

medaxis

PAIN AND THE CHRONIC WOUND



White paper by Dr. Mark D. Cregan

debritom⁺
micro water jet debridement

For patients, wound-related pain is often one of the most devastating aspects of living with a chronic wound. Indeed, an international survey of over 2000 patients living with chronic wounds showed that 60% of patients experience pain 'quite often' or 'all the time'¹. Living with painful, chronic wounds can also lead to mental health issues². However, pain is also a subjective experience, involving a number of neurological, physiological and psychosocial attributes creating the perception of pain and how an individual may respond to interventions³.

Being an unpleasant sensory and emotional experience, pain contributes to psychological stress, anxiety, fear and depression^{4,5}. In one study of patients suffering from pain related to chronic venous ulcers, 27% of the subjects experienced depression, while 26% experienced anxiety⁶. It has also been shown that higher levels of pain are directly correlated to higher levels of anxiety⁴ and that anxiety itself is driven by the anticipation of treatment³. Indeed, anticipation alone can significantly alter the pain experience^{7,8,9}. Anxiety also brings other deleterious effects in that it can decrease a patient's pain threshold and reduce pain tolerance¹⁰. Given these factors, it is therefore unsurprising that patients who express high levels of stress or anxiety in anticipation of pain, also rate the actual pain experience as more intense¹¹.

Pain can be divided into two categories: "Nociceptive Pain" and "Neuropathic Pain". Nociceptive pain is the body's normal physiological response to injury, whereas neuropathic pain is caused by a dysfunction or damage to the nervous system itself¹². When tissue is injured, pain signals and inflammatory mediators are released by peripheral nerves which act to stimulate nociceptive neurons and create the perception of pain by the central nervous system¹³. Neuropathic pain is best described as pain that is not otherwise explainable. It can occur as a burning pain, or as intermittent attacks of pain without obvious provocation, or even through the light stroking of the skin and arises due to abnormal signals from injured axons and/or nociceptors that share the innervation territory of the injured nerve¹⁴.

Chronic pain can manifest as spontaneous, intermittent or persistent pain¹⁵ and can be both nociceptive or neuropathic, depending on whether the integrity of the somatosensory nervous system is compromised by the underlying disease¹⁶. Chronic pain is caused by a sustained release of pain mediators creating a nociceptive malfunctioning of the nerve receptors and the associated pain stimulus being altered. The mechanism by which this works is that these pain mediators orchestrate a series of responses that result in changes in local blood flow and vascular permeability, activation and migration of immune cells, and stimulation of the release of growth factors from the surrounding tissues¹⁵. Together these effects create a chronic inflammatory response, which impedes healing¹⁷ and lowers the threshold of peripheral nociceptor stimulation, thereby increasing their responsiveness to stimulus¹⁸ and consequently the patient's susceptibility to pain.

A number of studies have suggested a link between psychological stress and delayed wound healing. For example, there is evidence that psychological stress is associated with slower or delayed wound healing in stressed older adults, adults with chronic wounds and surgical patients^{19,20} and that this is linked to an increase in cortisol secretion resulting in a longer time to heal²¹. Further, studies have identified a number of cortical and subcortical structures that are activated by the expectation of pain and associated emotional responses^{22,23,24}. This expectation of wound pain results in patients suffering higher levels of psychological stress, leading to a negative impact on the healing process⁵ by impacting a number of mechanisms responsible for wound healing.

Raised cortisol levels in response to psychological stress offer a potential mechanism of how reduced rates of wound healing occur⁵. It has been shown that increased cortisol levels suppress the immune system by decreasing neutrophil activity. Since neutrophils enhance the phagocytic ability of macrophages, this suppression decreases the ability of macrophages to remove debris from the wound²⁵. Cortisol also has been linked to suppression of fibroblast proliferation and matrix degradation, affecting the duration and strength of the wound²⁶. Further, cortisol stimulates the production of catecholamine, leading to vasoconstriction of small arterioles thereby decreasing peripheral blood supply, oxygen and nutrient transport as well as impacting the body's resistance to infection²⁵. Pre-operative stress has also been shown to have an effect on interleukin-1, such that the greater the stress, the greater the reduction in levels of interleukin-1 in the wound fluid²⁰. Since interleukin-1 plays a major role in regulating inflammatory mediator production in wounds, and also in perception of wound pain²⁷, the impact of patient stress on wound healing appears to be multifaceted.

