HALF-YEARLY (CIRCASEMIANNUAL) AURORAL ASPECTS OF BREAST CANCER GROWTH

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Aim. We examine a possible association of breast cancer (BC) growth and the latitude where patients live and the implications of this finding for the timing of surgery along shorter time scales such as the menstrual or the circadian systems, at all latitudes, since in many cases the month of diagnosis and of surgery coincided, a point yet to be cleared. Background. Survival rates were described earlier for a population of women from Turku, Finland and also in the Komi Republic, Russian Federation, where two peaks of BC patients' survival were associated with the month of diagnosis correlated with two peaks of sex hormone receptors in BC tissue. External factors may influence hormone-dependent BC growth and may relate to the evaluation of effects of surgery assessed along the scales of the day and the menstrual cycle. Methods. Data from the Komi Cancer Registry from 1985 to 1996 were analyzed by cosinor, with the fit of a period of 1 year and 4 harmonics. A relatively small sample of 1170 cases of primary breast cancer supported by histology was used. Cases with cause of death other than BC were excluded from analysis. 5-year survival of BC patients was analyzed, depending on the month of tumor detection and latitude of habitation. Patients from the regions of Vorkuta lived between 64.5-62.6 degrees N, those from Ukhta between 62.5-64.49 degrees N and those from Syktyvkar between 59-62.49 degrees N. Results. The best-fitting period differed in the 3 regions; it was a statistically significant half-yearly period only in Vorkuta, the most northerly region. The circasemiannual/circannual amplitude ratio was highest in the northernmost region of Vorkuta, 5.18, lowest for Ukhta, 0.671, and intermediate for Syktyvkar, 1.503, i.e., there was no linear relation to geographical latitude. Discussion. Seasonal changes in BC growth, in the incidence of BC detection, gross appearance of tumor tissue, survival rate of BC patients and sex hormone receptor values in BC tissue have been reported. An internal rhythmic (possibly endocrine) mechanism was proposed to synchronize the seasonality of hormone-dependent BC tissue growth through the change in its hormonal sensitivity. Seasonal changes of sex hormone receptor values in BC were studied in many investigations. Some authors reported an absence of rhythm, others the presence of rhythm of peak receptor values in spring, fall or both in spring and fall. A half-yearly pattern was time-microscopically documented in Uruguay for the incidence of hormone-related cancers while a circannual in the mortality of women with BC was found to differ before and after menopause in 2807 patients in Scotland. Our small sample suggests a half-yearly rhythm at high geographic latitudes only. Circasemiannual rhythms in auroral phenomena reported by Oransky are likely with maximal incidence in March-April and in August-September worldwide and are particularly prominent in the planetary geomagnetic index Kp. The electromagnetic field (EMF) is reported to modulate melatonin production. Melatonin may modulate sex hormone production in ovaries and/or sex hormone receptors, proto-oncogenes and epidermal growth factor receptors and gene expression in BC cells. The possibility that changes in EMF at high latitudes may serve as particularly effective external synchronizers or influencers of human sex hormone-dependent BC growth deserves consideration along all time scales at all latitudes. The possibility that BC growth is amplified at high latitudes by presumably geomagnetic half-yearly signatures is in keeping with much other information on half-yearly rhythms, notably in melatonin, but also in a variety of other phenomena, studied originally by Randall. The critical question from the point of view of auroral physics is whether the geomagnetic recording initiated by Humboldt, Gauss and Sabine, after

Beaufoy's collection of critical data should be complemented by the study of bioeffects as endpoints for physicists and biologists alike. References available from authors.