

# Ten Top Tips...

## The management of burn wounds



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**M**any people will experience a burn injury in their lifetime. Burn injuries range from the most severe – requiring high levels of critical care and surgical intervention – to simple burns, for which self-treatment may suffice.



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Burn injuries pose a considerable burden to health care resources across the globe.<sup>[1]</sup> In the UK, the figures are considerable, with 250 000 patients presenting in primary care, and a further 175 000 presenting to A&E annually. Approximately 40% of patients who require hospital admission

are admitted to non-specialist units.<sup>[2]</sup>

Healthcare professionals with varying degrees of experience in wound care manage a significant number of minor burns in the community. This article is aimed at healthcare professionals who do not regularly come into contact with burn wounds and highlights some of the key principles in burns assessment and management.

### 1 PROMPT FIRST AID IS ESSENTIAL

The intense early inflammation associated with untreated burns can cause progression of depth over 48 hours, so prompt first aid can limit the extent of the primary burn injury.<sup>[3]</sup>

Cool the burn for a single block of 20 minutes under cool running water.<sup>[4]</sup> If cooling is commenced within 3 hours of injury, it can significantly reduce pain and oedema, decrease cell damage by slowing cell metabolism in hypoxic tissue, decrease inflammatory response, stabilise vasculature and ultimately improve wound healing and reduce scarring.<sup>[5]</sup>

Cool running water dissipates heat better than a cold compress. Cold water or ice should

be avoided as they can cause vasoconstriction, deepening the burn or causing frostbite reference. Likewise, be wary of hypothermia while cooling burns by observing the maxim “cool the burn, warm the patient”. Prolonged cooling of extensive burn wounds (>20% total body surface area [TBSA] in adults; >10%TBSA in children) can cause hypothermia.<sup>[6]</sup> Cooling should be suspended if hypothermia is suspected.

### 2 REMEMBER ANALGESIA

Depending on depth, burns can be exceedingly painful reference. Analgesia will be required for the patients’ comfort, and during treatment to enable superficial debridement and accurate assessment. On going analgesia may be required to ensure pain-free dressing change.<sup>[7]</sup> Furthermore, some evidence suggests that emotional stress may slow down wound healing and compliance with physiotherapy,<sup>[8]</sup> therefore good pain management is critical.

Opioid analgesics are the backbone of analgesia for the burn patient, providing a range of potencies and administration options. The more simple analgesics, such as paracetamol, that has antipyretic and opioid-sparing properties should be considered for every patient. The dynamic evolution of the patient’s pain – from the initial burn injury to eventual healing – should be reflected by a similarly dynamic and flexible therapeutic plan that, when planned in conjunction with the patient, covers background, procedural, breakthrough, and post-operative pain.<sup>[9]</sup>

### 3 EFFECTIVE CLEANSING

Maintaining a clean burn wound is important. Remove debris and – for burn blisters greater than the size of the patient’s little fingernail – de-roof blisters.<sup>[10]</sup> This process allows assessment of the burn wound bed and prevents uncontrolled rupture of the blister, decreases the risk of blister infection, relieves pain in tense blisters, and reduces restriction of movement of joints.<sup>[11]</sup>

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In cases where the patient has scalp burns, or if the affected area is very hairy, shave the hair 2–5 cm around the burnt area. This allows for more accurate assessment of the extent of the wound, and helps avoid complications like folliculitis.

A study of burn cleansing by Hayek et al<sup>[12]</sup> found an almost 50/50 split in units that used either tap water or sterile saline. However, the units reported using only sterile saline in outpatients and for smaller burns. Broadly, burn wounds should be cleaned using an aseptic, non-touch technique.<sup>[13]</sup>

## 4 ACCURATE ASSESSMENT

Assessing the burn is key in clinical decision-making, and in the decision to refer (see also Top Tip #7). Size and depth are the two factors by which burn wounds are primarily classified:

