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# Thermal burns

## Assessment and acute management in the general practice setting

### Background

Appropriate care of minor burns is key if complications, leading to the need for surgical intervention and increased likelihood of poor outcomes, are to be avoided.

### Objective

This article provides guidance to support the appropriate management of thermal burns in the general practice setting.

### Discussion

Correct initial assessment of the patient with a thermal burn will determine whether they can be managed at home or require burns unit care, hospital admission for analgesia or specialist outpatient review. Factors that may impact on healing include the size, depth and location of the wound; the presence of oedema and blisters; as well as the patient's social circumstances, age and health status. First aid with cool running water should be applied to the burn for at least 20 minutes. Cooling and the application of an occlusive dressing will minimise the pain associated with partial thickness burns. Oral analgesics or short term hospital admission for adequate pain control may be necessary. Definitive management of minor burns involves dressings, rest, elevation and oedema control, and regular review as the burn wound evolves and heals. Referral should be considered for any burn wound that appears unlikely to heal within 14 days postinjury.

### Keywords

burns/diagnosis; burns/therapy; dressings



Minor burns are common injuries. In the Australian state of Victoria (population ~5 million), approximately 3800 people per year who do not require admission are known to present to hospital emergency departments with a burn injury; and many more present directly to general practitioners for definitive management.<sup>1</sup> Children account for around one-third of recorded burns presentations.<sup>1</sup> In contrast to patients requiring hospital admission for burn injury, 90% of nonadmitted burn injured patients are injured by contact with hot substances, rather than by exposure to flames.<sup>1</sup>

A minor burn is commonly defined as a superficial burn to less than 10% of total body surface area (TBSA) in adults and less than 5% TBSA in children. However, this definition is imprecise and not sufficient to determine which burns can be managed at home and which need hospital admission or outpatient specialist review. The impact of any burn wound will vary according to the social circumstances, age and health status of the patient as well as location of the wound. In general, burns that are appropriate for management in the general practice setting are small superficial burns that can be expected to heal spontaneously. In practice, many superficial burns that are smaller than 10% TBSA will be difficult to manage in general practice due to dressing and pain management requirements. Depending on local resources, such patients may be best initially managed in an outpatient clinic or admitted to hospital.

Appropriate initial care for minor burn wounds can prevent delayed healing, infection and poor scarring. This involves:

- first aid
- analgesia
- assessment of the size and depth of the burn wound
- assessment and management of factors that may impact on healing (eg. rest and elevation)
- dressings
- blister management and debridement (as necessary)
- review.

When a patient presents with a burn, it is important to be aware of the possibility of nonaccidental injury, especially in children and the elderly. This article deals with thermal burns only. Chemical and electrical burns are beyond the scope of this article. More detailed burns management guidelines, developed by the Victorian statewide burns services at the Alfred Hospital and Royal Children's Hospital Melbourne, are available online (see *Resources*).



## First aid

The application of cool to cold (around 15°C) running water to the burn for at least 20 minutes is considered to be the gold standard for burns first aid. This should be applied as soon as possible after injury, and is considered to be beneficial for at least 1 hour, and possibly longer, postburn. However, research evidence is not conclusive regarding optimal duration and delays after which first aid may no longer be helpful.

Early appropriate first aid to partial thickness burn wounds has been shown in an experimental animal model to be associated with earlier healing and less scarring.<sup>2</sup> In addition to improved healing outcomes, cold water also has an excellent analgesic effect, and modulation of pain related inflammatory mediators may be one mechanism by which first aid influences healing. Ice should not be used.

It is important to avoid the development of hypothermia during burn wound cooling, especially in children: cool the burn and warm the patient.

Hydrogel products, such as Burnshield™ or Burnaid™ are best considered as temporary dressings for acute burns applied after first aid treatment; however they may also be useful to cool the burn wound if clean cold running water is not available. These products have a cooling effect on the wound provided they are left exposed to the air so that evaporative heat loss occurs.

