Managing the pain of burn wounds

A significant burn is one of the most painful injuries a person can suffer. Unfortunately, burn pain is also one of the most difficult to alleviate, as both its severity and duration are highly variable. Essential treatments, such as wound debridement, skin grafting and physiotherapy, can cause more pain initially but may diminish the pain experience overall. If direct pain is not well controlled, not only will the patient suffer immediately, but he or she may take longer to recover and may develop chronic pain. Worryingly, studies show that pain is frequently under-estimated and under-treated, even in specialist burn centres (Patterson et al, 2004).

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Analgesia
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Psychological impact

In the short term, poorly managed pain may exacerbate burn hypermetabolism in major burns, contributing to under-nutrition, immunological impairment and sensitivity to infection. Long-term, prolonged pain will increase the risk of developing depression or post-traumatic stress disorder and by this and other mechanisms hinder recovery (Taal and Faber, 1997). Anxiety or depression may themselves heighten a patient's perception of pain, an unhappy vicious cycle that is difficult to break once established. Minor burn wounds, while easier to manage, are not immune from the long-term sequelae of badly controlled pain.

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The majority of the population will suffer a minor burn at some point in their lives — ask any audience of lay people. These are trivial injuries which from the pain perspective can be treated as any other small wound, with simple analgesia, but other wound care caveats should be considered, particularly the time to heal and the importance of change in wound appearance and/or pain intensity, as signs of problems such as infection. Around 13,000 people require admission to hospital for burns every year in the United Kingdom, and of these, on average about 300 will die (British Burn Association, 2001).

Burn pain management is a vast and fascinating topic and this article must therefore focus on managing pain during burn dressings' procedures, commenting about the use of more drastic measures such as general anaesthesia. However, to do so in isolation from the general management of the burn wound and its pain would skate unhelpfully over the many factors that influence procedural pain and make chronic pain more likely.

Burn classification

Most burn wounds are caused by thermal injury, such as flame and scalds (generally hot water, sometimes other hot fluids, notably oil or fat) or by cold injury (frost-bite). Burn wounds as a result of electricity, chemicals, contact with hot structures and radiation are more rare (Hettiaratchy and Dziewulski, 2004). Classifying the burn by area and depth can be an indicator for the intensity of pain that might be anticipated, although some studies have not found this to be an accurate predictor (Perry and Heidrich, 1982; Atchison et al, 1991). It has been reported that burn pain intensity may vary with, but cannot be predicted by, factors such as age or sex (Latarjet and Choinière, 1995).

The burn area (the percent of total body surface area, or %tbsa) is most accurately classified using the Lund and Browder chart (*Figure 1*) (Wachtel et al, 2000). Smaller injuries can be assessed by comparison to the palmar surface of the patient's (not the assessor's) hand, which equates to somewhat less than 1%tbsa; this works for burns less than 5%tbsa, but can be dangerously inaccurate for larger burns (Hettiaratchy and Papini, 2004).

The depth of a burn is classified by description according to the extent of damage to the skin's layers (*Figure 2*). The terms 'first, second and third degree' for superficial, partial- and full-thickness burns are no longer used in the UK, although they are still to be found in many first-aid manuals.

- **Superficial burns,** such as sunburn, damage only the epidermis and, as the nerves are intact, may be

