# Ozonetherapy in Complex Treatment of Obese Pregnant Women

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## Abstract

Obesity is known to cause multiple complications in the course of pregnancy and labor activity. Conventional preventive methods do not seem to provide the expectant efficiency.

118 pregnant women with various stage of alimentary obesity were examined. The first group (71 patient) received ozonetherapy, as a part of a complex treatment, in the form of intravenous infusions of ozonated saline (ozone concentration in ozone-oxygen mixture -- 400 mcg/l) daily for 5 days. The second group (47 patients) was on conventional treatment. In the first group there were registered an increase in the activity of antioxidative enzymes as well as a decrease in the total serum lipids, normalization of blood coagulation in women with hypercoagulation. On comparing the course of pregnancy and labor activity in the two groups of patients an evident positive clinical effect of ozonetherapy was elicited. Ozone-treated patients had lower rates of gestosis, premature delivery, prolonged gestation, powerless labor activity.

Thus, the received data let us consider ozonetherapy as a promising preventive method in a combined treatment of patients with the excess of the body weight.

## Introduction

The incidence of obesity in the structure of general morbidity is known to be high and to range within 15%-45%. Of serious concern is the extension of this pathology among people of the most active age and its increasing «rejuvenation»(1,2,4,9). The results of numerous studied done lately (10,11,12,14) confirm the fact that gestation process and labor in women with the excess of body weight are complicated more often compared to women with normal weight. In this connection obese pregnant women are referred to a group of high risk of obstetrical and perinatal complications. The available conventional preventive measures do not seem to be effective. Thus, a search for new methods of effective pregnancy, labor and postnatal period management in obese women keeps being an actual problem of today.

The aim of the study is to estimate ozone effect on the course of pregnancy, labor and postnatal period in women with exogenetic constitutional obesity and to work out recommendations and methods of ozone use to increase the efficiency in preventing complications of gestational process in women with the excess of the body weight.

## Material and Methods.

There have been examined 118 pregnant women with exogenetic constitutional obesity. 71 patients received complex treatment combined with medical ozone, 47 were on conventional therapy of gendevitum, ascorbic acid, folic acid, B6 vitamin, calcium pangamat, metionin. According to the stage of obesity all patients were divided into three groups. The first group comprised 42 women with mild form of the disease. The second group consisted of 44 women with II stage obesity. The third group was made up of 32 women with the obesity of III –IV stage.

Each group according to the method of treatment was subdivided into the trial (with ozonetherapy) and control (conventional therapy) subgroups.

The stage of the disease was determined by Obesity Table according to the height, body weight, age and the term of gestational development (9). To exclude patients with secondary forms of obesity (endocrinal and hypothalamic ones) the women were examined by endocrinologist and neurologist.

Along with the clinical analysis of the gestational course and postnatal period we studied a number of biochemical indices and homeostatic parameters. The assessment of lipid peroxidation (LP) and antioxidant system (AOS) was done by the intensity of induced chemoluminescence (ICL) and the level of LP molecular products – dien conjugates (DC) and Shiff bases (SB) in blood serum. DC contents were estimated by UV spectrum of lipid solution consumption in methanol-hexane with wavelength of 233nm with the use of СФ-26 spectrophotometer ("ЛОМО"). SB were assessed by D.Fletcher fluorimetric method with excitation wave of 365 nm and emission wave of 420 nm with the use of «Флуориметр АСО-1" device. ICL was registered by biochemoluminometer БХЛ-06.

To analyze lipid spectrum total cholesterol in blood serum was determined by Ilk (To analyze lipid spectrum total cholesterol in blood serum was determined by Ilk (Ильк) method, the contents of β-lipoproteins fraction was calculated by Burshtein-Samai (Бурштейн и Самай) method, the level of triglycerides – by Gottfried and Rosenberg method, modified by N.Aslanyan (Н. Асланян), and α-cholesterol – by A.Maddison method. The condition of blood coagulation system was examined by coagulograms and Thrombocytes aggregation index (TAI).

Radioimmunological method was used to study the contents of placental hormones with the use of СТЕРОН-Е3-125, РИО-ПЛ-125 sets (Belorussia).

Ultrasonic photometry and placentometry, as well as dopplerometric examination of bloodflow in uterine and umbilical arteries followed by calculation of systole-diastolic ratio (CDR) and resistance index (RI) were done with the use of «Sim - 5000 plus» equipment (Russia-Italy).

The received digital data were calculated by variational statistics and correlation analysis method using Microsoft Excel IBM PC/AT.

## Results and Discussion

Ozonetherapy was included into the preventive course for obese pregnant women in the period of 24-26 weeks of pregnancy. Ozone was used in a form of ozonated saline infusions done once a day for 5 days. Medical ozone was produced by 15-minutes barbotage of 200ml of sterile saline (9%NaCl) with ozone/oxygen mixture, ozone concentration being 400mcg/l. Medical oxygen, released from a gas-container, was delivered into the ozonator at a rate of 1l/min. To exclude false positive effect of ozonetherapy the women of the clinical trial did not receive medications with evident antioxidant effect (Vitamin C, vitamin B, gendevitum).

Analyzing the further gestational process we could establish that the use of ozonetherapy in patients with II-IV obesity makes it possible to abate the risk of late gestosis development and, primarily, of its severe forms. This pathology was registered 1.4 times less often among the patients of the second group treated with ozone than in the control group. Among the women undergoing the course of ozonetherapy there were no cases of severe form of the disease, moderate gestosis occurred in fewer cases (2.2 times less often) compared to the group of women receiving conventional treatment. ($p < 0,05$). Considering ozonetherapy influence on the possible risk of premature labor we found this complication to be more common in the control group of women with I-II obesity, treated without ozone (as much as1.5 times). The incidence of prolonged pregnancy in the control group was 1.7 times higher compared to the women of clinical trial ($p < 0,05$).

