Ischemia-modified albumin as an oxidative stress biomarker in preterm prelabor rupture of membranes

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Objective

Preterm prelabor rupture of membranes (PPROM), which still represents a serious problem of current perinatology, is responsible for approximately 3 and 30% of all and preterm deliveries, respectively. Recent studies have reported a potential pathophysiology for PPROM characterized by oxidative stress-induced premature senescence (aging) of fetal membranes. Ischemia-modified albumin (IMA) is a biochemical marker for the early diagnosis of myocardial ischemic events and cerebrovascular accidents. It is produced when hypoxia, acidosis or ischemia leads to a change on some region of human serum albumin, causing it to temporarily bind to transitional metals, such as cobalt, nickel and copper. The ischemia-reperfusion events trigger biochemical environmental changes globally known as ‘‘oxidative stress’’, defined as an imbalance between pro-oxidant and antioxidant substances, resulting from either increased production of oxidants or decreased antioxidant properties, or a combination of both. Increased IMA serum levels have been detected in patients with pre-eclampsia or fetal growth restriction (FGR) as a consequence of defective trophoblast invasion. Different markers of oxidative stress have been considered in the pathogenesis of PPROM, suggesting that reactive oxygen species (ROS) could play a role. The aim of this study was to examine the initial maternal serum IMA concentration as a biomarker of oxidative stress in pregnancies with PPROM and compare the results with healthy controls.

Methods

The current study was conducted at Yuzuncu Yıl University Faculty of Medicine, Department of Obstetrics and Gynecology clinic between November 2015 and October 2016. This descriptive cohort study consisted of forty pregnancies complicated by PPROM and 49 gestational age-matched healthy pregnancies in the third trimester of gestation. Maternal serum samples were obtained at the day of diagnosis and IMA levels were measured by using Albumin Cobalt Binding test. The absorbance of samples was measured at 470 nm using a spectrophotometer. Results were expressed in absorbance units (ABSU). The patients were followed till delivery and perinatal outcomes were recorded.

Results

There were no differences between the groups regarding maternal age, gravidity, parity, BMI and gestational age at sampling. The initial maternal C - reactive protein (CRP) and white blood cell count (WBC) values were similar between the groups. The gestational age at delivery, birthweight and Apgar scores of the study group were significantly lower in the study group compared to the control group (p: 0.001). PPROM pregnancies had higher maternal serum IMA concentrations (0.54±0.29 ABSU vs. 0.56±0.51 ABSU) than healthy controls at the time of first diagnosis (p: 0.020). The maternal serum IMA concentrations were negatively correlated with gestational age at delivery (r: -0.248, p: 0.019) and birthweight (r: -0.247, p: 0.020).

Conclusion

The present study demonstrated that the initial maternal serum IMA concentration which is an oxidative stress biomarker was increased in pregnancies complicated by PPROM in the third trimester of gestation. Also, the maternal serum IMA concentrations were negatively correlated with ongoing pregnancy outcomes like gestational age at delivery and birthweight. The current data further support the hypothesis that the development of PPROM is associated with systemic oxidative stress and it is not only a local phenomenon. The results of this study require further validation and confirmation with larger cohort studies.