

Original Article

Alteration in Pain Modulation in Women With Persistent Pain After Lumpectomy: Influence of Catastrophizing

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Abstract

Context. Persistent pain is common after surgical treatment of breast cancer, but fairly little is known about the changes in sensory processing that accompany such pain syndromes.

Objectives. This study used quantitative sensory testing to compare psychophysical responses to standardized noxious stimulation in two groups of women who had previously undergone breast cancer surgery: women with ($n = 37$) and without ($n = 34$) persistent postoperative pain.

Methods. Participants underwent a single testing session in which responses to a variety of noxious stimuli were assessed.

Results. Findings suggested that women with chronic pain after breast cancer surgery display enhanced temporal summation of mechanical pain, deficits in endogenous pain inhibition, and more intense painful aftersensations compared with those without long-term pain. Some of these group differences were mediated by higher levels of pain catastrophizing in the group of women with persistent pain.

Conclusion. These findings suggest that persistent postoperative pain is associated with alterations in central nervous system pain-modulatory processes. Future treatment studies might benefit from targeting these pain-modulatory systems, and additional studies using functional neuroimaging methods might provide further valuable information about the pathophysiology of long-term postsurgical pain in women treated for breast cancer. *J Pain Symptom Manage* 2013;46:30–42. © 2013 U.S. Cancer Pain Relief Committee. Published by Elsevier Inc. All rights reserved.

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Key Words

Hyperalgesia, lumpectomy, quantitative sensory testing, temporal summation, conditioned pain modulation, catastrophizing

Introduction

The development of chronic pain after breast surgery is strikingly common; reviews of the literature on mastectomy and lumpectomy indicate that persistent (i.e., lasting more than three months) pain after breast surgery occurs in close to 50% of cases, at a variety of sites.^{1–4} In a recent large study (more than 3000 women) with long-term (on average, more than two years after surgery) follow-up, a total of 47% of women continued to experience pain after breast cancer treatment.⁵ Patients report that pain is the most frequent and impairing symptom after breast surgery,⁶ and persistent pain has a substantial adverse impact on emotional and physical functioning and quality of life among women who have undergone surgical treatment of breast cancer.^{7–11} The advent of conservative breast surgery (i.e., lumpectomy), although having positive effects on body image,¹² has not resulted in a reduction in the rates of persistent postsurgical pain.^{5,13,14} In fact, several reports even suggest higher rates of post-lumpectomy pain compared with that of post-mastectomy pain.^{15,16} Indeed, some evidence suggests that breast surgery may even increase the experience of pain at distant muscle and joint sites, potentially via alterations in neuroendocrine or inflammatory systems or direct sensitizing effects on the central nervous system.¹⁷ The large, and increasing, numbers of annual breast surgeries^{18,19} dictate that millions of women may suffer from treatment-related pain after breast surgery, which historically has been undertreated.²⁰

Although individual differences in long-term, pain-related outcomes after breast cancer treatment are well documented, it is not entirely clear what differentiates women who develop persistent postoperative pain from those who do not. One factor of interest comprises individual differences in pain sensitivity and pain modulation, evaluated by measuring responses to standardized noxious stimuli under highly controlled conditions.^{21–23} A number of surgical

studies have used quantitative sensory testing (QST) techniques to assess the relationship between basal pain sensitivity and outcomes, such as acute postoperative pain. After limb amputation,²⁴ cholecystectomy,²⁵ anterior cruciate ligament repair,²⁶ gynecologic surgery,²⁷ lower abdominal surgery,²⁸ biopsy,²⁹ and cesarean section,^{30,31} presurgical QST findings were significantly correlated with acute postoperative pain. In each case, the individual differences reflecting greater sensitivity to pain (e.g., lower pain thresholds) were associated with more intense acute postoperative pain. Although similar studies of long-term postoperative pain are few, presurgical variability in thermal pain responses did predict six-month post-thoracotomy pain outcomes,³² and preoperative mechanical hyperalgesia was associated with poorer pain-related outcomes at three months after shoulder surgery³³ and six months after chest surgery.³⁴

To date, several QST studies have assessed women with post-mastectomy or post-lumpectomy pain.³⁵ Most of these studies perform testing in the affected area of the body, generally testing the operated breast and contralateral breast.^{36,37} In general, these studies have noted the presence of hyperalgesia, allodynia, and enhanced temporal summation of pain in the surgical area, and one study³⁸ has reported lowered pressure pain thresholds (PPTs) at a variety of body sites, suggesting a process akin to central sensitization. Collectively, however, relatively little is known about pain modulation in women with long-lasting pain after breast cancer treatment, and even less is known about the relationship of these factors to psychosocial functioning. Numerous reports have documented the prevalence and impact of negative affective factors in women with persistent pain after breast cancer treatment,^{7,13,39} but these processes have not been studied as potential contributors to maladaptive central pain processing mechanisms. Cognitive and emotional factors, such as catastrophizing, are strongly related to enhanced pain sensitivity in

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