

# Palpitations in Women With Breast Cancer Are Associated With Polymorphisms for Neurotransmitter Genes

Ying Sheng, RN, PhD, Yvette P. Conley, FAAN, PhD, Steven M. Paul, PhD, Bruce A. Cooper, PhD, Janet S. Carpenter, RN, PhD, FAAN, Marilyn J. Hammer, PhD, DC, RN, FAAN, Jon D. Levine, MD, PhD, and Christine Miaskowski, RN, PhD, FAAN

**OBJECTIVES:** To evaluate for associations between the occurrence of palpitations reported by women prior to breast cancer surgery and single nucleotide polymorphisms (SNPs) for neurotransmitter genes.

**SAMPLE & SETTING:** A total of 398 women, who were scheduled for unilateral breast cancer surgery, provided detailed information on demographic and clinical characteristics and the occurrence of palpitations prior to breast cancer surgery.

**METHODS & VARIABLES:** The occurrence of palpitations was assessed using a single item (i.e., "heart races/pounds" in the past week ["yes"/"no"]). Blood samples were collected for genomic analyses. Multiple logistic regression analyses were used to identify associations between the occurrence of palpitations and variations in neurotransmitter genes.

**RESULTS:** Nine SNPs and two haplotypes among 11 candidate genes were associated with the occurrence of palpitations. These genes encode for a number of neurotransmitters and/or their receptors, including serotonin, norepinephrine, dopamine, gamma-aminobutyric acid, Substance P, and neurokinin.

**IMPLICATIONS FOR NURSING:** These findings suggest that alterations in a variety of neurotransmitters contribute to the development of this symptom.

---

**KEYWORDS** breast cancer; cardioception; neurotransmission; palpitations; polymorphisms  
**ONF, 51(4), 332-348.**  
**DOI** 10.1188/24.ONF.332-348

Compared to the general population, survivors of cancer have a 3.93-fold increased risk of mortality from cardiovascular disease in the first year following their cancer diagnosis (Sturgeon et al., 2019). Palpitations are a common symptom in patients with cardiovascular disease (Essa & Lip, 2021; Mayou et al., 2003). In both the general population and menopausal women, occurrence rates for palpitations range from 8% to 74% (Carpenter, Sheng, et al., 2021; Enomoto et al., 2021; Lok & Lau, 1996). In patients with breast cancer, palpitation rates range from 15% prior to surgery (Sheng, Carpenter, Paul, Cooper, et al., 2023) to between 18% and 48% at 12–24 months following oral endocrine therapy (Choo et al., 2019; Kyvernitakis et al., 2014). Palpitations in patients with cancer are associated with a higher symptom burden and significant decrements in quality of life (Sheng, Carpenter, Paul, Conley, et al., 2023; Sheng, Carpenter, Paul, Cooper, et al., 2023).

Although palpitations are a common symptom, less is known about their underlying mechanism(s). As noted in several reviews (Ala et al., 2019; Bansal et al., 2019; Essa et al., 2021; Essa & Lip, 2021), patients with cancer may experience palpitations associated with cardiac arrhythmias (e.g., atrial fibrillation, sinus tachycardia); anxiety disorders (e.g., panic attacks); a variety of miscellaneous causes (e.g., caffeine, alcohol, thyroid disorders, electrolyte imbalances); and cancer-specific causes (e.g., chemotherapy).

In the authors' previous study of patients with breast cancer (Sheng, Carpenter, Smith, et al., 2023), the occurrence of palpitations was associated with polymorphisms for interleukin (IL)-1 beta (*IL1β*), *IL10*, and *IL13*. These findings suggest that inflammatory mechanisms contribute to the occurrence