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Bioregulatory Effects Of The Daily Wearing Of Medical And Preventive Pants On The Body Of Pregnant Women Suffering From Habitual Miscarriages Of The Fetus.

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ABSTRACT

In modern society, the high prevalence of habitual miscarriage continues to persist. The reasons for the development of this state are very diverse, which indicates the prospect of improving its pathogenetic treatment. In this regard, of particular interest is the development of non-drug treatment, which can strengthen the medicament effects used in this condition. In the research work carried out on women with habitual miscarriage of pregnancy, who were in the third trimester, the possibilities of the author's version of medical-prophylactic pants in terms of strengthening therapy for the maintenance of pregnancy were assessed. With the help of wearing author's trousers against the background of traditional medicament therapy aimed at maintaining pregnancy in patients with habitual miscarriage, it was possible to ensure high treatment efficiency and delivery on time in all cases. In the group of women with habitual miscarriage of pregnancy who received only pharmacological therapy in the course of the third pregnancy term they managed to bear pregnancy in 71.4% of cases. Probably, the high effectiveness of the use of the author's version of therapeutic and preventive pants is associated with their positive influence on the bioregulatory characteristics of the blood in pregnant women due to the revealed normalization of humoral influences. Received results allow considering medicinal-prophylactic trousers' wearing an important component of medical events aimed at maintenance of pregnancy in its third term in women with habitual miscarriage of pregnancy.

Keywords: habitual miscarriage of pregnancy, women, pregnancy, bioregulation, medicinal-prophylactic clothes.

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INTRODUCTION

Despite the significant advances in medicine, the high prevalence in developed countries retains the habitual miscarriage of pregnancy [1,2]. According to different data, its frequency varies in the range of 10-25% of women. Habitual miscarriage of pregnancy is determined by WHO (World Health Organization) as three and more earlier losses of pregnancy at the term before 20 weeks with the mass of fetus less than 500gr. In women suffering from habitual miscarriage of pregnancy the probability of abortion is much higher than in the population and is equal to 40-45% [3].

The great importance of a number of factors contributing to the formation of habitual miscarriage is proved. These include genetic causes [4], the presence of chronic infections of the genitals [5], the pathology of the uterus [6], the development of hyperandrogenism, inferiority of the luteal phase, thyroid dysfunction, polycystic ovary syndrome [7] and immune disorders [8]. However, in about half the cases, the causes of habitual miscarriage are not detected. There is reason to suspect that in these cases, the violation of humoral regulatory influences in women's body is of great importance. This violates the course of many metabolic and information processes in the blood of women, also contributing to the formation of various concomitant pathologies [9]. All this strengthens the processes aimed at premature termination of pregnancy and chronic miscarriage [10].

Traditionally applied therapy for the preservation of pregnancy in women with a habitual miscarriage is not always able to have a satisfactory effect and allow reporting of pregnancy [11,12]. Apparently, one of the options for increasing the effectiveness of therapeutic effects in this contingent of women can be an additional healing effect on their body that positively affects the humoral situation in their body. Non-pharmacological impacts having no side effects [13] can have special perspective in this respect.

Previous studies on humans [14] and animals [15,16] have shown the possibility of a number of therapeutic effects that can optimize the humoral regulation in the body [17]. High activity in this respect was shown by non-pharmacological impacts which can potentiate traditionally applied at many states pharmacological drugs [18]. At the same time, basic mass of population and especially pregnant women are characterized by low attachment to regular physical exercises [19]. That's why the search of variants of non-pharmacological correction is being continued. For this reason, the search continues for variants of non-drug correction, which will be more popular among the majority of pregnant women with habitual miscarriages [20,21], which can positively influence the level of biologically active substances in the plasma, which strongly affect the placental metabolism and rheology of blood. The author considers daily wearing of medicinal-prophylactic trousers (MPT) as an alternative to medicinal physical training at habitual miscarriage of pregnancy. From one side, the attachment to MPT among pregnant women is much higher than to medicinal physical training [22]. From the other side, MPT application can provide more functionally favorable womb state of a pregnant woman and lower the level of existing in her body disturbances [23,24]. Taking all this into account, we put the following aim in our research: to estimate the dynamics of pregnancy course and level of biologically active substances in the blood women with habitual miscarriage of pregnancy who daily wore the author's MPT in the third term of pregnancy.

MATERIALS AND METHODS

The conducted research was approved by the Local Ethic Committee of the Russian State Social University in May, 17th, 2016 (Record №5). All the examined women gave written informed agreement on participation in the conducted research. The research involved pregnant women in the third term living in Central Russia (Moscow city and Moscow region). The age of all the observed women was 22-30 years. Under observation we took women either without deviations in the reproductive field (the control group) or having habitual miscarriage of pregnancy (two groups of observation).

