OXIDATIVE STRESS IN THE DEVELOPMENT OF POSTPARTUM ENDOMETRITIS AND ITS PROGNOSTIC SIGNIFICANCE

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Abstract. The development of postpartum endometritis is characterized by an aggravated obstetric-gynecological, somatic, and social history, as well as a postpartum history with high levels of proinflammatory markers. The quality of the predictive ability of the models was assessed using the Nagelkerke determination coefficient R^2. R^2 for an increase in MDA concentration is 85.67%; and for a decrease in AOS activity, it is 93.52%, which proves the higher prognostic significance of the obtained regression models.

Key words: endometritis, postpartum period, lipid peroxidation, antioxidant system, systemic inflammation, postpartum sepsis, malondialdehyde.

Relevance of the study. Postpartum endometritis (PE) is the most common maternal infection of the postpartum period, occurring after 1–3% of vaginal deliveries and in 27% of cesarean sections (CS), which is of great concern [3,4,5]. Despite medical advances and a downward trend, it often leads to prolonged hospitalization and rehospitalization, especially in developed countries. Moreover, among deaths associated with postpartum sepsis, postpartum endometritis is the most common cause of death in the first 3–7 days after delivery [6]. Caesarean section is associated with a 5–10-fold increase in the incidence of postpartum infections and endometritis compared to vaginal delivery [6]. Moreover, the incidence of postpartum endometritis is approximately ten times higher with cesarean section performed after the onset of labor than with planned [6]. To reduce obstetric complications, the caesarean section rate recommended by WHO should not exceed 15–30% of the total number of births.

However, the informative value of clinical blood tests is limited, and changes characteristic of the inflammatory process are detected in no more than 60% of women in labor with endometritis [2]. Furthermore, the content of leukocytes and neutrophils, as predictors of postpartum endometritis in women in labor, does not have clinical or

prognostic value and can only serve as a screening test to exclude purulent-inflammatory diseases in women in labor [1].

In this regard, the search for predictors of the development of postpartum endometritis is relevant and the goal of our study: to study the prognostic significance of lipid peroxidation and the activity of the antioxidant system of the blood in the early postpartum period in the development of postpartum endometritis.

Materials and Methods: The study included 66 women in labor with postpartum endometritis of varying severity: 23 with mild endometritis, 22 with moderate endometritis, and 21 with severe endometritis. The control (comparison) group consisted of 23 women in labor with a physiological postpartum period. In all women in labor, lipid peroxidation levels and AOS enzyme activity were assessed on the third day after delivery.

Statistical analysis was performed using SPSS (IBM, version 21). Results are presented as the mean (M), variance (õ), and standard deviation (± m); median (25% lower quartile – 75% upper quartile). The assumption of normal distribution was verified using the Shapiro-Wilk test ($\alpha = 0.05$). The level of the end product of lipid peroxidation in cell membranes, malondialdehyde (MDA), in the blood plasma of women in labor with endometritis was statistically significantly higher than the corresponding control values and progressively increased in women with more severe cases.

Post-hoc comparisons of mean group MDA levels using Tukey's method showed that statistically significant differences in the analysis of variance were associated with differences in mean MDA values across all three groups.

The MDA concentration in moderate PE was 1.12 μmol/L ($p \leq 0.001$) higher than in mild PE; in severe PE, this difference was 4.70 μmol/L ($p \leq 0.001$); and the difference between mild PE and the control group was 0.55 μmol/L ($p \leq 0.001$); between moderate PE and the control group, 1.67 μmol/L ($p \leq 0.001$); and between severe PE and the control group, 5.24 μmol/L ($p \leq 0.001$).

An assessment of antioxidant activity (AOA) showed the opposite trend: with increasing PE severity, total AOA activity significantly decreased.

Post-hoc comparisons of mean group AOA activity indices using the Tukey-Kramer method in ANOVA analysis showed that statistically significant differences in the analysis of variance were associated with differences in mean AOA values in the comparison groups. The difference between the critical mean and mean group AOA activity (in %) in the comparison groups demonstrated a decrease in AOA with

increasing PE severity. The critical mean was the AOA value in % in group 4 – severe PE, with the difference between the critical mean and mean group AOA activity in women in labor without PE and with a severe course (X1 – X4) equaling -26.13 AOA units; with a moderate to severe course (X2 – X4) – 22.74 AOA units; the corresponding difference between a moderate to severe course is 13.46 AOA units, etc.

Discussion. Elevated free radical concentrations and reduced antioxidant capacity lead to oxidative stress. The development of oxidative stress may be one link in the chain of events leading to endometritis. Redox potential levels can modulate the severity and dynamics of endometritis, as well as disease progression. Biomarkers are associated with oxidative stress levels and endometritis severity.

Our results show a significant increase in lipid peroxidation and a significant decrease in antioxidant status in women with postpartum endometritis compared to the control group. This imbalance leads to a significant increase in the oxidative stress index in women with postpartum endometritis.

Conclusion. The development of postpartum endometritis is characterized by a complicated obstetric-gynecological, somatic, and social history, as well as a postpartum history with high levels of proinflammatory markers. The developed method for predicting the development of postpartum endometritis allows for the preclinical identification of women at high risk for endometritis in a maternity hospital, preventing the development of severe purulent-septic complications after childbirth, and serves as a measure to reduce maternal mortality.

Biochemical studies with determination of MDA and AOA in blood serum are useful as diagnostic methods for determining the risk of postpartum endometritis, significantly narrowing the range of studies and allowing to assess the risk of endometritis with high diagnostic accuracy using a limited range of studies.

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