Pain is a significant problem for patients with all types of wounds, and contributes to considerable levels of suffering and distress and subsequently a reduced quality of life⁵. Pain also has significant cost implications meaning a reduction in pain and stress for the patient should be implicit in any treatment regimen of chronic wounds⁵. Indeed, in the WUWHS consensus statement, it is stated that health care providers should ensure wound-related pain control for every patient¹². Analgesic medications are the most common method for pain management. This varied group of medications provide pain relief by interacting with different receptors in the peripheral and central nervous systems³. Low-level pain can be treated with paracetamol, whereas more severe pain might be treated with opioids or the administration of anaesthesia, which greatly adds to resource use and cost as some patients might require hospital admission due to the pain associated with dressing changes²⁸. Of the pain control methods not requiring hospital admission, local anesthetic is the most commonly used. Of the multiple methods available, the most appropriate for use must be identified according to the needs of the patient and the surgeon to achieve the best anesthesia with minimal use of time and resources²⁹.

Wound related pain is common and exacerbated during dressing changes³. Local anesthesia in the treatment of venous leg ulcers and is effective and performed in many clinics and hospitals in the world³⁰. Of the topical anesthetic options available, lidocaine-prilocaine cream (5%) has been shown to provide effective pain relief due to its ability to penetrate into tissue³¹, and has been shown to be especially beneficial in lower extremity wounds³². However, the application of the cream requires a longer waiting time when compared to a lidocaine (10%) spray, which produces a more immediate, albeit more superficial effect²⁹. There is some evidence to suggest that ibuprofen dressings may offer pain relief to people with painful venous leg ulcers³¹, however anti-inflammatory drugs are associated with significant side effects^{33,34}. Alternatively, inhaled equimolar nitrous oxide and oxygen mixture (NOOM) is proven to be an effective method to reduce mild to moderate pain by acting rapidly, however the analgesic effect ceases immediately when stopping the inhalation³⁵. NOOM has also been shown to be effective and well tolerated to reduce the pain associated with the care of bedsores and painful ulcers in elderly patients³⁶. Non-pharmacological means of pain management should also be considered, since communication prior to dressing changes and regarding procedures to be performed can reduce the feelings of fear and anxiety, and in turn minimize the pain experience^{37,38}.

Poor healing can result in wound infections or complications, as well as prolonged hospital stays, increased patient discomfort and delayed return to activity²⁰, hence the importance of good wound management. However, dressing removal, wound cleansing, debridement, microbial damage and inappropriate dressing selection can all contribute to wound-related pain. Of these, dressing removal and wound cleansing are often reported as the most painful experiences associated with wound management¹². Several studies have demonstrated the effectiveness of lidocaine and prilocaine cream to reduce pain during debridement^{31,39,40,41,42} and its repeated use is well tolerated⁴¹. However, when it comes to debridement, the proper management of pain felt during the debridement procedure itself also improves the success of pain treatment at rest, thereby enhancing the patients' quality of life³⁰.

Debridement is the process of removing slough, eschar, exudate, bacterial biofilms, and callus from the wound bed in order to facilitate healing. Sharp debridement using a scalpel, forceps, scissors, and/or curette is the most common method used, however proves to be a painful procedure even when local anesthetics are used^{32,43}. Since, debridement using a sharp surgical instrument can cause a considerable amount of pain⁴⁴, alternative, less painful methods of sharp debridement need to be considered. Recently, a study⁴⁵ highlighted that sharp debridement using micro water jet technology can be carried out with no or only minimal pain. Since increased anxiety tends to exacerbate pain³, these authors first demonstrated the minimal pain associated with the technology by performing an initial test of the micro water jet spray onto the patient's hand. By allowing the patient to get a feel for the force of the jet, they addressed any anxieties the patient may have been having relating to pain associated with the procedure. Given the relationship between the fear of pain and compliance to treatment protocols^{46,47} and thereby wound healing, the recent introduction of this micro water jet technology for debriding wounds promises to provide a lower pain option for management of chronic wounds, and in doing so, improving patient compliance to the wound treatment plan and overall wound healing.

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