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What Are the Psychiatric Sequelae of Burn Pain?

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Abstract

Burn injuries and their subsequent treatment cause one of the most excruciating forms of pain imaginable. Practitioners in the field have been concerned about the suboptimal management of acute pain in this population. Recent studies have shown that greater levels of acute pain are associated with negative long-term psychologic effects such as depression, suicidal ideation, and post-traumatic stress disorder for as long as 2 years after the initial burn injury. Research in other non-burn trauma populations has also pointed to the potential for unmanaged acute pain to delay wound healing and lead to other medical complications, such as infection and extended hospitalization period. The concept of allostatic load is presented as a potential explanation for the relationship between acute pain and subsequent psychologic and physiologic outcomes. A biopsychosocial model is also presented as a means of obtaining better inpatient pain management and helping to mediate this relationship.

Introduction

Nature of burn pain

A burn injury is one of the most painful injuries a person can endure, and the subsequent wound care required to treat it is often more painful than the initial trauma [1]. Severe burn injuries are almost always treated in surgical units and preferably in multidisciplinary burn centers. The practice of many burn centers is to debride the burned skin from an injury of intermediate depth on a daily or twice daily basis to avoid infection and promote healing. This process involves scraping off the dead skin and washing the area with antibacterial agents that often cause stinging. Deep burn injuries that lack the potential to heal on their own are typically treated with skin grafts. Such wound cleaning and grafting procedures might continue to inflict pain for a period of weeks to several months. Such pain can be worse than that experienced in the initial burn injury and can wear on patients with even the strongest of coping mechanisms.

There is evidence that we are grossly undertreating pain from burn injuries. A 1976 editorial in *The Lancet* [2] used the term “tight-fisted analgesia” to refer to our underprescription of opioid analgesic for acute pain in general. Melzack's [3] seminal 1990 article in *Scientific American* highlighted the tragedy of needless pain and used the term “opiophobia” to describe our irrational fear of prescribing and administering adequate opioid analgesics for acute pain management. He attempted to ease this fear by reassuring us of the minimal negative effects when such agents are used appropriately, as well as showing that the risk of an acute pain patient with no history of addiction developing a long-term addiction to opiates is less than 1/11,000.

However, there are several limitations of opioid analgesics in the treatment of burn pain [4]. First, they are often inadequate as the sole approach for controlling pain. Second, they often

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have unwanted side effects, such as sedation, respiratory depression, and constipation. The frequency (often daily) of burn wound debridements precludes stronger, anesthesia-assisted procedures, given that they can be dangerous and extremely expensive. As such, pain medications for most burn pain and anesthetic procedures for the worst episodes represent the highest standard of care. However, by themselves, they represent incomplete approaches with a series of drawbacks.

The control of acute pain has become a more visible goal in hospitals. Accreditation organizations, such as the Joint Commission on Accreditation of Healthcare Organizations, have mandated that the assessment and treatment of pain be a top priority for hospitals and that patients cannot be discharged from the hospital with poor pain control. This mandate is supported by recent evidence that acute, intense pain in the hospital setting can lead to unwarranted side effects several years after discharge. Nonetheless, linking pain control to accreditation and standards of care has resulted in improvements but has not eliminated undertreatment of pain.

Although the argument that adequate pain management can reduce immediate suffering should be sufficient rationale for health care professionals to provide such, it would also be useful to determine whether pain control has any impact on patients beyond this immediate relief. The rationale for aggressive acute pain control will be if it can be shown that treatment improves later functioning. Obviously, it is difficult to perform randomized controlled studies in these areas because of the ethical concerns in withholding pain medication in a treatment group. However, several researchers have followed an alternative approach by using inpatient pain levels as a predictor of psychosocial adjustment after discharge in correlational studies. There have also been several laboratory studies looking at the impact of pain on wound healing in an attempt to understand the stress and wound healing connection. Our interpretation of this evidence is that undermedicating acute pain not only puts a patient through needless suffering, but it can have significant physiologic and long-term psychologic effects as well. The following sections of this article briefly review the literature on the physiologic and psychologic effects of acute burn pain.