exquisitely painful especially during dressing changes

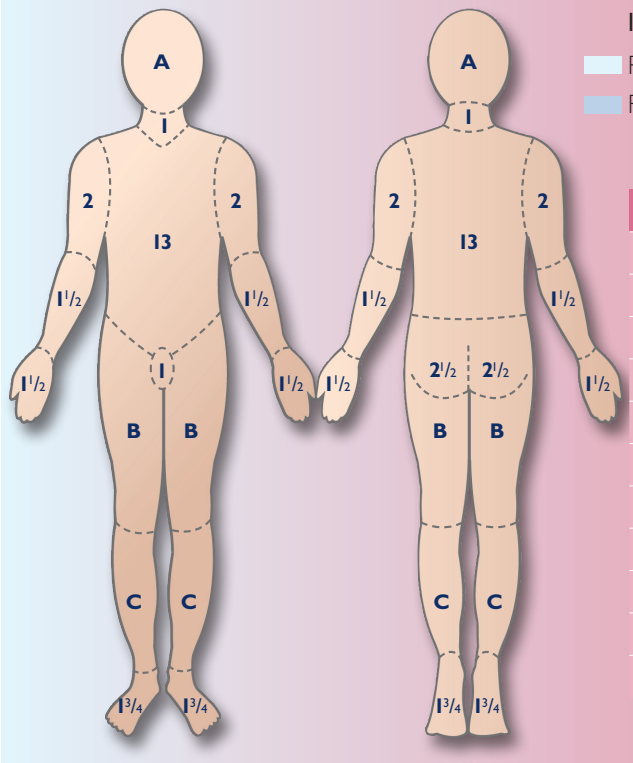
- **Partial-thickness burns** are often referred to as 'dermal burns' because the injury extends into, but not beyond, the dermis. They are usually subdivided according to the depth of tissue damage into superficial and deep dermal burns. Nerve endings are destroyed in the burned tissue but stimulated in deeper dermis layers, so significant pain can be anticipated
- **Full-thickness burns** extend through all the skin's layers and may also affect the subcutaneous tissue, muscle or bone. Due to the destruction of the nerve endings these burns are initially painless until the nerves start to regenerate. Nevertheless, inflammatory processes quickly stimulate pain in the immediate surroundings.

Nevertheless, it is futile to anticipate the pain experience from wound depth alone because the complex causation of wound pain means that no burn wound will remain pain-free for long (Choinière, 2003).

Most patients are likely to have more than one depth of burn, depending on the cause and pattern of injury. For example, a patient with a full-thickness burn, and therefore initially largely painless, may still be in pain from the surrounding partial-thickness burn. The inflammatory response will also spread to the surrounding unburned tissue causing hyperalgesia. Additionally, the greater the severity of a burn, the longer it will take to heal, with a greater requirement for treatment and interventions. It could therefore be anticipated that such a patient would perhaps suffer more, with increasingly complex pain over time than someone with an initially more painful, but more quickly healing, superficial burn.

The healing process itself can cause pain. Full-thickness and most deep dermal burns require skin grafts. Prior to the graft, all necrotic tissue must be excised and this can cause further damage to regenerating nerve

Lund and Browder charts



Ignore simple erythema

Partial-thickness loss (PTL)

Full-thickness loss (FTL)

Region	% PTL	% FTL
Head		
Neck		
Ant. trunk		
Post. trunk		
Right arm		
Left arm		
Buttocks		
Genitalia		
Right leg		
Left leg		
Total burn		

Relative percentage of body surface areas affected by growth

Age in years	0	1	5	10	15	Adult
A – ½ of head	9½	8½	6½	5½	4½	3½
B – ½ of one thigh	2¾	3¼	4	4½	4½	4¾
C – ½ of one leg	2½	2½	2¾	3¼	3¼	3½

Figure 1. Lund and Browder chart for classifying total burn surface area.

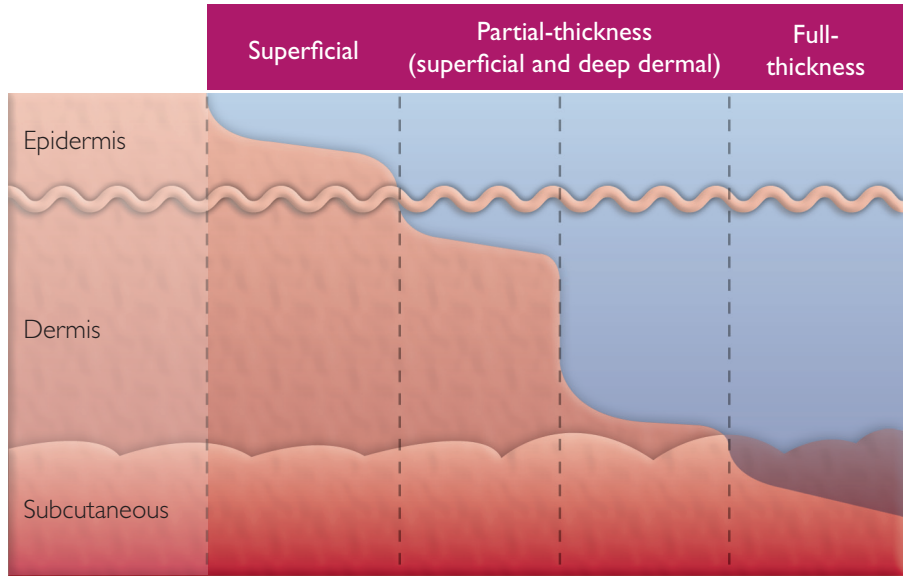


Figure 2. Diagram showing burn depths.