The control group was composed 35 of clinically healthy pregnant women being at the term of 28 weeks with two and more physiological childbirths in the anamnesis. The women from this group were known to have favorable obstetrical anamnesis, absence of spontaneous abortions and other obstetrical disturbances.

The criterion of involvement into the groups of observation was the following one – habitual miscarriage of pregnancy, i.e. the presence of three and more spontaneous abortions iteratively at the terms

before 22 weeks in the anamnesis of a woman. There were formed two groups of observation out of the examined pregnant women with habitual miscarriage of pregnancy. The first group of observation was composed of 42 women being at the term of 28 weeks' pregnancy and receiving standard maintaining pregnancy therapy. The second group of observation involved 44 women with habitual miscarriage of pregnancy also at the term of 28 weeks. The women from the second group of observation, except traditional therapy maintaining pregnancy, daily wore the author's variant of MPT.

Applied MPT had front and back halves. The upper part of the front half was made as a cut out detail of elastic material with raised belt-line and enlarged free fitting allowance. The upper part of trousers' back half was cut out of elastic material. Vertical leather stripes were stitched on it. They formed pockets where rigid plates were put. Similar leather stripes were also stitched on the upper part of trousers' front part. The lower line of vertical leather stripes' stitching had semicircular form on the front half of trousers and smoothly descended from the point 8-12cm lower than the top of the side seam till the point 10-15cm higher than the connection point of pace and middle seams of trousers. Besides, on the front half of trousers in the fields of side seams at the level of vertical leather stripes' disposition in MPT there were stitched some rebounded regulating details which were provided by the band VELKRO. Its reciprocal fragments were situated on the back half of trousers. Vertical leather stripes were 2.5-3 cm wide and were evenly stitched on the front and back halves of trousers. Used for MPT production rigid plates were made from fluoroplastic and were 1-3 mm thick [25].

Pregnant women from both groups of observation were under dynamic control with examination according to mentioned below methods at 28 weeks' and 38 weeks' pregnancy terms. The control group was observed and examined in the same terms. In the result of absence of reliable differences between both results of researches the control values are presented by one value – arithmetic average between both examinations.

All the pregnant women were examined in the following fields – common state, womb tone, fetal heartbeats, presence or absence of genital tracts' discharges. In laboratories we determined the activity of lipids' peroxidation (LPO) in blood plasma of the pregnant women. It was registered according to the content of thiobarbituric acid (TBA)-active products in it with the help of a kit produced by the firm "Agat-Med" (Russia) and according to the level of acylhydroperoxides (AHP) [26]. We also registered antioxidant blood activity [27]. We determined the concentration of P-selectin molecules and PECAM-1 (Bender MedSystems GmbH, Austria) by the method of enzymeimmunoassay in plasma [28].

In blood plasma of examined children we determined the content of thromboxane A₂ metabolite – thromboxane B₂ and prostacyclin metabolite – 6-keto-prostaglandin F_{1α} by enzymeimmunoassay with the help of sets produced by the firm "Enzo Life science" (USA). We also determined the summary content of nitric oxide metabolites [29] in children's plasma.

Received in the research results were processed by Student's t-criterion.

RESULTS OF INVESTIGATION

Dynamic observation of the pregnant women from both groups of observation showed that only women wearing MPT managed in 100% of cases to maintain pregnancy till the term of 38 weeks and fulfill delivery as it was planned with receiving of alive full-term newborns. This group of pregnant women in the course of the third term of pregnancy was noted to have satisfactory general state and normal womb tone; fetal heartbeats were clearly heard and genital tracts' discharges were absent. In the first group of observation only 30 women (71.4%) reached 38 weeks' term of pregnancy with consequent planned delivery. Pregnancy came to a standstill in two women from this group (4.8%) at the terms of 30 and 32 weeks. The rest women (23.8%) were registered to have preterm delivery with receiving of alive premature newborns in all the cases.

Existing at the beginning LPO activation gradually lowered in women from the groups of observation by the 38th week of pregnancy. In the group with daily MPT wearing it turned out to be possible to lower its intensity till the control level. So, in this group the quantity of AHP and TBA-products in plasma lowered by the end of observation from 2.52 ± 0.39 D₂₃₃/1ml and 4.72 ± 0.54 umol/l (control values – 1.82 ± 0.27 D₂₃₃/1ml and 3.37 ± 0.32 umol/l respectively) till 1.96 ± 0.34 D₂₃₃/1ml and 3.45 ± 0.41 umol/l respectively. It turned out to be

possible in the result of evident strengthening of plasma AOA in them till $34.0 \pm 0.38\%$ by the end of observation (control value – $34.7 \pm 0.45\%$). Positive results of women who didn't wear MPT were less significant. In the result of MPT wearing by women with habitual miscarriage of pregnancy there was noted more evident lowering of initially high concentrations of adhesion molecules in their plasma (Table 1). So, by the 38th week of pregnancy in the second group of observation the levels of P-selectin and PECAM-1 lowered more evidently (by 15.6% and 16.3% respectively) and reached the control values.