Review of the Literature

In 1995, Ptacek et al. [5] looked at procedural pain during hospitalization as it related to adjustment at 1 month post-discharge in 43 patients treated at a major regional burn center. Using the Brief Symptom Inventory (BSI) and the Sickness Impact Profile (SIP), patients with higher pain scores (based on a composite of several measures over time) showed poorer adjustment on these measures after 1 month. Using a hierarchical regression analysis, they were able to show that this relationship remained significant even after controlling for the effects of a patient's preburn adjustment.

The same research group looked at this question to see if the relationship held true longer than 1 month post-discharge and controlled for burn-related factors [6•]. With a sample size of 122 burn survivors, they used the same pain composite scores (visual analogue scale pain ratings for inpatient procedural pain) to determine impact on adjustment at 1 year and 2 years post-burn injury. The BSI, SIP, and a post-traumatic stress disorder (PTSD) measure were again used to assess adjustment. At 1 year post-burn injury, inpatient pain levels were significantly correlated with all three outcome measures. Those with higher inpatient pain scores reported more symptoms on the BSI and SIP and higher rates of PTSD. At 2 years post-burn injury, higher inpatient pain scores correlated with PTSD symptoms. Regression analyses again showed that this relationship cannot be accounted for by preinjury mental health and also showed that inpatient pain scores were stronger predictors than the size of the burn or the length of hospitalization.

Van Loey et al. [7] also found that anxiety related to acute pain was a predictor of PTSD symptoms 1 year after the injury. In a later review of the literature, Van Loey and Van Son [8] concluded that the evidence was strong enough to suggest that patients who express high anxiety related to pain were at risk for developing PTSD symptoms long after discharge and stated that “prolonged, painful treatment of burn injuries enhances the risk of chronic PTSD.”

A recent article by Edwards et al. [9••] examined the relationship between acute pain at discharge and long-term suicidal ideation (SI). These investigators used the Bodily Pain Scale of the Short Form-36 and two items from the BSI that specifically assessed SI at 6 months and 12 months post-burn injury. They were able to look at the spectrum of SI by classifying participants into one of three groups: 1) no self-reported SI; 2) self-reported passive SI; and 3) self-reported active SI. They then used four mutually exclusive classifications for data analysis: 1) no SI (52% of the sample); 2) developing any SI (20% of the sample); 3) persisting or worsening SI (17% of the sample); and 4) resolving or improving SI (10% of sample). Although pain severity substantially decreased at 6 and 12 months post-injury, 25% to 33% of patients still reported some form of SI. An analysis of variance comparing the four groups revealed that the no SI group and the resolving or improving SI group reported significantly less pain at discharge than the persisting or worsening SI group. As in previous studies, they also found that a patient's prior mental health status and the characteristics of the injury, such as size of the burn, were poor predictors of later SI, leading the authors to conclude that pain severity was the most robust predictor for later SI. They argued that these findings are supported by previous evidence in the non-burn literature showing that there are disproportionately high suicide rates among individuals suffering from different types of pain. Specifically, studies have shown increased rates of SI in those who report persistent chronic pain conditions [10–12]. We can hypothesize that one reason for the relationship between acute pain and later distress in those with burn injuries is that acute pain can develop into chronic pain, and that those who suffer from chronic pain have higher rates of depression and SI. However, the relationship between acute burn pain and the subsequent development of chronic pain has not been established.

Finally, the relationship between acute burn pain and long-term adjustment has received even less attention in children. Saxe et al. [13] attempted to establish a link between acute pain and long-term outcome after trauma by looking at the amount of morphine that was administered to children during their hospitalization for burn injuries. They found that the amount of morphine received was indeed the best predictor of the future development of PTSD. Other studies have supported the relationship between chronic psychologic and environmental stress and health and well-being in children in non-medical populations [14]. Such studies emphasize that children may be particularly vulnerable to the impact of stress on chronic health conditions.

Allostatic Load and the Biopsychosocial Model of Adjustment

The concept of allostatic load can be useful in explaining the mechanisms of how high levels of acute pain can have an impact on a person months to years later. This theory can also guide us in developing and implementing interventions to prevent the long-term consequences of acute pain.

