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Light therapy and mood in breast cancer

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Dear Editor,

As found by White *et al.*,[1] inadequate or poor quality sleep is associated with an increased risk of breast cancer. In patients, sleep can interfere immune function, alter responses to stress, and impact daytime activities and quality of life which is not only a target in the treatment of patients affected by cancer but also a predictor of response to therapy. Moreover, circadian rhythm alterations strongly influence the development of depressive symptoms and fatigue syndrome. Not only breast cancer patients perceive fatigue before they begin chemotherapy, but the syndrome worsens during treatment[2] and a large proportion of patients continue to experience it for months after therapy is completed. Morning bright light treatment has been found to prevent overall fatigue from worsening during chemotherapy[3] and to protect women from circadian activity rhythm deterioration during chemotherapy.[4] No study so far focused on the effect of light therapy on mood in breast cancer patients.

Bright light therapy is effective in the treatment of depression, delayed, or advanced sleep phase syndrome, jet lag, and shift work syndrome.[5] Similar to bright light therapy, dawn simulation has an antidepressant effect and normalize hypersomnic, phase-delayed, and fractionated sleep patterns.[6] The advantage of this technique is that the light signal is presented while the patient is asleep, and it can be applicable for the patients with hypersomnolence.

To study the effect of light therapy on mood in patients affected by cancer, we recruited 10 women (25–62 years) affected by breast cancer (stage I–III) under anthracycline-based chemotherapy treatment. The study approval was obtained from the ethical committee of the hospital. Patients gave their written informed consent to participate into the study. Patients were administered Dawn therapy in early morning for 2 weeks (white light up to 400 lux). Daily sleep quality was assessed by Pittsburgh Sleep Quality Index (PSQI). The Functional Assessment of Cancer Therapy General Version 3 (FACT-G) scale was administered to assess quality of life and fatigue at the beginning and after the end of dawn simulation light therapy. During the 3 days before the beginning of the study, the 3 days after 1 week of light therapy, and the 3 days after the end of the chronobiological treatment, patients self-assessed subjective mood levels with a 10-cm Visual Analogue Scale (VAS)[7] rating three times during the day. Each patient-perceived mood level on each day was calculated as the mean of the three scores for that day.

All the considered variables respected the normality assumption (Kolmogorov–Smirnov test). *t* test analysis on the sample before and after dawn treatment found no significant differences in FACT-G scale total score. When considering FACT-G dimensions, significant variations were found in emotional ($t = 2.57$; $p = 0.0029$) and social dimension ($t = 3.7$; $p = 0.0049$), with patients showing an increase in emotional well-being and a reduction in social well-being after treatment. When considering sleep quality as measured with PSQI, no difference was found in total score, but a significant reduction after treatment was found in sleep latency ($t = 2.7$; $p = 0.024$) and on the ratio between time asleep and time in bed ($t = 2.54$; $p = 0.032$). For each patient, we calculated a mean of VAS scores of the three days before and after treatment. Significant variations in perceived mood ($t = -3.55$; $p = 0.0062$) with therapy leading to a positive effect were found. Mean basal score was 44.86 (SD = 10.43) and mean after treatment score was 61.47 (SD = 15.83).

To investigate the possible influence of changing in sleep quality and quality of life on changes in VAS scores, we analyzed data in the context of the General Linear Model with a repeated measures ANOVA. Daily VAS scores were the dependent variables, time was the within subjects factor, and the change (from the baseline) of the quality of life as measured with FACT-G scale and the change (from the baseline) of quality of sleep as measured with PSQI were the between subject factors. Treatment was associated with a progressive improvement of perceived mood ($F = 2.54$; d.f. 18,7; $p = 0.0013$). This change was influenced by the change in sleep quality ($F = 1.77$; d.f. 18,7; $p = 0.036$) and not by the change of FACT-G scale scores. When considering FACT-G dimensions, only changes in physical well-being were shown to influence changes in perceived mood ($F = 2.63$; d.f. 18,7; $p = 0.009$). Neither emotional, social, and functional well-being had a significant influence.

We confirmed the usefulness of dawn simulation light therapy in preventing fatigue from worsening during chemotherapy, with an improvement in emotional well-being. A trend in decrease in PSQI total score was found after treatment. Moreover, a reduction of sleep latency and of the ratio between time asleep and time in bed was observed, suggesting an improvement in patients' quality of sleep.

We also found that dawn light therapy induced an amelioration in patient perceived mood, which is influenced by the improvement of quality of sleep and in fatigue syndrome.

Depression is one of the most common psychiatric diseases in cancer patients,[8] with some studies reporting rates as high as 57% in patients with breast cancer. Depressive symptoms reduce cancer patient adherence to medical interventions, decrease quality of life, and increase suicide rates. In patients assuming chemotherapy, the use of antidepressant drugs may be linked to various drug–drug interactions leading to an increase in side effects, influencing continuation

rates and outcomes. Moreover, another potential issue is concurrent treatment with antidepressant drugs and tamoxifen. Tamoxifen is converted to its more potent metabolite endoxifen by the cytochrome p450 enzyme CYP2D6 which is inhibited by most of effective antidepressant drugs. The use of selective serotonin reuptake inhibitors leading to low serum concentrations of endoxifen[9] could decrease the potency of tamoxifen and adversely affect breast cancer outcomes.

Our results not only confirmed the usefulness of light therapy as a supportive care for patients affected breast cancer but also suggested the chronobiological intervention as a promising treatment for depressive syndromes in neoplastic patients under chemotherapy. Further research is needed in bigger samples and to study the persistence of mood benefits also after the end of the chronobiological treatment.

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