## Analgesia

Partial thickness burns are painful. Cooling these burns and applying an occlusive dressing can help minimise pain and oral analgesics should be prescribed if necessary.<sup>3</sup> Some patients may require short term admission for adequate pain control if oral analgesia is insufficient. Elevation of the injured part to prevent oedema will also minimise the development of pain associated with swelling and stiffness.

## Assessment of the size and depth of the burn wound

The most useful method for assessing the size of small burns is using the palmar surface of a patient's hand (including fingers), which approximates 1% of TBSA. Larger burns are more accurately assessed using the 'rule of nines' chart for adults and the Lund and Browder chart (or one of its modifications) for children (see *Resources*).

The depth of a burn determines its capacity to heal by regeneration of epithelium from undamaged adnexal structures, such as hair follicles, in the dermis. Assessing the depth – and therefore the healing potential – of burn wounds is generally straightforward for both superficial and deep burns (*Table 1*). The clinical features are usually obvious, and primarily related to the depth of damage to the dermis. Living superficial dermis exposed after the removal of blisters is moist, pink and has a brisk capillary return. Due to the exposure of sensory nerve endings in the superficial dermis these wounds are often extremely painful and tender. Burns involving the reticular dermis and deeper, are progressively less well perfused and less sensitive as the injury deepens to a dry, insensate, unperfused full thickness burn wound.

Some burns at presentation are not obviously deep or superficial: these burns are referred to as 'mid-dermal' and generally have sluggish

capillary return with some preserved sensation. It is not possible to predict the healing of such burns acutely, especially if they are small: they should be managed in an expectant fashion, as their capacity to heal may not become evident for some days after injury. With the passage of time (usually several days), these burns either progress to develop definite features of a deep burn, or else gradually recover a capillary circulation and progress to healing. The healing potential of scald burns in children and the elderly especially, may also be difficult to assess on presentation.

## Factors that may impact on healing

Burn wounds evolve in the first few days after injury, as the process of inflammation becomes established and healing progresses. Sometimes healing does not proceed as expected. The elderly and unwell frequently have very limited capacity to heal even quite superficial burns. Burns involving the feet and lower leg often become more painful, swollen and deeper in the days after injury, especially if the patient does not rest with the limb elevated. This highlights the importance of active management of oedema in the acute phase of care; an aspect of management that is frequently overlooked. Oedema interferes with mobilisation, predisposes to stiff joints (especially in the hand) and delays healing. Where possible, the injured part should be kept elevated and supportive elastic tubular bandages should be applied over dressings, if needed, to control swelling.

It is uncommon for small superficial burns to become infected.

However, if a wound that was initially assessed as superficial appears to be deepening or fails to heal, it is important to consider the possibility that this may be due to the development of infection. Prolonged healing times are associated with poor scarring. Referral should be considered for any burn wound that appears unlikely to heal at 14 days postinjury.<sup>4</sup>

## Dressings

There is little evidence to establish the superiority of any particular burns dressing;<sup>5</sup> however several basic principles should inform the choice of dressing.

Moist wound healing is preferred over the exposure treatment of burn wounds, as this is associated with improved healing and less pain. A burn wound produces exudate, which may be copious in the first 24–48 hours after injury. After this period there is less exudate and dressings should be switched from the primarily absorptive (eg. paraffin gauze/gauze or Melolin™) to a nonadherent occlusive type (such as polyurethane films, eg. Tegaderm™, Opsite™) or hydrocolloids (eg. Duoderm™, Comfeel Plus™).

Burns should be reviewed within 48 hours after injury in order to reassess depth of wound in cases where this may have been unclear at presentation, and also to change the initial dressing, which at this point will generally be soaked. Although there is great attention paid to choice of dressing, in practice the most important factor in burn wound management is to ensure early review after injury. As healing progresses, dressings should be changed less frequently in order to avoid disturbing regenerating epithelium.

