

Wound-related pain: anxiety, stress and wound healing

Pain is a common problem in patients with chronic wounds. This article discusses a systematised approach to address and manage wound-related pain. The impact of psychological factors on pain is often overlooked. Substantial evidence indicates that the more anxiety patients experience from anticipation, the higher their levels of pain during dressing changes. Anxiety as a psychological stress can trigger a cascade of physiological events that impair wound healing. Strategies to allay anxiety must be part of a comprehensive pain treatment plan.

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KEY WORDS

Wound-related pain
Anxiety and stress
Quality of life
Dressing changes

Pain is common in patients living with chronic wounds (Woo and Sibbald, 2008). Wound-related pain may be exacerbated at the time of dressing change, but it may also be persistent between dressing changes (Woo et al, 2008). Recognising the primacy of pain as part of chronic wound management, international consensus documents place the emphasis on the need to assume all chronic wounds are painful unless the patient indicates otherwise (Woo et al, 2008).

Studies of patients with venous leg ulcers indicated that as many as 80% of patients reported acute or chronic wound pain, with half of them rating pain as moderate to the worst possible pain (Briggs and Nelson, 2010). Patients

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gave vivid descriptions of the pain experiences even after the leg ulcers had healed. Of the 132 patients who developed pressure ulcers, Dallam et al (1995) reported that 59% experienced some type of pain in a hospital setting. Szor and Bourguignon (1999) explored pain in 32 patients with pressure ulcers. Most of the participants (75%) rated pain as distressing, while 18% described pain as horrible or excruciating. Consistent with previous findings, Meaume et al (2004) reported that 77% of a large sample of 2936 patients with chronic wounds experienced spontaneous pain. To avoid pain, many

patients are forced to limit their activities which affects their personal life (e.g. bathing, shopping), social, family, and work life, thereby eroding their overall quality of life. Patients describe wound-related pain as all-encompassing and one of the most devastating aspects of living with chronic wounds (Price et al, 2008). However, the management of pain by healthcare professionals is often relegated to a lower priority (Vermeulen et al, 2007).

Stress and anxiety

Collectively, emerging evidence indicates that pain constitutes a major source of stress in patients with chronic wounds (Hyde et al, 1999; Beitz and Goldberg, 2005; Hareendran et al, 2005). Increased levels of stress and heightened anxiety have been demonstrated to lower pain threshold and tolerance, as the person may become more vigilant of somatic signals. The result is a vicious cycle of pain, stress/anxiety, and worsening of pain.

To encapsulate this unique phenomenon in which pain is intensified by stress/anxiety, Colloca and Benedetti (2007) eloquently explained the 'nocebo effect' (versus placebo effect). Individuals who express high levels of stress or anxiety in anticipation of pain, also rate the actual pain experience as more intense. A possible neural circuitry mediated by cholecystokinin has been documented by Benedetti et al (2006),

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linking stress/anxiety to pain perception. Other neurobiological studies have identified potential involvement of cortical and subcortical circuitries, including the periaqueductal gray matter (PAG), frontal cingulate and insular cortices, limbic system, amygdala and hypothalamus (Rainville et al, 1997; Price, 2002; Bush et al, 2000; Apkarian et al, 2005).

Anxiety has been correlated with increased wound-related pain both at dressing change and between dressing changes. Aaron et al (2001) demonstrated that anxiety is a significant predictor of procedural pain during dressing change and accounts for 40% of the variance of reported burn-related pain. In patients suffering from pain related to chronic venous ulcers (Jones et al, 2006), 27% of the subjects were considered depressed, while 26% were considered anxious. It was also demonstrated that the higher their levels of pain, the more anxiety experienced. ($p < 0.001$).

In a more recent study, Woo (2010) asked 96 patients with chronic wounds to indicate their anticipatory pain before dressing changes and to rate the intensity of pain at various intervals during dressing changes using a visual analogue scale (VAS). Anxiety was also evaluated with a shortened state anxiety instrument that consisted of six word descriptors including worried, calm, tense, upset, nervous, and anxious from the Spielberger state-trait anxiety inventory (Spielberger et al, 1970). Pearson's correlation coefficients were calculated to examine the relationships among variables. Anxiety was positively and significantly correlated to anticipatory pain (.67), pain at dressing removal (.53) and pain during wound cleansing (.46). Patients who experienced higher levels of anxiety anticipated more pain and experienced more intense pain during dressing changes than patients with lower levels of anxiety.