endings. Furthermore, at the donor skin site a new wound is generated, which is akin to a shallow dermal wound with many cut nerve endings. The donor site may be more painful than the original burn wound. Nerve regeneration can be painful, and may have neuropathic elements such as tingling and itching. The prolonged and repetitive nature of burn wound pain, particularly in deeper wounds, is the reason why a significant proportion of patients go on to develop chronic abnormal sensation syndromes, including post-healing pain and intense itching (Dauber et al, 2002; Brooks et al, 2008).

Types of burn pain

The literature tends to differentiate burn pain into four groups (Patterson, 2004):

- Immediate pain
- Resting or background pain
- Breakthrough pain
- Procedural pain.

Chronic pain and paraesthesia due to changes in the repaired nerve fibres may also occur. One US study of 358 burn survivors found that 52% reported chronic pain, with a mean time since injury of 12 years (Dauber et al, 2002). However, as this was a postal questionnaire, it is possible that those who were still in pain were more likely to respond. Nevertheless, a significant number of patients with burns do develop chronic pain. Adequate pain control in the initial stages of burn healing can limit or even prevent the development of chronic pain.

Immediate pain

The level of immediate pain experienced following a burn depends on a variety of factors, including the depth and area of burn. The relationship is not linear but is influenced by the psyche and prior experiences of the patient, as well as the nature of the wound. Good initial management, such as cooling the burn as a first aid measure and providing prompt analgesia is essential, especially to minimise the pain inevitably caused by clinical staff when assessing the burn (Dearden et al, 2001).

Managing immediate pain

Intravenous analgesia using opiates is the modality of choice for larger burns, but may sometimes be necessary in minor injuries to gain initial pain control. Oral or intramuscular absorption may be unpredictable in large injuries (>5%tbsa), where fluid shifts cause temporary circulation deficits in muscle and gut tissues. Therefore, the administration of small incremental doses of opiates until control is achieved should be matched by vigilant attention to side-effects, such as respiratory depression and drowsiness, together with scrupulous knowledge of the pharmacokinetics of the drug used; the goal is comfort, not absence of pain. Oral or intravenous paracetamol may reduce the amount of opiate required.

Resting or background pain

Resting or background pain is the constant pain present at the site of injured tissue, and will include pain in the donor areas where skin has been harvested for grafts (Choinière, 2003). Background pain can vary from day to day, ranging in intensity from mild to severe and can often persist for weeks without any decrease over time. The treatment of background pain can be difficult without causing unpleasant side-effects such as nausea and itching. These factors, along with a fear of opioid dependency, may lead to insufficient analgesia being provided. David Patterson, a clinical psychologist with many years' experience in the management of pain in burn patients, states that there is 'no evidence that opioid addiction occurs more commonly in burns patients than in other populations requiring opioids for acute pain' (Patterson et al, 2004).

As the patient's experience of background burn pain has different components and varies both over time and between patients, pain management must be well evaluated and tailored to the individual (Latarjet and Choinière, 1995). These authors also stress that, 'pain sensitivity may increase over time, and all the more so if pain management has been inappropriate'. McCaffery and Pasero (1999) recommend that when patients are hospitalised, pain ratings for each type of pain should be recorded throughout the day to facilitate pain management, with the derived scores being used to influence the subsequent dosing regimen. A perception persists even in specialised burns units that this is time-consuming and may not be feasible on a busy ward. However, Jonsson et al (1998) have shown that in practice diligent monitoring of pain intensity is not only feasible, but brings benefits in terms of patient satisfaction and recovery. A simple, four-point pain score regularly recorded and acted on is better than nothing in this respect.

