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Short Report

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Oxidative Stress in Mothers and Their Newborns in Different Types of Labour

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Labour is a very stressful process both for mothers and their babies due to various factors such as pain, fear, anxiety and hypoxia (1). These factors also lead to significant oxidative stress and high production of free radicals which are involved in the pathogenesis of various diseases (2) .

The most important end-products of free radical reactions are malondialdehyde (MDA), one of the aldehyde products of lipid peroxidation and conjugated dienes (CD). Recognition of lipid peroxidation involvement in the pathogenesis of a disease is important, because the deleterious effects of this process might be prevented by administration of scavenging systems or antioxidants (3).

In healthy subjects, there is a balance between oxygen-derived free radical production and their removal by antioxidants. During labour, this balance may be impaired due to the above mentioned factors. However, the degree of impairment may vary from labour to labour. Therefore, we believe that it is mandatory to determine the type of labour with the least oxidative stress.

For this reason, we compared three types of delivery (vaginal, caesarean, and delivery under regional analgesia) in respect to oxidative stress both for mothers and their newborns.

For this purpose, 60 mothers and their 60 newborns were included in the study. The cases were divided into three groups according to the type of labour as follows:

1- Vaginal delivery (VD) group: 20 mothers 20-36 years old and their 20 newborns.

2- Regional (epidural) analgesia (RA) group: 20 mothers 20-36 years old and their 20 newborns.

3- General analgesia (GA) group: 20 mothers 21-29 years old and their 20 newborns.

Only mothers who gave birth at term (duration of gestation 38-42 weeks) were included in the first group. All mothers were healthy and had no obstetrical complications. Primiparous pregnant women and those with complicated labour were not included in the study.

Only mothers who gave birth by caesarean section under elective conditions and had no gestational disease were included in the second and third groups.

Mothers who gave birth under emergency conditions and with complications were not included in the study. Operative delivery was effected at the discretion of the attending obstetricians. As an anaesthetic agent, propofol (2 mg/kg) and succinylcholine (1 mg/kg) were used in the general analgesia group. In addition, they were intubated with 100% oxygen.

5 millilitres (25 mg) of bupivakain was used via an epidural catheter in the regional analgesia group.

A total of 5 ml of umbilical cord arterial blood from the newborns and 5 ml of venous blood from their mothers were collected at birth and malondialdehyde (MDA) levels of the samples were measured by Draper and Hadley's method (4) based on tiobarbituric acid

(TBA) reactivity. MDA, an end-product of fatty acid peroxidation, reacts with TBA to form a coloured complex that has maximum absorbance at 532 nm. Statistical calculations were carried out with SPSS for Windows 8.0 version.

The MDA levels of the mothers and their newborns are presented in Table. The MDA levels of the newborns in all groups were significantly lower than those of their mothers. The highest MDA levels of the mothers were in the GA group, whereas the lowest levels were in the RA group and the difference was statistically significant ($p < 0.05$). The MDA levels of the newborns were highest in the VD group and lowest in the RA group with a statistically significant difference ($p < 0.05$).

Our results showed that the mothers in the GA group were under the highest and the mothers in the RA group were under the lowest influence of oxidative stress.

We believe that the main source of high level of MDA in the GB group is hyperoxygenation, because in that group 100% oxygen was used for ventilation. Similar findings in the literature support this view (5). In addition, general anaesthesia is kept superficial to prevent neonatal depression which results in pain and stress in mothers. Thus, more cathecolamins are released as a result of superficial stress, which might lead to increased lipid peroxidation.

On the other hand, in the VD group the main source of oxidative stress in mothers is pain. Fear and anxiety are additional factors.

We found the lowest MDA levels of the mothers in the RA group. In these cases, pain is removed by local analgesia without affecting the consciousness of the patient and no oxygen is used. Thus, both physiological stress and oxygen pressure are lowest in this group, which results in the lowest MDA levels.

In our study, the lowest oxidative stress was found in the newborns of the RA group and the highest was in the VD group. During vaginal birth, prostaglandins and thromboxans are released to induce labour. It is known that the synthesis of these products increases lipid peroxidation (6). Since MDA was reported to pass from the placenta to fetal circulation, increased MDA production in the mother causes high levels of MDA in newborns (1). In addition, the pain and stress of mothers due to lack of anesthesia results in higher production of MDA. Thus, the determination of free radical products or antioxidant activity in such cases is thought to be beneficial either to show tissue damage or to decide on prophylaxis. Our results are consistent with those of other investigators (7).

On the other hand, increased lipid peroxidation in cord blood was regarded as a sign of intrauterine hypoxia, which may result from delayed labour (8). In addition, trauma due to delayed labour, manual pressure to simplify labour, narrowness of birth ways or abnormalities in the birth process are other additional causes of increased lipid peroxidation in this type of labour.

The MDA levels of the newborns in all our groups were significantly lower than those of their mothers. This might be due to high levels of bilirubin, which is a significant antioxidant. The young age of the newborns is another factor.

It has been reported that measurement of the antioxidant capacity of newborns is necessary for preventing them from any free radical damage and to choose the correct prophylaxis (9).

In conclusion, our results show that the lowest oxidative stress, both for mothers and their newborns, was in the group who gave birth under regional (epidural) analgesia.

Table. MDA levels of the mothers and their newborns (X ± SD).

Group	n	MDA-M (nmol/ml)	MDA-N (nmol/ml)	t	P
VD	20	5.66 ± 0.90	2.50 ± 0.42	14.715	< 0.0001
GA	20	5.99 ± 1.50	2.18 ± 0.57	10.739	< 0.0001
RA	20	4.85 ± 1.50	2.04 ±0.55	8.015	< 0.0001
Total	60	5.50 ±1.36	2.24 ±0.54	13. 98	< 0.001

M: Mothers N: Newborns

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