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INSULIN-RESISTANCE AND LIPIDS METABOLISM IN WOMEN AT MENOPAUSE

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Summary

The article describes lipid metabolism in women during premenopausal and considered their relationship with the level of insulin sensitivity and abdominal obesity. Examined 20 women aged 46-48 years, with fixed transition to pre-menopause on the bases of menstrual cycle dysfunction or amenorrhea during a year as well as a decrease of visualized follicular reserve according to the results of ultrasonic examination of the organs of the small pelvis, were involved into investigation. Body mass increase with abdominal obese formation and disorders of the lipid metabolism against a background of insulin resistance is observed in women during pre-menopause against a background of sexual hormones deficiency.

Keywords: lipid metabolism, abdominal-visceral obesity, insulin resistance, perimenopause.

Introduction

Pre-menopause is the physiological transition period in woman's life during which

involution processes in the reproductive system, characterizing with the generative and menstrual function stopping, prevail against a background of the age changes [5]. It lasts about 10 years and embraces period from 40-45 years to menopause.

It is known that women'ssexual hormones control lipid exchange and carbohydrate metabolism in the organism, accelerating fats' splitting and suppressing synthesis of lipid fractions [2]. Since pre-menopause is characterized by progressing emaciation of the follicular apparatus of the ovaries and concentration variability of the women's sexual hormones in the blood plasma [8], it is possible to presume the presence of changes in lipid exchange on this stage of woman's life. The analysis of the literary sources affirm that studying the lipid exchange depending upon involution processes in the ovaries was carried out only in women under climacteric period [2, 3, 6, 8, 12, 13], and only separate works [4, 5] are devoted to the investigations of these changes during pre-menopause period.

Material and methods

Examined 20 women aged 46-48 years, with fixed transition to pre-menopause on the bases of menstrual cycle dysfunction (periodic delays of menstruation from 1 to 6 months) or amenorrhea during a year as well as a decrease of visualized follicular reserve according to the results of ultrasonic examination of the organs of the small pelvis, were involved into investigation.

According to the results of anthropometrical investigations body mass index and the ratio of circumference of the waist and thighs was determined in women.

Investigations of the indices of the lipid exchange (triglycerides, general cholesterol (Chl general), lipoprotein cholesterol of high density (Chl LPHD), lipoprotein cholesterol of low density (Chl LPLD), and atherogenesity coefficient), levels of insulin and glucose were accomplished by photometric method on biochemical analyzer "Slim".

The results of investigation and discussion

It is known that estrogens in normal contribute to accumulation of adipose tissue in the area of thighs and buttocks [11], however, during the period of menopause the level of these hormones is significantly decreased that may contribute to the space localization change of accumulated adipose tissue in the woman's organism.

Anthropometric investigation of women in menopause period was conducted to verify this assumption. According to the data obtained (table 1), the body mass index in women during menopause fluctuated in the range of 32.21-37.88 kg/m², constituting on average 35.17±0.52 kg/m² in them, testifying to the presence of obesity II degree according to the scale elaborated by the World Health Organization, [15].

Table 1

Anthropometric indices of women in menopause

Aanthropometric index	Women in pre-menopause	Norma
Body mass indexkg/m²	35,17 ± 0,52	18,5–25
Waist circumference / Femur circumference, c.u.	0,89 ± 0,01	< 0,8

The ratio of circumference of the waist and thighs in women during the period of pre-menopause fluctuated in the range from 0.85 to 0.93 c.u, on average, permitting to ascertain the pathological adipoxia in the abdominal region [7].

The results, obtained by us, coordinate with literary data, where it is indicated that an increase of the visceral adipose tissue is a common and typical change in composite body structure in women in menopause [14].

Thus, decrease of estrogens' level is accompanied with the development of the abdominal obesity, what coordinates with literary data [12]; however, the pathogenesis of this phenomenon remains not ascertained. It is known that visceral adipocytes contain a significant quantity of β-adrenoceptors, corticosteroids and androgenic receptors and relatively small quantity of α2-adrenoreceptors and receptors to insulin. These peculiarities determine high sensitivity of the visceral adipose tissue to lipolityc action of catecholamine's and low to antilipolityc action of insulin (especially in postprandial period) and provide high inclination to the hormonal changes accompanying abdominal obesity very often [1, 3].