Wound-related pain

Wound-related pain involves an intricate interplay of various underestimated systemic and patient factors (i.e. stress

and anxiety). To increase healthcare professionals' awareness of the complexity of wound-related pain, the wound-related pain model developed by Woo and Sibbald (2008) (Figure 1) proposes a systematic approach to ensure that the cause of the wound, local wound care issues and patient-centred concerns are adequately assessed and treated (Woo and Sibbald,

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2008). The primary goal is to improve patient outcomes and enhance patient quality of life, even when healing is not expected (i.e. with non-healable wounds because the cause cannot be corrected, or maintenance wounds when patient adherence to the treatment plan is poor).

The key components of the wound-related pain model are:

- ▶ Cause(s) of the wound: is pain related to the underlying pathology of the wound? Leg ulcers may be painful due to the associated oedema of venous disease. Other differential diagnoses related to pain may include acute lipodermatosclerosis, infection, along with superficial or deep phlebitis. A person with diabetes may experience pain as a result of neuropathy, infection of the deep tissue including osteomyelitis, or a deep disruption of the bony structure due to Charcot changes. Among patients at risk for pressure ulcers, ischaemic or deep tissue injury (tissue deformation) can also be painful (Woo and Sibbald, 2008)
- ▶ Patient-centred concerns: what is the meaning of pain (e.g. a means to attract attention, challenge to overcome, punishment, personal defeat)? What are the psychosocial factors that may impact on pain

perception? How does pain affect patient quality of life? Various contextual factors, beliefs, attitudes, past experience and expectations can influence pain perception. As illustrated by the findings reported by Woo et al (2009), pain and anxiety are interconnected and circular in patients with chronic wounds. Anxious patients have a propensity to anticipate more painful symptoms. The anticipated effect of pain has been demonstrated to intensify the actual pain experience at dressing change

- ▶ Local wound factors: is there recurring trauma (at dressing changes or other times) to the wound? Is there an undiagnosed infection or inflammatory pathology? Is there too much or too little moisture? Tissue trauma, infection (increased bacterial burden) and poor moisture balance (either too dry or too wet in the wound milieu) may contribute to pain. Gardner et al (2001) evaluated the validity of 12 clinical signs and symptoms to identify localised infection among 36 individuals with chronic wounds. None of the subjects in this study with non-infected wounds exhibited increasing pain as an indicator. The reported specificity of 1.0 in the study indicated that pain is a key parameter for wound assessment.

Dressing removal is painful when the contact layer adheres to the wound bed due to dried out materials, aggressive adhesives, granulation tissue and capillary loops growing into the product matrix, or the glue-like nature of dehydrated (crusted) exudate. Enzyme-rich exudate may spill over to wound margins causing maceration or tissue erosion (loss of part of the epidermis but maintaining an epidermal base), with an increased risk of trauma (Woo et al, 2008). In a randomised control trial (RCT) comparing two foam dressings, subjects registered higher levels of background pain with macerated periwound areas (Blackburn-Munro, 2004). In a recent study, Woo (2010) indicated that cleansing

that involves scrubbing and cold solutions can evoke a significant amount of pain.

Relationship between pain and wound healing

Pain and stress may slow wound healing through various intricate mechanisms. Chronic wound-related pain constitutes a psychological stressor that triggers the hypothalamic-pituitary-adrenal axis promoting the production of vasopressin and glucocorticoid (cortisol) (McGuire et al, 2006). Vasopressin is a potent vasoconstrictor compromising the delivery of oxygen and nutrients for wound healing. Cortisol reduces the immuno-

inflammatory response, suppresses cellular differentiation and proliferation, inhibits the regeneration of endothelial cells and delays collagen synthesis. In the presence of cortisol, T-cells become less responsive to the interleukin-1 (IL-1) signalling for the production of growth factors that facilitate T-cell proliferation (Johnson, 1995).

To validate the relationship between chronic pain and wound healing, McGuire et al (2006) studied 17 women who underwent gastric bypass surgery. Patient pain ratings over four weeks post surgery were significantly associated with delayed healing of a 2.0mm punch biopsy wound site. Glaser et al (1999)

examined the key determinants for the healing of venous and mixed venous/arterial ulcers (n=155). Using a hierarchical multiple regression analysis, pain on mobility was found to be a significant predictor for wound healing (B=.46, p<.0001). Kiecolt-Glaser et al (1995) compared wound healing in 13 women caregivers (mean age=62.3 years) who had a relative with Alzheimer's disease and 13 controls matched for age (mean age=60.4 years). All the subjects acquired a wound from a 3.5mm punch biopsy at the same anatomical location (non-dominant forearms). Time to achieve complete wound closure was increased by 24% or nine days longer in the stressed caregiver versus control groups (p<0.05). Caregivers' peripheral blood leukocytes exhibited a diminished ability to express the IL-1β gene in response to lipopolysaccharide stimulation *in vitro*. Interleukins play an important role to protect the host against infection and prepare injured tissue for repair by enhancing phagocytic cell recruitment and activation (Glaser and Kiecolt-Glaser, 2005).

