wound. The application of ice to burns results in vasoconstriction which compromise perfusion to the area of the injury and results in progression or conversion of the burn wound.

Care needs to be taken when cooling larger burns owing to the increase in the risk of hypothermia.

When dealing with chemical burns the affected area should be irrigated with copious amounts of water. It is not advisable to soak the burn in water or use any agent to neutralise the chemical as this may result in an exothermic reaction which will exacerbate the burn.

If the burn has occurred on an extremity, any jewelry or clothing should be removed before oedema develops as these may compromise perfusion to the area.

Adequate pain relief should be administered and if the patient does not require referral to a specialised burns unit local wound management will have to be considered.

It is important to realise that an acute burn wound is essentially considered “sterile”. Initial treatment is aimed at keeping the wound surface as contaminant free as possible. It is therefore advisable to cleanse the wound with water. A mild antibacterial wash (e.g. dilute chlorhexidine) should only be used if the burn wound is heavily exuding.

Table II: Examples of commercially available dressings that can be used in the management of minor burns (Adapted from Senarath-Yapa, 2009)

<table>
<thead>
<tr>
<th>Type of dressing</th>
<th>Examples</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non- or low-adherent</td>
<td>Silicone (Mepitel’), Tullegras (Jelonet’, Adaptic’, Cutimed Classic’, Paranet’)</td>
<td>First- or second-degree burns with minimal exudate</td>
</tr>
<tr>
<td>Polyurethane film dressings</td>
<td>Opsite Flexigrid’, Tegaderm’, Leukomed Absorbent’, Bioclusive’, Mefilm’</td>
<td>First- or second-degree burns with minimal exudate Should not be used in infected or heavily exuding burn wounds</td>
</tr>
<tr>
<td>Hydrocolloids</td>
<td>Comfeet®, Granuflex®</td>
<td>First- or second-degree burns with minimal to moderate exudate</td>
</tr>
<tr>
<td>Hydrogels</td>
<td>Intrastie’ gel, Cutimed’, Nugel’, Granugel’</td>
<td>Superficial burns that require a small degree of autolytic debridement</td>
</tr>
<tr>
<td>Hydrofibres</td>
<td>Aquacel’</td>
<td>First- or second-degree burns that are moderately exuding</td>
</tr>
<tr>
<td>Alginates</td>
<td>Keltostat’, Melgisorb’, Seascorb’, Curasorb®</td>
<td>Used as a haemostat on skin graft donor sites First- or second-degree burns that are moderately to heavily exuding</td>
</tr>
<tr>
<td>Foam</td>
<td>Allevyn’, 3M® foam, Biatain®, Teille®, Mepilex’</td>
<td>First- or second-degree burns that are moderately to heavily exuding</td>
</tr>
<tr>
<td>Antimicrobials</td>
<td>Chlorhexidine (Bactigras’), Iodine (Inadine’), Silver (Allevyn’ Ag, Silverlon’, Bactrazine’, Aquacel’ Ag), Nanocrystalline silver (Acticoat’)</td>
<td>First-, second- or third-degree burns that show clinical signs of infection High-risk areas (hands, feet, genitalia) High-risk patients (immunocompromised, diabetics) Delayed presentation</td>
</tr>
</tbody>
</table>

There is a wide selection of dressings available on the market for treatment of burns, and at first glance it may be a daunting task to decide which dressing will be most appropriate for the management of a particular minor burn wound (Table II). The decision should ultimately be based on the characteristics of the wound. Complications associated with management of minor burns normally arise as a result of “overtreatment”, i.e. too frequent dressing changes, the use or misuse of topical antibacterials and inappropriate use of topical or systemic antibiotics. The aim of management of a minor burn wound should be to maintain a moist wound healing environment as dessication increases
the risk of burn wound conversion, infection and delays wound healing.

The burn wound should be reassessed at approximately 48 to 72 hours after initial treatment, once the exudate and oedema have settled as this will allow for a more accurate assessment of the extent of the burn injury and will also allow for more definitive plan with regard to a wound management regime.

**Conclusion**

An accurate assessment of the patients and their burn is essential to enable the most appropriate and effective care to be delivered. Many factors need to be considered before applying the term “minor” to the burns of an injured patient. It is important that the patient with minor burns receive adequate postinjury care, so the quality of the outpatient care is aligned to globally accepted best-practice standards.

**Bibliography**