**Size.** A range of methods for estimating the extent of a burn are available. Burns extent is recorded as a percentage of TBSA. Lund and Browder's<sup>[14]</sup> method charts the percentage of body area burned using a chart that sections the body into portions for easier calculation of extent. The palmar method takes the palmar surface of the patient's hand as being equivalent to 1% of total body surface area (TBSA), allowing the clinician to estimate the extent burn wound.<sup>[15]</sup> The "Rule of Nines" method is advocated by the British Burn Association's Emergency Management of the Severe Burn Course. This method is a good, quick way of estimating medium to large burns in adults. The body is divided into areas of 9%, and the total burn area can be calculated. It is not accurate in children.<sup>[16]</sup>

**Depth.** It is important to keep in mind that a single episode of wounding may include regions of varying depth. In brief, burn depth can be classified as follows:

- **Superficial burns** [Figure 1A] involve only the dermal layer and are highly painful. Healing is rapid and uncomplicated. Superficial areas should not be included if using burn size to determine fluid resuscitation.<sup>[17]</sup>
- **Partial thickness burns** [Figure 1B] extend through the epidermis downward into the papillary, or superficial, layer of the dermis. These wounds become erythematous because the dermal tissue becomes inflamed. When pressure is applied to the reddened area, the area

will blanch but demonstrate a brisk or rapid capillary refill upon release of the pressure, which is a hallmark of the superficial partial-thickness burn. Thin-walled, fluid-filled blisters will develop within minutes of the injury.<sup>[18]</sup> This burn type will heal without surgical intervention. Dressings should be changed every 2–3 days to allow for regular re-assessment. If initially assessed in a burns unit, these wounds can be treated in the community.

- **Deep dermal burns** present as blotchy cherry red skin loss.<sup>[19]</sup> Blanching may not be seen on assessment as a result of capillary damage.<sup>[17]</sup> Deep dermal burns take a long time to heal and may require skin grafting.<sup>[20]</sup> Once assessed in a burns unit these wounds can be cared for in the community by district or practice nurses. Patients will need regular reviews by the burns service. The deeper dermal damage means this burn type may take several months to fully heal.
- **Full thickness burns** [Figure 1C] can have a dry white waxy or black appearance. Wounds are insensate due to nerve damage and rarely heal without surgical intervention.<sup>[21]</sup> Full thickness burns will need to be assessed by a plastic surgeon as soon as possible so any surgical

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**Figure 1.** Examples of [A] superficial, [B] partial thickness, and [C] full thickness burns.

intervention can be planned promptly. Early skin grafting has been shown to result in faster wound healing and a reduction in wound infection.<sup>[22]</sup>

## 5 DRESSING SELECTION FOR BURN WOUNDS

The following dressings should be considered when managing burns:

- Use cling film if transferring to a burns unit as a temporary dressing. This or any other dressing should not be applied onto a chemical injury until the chemical component has been sufficiently irrigated as guided by wound pH. It should be remembered that cling film should be only one layer thick and never used on face burns (also see Top Tip #10).
- For facial burns use liquid / soft paraffin or saline soaked gauze. All facial burns must be seen by a burns unit.<sup>[23]</sup>
- Atraumatic, low-tack dressings may be used. Non-stick silicone / lipo-colloid mesh dressings can be used as a primary layer, with secondary padding and joint to joint bandaging. Figure of eight bandaging from distal to proximal to aid circulation and reduce oedema.<sup>[24]</sup> Tight bandaging should be avoided on limb burns in case of oedema and swelling.
- For smaller burns non-stick foams are ideal dressings as they are easy to apply, easy to remove, maintain a moist wound healing environment and are available in a range of shapes and sizes.
- Topical creams such as silver sulfadiazine should be avoided.<sup>[25]</sup> Silver sulfadiazine should only be used if the wound has been assessed by a burns service as the creams can change the colour of wound tissue, making subjective depth assessment difficult.<sup>[26]</sup>
- Increased capillary permeability in the first 48–72 hours following a burn injury means increased exudate,<sup>[27]</sup> so these wounds should initially be dressed with a highly-absorbent dressing. Using the appropriate primary dressing as mentioned above will prevent dressing adhering to the wound. Dressings should be changed after 48 hours as strikethrough is likely.<sup>[28]</sup>
- Prolonged use of hydrogel dressings, especially in children and older people with larger burn areas, can cause hypothermia and should be avoided.<sup>[6]</sup>

## 6 ELEVATE TO REDUCE OEDEMA

Oedema occurs most commonly in the first 48 hours following burn injury. Oedema interferes with tissue perfusion and wound healing by increasing the diffusion distance between capillaries and cells.<sup>[29]</sup> Thus, where possible, the wounded area should be elevated to reduce swelling.