Dressings containing silver, which is a potent and effective topical antimicrobial, are increasingly available. However, their value in the



treatment of small partial thickness burns is not established. This is also the case for other topical antimicrobials and systemic antibiotics. Silver sulfadiazine cream in comparison to other dressings has been associated with delayed healing when used in the management of partial thickness wounds.<sup>5</sup>

For contaminated wounds, such as those that have been immersed in water from dams or rivers, it is reasonable to use some type of topical antimicrobial for a few days after thorough wound cleaning. Also, consider the need for tetanus prophylaxis and oral antibiotics. There are many suitable alternatives for burn wound dressings choices. General practitioners can access [www.vicburns.org.au](http://www.vicburns.org.au) for further guidance.

### Blister management and debridement

Blistering is the hallmark of the superficial partial thickness burn and may also be present at initial presentation in deeper burns, but these are often large and rupture early. There is little consensus regarding the management of the burn wound blister<sup>6</sup> with theoretical arguments centring on the content of blister fluid and whether constituent cytokines and growth factors are more likely to favour or retard wound healing. However, practical considerations tend to dictate management. Intact blisters provide a moist wound healing environment and debriding them at initial presentation is frequently painful. In general, the larger the blister, the deeper the burn, and the

more likely it is to rupture. Small blisters <6 mm are unlikely to rupture early and can usually be dressed pending review. Larger blisters should be debrided initially or at first review in order to allow for adequate wound assessment. Also, sterile aspiration of large blisters can sometimes be useful to decrease discomfort associated with pressure build-up in blisters and delay rupture. Ruptured blisters should be debrided in order to remove all loose skin and necrotic and possibly contaminated material from the wound.

Opinions differ as to the value of using the blister roof (dead epidermis) as a dressing on rupture of the blister: it should not be left in situ if the wound is contaminated. If a decision is made to leave the blister roof alone, it is important to monitor the wound to ensure infection does not supervene under the epidermis – a risk if contaminated fluid is allowed to accumulate. The wound bed, and thus the depth of the burn, cannot be accurately assessed without blister debridement, so at some point debridement is usually indicated.

### Postacute care

Superficial burns that heal within 2 weeks are unlikely to develop hypertrophic scarring. However, these burns can result in hyperpigmentation which may not resolve, especially in dark-skinned people.

	<b>Superficial epidermal (eg. sunburn) First degree</b>	<b>Superficial dermal (partial) Second degree</b>	<b>Deep dermal thickness (partial) Second degree</b>	<b>Full thickness Third degree</b>
<b>Pathology</b>	Involves epidermis only	Involves epidermis and upper dermis, most adnexal structures intact	Involves epidermis and significant part of dermis, only deeper adnexal structures intact	Epidermis, dermis and cell adnexal structures destroyed
<b>Appearance</b>	Dry and red, blanches to pressure No blistering	Pale pink, smaller blisters Wound base blanches with pressure	Blotchy red or pale deeper dermis where blisters have ruptured	White/waxy/charred No blisters No capillary refill
<b>Sensation</b>	May be painful	Increased sensation Very painful and tender	Decreased sensation	No sensation
<b>Circulation</b>	Normal, increased	Hyperaemic Rapid capillary refill	Sluggish capillary refill	No circulation
<b>Colour</b>	Red, warm	Pink	White/pale pink/ blotchy red	White/charred/black
<b>Blisters</b>	None or (days) later or desquamation	Yes (within hours of injury)	Early – usually large blisters which rupture rapidly and slough	Epidermis and dermis destroyed No blistering
<b>Healing time</b>	Within 7 days	7–14 days	Over 21 days	Does not heal spontaneously
<b>Scarring</b>	No scarring	Colour match defect. Low risk of hypertrophic scarring	High risk (up to 80%) hypertrophic scarring	Wound contraction Heals by secondary intention



Patients should be advised to avoid sun exposure while the posthealing inflammatory phase persists, and to apply a low irritant sunscreen liberally at the site of healed burns. They should be warned that newly healed skin is fragile and will tend to develop blisters with minor trauma. The development of small superficial cystic lesions that look like pimples is common and these will generally resolve. A moisturiser can be helpful, especially in the early phase after healing when dryness can be a problem. In general, if burns have healed without complication in a timely fashion, ongoing scar management manoeuvres are not required. Patients with hand burns who develop persisting stiffness – which is often the result of oedema not managed in the healing phase – may require referral to a hand therapist.