Managing background pain

Background pain management is best addressed by a structured approach, such as that of the World Health Organization (WHO) analgesic ladder (*Figure 3*), developed for cancer pain but which has proved useful as a guide for managing many types of pain of varying intensity persistent over weeks or months. Pre-emptive, regular dosing supplemented by additional prescriptions for breakthrough pain is most effective in practice, provided the patient has freedom to refuse analgesia when completely pain-free. Patterson et al (2004) commented that when patients required hospitalisation, their burns will usually be severe enough to require opioids for effective analgesia. In lesser injuries, non-steroidal anti-inflammatory drugs (NSAIDs) and paracetamol (acetaminophen) can be remarkably effective when taken regularly, by reason of their anti-inflammatory, anti-prostaglandin actions (Pal et al, 1997). They also have an important role as adjuncts in all patients, as they can be opioid-sparing.

NSAIDs should be used with caution in the elderly, those with moderate-to-severe asthma and those with renal impairment. Furthermore, due to the antiplatelet properties of NSAIDs and aspirin, patients with extensive open wounds or skin grafts may be at an increased risk of bleeding, especially during and immediately after skin grafting. Both paracetamol and NSAIDs can be made more effective by judicious, regular low doses of oral

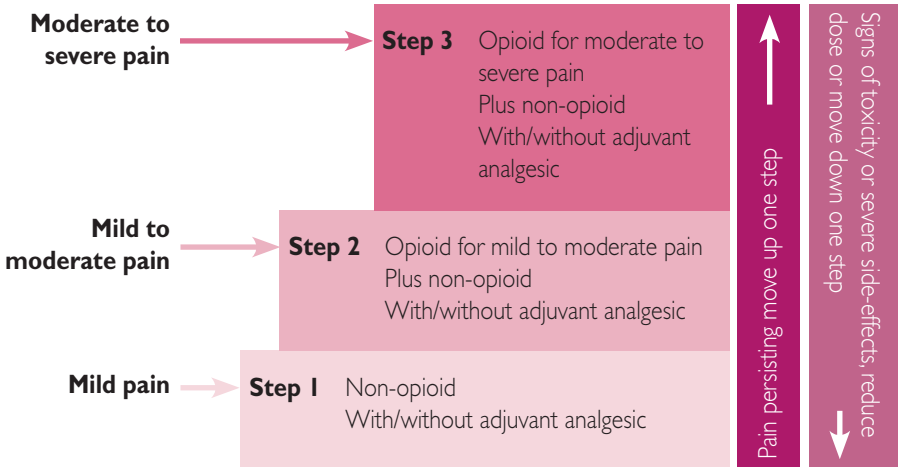


Figure 3. The WHO analgesic ladder (WHO, 2008).

morphine, and the amount required provides a further indication of the adequacy of regular analgesia.

Synthetic opioid agents, such as tramadol, can be useful in the management of burns pain, especially when NSAIDs are contraindicated, but their effect can be disappointing. Other supplements such as clonidine or gabapentin may bring benefit if the opiate dose is high but partially effective, or if dose escalation is seen. Gabapentin has been proven to be effective in neuropathic pain (Melzack and Wall, 2003), counteracting spinal cord 'wind-up' (Tzvetanka Ivanova-Stoilova, 2008). Those who advocate its use in burn pain management hypothesise that there is a neuropathic element in immediate post-acute, as well as chronic burn pain. Cuignet et al (2007) reported that the adjunctive daily use of 2400 mg gabapentin in divided doses in addition to opioids, reduced both the pain score and morphine requirements of the patient and, therefore, reduced side-effects such as sedation, nausea and vomiting. They suggested that this was due to the ability of gabapentin to prevent central hyperalgesia induced by the burns. However, they acknowledge the small sample size (n = 10) and recommend further randomised studies. Finally, in this context of adjuncts to opioids, ketamine given orally may inhibit the expression of secondary hyperalgesia (Mikkelsen et al, 2000), although this has yet to be confirmed in the burns clinical setting.