Sterling and Eyer [15] first defined allostasis as the adaptation that the body makes in response to stressful events. The process involves activation of several physiologic systems, including the immune system, and is essentially the body's ability to maintain “stability through change.” The body is able to cope effectively with these stressors when adaptations are activated infrequently; however, there is the potential for the system to become overloaded. McEwen and Stellar [16] described what happens to the body when these allostatic systems are overstimulated and were first to use the term “allostatic load.” There are three types of allostatic

load, including frequent activation of allostasis, the body's inability to turn off allostasis when the stressor is removed, and an inadequate response to the stressor. McEwen [17] provides a more detailed discussion of allostatic load. Simply, it is the measure of cumulative wear and tear on the body. It is important to view allostatic load as an interaction between genetic, environmental, and social factors.

The identification of the body's physiologic response to stressors sparked a large surge of research examining the potential harmful effects of allostatic load on the body over time. Most relevant to the study of burn injuries is the body of literature that has shown slowed wound healing under psychological stress. Kiecolt-Glaser et al. [18] looked at the amount of time it took a punch biopsy wound to heal in women who were in a typically stressful role of serving as caregivers for a demented relative and compared this with a control group of women in a less stressful environment, and found the wounds in the caregiver group took significantly longer to heal. This work was later replicated in a group of college students undergoing exams [19•]. More importantly, such concepts were extended to examining the effects of uncontrolled pain on wound healing in surgical patients, and again, it was shown that higher post-surgical pain levels in women who underwent gastric bypass surgery delayed healing of wounds from a punch biopsy. This relationship between high pain levels and delayed wound healing was maintained even after controlling for presurgery depressive symptoms and other post-surgical medical complications. The authors went on to hypothesize that the pain and wound healing link can be explained by the neuroendocrine and immune pathways that are altered under stress, and relevant to the process of wound healing. Specifically, the interactive effects of the glucocorticoids and proinflammatory cytokines are the primary physiologic mechanisms underlying both stress and wound healing [19•]. Although there have been no specific studies looking at the relationship between stress and the healing of burn wounds, these mechanisms are critical in restoring tissue perfusion, wound healing, and defending against infection, all necessary in recovery from a burn injury. Patients with burn injuries are already susceptible to many types of infections due to the large areas of open wounds. These infections lead to failing skin grafts and longer lengths of hospitalization. In patients who have large burns, infections can be life-threatening. If immune function is suppressed due to the stress of uncontrolled pain, their ability to fight off infection is further compromised.

As mentioned earlier, a person's response to allostasis is a function of his or her personality style and coping mechanisms and how these interact over time with the environmental factors that are present. For example, the size and severity of a burn injury do not predict psychological outcome; factors such as whether the patient has a history of depression or alcohol abuse interact with coping style, social support, secondary complications, and pain to determine outcome. This is otherwise known as a biopsychosocial model, and it can be very useful in explaining and predicting the long-term outcome of burn injuries. Acknowledging that outcome depends on such a complex interplay of factors can enable us to understand why a person with minor burns may show a devastating psychological reaction, whereas someone with a massive burn injury may adjust surprisingly well. Future research on the psychological impact of pain will ideally adopt a biopsychosocial model that can account for the complex interplay between the allostatic load, preinjury personality variables, stress appraisal, and coping and environmental buffers, such as social support.

Conclusions

The evidence reviewed in this article should strengthen the argument that acute pain management must be a priority in burn injury treatment. In addition to the immediate relief of suffering, there appears to be a relationship between poor acute pain management and later distress that might be manifested by issues such as depression, PTSD, or SI. Recent evidence

also suggests that the stress associated with unmanaged acute pain can actually delay wound healing and lead to further medical complications.

A comprehensive pain management plan for burn pain will follow a biopsychosocial model and consider the many variables potentially associated with pain. The biological factors should be treated with medical approaches. These include long-acting opiates for background pain; shorter-acting opiates for breakthrough pain; stronger, fast-acting opiates for procedures such as wound care; and anxiolytics that can help control anxiety and temper the relationship between anxiety and pain [20]. Psychologic factors can typically be addressed with nonpharmacologic approaches as adjuncts to traditional medications. There has been solid evidence that hypnosis [21], as well as virtual reality for both hypnosis [22] and distraction [23–28], can help to alleviate burn pain. In addition, some evidence has suggested that perceived social support can play an important mediating role in decreasing stress, reducing pain, and promoting wound healing [29].

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