## Referral to a specialist burns unit

Patients with severe or extensive and complex burns require urgent referral to a specialist burns unit (Table 2).<sup>7</sup> In addition, patients with small deep burns usually require surgical referral, as most of these types of injuries require surgical excision and reconstruction. Burns services in each state can provide referral and management advice (see Resources).

## Key points

- First aid: cool the burn, warm the patient.
- Burn wound assessment is aimed at predicting time to healing.
- Burn wounds evolve and require regular review. Reassess at 24–48 hours postinjury, and then as indicated as healing progresses.
- Good basic acute burn care involves the provision of analgesia, appropriate dressing choices and oedema control.
- Burns that do not heal within 14–21 days have increased risk of poor scarring.
- All deep partial thickness and full thickness burns should be referred early for surgical opinion and will generally require excision and grafting.

**Table 2. Indications for referral to a burns unit**

- Burns with associated inhalation injury
- Burns >10% of total body surface area
- Burns to special areas – face, hands, major joints, feet and genitals
- Full thickness burns >5% total body surface area
- Electrical burns
- Chemical burns
- Circumferential burns of limbs or chest
- Burns with associated trauma
- Burns in patients with pre-existing illness or disability that could adversely affect patient care and outcomes
- Suspected nonaccidental injury in children or vulnerable people
- Burns in the elderly and in children <12 months of age
- Small area burns in patients with social problems, including children at risk
- Burns occurring in pregnant women

## Resources

- Burns Management Guidelines: [www.vicburns.org.au](http://www.vicburns.org.au)
- Rule of nines chart for adults: [www.vicburns.org.au/burns-assessment/total-body-surface-area/wallace-rule-of-nines-adults-only.html](http://www.vicburns.org.au/burns-assessment/total-body-surface-area/wallace-rule-of-nines-adults-only.html)
- Modified Lund and Browder chart for children: [www.vicburns.org.au/burns-assessment/total-body-surface-area/paediatric-burns-assessment.html](http://www.vicburns.org.au/burns-assessment/total-body-surface-area/paediatric-burns-assessment.html)

### Statewide burns services

#### Queensland

Adults: [www.health.qld.gov.au/rbwh/services/burns.asp](http://www.health.qld.gov.au/rbwh/services/burns.asp)  
Royal Children's Hospital 07 3636 3777

#### New South Wales

[www.aci.health.nsw.gov.au/networks/burn-injury/contact](http://www.aci.health.nsw.gov.au/networks/burn-injury/contact)

#### Victoria

Adults: [www.alfred.org.au/burns\\_unit](http://www.alfred.org.au/burns_unit)  
Children: [www.rch.org.au/burns/contact](http://www.rch.org.au/burns/contact)

#### Tasmania

Royal Hobart Hospital 03 6222 8308  
[www.dhhs.tas.gov.au/hospital/royal-hobart-hospital/contact](http://www.dhhs.tas.gov.au/hospital/royal-hobart-hospital/contact)

#### South Australia

Adults: [www.rah.sa.gov.au/burns/contact.php](http://www.rah.sa.gov.au/burns/contact.php)  
Children: [www.wch.sa.gov.au/services/az/divisions/psurg/burns/index.html](http://www.wch.sa.gov.au/services/az/divisions/psurg/burns/index.html)

#### Western Australia

[www.rph.wa.gov.au/Burns\\_Department/index.htm](http://www.rph.wa.gov.au/Burns_Department/index.htm)

#### Northern Territory

Royal Darwin Hospital, Burns Unit 08 8922 8888

#### New Zealand

[www.nationalburnservice.co.nz](http://www.nationalburnservice.co.nz)

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