Acta Scientific Women's Health (ISSN: 2582-3205)

Volume 4 Issue 10 October 2022

Short Communication

Fetal Hypoxia: Why Intrauterine Ventilation of Lungs Seems Like a Bad Idea Today

Aleksandr L Urakov[1]*, Natalya A Urakova[2] and Anastasia P Stolyarenko[3]

[1]Professor, Head of the Department of General and Clinical Pharmacology, Izhevsk State Medical Academy, Izhevsk, Russia

[2]Associate Professor of the Department of Obstetrics and Gynecology, Izhevsk State Medical Academy, Izhevsk, Russia

[3]Student of Izhevsk State Medical Academy, Izhevsk, Russia

***Corresponding Author:** Aleksandr L Urakov, Professor, Head of the Department of General and Clinical Pharmacology, Izhevsk State Medical Academy, Izhevsk, Russia.

DOI: 10.31080/ASWH.2022.04.0427

Received: August 26, 2022

Published: September 05, 2022

Fetal hypoxia during delivery is one of the most likely causes of brain cell damage, resulting in infantile cerebral palsy (ICP), encephalopathy and mental retardation [1,2]. Fetal hypoxia has been shown to occur most frequently in children subjected to surgical delivery (15-20%) and when physiological birth is prolonged beyond 12 hours in both cephalic and breech fetuses [2]. Typically, birth asphyxia develops in the first or second period of birth [3]. In severe cases, the diagnosis of neonatal asphyxia is made after birth only.

Unfortunately, there is still no reliable way to diagnose birth asphyxia in a timely manner. Therefore, the diagnosis of birth asphyxia is made too late. The fact is that the diagnosis of birth asphyxia is established in the presence of severe metabolic acidosis in the umbilical cord blood, a low Apgar score and symptoms of brain cell damage. But, as a rule, all these indicators are in the hands of obstetricians only after the fetus emerges from the birth canal, that is, after the fetus is born and the fetus starts ventilating of his lungs. Moreover, all these indicators appear with hypoxic damage of only a very large number of fetal brain cells and often only after the process of hypoxic cell damage has become irreversible.

The causes of a significant decrease in fetal oxygen delivery have been shown to be umbilical cord compression, premature placental detachment or uterine rupture. It is generally accepted to diagnose the sudden development of acute intrauterine hypoxia in cases where the fetal heart rate suddenly decreases against a background of persistent bradycardia. It is believed that it is possible to prevent hypoxic brain damage in these cases only if the fetus can be extracted by emergency Caesarean section within 15-20 minutes after the onset of the acute event [3]. This is why fetal heart rate monitoring has become standard obstetric practice and has remained virtually unchanged since the 1960s [4,5].

Nevertheless, the diagnosis of fetal hypoxia during birth by heart rate dynamics remains a difficult task, and the results are considered by many researchers to be controversial and insufficiently reliable. The fact is that the possibility of preventing fetal asphyxia and its most severe consequence, ICP, using continuous monitoring of fetal heart rate in combination with additional tests has not yet been proved [3,5].

This is why newborns still suffer from asphyxia at birth, which in severe cases leads to hypoxic-ischemic encephalopathy (HIE) and cerebral palsy [5]. In this regard, the prevalence of infantile cerebral palsy is about 0.2% and has remained constant over the past 40 years. Cases with severe congenital asphyxia with multiple organ malformations and signs of hypoxic-ischemic encephalopathy have been shown to have a high mortality rate, and the risk of irreversible brain damage increases by 10-30 times [6]. In this case, the only way to reliably prevent intrauterine fetal hypoxia and eliminate asphyxia of the newborn remains an emergency Caesarean section,

if it is accompanied by good neonatal resuscitation [7]. In parallel, studies are underway to reduce the severity of encephalopathy and the likelihood of cerebral palsy using artificial cerebral hypothermia in infants [8-10].