Slings should be avoided as these may restrict patient movement, pillows can be used when sitting or laying down. Principles of reduction should be adhered to including movement, compression, elevation or positioning of limbs for gravity assisted flow of oedema from limbs. The potential splinting effect of slings will not control oedema, it will only channel fluid to an immobile area.<sup>[30]</sup>

## 7 KNOW WHEN AND WHERE TO REFER

The London and South East of England Burn Network (LSEBN) have developed the below referral criteria.<sup>[25]</sup> The LSEBN criteria are based on international evidence and expert opinion, but clinicians should become familiar with their local policies and procedures on referral to their regional burns service. Consider telemedicine if available, which allows pictures to be sent securely for expert review and treatment advice.<sup>[31]</sup>

### Adults:

- Consider if >3% TBSA partial thickness burn
- All deep dermal and full thickness burns
- All burns associated with electrical shock
- All burns associated with chemical burn
- All burns associated with non-accidental injury (also see Top Tip #9)
- All burns to face, hands, perineum, feet
- All burns circumferential to limbs or trunk or neck
- All burns with inhalation injury
- All burns not healed within two weeks

### Children:

- Consider if >1% TBSA partial thickness burn
- All deep dermal and full thickness, circumferential burns and burns involving the face, hands, soles of feet, perineum
- All burns associated with smoke inhalation, electrical shock or trauma
- Severe metabolic disturbance
- Children with burn wound infection
- All children "unwell with a burn"
- Unhealed burns after 2 weeks
- Neonatal burns of any size
- All children with burns and child protection

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concerns (also see Top Tip #9)

**Other:**

- All burns with other injury
- All burns with significant comorbidity or pregnancy
- All infected burns
- Any other case that causes concern, discuss with local burn service.

## 8 RECOGNISE THE IMPORTANCE OF FOLLOW-UP

Burns are dynamic wounds and can deepen in the first 72 hours, as demonstrated in seminal work by Jackson.<sup>[32]</sup> This is especially true of the partial thickness and deep dermal burns, where the tissue has the potential to heal or alternatively to progress to full thickness depth.<sup>[29]</sup> There are number of local (e.g. increased inflammation and impaired blood flow), systemic (e.g. hypovolaemia), and environmental (e.g. inappropriate wound management) factors that can lead to burn wound progression.<sup>[32]</sup>

Due to the dynamic nature of burn wounds, a follow-up review within 48 hours of the original injury is advised.<sup>[28]</sup> At this stage, true depth of the burn should be apparent.

Analgesic requirements should be reviewed. As the burn wound heals, the nerve regeneration may cause an increase in wound pain and, therefore, an increase in analgesic requirements.<sup>[33]</sup> Patient's experience of poor pain management can lead to non-concordance with therapy and heightened anxiety regarding dressing changes, which will delay healing and, as a result, increase the likelihood of scarring.

The review should include assessment of the appropriateness of the dressing. A good burns dressing, as suggested by Alsbjorn et al,<sup>[26]</sup> and supported by Selig et al:<sup>[34]</sup>

- Should maintain a moist wound environment
- Be non-adherent, absorbent, and maintain close contact with the wound
- Be easy to apply and remove
- Be painless on application and removal
- Should protect against infection

Any burn wound not healed within 2 weeks should be referred to a specialist burns service for review.<sup>[25]</sup>

Post-burn wound care is essential to burns management and involves:

- Daily application of skin moisturiser for dry, flaky skin. This helps the often present pruritis.<sup>[26]</sup>

- Protection of healed areas from the sun with use of sun block for 6–12 months to prevent further thermal damage or pigmentation changes to the affected area.<sup>[28]</sup>
- Scar management by way of pressure garments or silicone - to alleviate physical discomfort and functional limitation.
- Psychological support to deal with trauma of burn injury and living with disfigurement.