Blood of women with habitual miscarriage of pregnancy at the beginning of the third term was noted to have imbalance of arachidonic acid metabolites: the level of thromboxane B₂ in their plasma turned out to be higher in comparison with the control level nearly by 25.0%, whereas the level of 6-keto-prostaglandin F_{1α} decreased nearly by 20.0% (Table 1). At the same time, they were noted to have content decrease of the quantity of nitric oxide summary metabolites in plasma nearly by 33.0% in comparison with the control values.

Table 1: The dynamics of hematological indices of the examined pregnant women with habitual miscarriage of pregnancy in the third term who wore medicinal-prophylactic trousers

Parameters	Pregnant women with habitual miscarriage				Control, n=34, M±m
	Traditional treatment		additional wearing of medical and preventive pants		
	28weeksofpregnancy, n=42	38weeks of pregnancy, n=30	28weeksofpregnancy, n=44	38weeksofpregnancy, n=44	
Acylhydroperoxides of plasma, D ₂₃₃ /l ml	2.56±0.57 p<0.01	2.21±0.49 p ₁ <0.05 p ₂ <0.05	2.52±0.39 p<0.01	1.96±0.34 p ₁ <0.01	1.82±0.27
Thiobarbituric acid-products of plasma, umol/l	4.67±0.50 p<0.01	3.92±0.45 p ₁ <0.01 p ₂ <0.05	4.72±0.54 p<0.01	3.45±0.41 p ₁ <0.01	3.37±0.32
Antioxidant activity of plasma, %	24.0±0.48 p<0.01	29.2±0.36 p ₁ <0.05 p ₂ <0.05	23.7±0.42 p<0.01	34.0±0.38 p ₁ <0.01	34.7±0.45
P-selectin, ng/ml	123.6±0.45 p<0.01	112.5±0.52 p ₁ <0.05 p ₂ <0.05	124.6±0.59 p<0.01	105.1±0.41 p ₁ <0.01	103.2±0.48
PECAM-1, ng/ml	60.2±0.32 p<0.01	56.0±0.29 p ₂ <0.05	61.3±0.28 p<0.01	51.3±0.24 p ₁ <0.01	49.8±0.34
thromboxanB ₂ , pg / ml	212.4±0.55 p<0,01	186.0±0.62 p ₁ <0.05 p ₂ <0.05	220.6±0.49 p<0.01	168.9±0.57 p ₁ <0.01	169.9±0.66
6-keto-prostaglandin F _{1α} , pg / ml	83.7±0.35 p<0.01	90.2±0.36 p ₁ <0.05 p ₂ <0,05	81.8±0.25 p<0.05	99.0±0.36 p ₁ <0.05	99.2±0.49
nitric oxide's metabolites, umol/l	29.9±0.19 p<0.01	33.4±0.30 p ₁ <0.05 p ₂ <0,05	29.0±0.31 p<0.01	38.1±0.29 p ₁ <0.01	38.6±0.35

Conventional signs: p – signification of initial parameters' differences in groups of observation and control group; p₁ – signification of accountable indices' dynamics in groups of observation; p₂ – signification of results' differences of correction impact in groups of observation and values of control group.

Plasma of women with habitual miscarriage of pregnancy who daily wore MPT, by the end of observation was noted to have leveling of initially existing imbalance of arachidonic acid metabolites. By the 38th week of pregnancy the level of thromboxane B₂ in their plasma fell by 30.6% and the level of 6-keto-prostaglandin F_{1α} rose by 21.0%, having reached the control level in both cases (Table 1). By the end of

observation it was accompanied by content rise of nitric oxide summary metabolites in their plasma by 31.4%. Given indices didn't reach the control values in pregnant women receiving only traditional saving pregnancy therapy.

DISCUSSION

Modern women still have a very common habit of miscarriage. Currently, medicine recognizes the polyethiologic status of this condition, which indicates the need to search for and analyze in detail the pathogenetic mechanisms for the realization of different etiological factors. Recently, many researchers are inclined to believe that the important role in the development of habitual miscarriage of pregnancy is played by violations of humoral influences on the body of women, including those affecting the components of hemostasis [30].