Finally, it is important to remember that correct management of background and breakthrough pain can make a substantial positive difference to successful control of wound procedural pain; conversely, inadequate background pain control may increase patient anxiety about added pain during procedures, and thereby increase negative responses to necessary wound care interventions. This applies to minor wounds treated on an outpatient basis, as well as to inpatient treatment. Therefore, in dressings clinics, the patient's background pain experience at home should be specifically enquired about and stoic responses, e.g. 'I grin and bear it', 'I'm OK doc, really', 'It's worse at night, but I cope', should be probed. Reluctance to take painkillers at home should be counselled, particularly in respect of night pain (arguably the most psychologically demoralising part of the pain experience).

Inadequate control of pain prior to wound dressing changes could result in the anticipation of pain, thereby increasing patient anxiety and suffering.

Non-pharmacological approaches to background pain have been investigated and found helpful in some instances. Burns have a major psychological impact on the patient, not only from the trauma of sustaining the injury and continual pain, but also from the disfigurement of the wound itself. Adjustment disorder, post-traumatic stress disorder, sleep disturbance, anxiety or depression may develop, hindering the patient's recovery and actually increasing their pain (Patterson et al, 1993; Franulic et al, 1996). Many burns centres employ psychologists or psychotherapists to help patients cope and adjust; it is no coincidence that these professionals also contribute significantly to pain control, as evidenced by their contributions to the burn pain literature (e.g. Patterson et al, 2004; Choinière, 2003).

Breakthrough pain

It is often difficult to distinguish between changes in background pain and additional pain caused by movement — both of which would be regarded as 'breakthrough pain'. For this reason, breakthrough pain has been dealt with alongside background pain (see above). Essentially, the same strategies apply for managing breakthrough pain as for background pain. It is vital to think of it, and to ensure breakthrough analgesia is included in the regimen (an 'as required' prescription of oral morphine three-hourly, for example). Excessive use of breakthrough analgesia is one factor that should normally trigger a review of the regular analgesia prescription.

Procedural pain

Procedural pain is experienced when therapies such as wound cleaning, debridement, dressing changes or physiotherapy are carried out. The debridement, cleansing and re-dressing of wounds stimulates the already hyperalgesic regenerating nerve endings and may cause intense pain. In addition, these procedures may need to be repeated several times a day for weeks or months. Inadequate control of pain prior to wound dressing changes could result in the anticipation of pain, thereby increasing patient anxiety and suffering. The requirement for anxiolytics such as benzodiazepines may then also increase. Byers et al (2001) showed that procedural pain was always much greater than resting pain, but the level of anxiety was not significantly different

between the two. In contrast with resting pain, procedural pain matched the patients' estimation of what was an acceptable maximum level on average. Unsurprisingly, patients' anxiety about pain roughly correlated with the size of the wound, and the use of opiates and anxiolytics during a particular procedure correlated strongly with the patient's prior experience — more pain last time, more demand for pharmaceuticals this time (Byers et al, 2001).

Can the level of pain anxiety be predicted? According to Aaron et al (2001), it can. These authors have devised and evaluated a tool, the Burn-specific Pain Anxiety Score (BSPAS), which they say is the best predictor of procedural pain levels. While it does not predict resting pain levels, it is the only significant predictor of decreased physical function after discharge. This study was undertaken in a specialised burn unit so the relevance of this tool to non-major burns is unclear, but it would not be unreasonable to suppose that good quality pain control is both humane and beneficial to overall recovery in all patients.

After the wound has been re-dressed, there is usually little or no residual pain additional to the background pain levels already being experienced. Indeed, for a while, background pain may be lessened after dressing changes. Much depends on the dressing being used. The use of wound dressings designed for maximum healing may also result in pain reduction (Barret et al, 2000).

Physiotherapy improves mobilisation and helps prevent scarring and contractures. In the early stages of wound healing, range of motion exercises may be best carried out when the patient is under general anaesthesia or sedated for wound debridement or dressing changes. Inadequate pain control at these times could mean the patient is later reluctant to mobilise, so hindering recovery. However, once active rehabilitation starts sedation must be relaxed so that the patient can be involved. Fortunately, by this stage, motivation to return to active independent living can mitigate pain unless earlier experiences have induced fear.