Based on previous findings, Glaser et al (1999) examined psychological stress and the levels of proinflammatory cytokines in experimentally-induced skin blisters on the forearms of 36 women (mean ±SD age, 57.2 ±6.6 years). The specimens were aspirated and analysed within 24 hours of blister formation. Women who reported more stress on the Perceived Stress Scale produced significantly lower levels of IL-1 (p<0.03) and IL-8 (p<0.04).

In another study, Garg et al (2001) observed the skin barrier recovery rate from damage caused by tape stripping in 27 university students. Serial assessments were performed on three occasions: after the winter holiday when stress levels were low, during examination week with high stress levels, and after the spring holiday when stress levels waned. Consistent with their hypothesis, the investigators reported that barrier recovery was significantly slower during the high stress periods compared to the low stress periods (F= 18.87; df= 12.2; p<0.001). The correlation coefficient

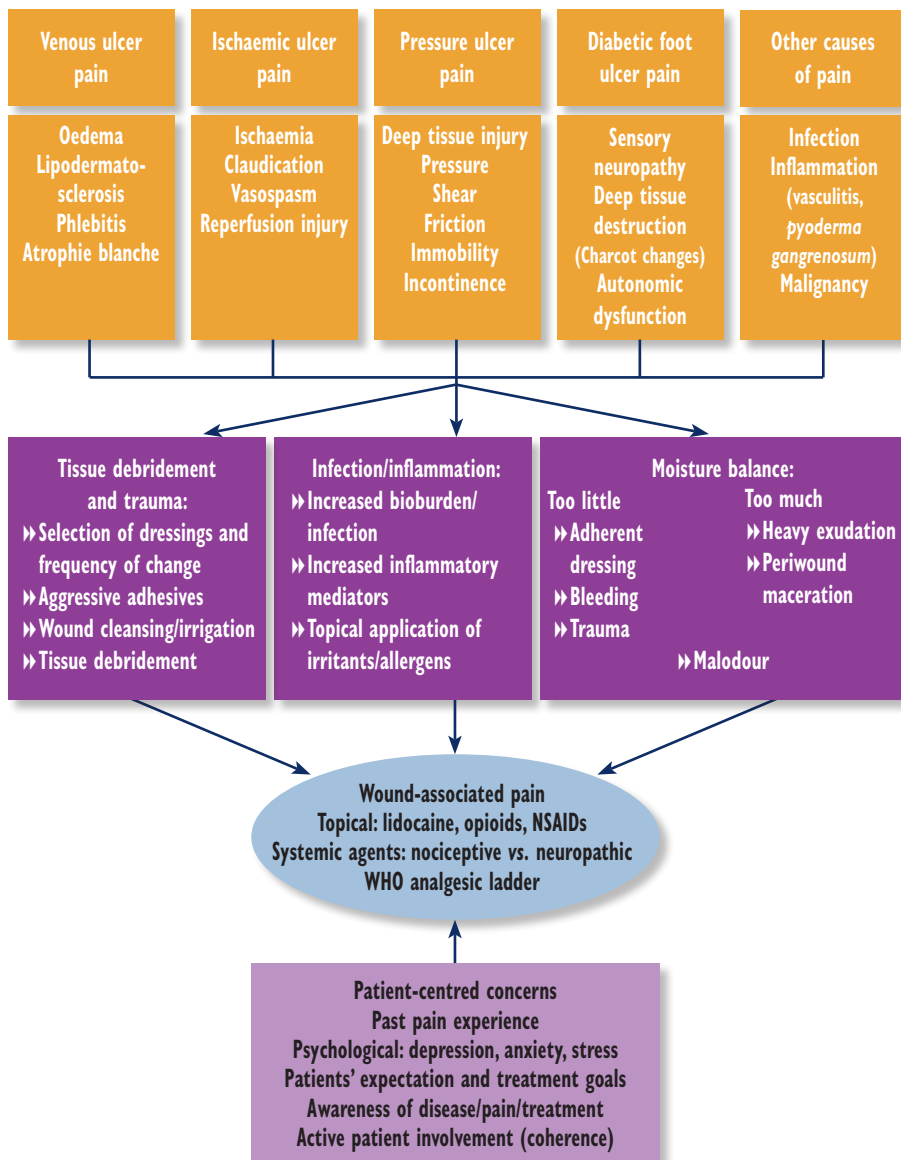


Figure 1. Wound-related pain model: the wound, the cause, the patient (Woo and Sibbald, 2008).

for the relationship between stress and barrier recovery was significant ($r=-0.42$; $p=0.03$), indicating the higher the stress, the slower the barrier recovery rate. Similar findings were reported by Ebrecht et al (2004), who monitored wound healing in dermal biopsy sites among 24 subjects, found that stress and emotional distress were negatively correlated to wound healing rate between day seven and 21 after the biopsy ($p<0.05$).