It is clear that presence of these changes at habitual miscarriage of pregnancy worsens metabolism and circulation processes in the womb thus weakening trophism of placenta and fetus [31,32]. The basis of these disorders is the deterioration of the course of membrane processes in blood cells and vessel walls [33]. Of great importance in this is the weakening of the antioxidant defense of the organism with the increase in the intensity of LPO in plasma and its cells. It is the free radicals that greatly disturb the functioning of all cell membranes and the metabolism through them.

Important concentrations of cellular adhesion molecules P-selectin and RESAM-1 are considered to be markers of changes in cellular interactions in the blood. It is recognized that fluctuations in the levels of P-selectin and RESAM-1 concentrations are associated with changes in the ability of blood cells to aggregate and disaggregate. Their increased concentrations in the examined women indicate an excessive level of their expression and thus a high potential of platelet and endothelium interaction in the habitual miscarriage of pregnancy [34,35,36].

Modern medicine and rehabilitation are increasingly beginning to seek new forms of recovery [37,38], including pregnant women [39]. Application of medicinal-prophylactic clothes [40,41] is one of new rehabilitation variants. The design of these clothes is conducted with the account of last achievements of physiological science [42]. Because of wide prevalence of habitual miscarriage of pregnancy, designing of MPT for pregnant women with this pathology acquires great signification. But additional researches are needed for final clarification of all the aspects of MPT positive impact on a body against the background of maintaining pregnancy therapy. It was begun in the present research.

The daily wearing of MPT in the third trimester of pregnancy by women diagnosed with her habitual miscarriage showed their potentiating effect on the traditionally held pregnancy-preserving treatment. So, at the absence of MPT wearing planned delivery was possible in this category of women only in 71.4% of cases. But in case of their wearing the efficiency of such treatment reached 100% what underlined high rehabilitating potential of MPT. It is evident that reached results are conditioned by specific impact of MPT which is mostly based on eliminating of trophic disturbances on behalf indices' humoral regulation improvement.

It was found out in our research that LPO intensity in blood plasma in the third term of pregnant women with habitual miscarriage of pregnancy was lowered more evidently at daily MPT wearing. Thus, it improved functioning of their internals. At the same time, weakening of LPO activity in platelets' membranes provided activity optimization of enzymatic systems of cells of blood and vessels and receptors on their surface. Decrease in the plasma level of P-selectin and RESAM-1, detected in pregnant women of the second observation group, who daily worn LPB, contributed significantly to the improvement of the functioning of hemostasis and blood rheology. This minimized the risk of episodes of blocking the capillary bed and formed optimal conditions for metabolism in tissues [43,44].

In the result of constant MPT wearing the synthesis of biologically active substances, balanced in vascular wall of women with habitual miscarriage of pregnancy in the third pregnancy term. It was established that the level of thromboxane A₂ fell in blood of these women against the background of daily MPT wearing. It was pointed by level lowering of its inactive form – thromboxane B₂ – in blood. It was accompanied in them by plasma concentration rise of its physiological antagonist – prostacyclin what promoted balance restoration of arachidonic acid metabolites' activity in their blood. Vessels' disaggregative properties strengthened in

wearing MPT women on behalf of NO growth in their blood. Evidently, it was provided by activation of endothelial NO-synthase synthesis in the result of LPO processes' suppression in plasma [41]. Given situation minimized erythrocytes' microrheological disturbances what led to the improvement of microcirculation processes and strengthened trophism including womb vascular walls, thus, forming conditions for carrying a baby to full term [42].

It can be argued that the use of MPT in women with habitual miscarriage in the third trimester of pregnancy enhances the effect of pregnancy-preserving treatment by significantly weakening the processes of LPO in the body, thereby strengthening the metabolic processes. The improvement in the rheological properties of blood in the capillaries is the basis for the recovery of the woman and the provision of a functionally beneficial situation in her body [46,47].

CONCLUSION

An important and hard-to-solve problem of modernity is the persistence of a high incidence of habitual miscarriage in developed countries. Sufficiently greater importance in the formation of this condition is the violation of humoral influences, causing deterioration of metabolic processes in the uterus of a pregnant woman. They cause worsening of metabolic processes in the womb of the pregnant woman. Taking into account the high degree of readiness of pharmacological treatment of habitual miscarriage of pregnancy, it seemed to be very significant to conduct the search of non-pharmacological impact on a woman's body able to potentiate pharmacological therapy in the third term of pregnancy. Daily wearing of medicinal-prophylactic trousers from the 28th week till the 38th week of pregnancy was accompanied in all the cases by maintenance of pregnancy till planned delivery. Received results allowed considering wearing of medicinal-prophylactic trousers to be an important and effective component of treatment maintaining pregnancy in its third term in women with habitual miscarriage of pregnancy, and give possibility to recommend their application as widely as possible.

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