However, this method is also used untimely in obstetric practice, namely, only after the fetal head emerges from the birth canal to the outside. Because of the late application, local hypothermia of the fetal head cannot be highly effective.

Thus, despite the fact that Caesarean section as a method of emergency fetal rescue from death was proposed in 715 BC [11], it remains the only reliable way to eliminate intrauterine fetal hypoxia [12]. In recent years, the use of the obstetrical Stange test has been proposed for the timely use of Caesarean section [13]. This obstetric innovation is based on the possibility of timely assessment of fetal resistance to intrauterine hypoxia by the duration of fetal immobility period during voluntary maternal apnea [14,15].

The resuscitative role of Caesarean section is the urgent removal of the fetus from the amniotic fluid, in which it "drowns" inside the uterine cavity during intrauterine hypoxia [15]. It is not a secret that in such "underwater" position a fetus cannot stay alive without oxygen for a long time: it sinks in amniotic fluid, and its airways fill up with this water as a normal drowned person. That is why, after the fetus is successfully removed from the body of mother by Caesarean section, the same resuscitation measures are taken as for rescuing a normal drowned person from under water, i.e. water is immediately removed from the airways and artificial lung ventilation with air is carried out.

In this connection, it is reasonable to ask whether the life of a fetus "drowning" in amniotic fluid inside the uterine cavity can be extended in the same way as the life of an adult swimmer under water or an astronaut in space is extended, namely by forcing breathing gas with oxygen into the airways? In other words, if the cause of encephalopathy and cerebral palsy is the cessation of oxygen delivery to the fetus with blood through the umbilical cord, then this cause can be eliminated by increasing oxygen delivery to the fetus by means of artificial ventilation of its lungs inside the womb. Previously, it was reported that an intrauterine aqualung and its method of application for intrauterine fetal lung ventilation inside the uterus were developed to solve the above problem [16,17].

However, this idea has not found application in obstetric practice. Most likely, artificial ventilation of fetal lungs inside the uterus will not find a use in the near future, because for forced ventilation it is necessary to supply breathing gas to the airways under different excess pressure due to periods of uterine contraction and relaxation during labor activity. Moreover, during strong labor contractions (during maximum contractile activity of myometrium) the value of excess gas pressure should be maximum, and during the periods between contractions (during relaxation of myometrium) the value of excess pressure should be minimum. Regardless of this, the dynamics of overpressure value of breathing gas must not just be periodically large and small, but in each individual time interval it must be OPTIMAL. Otherwise either the fetal chest will expand excessively due to a ruptured lung and pneumothorax will occur, or the chest will not expand at all, because breathing gas will not fill the airways, the fetal lungs will not expand, and the fetus will be choked by amniotic fluid (drown in it). In both cases the fetal brain will not be supplied with oxygen.

Obviously, this problem can only be solved in the future by using a special system of appropriate sensors monitoring the dynamics of intrapulmonary pressure in the fetus, and a special computer program designed to maintain not only the optimal biomechanics of intrauterine (underwater) ventilation of the fetal lungs, but also to maintain the necessary oxygenation of fetal blood regardless of periods of myometrium contraction and relaxation during labor and fetal movement through the birth canal until the birth of the newborn and the beginning of the natural birth.

At first glance, it seems that the practical implementation of the above method of fetal resuscitation in obstetrics is a science fiction. Nevertheless, scientific and technological progress will sooner or later provide intrauterine fetal blood oxygenation in conditions of cord compression, premature placental detachment and/or uterine rupture, and we will witness this as we witnessed cosmonauts breathing in outer space thanks to the development of appropriate spacecraft and spacesuits for cosmonauts in Russia. By the way, it was Russia that first proposed a revolutionary way to combat hypoxia by injecting "in the right place" an aqueous hydrogen peroxide solution rather than breathing gas [18,19]. The advantage of hydrogen peroxide solution over oxygen gas is obvious: the solution is not compressed and can be delivered directly to the brain.