The process of labor activity demonstrated that among the patients of the three groups receiving ozonetherapy, the weakness of labor activity occurred less often (1.6-1.7 times less) compared to that in the control subgroups ($p < 0,05$). We came to the conclusion, that ozone can improve hemodynamics condition and enhance the intensity of oxidation-reduction processes in tissues, as well as to stimulate FPC hormonal function, thus, increasing energetic potential of myometrium and producing a positive effect on uterine contraction. Special attention should be drawn to the fact there were fewer cases of bleeding during the third labor -- and postnatal periods in women with II obesity, treated with ozone (1.5 times less). Cesarean operations were done 2.1 times less often in the first and second ozone subgroups, than in control ones.

Ozonetherapy was not found to have any influence on macrofetal development in women with any grade of obesity. But it helped to significantly decrease the risk of retarded intrauterine fetus development. 13% of patients that were on conventional therapy were found to have fetal hypotrophy, while among ozone-treated patients this pathology was not revealed.

In the third group of patients treated with medical ozone during the preventive course, ozone effect appeared to be less pronounced.

Analysis of adaptation period provided profound evidences of marked impairments in new-borns from mothers being on conventional treatment (perinatal encephalopathy of hypoxic genesis, respiratory syndrome).

In order to reveal ozone pathogenic mechanisms, we studied ozonetherapy effect on LP and AOS condition, lipid metabolism, FPC hormone-producing function, coagulation system and utero-feto-placental bloodflow in patients with the excess of the body weight.

Metabolic changes that are common in obesity are known to create favourable conditions for LP activation (7,8). It is connected with increased contents of lipids, LP substrates, in blood and with the decreased level of oxidation-reduction processes in the body. As a result, the disorders of free radicals reactions become involved into the pathogenesis of the majority of complications in the course of pregnancy and labor activity. In clinical conditions we could establish, that after insignificant activation of LP processes due to first ozonetherapeutic procedures on the third day of treatment there appears a valid decrease of DC and SB levels with simultaneous elevation of AODS activity, revealed by increase of Imax/S values according to biochemoluminescence analysis. Optimal correlation of these parameters is observed on the fifth day of ozonetherapy. Further observations revealed the decrease in DC contents, initially increased in women with I-grade (1.7 times) and II-grade (1.8times) of obesity by the end of the treatment, making up 0,35 ± 0,09 and0, 41 ± 0,06 units of relative density/mg of total lipids ($p < 0,05$). Ozonetherapy was also found to induce 40 - 42% decrease in the SB concentrations in patients with I-II obesity ($p< 0,05$).

Evaluation of changes in the lipid spectrum brought forward hyperlipoproteidemy of II and IV types. After the course of ozonetherapy the patients with I-II -obesity exhibited the tendency to decreasing TG levels, the most pronounced difference in the contents of this lipid fraction being marked in the cases with initial hypertriglyceridemia. TG concentration had a valid decrease by 21-27% on the average.

Similar effect of ozonetherapy was received in re-evaluation of total cholesterol and β-lipoproteins contents in the blood of patients with I-II-obesity (decrease by13% and 17.6%, respectively). Ozonetherapy was found to have a less marked effect in patients of the third group compared with the first and the second groups. However, the contents of total cholesterol in patients with initially increased levels of the fraction appeared to be decreased by 8%.

To study the effect of ozonetherapy on the state of blood coagulation system in obese pregnant women analysis of coagulogram and thrombocytes aggregation index (TAI). The most distinct ozone effect was evinced in the second group of patients, for in the first group the parameters of blood coagulation were initially changed in a small number of patients. In patients with obesity of the II grade we registered valid increase in the parameters of activated time of recalcification (ATR) and partially activated thromboplastin time (PATT). With increased contents of fibrinogen in blood, its concentration decreased by 26% ($p < 0,05$), reaching the normal range. According to our findings, medical ozone did not produce any effect on a number of thrombocytes, but diminished their aggregational activity. Ozonetherapy was also found to activate fibrinolysis and to reinforce the activity of antitrombinIII-heparin complex.

The assessment of estriol and placental lactogen in peripheral blood, analysis of dopplerometric indices of the bloodflow in uterine and umbilical arteries helped to reveal favourable effect of ozonetherapy on the state of uteroplacental circulation and FPC hormone-producing function in pregnant women with obesity.

It should be noted, that conventional therapy did not produce any significant effect on the course of gestational process and actually did not conduce to improvement of the studied biochemical parameters.

## Conclusion

In the course of clinical trial we have established direct correlation between the index of thrombocytes aggregational activity, level of total lipids in blood and DC and SB concentrations. It confirmed the idea of hyperlipidemia and increased contents of LP products being able to activate blood coagulation processes in obese patients and to deteriorate central and peripheral circulation, the mechanisms responsible for dysfunction of fetoplacental complex.

Thus, the clinical trial has demonstrated positive ozone effect on the clinical course of pregnancy, labor, postnatal period and the condition of new-borns of women with the excess of the body weight. It can be explained by favourable effect of ozonetherapy on LP processes, AODS activity, lipid metabolism, blood coagulation system, utero-feto-placental circulation and FPC hormone-producing function. The received findings provide profound evidences to recommend medical ozone to be used in the combined preventive treatment of pregnant women with exogenic constitutional obesity.

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