## 9 NON-ACCIDENTAL BURN INJURIES

Non-accidental burn injuries can present in any patient, but a high level of suspicion should be maintained by the clinician when assessing burns in small children<sup>[35]</sup> (Figure 2) and elderly and vulnerable adult patients.

Consider non-accidental injury if:

- The mechanism or pattern of injury described does not match the injury sustained.
- There is a delay in presentation.
- There is inconsistency in history.
- There are signs of other trauma.
- There are certain patterns of injury (cigarette marks or bilateral "sock" or "shoe" scalds).
- Well defined demarcation lines/ lack of splash marks.

Adults are also at risk of non-accidental injury, especially the elderly and other vulnerable people. Carers and clinicians should take a few minutes to really look at the injury and ask themselves if the injury matches the story. Where it does not, this can alert them to the possibility of potential neglect or abuse.

Figure 3 shows a patient who was hoisted into a bath. Carers stated that the patient screamed as soon as her skin touched the water. However, the buttocks have been fully submerged and the white waxy appearance and deeper cherry red areas to the buttocks and thighs suggest deeper and longer submersion.

## 10 CLINICAL CONSIDERATIONS FOR SPECIFIC BURN TYPES

### Electrical burns

- An electrocution injury can cause deep cutaneous burns, cardiac arrhythmias, limb loss, and serious systemic effects.<sup>[35]</sup>
- Domestic (low) versus industrial (high) voltage injury:
  - Low voltage electrical injuries will cause localised, deep burns and may initiate arrhythmias.

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**Figure 2.** A non-accidental burn in a young child. Note the well demarcated nature of the burn and the lack of splash marks.



**Figure 3.** A non-accidental burn in an adult. The history of injury was inconsistent with the clinical presentation.



- High voltage injury will cause severe tissue damage, penetrating through fat, muscle, and bone. Resulting muscle necrosis puts the patient at risk of rhabdomyolysis, leading to acute kidney injury. These patients are at higher risk of compartment syndrome and the irreversible damage to tissues may lead to limb amputation.

- Look for "entry" and "exit" sites (may not always have both), as these are associated with severe deep tissue damage.
- Assess the patient's electrocardiography (ECG) rhythm. If the initial ECG is normal and there is no history of loss of consciousness, then no further ECG monitoring is needed. Otherwise, 24-hour ECG monitoring is required.<sup>[35]</sup>

**Chemical burns**

- Chemical burns continue to cause cutaneous damage until completely removed.
- Copious irrigation with water, away from healthy tissue to avoid further contamination. Adequacy of irrigation is guided by regular pH testing of the wound. Special attention must be paid to ocular chemical burns ensuring immediate irrigation with water (or if not available, normal saline), remembering to flip the lids and irrigating the fornices to remove any material that may be retaining chemicals.

- Do not wrap chemical burn wounds in polyurethane wrap (ClingFilm) as it will contain the chemical, causing further tissue damage.
- Alkalis cause deep, penetrating burns and will require prolonged irrigation. The aim of water irrigation is to achieve a pH of 7.
- Certain chemicals may cause systemic effects or have a definitive antidote – contact TOXBASE ([www.npis.org/toxbase.html](http://www.npis.org/toxbase.html)) for guidance on management.
- The extent of chemical burn injuries can be limited by prompt and copious irrigation guided by pH testing strips.<sup>[36]</sup>

**CONCLUSION**

Burns can be complex life threatening wounds. Even relatively minor burns can have significant physical effects and require prolonged specialist treatment from specialist burn teams. Large burns services should be equipped not only to care for patients but also to provide help, guidance, and expertise to clinical staff looking after patients outside specialist environments. With good communication and information sharing, patients with non-complex burn wounds can be cared for in a more general environment with positive outcomes.

Burn wounds, like all other types of wound that clinicians come across in daily practice, need accurate assessment, effective analgesia and effective treatment, with specialist referral when required with appropriate follow-up. ■

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