Managing procedural pain

Optimal treatment of the burn wound

The most important factor in achieving pain control during successive procedures for the burn wound is not, paradoxically perhaps, the analgesia component, but how the burn wound itself is managed. If not managed actively and appropriately (for more detail on appropriate management of burn wounds, see Papini, 2004), the wound has more potential to become chronic, pain relief will be harder to achieve, scarring will be worse and harder to manage, and chronic pain syndromes are more likely. There is no reason to believe that this is less true for small burns than it undoubtedly is for larger injuries, especially if the burn is in important areas such as the hands, feet, perineum, or across joints.

Appropriate wound management coupled with aggressive pain management, tailored to the type of wound, the stage of healing and any necessary surgical intervention, will minimise negative pain influences and maximise recovery, both physical and psychological.

The key question is: Will this burn wound heal spontaneously in a 'reasonable time'? If yes, then all is well and good; if not, with some careful exceptions, surgical treatment delivers the best results with the least pain and the least risk of long-term pain sequelae.

Time to healing

Burns heal by secondary intention from healthy epithelium. This derives from the basement membrane of the epithelium in superficial burns, and from adnexal epithelial structures in shallow dermal burns. There are no such structures surviving in full-thickness burns, and so spontaneous healing of any deep burn bigger than a two-pence piece within a reasonable time span will not occur, therefore, surgery is essential. When spontaneous healing is allowed (very rarely, usually in patients seriously unfit for surgery), healing takes many weeks, the skin quality is poor, patch-up grafting is often still required, scarring is severe and chronic pain is more likely. Burns that may be expected to heal spontaneously include:

- **Superficial burns** affecting only the epidermis will generally heal spontaneously within seven days. There will be peeling and final resolution may take longer, but re-epithelialisation will be confidently apparent within that timescale. The wound will be painful, sometimes exquisitely so, and this pain must be aggressively and appropriately managed by regular multi-modal analgesia with additional, as required, therapy. Chronic pain syndromes are unlikely
- **Shallow dermal burns** usually have an intact capillary circulation. The skin will blanch on (sterile) digital pressure, and capillary return time will be normal or simply shortened. These wounds heal within two to three weeks with some, but not excessive, scarring. However, between 40% and 60% of these wounds will convert to deep dermal, or even full-thickness wounds under the influence of the inflammatory response and/or infection in the first 48 to 72 hours. Any wound that has not healed by 10 days should be referred for plastic surgery assessment.

Spontaneous healing is not expected in deep dermal burns. The adnexal structures are more sparse than in shallow dermal burns and unsightly and often unstable scars result. Therefore, grafting at two to three weeks delivers better outcomes in most patients. Asian and African skin types are usually allowed a little more time (a week or two at most) for spontaneous healing, because they are more prone to hypertrophic or keloid

scar formation in donor sites as well as the wound itself.

In summary, the appropriate wound management coupled with aggressive pain management, tailored to the type of wound, the stage of healing and any necessary surgical intervention, will minimise negative pain influences and maximise recovery, both physical and psychological.

Lastly, in this context of wound management, it is essential to be vigilant at every patient assessment, be it on the ward or in the clinic, for any change in the wound: redness around, increased swelling, systemic changes such as change in food tolerance or new systemic infection and any shift (usually for the worse) in analgesia requirement. Any/all changes may signify an invasive wound infection, which must be aggressively managed under guidance from a microbiologist with experience of burn wounds. Crucially, even if well managed, an infection usually converts a shallow wound, for which expectant but vigilant management is appropriate, into a deeper wound requiring surgical intervention after the infection has been brought under control.

Specific protocols for procedural pain

A vast number of methods for managing procedural pain in burn care are discussed in the clinical literature. However, the quality of that evidence is variable, generally poor, not least because conducting appropriately controlled studies in this area is difficult — there being just too many variables. Therefore, what follows in this section is a digest based on the experiences of the senior author of this article of what works in practice.

Small burns, or larger wounds that have mostly healed, are readily managed by supplements to regular analgesia — additional oral morphine with or without a benzodiazepine being the mainstay. Benzodiazepines are used as adjuncts to opiates in procedural pain to reduce anxiety (Choinière, 2003). A trial of lorazepam showed it was effective in reducing anxiety and opiate requirements in patients with high pain or anxiety scores (Patterson et al, 1997). However, in an outpatient setting, benzodiazepine use is usually inappropriate, unless there is somewhere for the patient to sleep it off afterwards. At very least, patients should be encouraged to take their usual analgesia and if they have not done so, it should be given immediately and the procedure delayed to allow time for the medication to be absorbed.