Deficiency of the women's sexual hormones contributes to an increase of lipoprotein-lipase activity in the adipose tissue of the thigh-buttock, as well as a decrease of its activity in the abdominal and visceral adipose tissue, promoting more intensive lipolis, increase concentration of free adipose acids in the blood [8]. However, such changes are clearly described in literature only for the women of climacteric period [6].

According to the results of our investigations (table2) an increase of the triglycerides level from 0.7-1.7 mmol/l in normal to 2.74±0.1 mmol/l is observed in women with the metabolic syndrome in pre-menopause period being the evidence of the hypertriglyceridemia presence. This confirms an increase of the levels of the general cholesterol to 6.72±0.13 mmol/l and Chl LPLD to 3.93±0.1 mmol/l, as well as a decrease of the Chl LPHD level to 0.6±0.08 mmol/l.

Table 2

Indices of lipid exchange in women during pre-menopause

Lipid exchange indices	Women in pre-menopause	Norma
triglycerides, mmol/l	2,74 ± 0,1	0,7–1,7
Chl general, mmol/l	6,72 ± 0,13	до 5,2
Chl LPLD, mmol/l	3,93 ± 0,1	до 3,3
Chl LPHD, mmol/l	0,6 ± 0,08	> 1,68
Atherogenesis coefficient, c.u.		< 3

Atherogenesis coefficient in women during pre-menopause period constitutes 12.4±1.95 c.u., exceeding standard meanings in 3 times what is unfavorable factor of the development of atherosclerosis and cardio-vascular diseases [9].

Visceral adipose tissue in contrast to adipose tissue of other localization has powerful capillary network and is directly united with the portal system of the liver [14]. Direct getting of free adipose acids, as well as other biologically active substances, which are discharged from the adipose tissue to the liver, by the opinion of many researchers [1, 3, 10], is one of the pathogenic mechanisms of insulin resistance.

Table 3

Indices of insulin resistance in women in pre-menopause

Indices of insulin resistance	Women in pre-menopause	Norma
Glucose of the blood, fasting, mmol/l	5,62 ± 0,15	4,4–6,6
Glucose of the blood in 30 minutes, mmol/l	6,31 ± 0,18	
Glucose of the blood in 60 minutes, mmol/l	7,32 ± 0,27	
Glucose of the blood in 120 minutes, mmol/l	8,23 ± 0,26	
Insulin fasting, mcOD/ml	6,27 ± 0,25	3–5

For the purpose of elucidation of the possible mechanisms of the lipid exchange disorder in women during pre-menopause the authors carried out investigation of insulin level

(table 3).

In standard insulin level fasting in the blood varies from 3-5 mc OD/ml [4], whereas insulin level in plasma fasting constitute 6.27±0.25 mcOD in women during menopause according to the results of our investigation and is estimated as basal hyperinsulinemia, what, in its turn, is insulin resistance marker.

The authors conducted glucose- tolerant test to confirm this fact. Glucose level fasting was in the ranges from 4.7 to 6.4 mmol/l, constituting on average 5.62±0.15 mmol/l in women in pre-menopause period, corresponding to standard meanings [2].

When carried out glucose-tolerant test it has been revealed that glucose level in the blood in 30 minutes from the moment of its introduction increased on average by 0.69 mmol/l in comparison with the basal level, in 60 minutes – by 1.7 mmol/l, and in 2 hours exceeded the basal level of glucose in 1.5 times. The indicated dynamics of the glucose level in the blood at glucose-tolerant test and increased basal level of insulin in the blood allow coming to a conclusion concerning insulin resistance presence in women during pre-menopause.

At visceral obesity under conditions of insulin resistance due to surplus getting of free adipose acids into the liver and changes of lipoprotein-lipase and hepatic triglyceride-lipase activity, breakup of lipoproteins, rich with triglycerides, slows down, hypertriglyceridemia develops, what in its turn contributes to the level decrease of Chl LPHD, formation of small parts of Chl LPLD. That is to say, locked circle, which contributes to the adipose tissue storage in the abdominal area, is formed.

Conclusions. Body mass increase with abdominal obese formation and disorders of the lipid metabolism against a background of insulin resistance is observed in women during pre-menopause against a background of sexual hormones deficiency.

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