Short communication: seasonal onset of menopause?

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BACKGROUND: Seasonal variations of reproductive functions in wild mammals are well known. Similar but blunted seasonal trends have also been described for humans. METHODS: We performed a questionnaire-based study of 149 patients that was designed to search for environmental influence on symptom presentation among patients attending an open menopause service. RESULTS: The evaluated data show a conspicuous seasonality in cessation of menstrual bleeding, with a higher peak after the vernal (spring) equinox and a lower one after the autumn equinox. CONCLUSIONS: Of the several environmental factors considered in this study, the sequence of seasons seems to affect most obviously the process leading to the loss of menstrual cycling. The triggering factor(s) eliciting the onset of the menopausal process and the mediators involved, however, need further analysis.

Key words: equinox/human menopause/menstrual cycle/seasonal change

Introduction

The menopause syndrome is a complex set of symptoms known to be determined partly by endogenous and partly by exogenous influences. Pharmacological replacement of the ovarian hormones which are lacking (HRT) is a common practice nowadays. There still remains, however, an array of endogenous factors that irreversibly change in connection with the climacteric period. Modification of exogenous factors, on the other hand, could be attempted with a fair chance of success.

Nevertheless, only scarce data are available to date about the exact nature of environmental and/or lifestyle determinants of the menopause syndrome. Hence we propose that more detailed studies are needed to obtain knowledge that may aid us in implementing innovative approaches in its treatment.

Materials and methods

The present study was performed among patients attending our outpatient menopause service. By filling out an anonymous questionnaire, the volunteers signed an informed consent and provided information concerning the modalities of the menopause syndrome and reproductive–gynaecological history. Lifestyle (diet, exercise, etc.) and environmental factors were also recorded. The study was approved by the regional ethics committee. The questionnaire contained two differently phrased questions regarding the season of the first missed bleeding in peri-menopause, and these were at distant sheets of the questionnaire to assess reproducibility of the answers. Of the 149 responders evaluated, all had some kind of climacteric complaints, 74 were post-menopausal (>1 year amenorrhoic), 34 were peri-menopausal (3–12 months amenorrhoic) and 41 were pre-menopausal (<3 months amenorrhoic) at the time of completion of the questionnaire.

The median age of the subjects was 52 years (minimum 43, maximum 67).

Time divisions, such as hours of a day or months (and seasons) of a year, represent a circular scale of measurement. Since the widely used methods for scalar data are unable to analyse circular distributions properly (Zarr, 1984), the $\chi^2$ goodness of fit test was chosen to analyse data obtained in our study.

Results

Of the 149 completed questionnaires, 102 provided reliable information concerning time of the year at the first missed bleeding. The answers were accepted as being valid only when repeats were in agreement. Seventy-two of the responders remembered the exact month, while 30 could recall only the season.

Our sample shows a conspicuous seasonality in cessation of menstrual bleeding, with a higher peak after the vernal (spring) equinox and a lower one after the autumn equinox (Figure 1, Table I). Considering the four seasons in this sample, the events observed are not scattered uniformly all year round according to the $\chi^2$ goodness of fit test for circular data. ($P < 0.005; \chi^2 = 13.294; \text{df} = 3$).

Discussion

The seasonality found in cessation of menstrual bleeding seems to support the influence of environmental factors on female human reproductive functions even at their decline. The pattern of the two maxima following the equinoxes appears to be similar to the bimodal distribution of conceptions in Eastern Europe (Cagnacci and Volpe, 1996). Seasonal breeding of most mammals is a well-known phenomenon. A thorough search in
the literature has failed to find data from human reports similar to those presented in Nozaki et al. (1995) and Shideler et al. (2001) on the topic of menopause and seasonal changes. In civilized humans, such seasonality is severely blunted by social–behavioural influence and/or by the artificial environment, yet seasonal alterations of ovarian activity have been demonstrated in macaque females (Shideler et al., 2001), and biannual changes in the sensitivity of the hypothalamo–hypophysial axis toward negative feedback of estradiol seem to be maintained even after menopause in female Japanese monkeys (Nozaki et al., 1995).

Melatonin is generally accepted as a signal that transmits length of day information to different physiological processes, although the underlying mechanisms may vary. Even in humans, the intricate relationship of melatonin and the menstrual cycle is well documented (Cagnacci and Volpe, 1996). Melatonin binding is found in the ovaries (Ayre and Pang, 1994), and ovarian steroid hormone production is influenced by melatonin (Brzezinski et al., 1992). The harmony of these links seems to become disrupted in parallel with a decrease of melatonin levels in early peri-menopause (Vakkuri et al., 1996).

In view of these data and our findings, a plausible scenario for onset of menopause might be the following: cessation of ovarian function is a process from regular toward irregular control and is not merely due to the exhaustion of the gonadal tissue in its capacity to produce developing follicles that provide an adequate hormone supply. Rather, it can be perceived as a loss of ability for cyclic renewal of ovarian reproductive competence governed normally by several endogenous and exogenous factors affected by climatic conditions (e.g. length of day, temperature, humidity, etc.). A periodicity of either 12 or 6 months length seems to be operative in this regimen at least at the latitude and climate observed in this study. Due to imbalance of these factors in pre-menopause, the process eventually culminates to a point where it stumbles into a non-recoverable state, i.e. ovarian failure. Length of day is surely only one of several factors to be considered here. Moreover, as we have learned recently, melatonin might not be the only agent of circadian phototransduction (Campbell and Murphy, 1998).

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References

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Figure 1. Seasonal distribution of first missed bleeding. Open symbols/dotted lines represent cases where the exact month of first missed bleeding was available. Closed symbols/solid lines represent cases where only the season was identified.

Table 1. Seasonal distribution of first missed bleeding

<table>
<thead>
<tr>
<th>Month</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>January</th>
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<td>3</td>
<td>6</td>
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<td>8</td>
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<td>December</td>
<td>9</td>
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<td>January</td>
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Open symbols represent cases where the exact month of first missed bleeding was available. Closed symbols represent cases where only the season was identified.

Human menopause and seasonal change

Table I. Seasonal distribution of first missed bleeding

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