Caution should be exercised when managing nearly-healed wounds, as the pain may be greater than anticipated. Newly-healed scars may be 'angry' and sensitive, and the surrounding normal skin may have become sensitised to touch. Allodynia is fortunately not a common sequel to burn injury, but when it does happen it is very perplexing for the patient: the sense of relief when someone shows that they not only understand but can also explain it, is almost palpable (Tzvetanka-Stoilova, 2008).

Entonox™ (pre-mixed oxygen and nitrous oxide 50:50; British National Formulary [BNF], 2009) is used in initial dressing changes. It is particularly useful as an adjunct to oral analgesia in circumstances where the dressing is mostly comfortable, but with short periods of more extreme soreness. It has a quick onset of action at around 20 seconds and does not cause loss of consciousness or prolonged sedation when self-administered. Furthermore, it can reassure anxious patients with previous negative experiences — discovering that they required less pain control than they thought, helps to improve future confidence. However, there is a risk of megaloblastic anaemia after prolonged exposure that may limit its usefulness for repeated dressing changes. Further studies are required to determine if repeated, daily short exposure to nitrous oxide may further exacerbate the haematological and immunological abnormalities already seen in major burns patients (Pal et al, 1997).

Much has been written about non-pharmacological approaches to procedural pain in burns. Hypnosis, virtual reality therapy, cognitive behavioural therapy (CBT), and avoidance and relaxation techniques have all been used to improve pain relief (Pal et al, 1997; Choinière, 2003). For practical purposes, such techniques require time and special expertise that may not be readily available in a busy ward or clinic. There is no doubt, however, that simple distraction works wonders; for adults, the most reassuring distraction and easiest to provide is 'banter'. The nurse or doctor who stays quiet while working unsettles the patient, creating anxiety. You can talk about anything: the weather, recent holidays, what you like to eat. Also, reassuring talk about the wound helps at this time, using the opportunity to educate the patient about what to expect, including that pain is normal and can be treated.

For children, play is invaluable and need not necessarily be simply a distraction. The child can be encouraged to participate in the dressing changes by helping to remove the old dressing, turning it into play (with much splashing if water is being used). In wards where burn injured children are treated, a separate play area is essential where nothing disagreeable ever happens, including dressing changes.

Patient-controlled analgesia (PCA)

Patient-controlled analgesia (PCA) with morphine or fentanyl is an effective method of pain management for post-operative pain, but has also been used for analgesia during dressing procedures (Prakash et al, 2004). The patient has to be physically capable of operating the PCA. This may not be possible if, for example, both the patient's hands are burned. When the patient is asleep and not regularly requesting medication, opioid blood levels will fall and the patient may experience pain on waking. Also, the patient may deliberately under-medicate him or herself to avoid unpleasant side-effects (Choinière, 2003). Nevertheless, the technique has its place.

The fact that oral medication is not always possible or satisfactory is evidenced by a steady trickle of reports of other methods of analgesia delivery.

A study in Australia found that patient-controlled intranasal fentanyl (given as a nasal spray) was as effective at controlling the pain of dressing changes and debridement as oral morphine (Finn et al, 2004). Fentanyl-containing lollipops have been used successfully for analgesia delivery in children (Choinière, 2003). Non-invasive analgesia lessens the risk of infection and may be important where intravenous access is difficult or impossible.

Intravenous infusions

For major dressing changes, standard opioids may not be the best choice for procedural pain as they are relatively slow to act and excess sedation may continue long after the procedure has ended. Short-acting opioids, such as fentanyl, given intravenously may be more suitable, but more effective in practice is the use of sedatives and analgesics by continuous infusion.

