The Climacteric as a Crucial Stage of Female Life

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Abstract: In women, the internal milieu undergoes relatively rapid physiological changes during puberty and at climacteric. Menarche and menopause are hallmarks of these two phases of female life, respectively, and changes of ovarian function account for these two events. The former event represents the appearance of ovarian function based on maturation of the hypothalamus, the control center for sexual function, whereas the latter event represents the termination of ovarian function secondary to ageing of the ovaries. During these two periods, women require particular attention to health care. Menopause gives rise to a variety of symptoms, because degenerative changes due to ageing are combined with a decrease of estrogen production due to reduced ovarian function. In a subset of women, treatment for menopausal symptoms has to be continued for a long period. Because the physical changes at menopause cannot be understood without complete knowledge of the action of estrogens, a thorough understanding of their systemic effects is mandatory. In addition, physiological changes secondary to the lack of estrogens should be discriminated from pathological changes so that appropriate medical intervention can be given in a timely manner for the latter. When these problems are solved, an ideal system for the support of ageing women may be established.

Key words: Life stage; Climacteric; Menopause; Estrogen; Climacteric syndrome

The Ageing Society

According to the 2001 abridged life tables, the average lifespan of Japanese men and women is 78.07 and 84.93 years, respectively, meaning that Japan has attained unprecedented ageing society in the world. Before World War II, the average lifespan for men and women was between 45 and 50 years, and women outlived men by two or three years. Subsequently, the average lifespan of women lengthened more rapidly than that of men. By

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Obstetrics and Gynecology investigated the occurrence of menopause in 3,591 women and reported that the average age was 49.7 years.\(^1\) The age of menopause varies little with race or the period of history. It is associated with genetic factors. Smoking and a slender physique are reported to be associated with a somewhat earlier menopause.

As stated above, the time of menopause can be specified, but the internal milieu does not change instantly at the time of menopause. Instead, gradual changes occur before and after menopause, while ovarian function declines slowly towards its termination. This transitional phase is defined as the perimenopause or climacteric. The latter term is derived from “klimax,” which is a Greek word for ladder. This accurately expresses the characteristic endocrine changes in women around the time of menopause.

**Endocrine Changes during the Climacteric**

Typically, the menstrual cycle begins to lengthen about five years before menopause, before which menstruation has occurred regularly about every 28 days (Fig. 1). However, menopause occurs without prior lengthening of the menstrual cycle in about 10% of women. According to a survey performed in Japan, menstrual irregularity started before the age of 45 years, at 46 or 47 years, and at 48 or 49 years.
in 15%, 30%, and more than 40% of women, respectively.\textsuperscript{1)}

The levels of various hormones vary during the climacteric. First, the level of follicle-stimulating hormone (FSH) begins to increase progressively from 4 or 5 years before menopause. This change is preceded by a decrease in the blood levels of inhibin, which is secreted from the ovaries and inhibits pituitary secretion of FSH. Slightly increased FSH levels do not affect either the menstrual cycle or blood estradiol levels, but reflects the decline of reproductive function due to ageing. In other words, even if the cycle is normal, elevated FSH levels are suggestive of poor quality of oocytes. Under such conditions, fertility can be considered to show a substantial decrease. After elevation of FSH levels, LH levels also begin to increase from several years before menopause. An increase in LH levels is less marked than that of FSH (Fig. 2).

Regarding blood levels of estradiol, although the function of the ovaries (where estradiol is produced) begins to decline before menopause, its production is maintained because an increase of FSH offsets the decline of ovarian function. Estradiol levels are maintained, or are slightly increased in some cases, until about one year before menopause. At the time of menopause, both FSH and LH levels increase rapidly, but estradiol levels continue to decrease for a few years until it approaches the level similar to castration. Unlike estrogens, testosterone (a typical androgen) only decreases slightly after menopause. Androgen production by the adrenal glands decreases gradually with age, but persists for at least 10 years after menopause.

In postmenopausal women, low estrogen levels are mainly maintained by conversion of androgens in the peripheral adipose tissue. The more subcutaneous fat women have, the higher estrogen levels are.\textsuperscript{2)} In obese women, the occurrence of climacteric symptoms is less frequent, and they have a relatively higher bone mineral density than in slender women, partly because of the production of estrogen by the adipose tissue.

### Mental and Physical Changes during Climacteric

The reduction of estrogen production accounts for many of the biological changes during climacteric. There is overlap between changes...
due to the loss of estrogen and other ageing processes. Various symptoms that appear during climacteric are called climacteric symptoms or climacteric syndrome. Climacteric symptoms are listed, with the frequency and average age of occurrence, in Table 1.1)

Climacteric symptoms can be classified as shown in Table 2.3) Vasomotor symptoms are most closely associated with the decrease of estrogen production, including hot flushes and sweating. In 10–25% of the female population, these two symptoms appear before menopause and they occur in 70–80% overall. At first, hot flushes develop during the night, and then in the daytime also. The onset is induced by stress. Hot flushes are frequently associated with sweating and palpitations. Their frequent occurrence during the night results in insomnia. Symptoms other than these vasomotor manifestations are associated with the personality, and with factors related to the family and society, which makes their pathogenesis complicated. Consequently, the incidence and symptoms of climacteric syndrome vary with the period of history and between countries. The commonest symptom in Japan is shoulder stiffness (Table 1).1) In Europe and the United States, however, the occurrence of this symptom during climacteric has almost never been described.

The decrease of estrogen levels gives rise to atrophic changes of the genitourinary tract. These changes appear after the manifestations of climacteric symptoms. In other words, vaginitis, vulvar pruritis, vaginal dryness, dyspareunia, urinary tract infection, and frequency occur several years after menopause. The skin also becomes thin and dry, which is considered to be caused by a decrease of cutaneous collagen fibers due to estrogen deprivation.

Estrogens are known to maintain and improve brain function. Although there is no conclusive evidence, it has been reported that estrogens can improve memory, and are effective for preventing Alzheimer’s disease and suppressing its progression.

After menopause, bone mineral density decreases rapidly. Estrogen replacement therapy can prevent this decrease, and reduces the risk of fracture due to osteoporosis. In addition, estrogens are closely associated with lipid metabolism. The decrease of high density lipoprotein (HDL) cholesterol, as well as elevation of low density lipoprotein (LDL) cholesterol and total cholesterol, after menopause are mostly attributed to the decrease of estrogen levels.

### Health Care for Postmenopausal Women

Women’s health is more closely associated with biological and social factors than men’s health. In particular, climacteric can be regarded as a transitional phase in which the internal and external milieu undergoes great changes and it is a crucial phase for women. It is important for women to change their health management methods and life goals to get along in good shape at the onset of the latter half of their lives. The decrease of female hormones at climacteric is dramatic. Medical specialists who play a role as healthcare providers must clearly understand the symptoms and pathological
conditions associated with climacteric, and must provide individual women with health care to improve their QOL and prevent diseases that particularly affect women undergoing menopause.

REFERENCES

