Meeting the Challenges of Wound-associated Pain: Anticipatory Pain, Anxiety, Stress, and Wound Healing

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Pain is an unpleasant physical and emotional experience that plays a key role in the lives of people with chronic wounds.1-3 It is well documented that the majority of patients with chronic wounds suffer from moderate to severe pain for a protracted period of time with frequent exacerbations.4-8 Although pain often is associated with conditions intrinsic to underlying etiologies (eg, acute lipodermatosclerosis in venous leg ulcers, Charcot changes with diabetic foot ulcers), trauma (pressure, shear, and friction), chemical irritation, infection, or inflammation, spontaneous pain may occur due to sensitization of nerve fibers.9 In studies conducted during dressing changes, patients describe the most excruciating pain at dressing removal as aggressive adhesives are peeled away from fragile and damaged periwound skin.10-12 Increasing evidence also validates pain with wound cleansing, especially when abrasive materials or forceps are used to remove debris from the wound bed.11,13

To raise awareness and promote a systemic approach to managing pain, Woo and Sibbald1 developed a wound-associated pain (WAP) model that highlights three key components: the wound, the cause, and the patient (see Figure 1). First, the underlying cause of the wound-associated pain must be treated.2,6 Second, local wound care issues that may exacerbate wound-associated pain must be addressed. These include tissue trauma (dressing removal and wound cleansing)5,17,18; infection/inflammation (increased pain is a warning sign for potential deep wound infection)19,20; and patient-centered concerns (eg, anxiety, depression, anticipation of pain).21-24

![Figure 1. Wound-associated pain model. ©2007 Woo & Sibbald](image)
While a plethora of advanced wound care products and treatment modalities has been developed over the years, little attention is paid to patient factors that can modulate pain and wound healing. Experimental and clinical studies of pain elucidate that the same stimulus does not always evoke the same experience of pain. Variability in pain perceptions can be influenced by many contextual and psychological (patient-centered) factors. Accumulating evidence has demonstrated that anxiety in relation to anticipation of impending pain can lead to increased self-reported pain intensity, reduced pain tolerance, and decreased pressure pain thresholds. With heightened anxiety, environmental and somatic signals are brought to the patient's attention, sharpening the degree of sensory receptivity. Similar to the concept of a self-fulfilling prophecy, the term nocebo effect (versus placebo effect) is used to connote the phenomenon in which pain is incurred or intensified by patients' anticipation or expectation.

The Pathophysiology of Anticipated Pain

Anticipation of pain and associated anxiety are more than psychological phenomena. They have been demonstrated to trigger the activation of cholecystokinin, which plays a crucial role in pain transmission. Neuroimaging studies documented that the anterior cingulate cortex, the prefrontal cortex, and the insula are activated during the anticipation of pain, suggesting a specific neurocircuitory connection. Anxiety also may reduce the descending inhibition signals, allowing pain to gain access through the "gate control mechanism" to the central nervous system.

How do anxiety and anticipation of pain affect wound healing? Psychological stress as result of pain and anxiety activates the hypothalamic-pituitary-adrenal (HPA) axis and cortisol production. The hormone glucocorticoid modulates immune cells by suppressing differentiation and proliferation, down-regulating gene transcription and reducing expression of cell adhesion molecules that are essential for cell trafficking. Deficient inflammatory response will hamper the body's defense against invading organisms and removal of debris from wound bed for tissue regeneration. Several studies have demonstrated the association between stress and impaired healing. Kiecolt-Glaser compared wound healing in 13 women caregivers who had a relative with Alzheimer's Disease to 13 controls matched for age. Time to achieve complete closure of biopsy-induced wounds was 9 days longer in the caregiver versus control groups due to caregiving stress (P <0.05). Marucha et al documented that the average complete wound healing time was significantly longer in 11 students during stressful examinations (P <0.001). Garg et al observed that skin barrier recovery rate from damage caused by tape stripping was significantly slower during a high versus low stress period (P <0.001). Glaser and his team examined psychological stress and the levels of proinflammatory cytokines in experimentally-induced skin blisters on the forearms of 36 women. Women who reported high stress produced significantly lower levels of IL-1 alpha (P <0.03) and IL-8 (P <0.04). On the other hand, chronic and repeated stress/pain may attenuate the HPA axis feedback mechanism. The result is excess inflammatory response and end-products (eg, MMPs) that stall wound healing.

In a cross-sectional study of patients with leg ulcers (n = 190), Jones et al examined the relationships between anxiety, living alone, mobility, exudate, and pain. Only pain and anxiety were significantly related. Woo et al examined pain, anxiety, and anticipatory pain in 96 patients with chronic wounds. The subjects were asked to rate their levels of anticipatory pain and actual pain levels at different times during wound care using a numerical rating scale. Anxiety was measured by Spielberger's State Anxiety Inventory. During dressing change, patients rated cleansing and dressing removal as the most painful. Consistent with previous findings, the higher the anxiety before dressing change, the higher the anticipatory level of pain and the more intense the pain expressed during the procedure (P = 0.000), a significant correlation. Linear regression identified anxiety as a significant predictor of mean pain scores, accounting for 25.7% of variance.

Implication for Practice

Anxiety-reduction techniques include relaxation, music, touch therapy, visual stimulation, hypnosis, stress-reducing strategies, guided imagery, behavioral and cognitive therapy, and distraction. These techniques have been suggested as options for managing wound pain. In addressing anxiety and anticipation of pain, the importance of the therapeutic relationship...
between patients and healthcare providers cannot be underestimated. Clinicians must recognize that certain individuals are more likely to overestimate pain, making them susceptible to anxiety. Before initiating any wound care procedures, adequate information tailored to individual level of understanding should be provided. To mitigate pain, it is important to:

- Engage patients, their families, and other caregivers by talking about their pain and concerns about debridement
- Empathize about the impact of pain
- Educate patients by explaining why the procedure is required and how it is done
- Enlist their participation by allowing the patient to actively participate during the procedure and call time outs. (Table 1).44

References


TABLE 1
THE FOUR E’S TO ADDRESS PAIN

<table>
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<tr>
<th>Engaged</th>
<th>Ask something about the patient other than the reason for the visit True concern and understanding for the patient’s pain Explain the provider perspective Listen to the patient perspective Negotiate a compromise</th>
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