Propofol and alfentanil by infusion can, with experience, be titrated to provide excellent sedation without loss of airway (Gallagher et al, 2000). Remifentanil is a new, very short-acting opioid, which can be used with propofol, but is also increasingly used alone as it gives profound analgesia while retaining consciousness and a degree of cooperation. In all such techniques, the margin between adequate sedation and general anaesthesia is so narrow that anaesthesia expertise and monitoring are essential. Remifentanil is so short-acting that it provides no residual analgesia after it is stopped, so another means of ensuring continued analgesia must be provided before the end of the procedure.

Ketamine

Ketamine was developed as a general anaesthetic, but is used mainly in developing countries where specialist expertise is hard to come by, or for induction in patients who are seriously compromised (for example, bleeding aortic aneurysm). Ketamine is a potent analgesic and is therefore still used to provide analgesia and sedation for dressing changes; it can also reduce opioid requirements when long use is associated with tachyphylaxis in sedated patients in intensive care. However, it is associated with a 5–30% incidence of emergence delirium reactions, particularly in the elderly (Patterson et al, 2004). These may be minimised but not entirely eliminated by the concurrent use of benzodiazepines. Nevertheless, it remains a useful agent for dressing changes in small children. In particular, when low doses are used carefully as a sedative-analgesic. These children seem not to experience hallucinations, or perhaps are not bothered by them.

General anaesthesia

There are circumstances, e.g: initial aggressive wound debridement on admission particularly in children; the first dressing after graft surgery; and repeated dressing of extensive burns, when general anaesthesia may be the only means of achieving satisfactory pain control for a non-operative procedure. Because general anaesthetic agents have a depressive effect on bone marrow and the immune response mechanisms already diminished by the burn injury, and because they inhibit nutrition intake, their use for non-operative procedures is kept to a minimum, and the patient is 'weaned' onto other analgesia regimens as soon as possible. Adequate analgesia must be established during recovery.

Local anaesthesia

Donor site analgesia can be achieved by topical application of local anaesthetic (0.5% bupivacaine or 2% lidocaine mixed 1:1 with aqueous gel, or lidocaine 2% spray) before the dressing is applied (Norman and Judkins, 2004). The possibility that absorption from this site may risk systemic toxicity has been explored in one reassuring study of small donor sites (Bulmer and Duckett, 1985); but Patterson et al (2004) mention (but do not reference) reports of seizures linked to systemic absorption at the open wound site; this question would seem to remain an open one.

Nerve blocks

Where burns are restricted to specific areas, such as the arm or the leg, nerve blocks are an option for procedural pain. They have the advantage of relatively quick onset, may reduce opioid requirements and therefore side-effects, and can provide complete analgesia for several hours. Drawbacks include the time taken to give the block and the risk of infection. A small study (n = 20) at a centre which usually harvests skin for grafts from the medial or lateral upper thigh found that a femoral nerve block of 0.2% bupivacaine or ropivocaine was effective in reducing opiate requirements, although opiate side-effects were not reduced (Cuignet et al, 2004). Another study of 100 patients found that using a nerve block during the harvesting procedure itself provided adequate analgesia (Gupta et al, 2007).

Conclusion

Burns are common and extremely painful, yet the literature concurs that burn pain management is often inadequate. Burn pain management is complex, with several different types of pain to manage and many treatment options. To achieve a high level of pain control, pain must be regularly and adequately assessed and analgesia tailored to the individual's needs and psychological state.

While there is data in the literature focusing on many different aspects of burn pain management, a large proportion is either case reports or clinical trials with sample sizes too small for the results to be considered significant. This may be due to the small numbers of inpatients with comparable injuries treated at individual burn centres. The majority of studies acknowledge this and recommend further research. Multi-centre or national studies may be necessary to achieve a significant sample size. WUK

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Key points

- Around 13,000 people require admission to hospital for burns every year in the United Kingdom, and of these, on average about 300 will die (British Burn Association, 2001).
- The complex causation of wound pain means that no burn wound will remain pain-free for long (Choinière, 2003).
- Correct management of background and breakthrough pain can make a substantial positive difference to successful control of wound procedural pain.
- Burns have a major psychological impact on the patient, not only from the trauma of sustaining the injury and continual pain, but also from the disfigurement of the wound itself.
- To achieve a high level of pain control, pain must be regularly and adequately assessed and analgesia tailored to the individual's needs and psychological state.

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