Rest-activity circadian rhythm and sleep in sporadic and genetic breast cancer

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Abstract:

Circadian rhythms regulate several physiological processes and are increasingly recognised as important indicators of health and disease. In breast cancer (BC), alterations of the rest–activity circadian rhythm (RAR) have been reported at different stages of the clinical pathway, including before surgery and during chemotherapy. However, only a limited number of studies have investigated RAR characteristics in BC survivors after treatment completion and several years after the primary diagnosis. Understanding long-term circadian alterations may provide relevant insights into behavioural patterns, quality of life, and potential lifestyle interventions in BC survivorship.

This intervention aims to summarise evidence from three complementary studies investigating the relationships between RAR, physical activity (PA), and sleep behaviour in BC survivors and in women carrying BRCA1/2 mutations.

In the first study, RAR was objectively assessed through 7-day actigraphic monitoring in 15 BC survivors (56.7 ± 6.6 years) evaluated five years after primary diagnosis and in 13 healthy controls (54.4 ± 7.2 years). Rhythmometric analysis using the cosinor method showed significantly lower mean activity levels and circadian amplitude in BC survivors. Specifically, the MESOR was 192.0 a.c. in the BC group compared with 276.4 activity counts in controls ($p < 0.001$), while amplitude was 167.0 vs 222.6 a.c., respectively ($p < 0.001$). In contrast, acrophase values were similar between groups (15:09 vs 15:01), indicating preserved circadian timing despite reduced activity levels [1].

A subsequent analysis of the same dataset using non-parametric circadian indices confirmed these alterations and provided additional information on the structure of the activity rhythm. BC survivors showed significantly lower mean activity levels (189 vs 268 a.c., $p < 0.001$) and reduced daytime activity (M10: 326.82 vs 428.07 a.c., $p < 0.01$), as well as lower nocturnal activity (L5: 11.27 vs 34.41 a.c., $p < 0.0001$) compared to controls. Moreover, intradaily variability was significantly higher in BC survivors (0.86 vs 0.65, $p < 0.01$), suggesting a more fragmented RAR across the 24-hour cycle [2].

The third study focused on women carrying BRCA1/2 mutations. In a cross-sectional analysis of 63 mutation carriers (47.6 ± 12.5 years), PA and sleep were assessed using the Godin-Shephard Leisure-Time Physical Activity Questionnaire and the Pittsburgh Sleep Quality Index, respectively. Women in the highest tertile of PA (≥27 METs/week) had a significantly higher probability of being good sleepers than those in the lowest tertile (PR = 2.85; 95% CI:

1.25–6.52). In addition, increases in moderate and vigorous PA were associated with improved sleep quality [3].

Overall, these findings highlight persistent reductions in daily activity levels and increased fragmentation of RARs in BC survivors, even several years after diagnosis. At the same time, higher PA levels appear to influence sleep behaviour in women genetically predisposed to BC positively. These results underscore the importance of structured PA interventions to improve RAR regulation, sleep quality, and overall quality of life in both BC survivors and high-risk populations.

References:

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