Although causality between pain and healing cannot be inferred, venous leg ulcer patients who were randomised to a nurse-managed leg club achieved a 76.8% reduction in mean ulcer size (mean 10.3cm^2 to 2.39cm^2), with a significant reduction in pain levels over 12 weeks ($p=0.001$) (Edwards et al, 2005). In contrast, mean ulcer size was merely reduced by 11.8% in the control group (7.63cm^2 to 6.8cm^2) without any significant changes in pain scores. Leg clubs create a social platform for patients to support, empathise and empower each other, bolstering their abilities to cope with pain and associated stress.

In a prospective study, Woo and Sibbald (2009) followed 102 patients with either leg or foot ulcers for four weeks. Pain was measured with a numerical rating scale (with 0 being the least pain and 10 the most severe pain). Almost half of the subjects (45.6%) were inflicted with severe pain (pain ratings of 7 or above) in relation to their ulcers. The average level of pain was reduced from 6.3 at week 0 to 2.8 at week 4 ($p<0.001$). To examine the relationship between pain and wound healing, pain levels were compared in two groups of patients by separating those who achieved wound closure and those who did not. The mean pain score was 1.67 for the patients who had their wounds healed, in contrast to 3.21 for those who did not achieve complete wound closure ($p<0.041$).

Therapeutic relationship and pain management

Effective management of pain not only requires the use of pharmacological agents, but also mindful attention to psychological factors that are part of the

tapestry of pain assessment (Woo et al, 2008). While no one is immune to the feelings of anxiety before a potentially painful procedure, strategies that allay anxiety may lessen the pain experience. Clinicians should pay attention to other sources of anxiety that may be associated with stalled wound healing, such as fear of amputation, body disfigurement, repulsive odour, social isolation, debility and disruption of daily activities (Price et al, 2008; Woo et al, 2008; Woo, 2010).

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A therapeutic relationship between the healthcare professional and the patient can enhance treatment adherence to optimise patient outcomes (Robinson et al, 2008). Crucial to cultivating a therapeutic alliance, clinicians must first acknowledge that anxiety and pain are common experiences at dressing changes. While patients should be informed that these symptoms are part of a normal response, emphasis should be placed on available treatment options and achievable goals to minimise them. Based on Keller and Carrolls' suggestions (1994), the following communication strategies are proposed:

- ▶ Engage patients by talking about their pain and their concern about wound care and dressing changes. There is a need to reinforce the belief that patients with chronic wounds do not have to live with persistent or temporary pain, and active participation in their assessment, treatment and coping behaviours should be fostered
- ▶ Empathise the impact of pain for individuals with chronic wounds
- ▶ Educate patients by explaining procedures and how they are performed. Pain-related education is a necessary step as it helps to dispel common misconceptions and myths that may obstruct effective pain management

Key points

- ▶ Pain is a common problem in patients with chronic wounds.
- ▶ Wound-related pain is linked to anxiety, constituting a significant psychological stressor.
- ▶ Stress promotes the production of hormones and vasopressin that can impair wound healing.
- ▶ Anxiety must be addressed to reduce wound-related pain.

- ▶ Enlist patient participation by actively engaging them during the procedure and giving them permission to call time-outs.

Conclusion

Pain is a common symptom for persons with chronic wounds. The pain experience continues to generate conceptual and methodological debate due to its vicissitude. Troublesome pain symptoms may evolve from one or more sources, including wound aetiologies and local wound care such as surgical debridement procedures or dressing changes. Sub-optimal local components of the wound base that may be associated with pain include unwanted debris, bacterial damage from superficial critical colonisation or deep compartment infection, abnormal inflammation, or moisture imbalance (excess or paucity).

It is crucial to remember that chronic wound-related pain is linked not only to abnormal wound characteristics, such as infection, trauma and ischaemic injury, but also to human suffering (Krasner, 1998). Pain has a great impact on quality of life,

emotional state, and sense of well-being (Pieper et al, 2000; Hopkins et al, 2006; Ribu et al, 2006). To improve the lives of individuals with chronic wound-related pain, new pain-related knowledge needs to be translated into the treatment of the affected patients' physical and emotional state. **WUK**

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