Bibliography

1. Urakov AL and Urakova NA. "Fetal hypoxia: Temperature value for oxygen exchange, resistance to hypoxic damage, and diagnostics using a thermal imager". *Indian Journal of Obstetrics and Gynecology Research* 7.2 (2020): 232-238.

2. Drazancić A., *et al*. "Povezanost fetalne hipoksije, neonatalne asfiksije i hipoksicko-ishemicke encefalopatije [Relation between fetal hypoxia, neonatal asphyxia and hypoxic-ischemic encephalopathy]". *Jugoslavenska Ginekologija i Perinatologija* 31.3-4 (1991): 72-76.

3. Schneider H. "Geburtsasphyxie - ein immer noch ungelöstes Problem der Perinatalmedizin1 [Birth asphyxia - an unsolved problem of perinatal medicine]". *Zeitschrift fur Geburtshilfe und Neonatologie* 205.6 (2001): 205-212.

4. Palsdottir K., *et al*. "Fósturköfnun og heilakvilli af völdum súrefnisthurrdar--tídni og áhaettuthaettir á medgöngu og í faedingu [Birth asphyxia and hypoxic ischemic encephalopathy, incidence and obstetric risk factors]". *Laeknabladid* 93.9 (2007): 595-601.

5. Borruto F., *et al*. "Prevention of cerebral palsy during labour: role of foetal lactate". *Archives of Gynecology and Obstetrics* 278.1 (2008): 17-22.

6. Schneider H. "Bedeutung der intrapartalen Asphyxie für die Entstehung von kindlichen Hirnschäden [Significance of intrapartum asphyxia for the onset of fetal brain damage]". *Geburtshilfe und Frauenheilkunde* 53.6 (1993): 369-378.

7. Futrakul S., *et al*. "Risk factors for hypoxic-ischemic encephalopathy in asphyxiated newborn infants". *Journal of the Medical Association of Thailand = Chotmaihet Thangphaet* 89.3 (2006): 322-328.

8. Selway LD. "State of the science: hypoxic ischemic encephalopathy and hypothermic intervention for neonates". *Advances in Neonatal Care: Official Journal of the National Association of Neonatal Nurses* 10.2 (2010): 60-68.

9. Higgins RD. "Hypoxic ischemic encephalopathy and hypothermia: a critical look". *Obstetrics and Gynecology* 106.6 (2005): 1385-1387.

10. Shankaran S and Laptook AR. "Hypothermia as a treatment for birth asphyxia". *Clinical Obstetrics and Gynecology* 50.3 (2007): 624-635.

11. Moore MC and Costa CM. "Cesarean section: Understanding and celebrating your baby's birth". In: A Johns Hopkins Press Health Book (2004).

12. Molina G., *et al*. "Relationship between Cesarean delivery rate and maternal and neonatal mortality". *JAMA* 314.21 (2015): 2263-2270.

13. Urakov AL and Urakova NA. "Modified Stage test gives new gynecological criteria and recommendations for choosing caesarean section childbirth". *BioImpacts* 12.5 (2022): 477-478.

14. Urakova NA and Urakov AL. "Low value of apnea-test on fetal survival in intrauterine hypoxia is universal indicator for planned Caesarean section". *Acta Scientific Women's Health* 2.9 (2020): 11-15.

15. Urakov A and Urakova N. "A drowning fetus sends a distress signal, which is an indication for a Caesarean section". *Indian Journal of Obstetrics and Gynecology Research* 7 (2020): 461-466.

16. Urakov A. "Intrauterine lungs ventilation of human fetus as saving his life during hypoxia myfh or reality?" *Journal of Perinatal Medicine* 41 (2013): 476.

17. Urakov AL., *et al*. "New operational technology of intrauterine ventilation the fetus lungs by breathing gas". *AIP Conference Proceedings* 1688 (2015): 070001.

18. Urakov AL. "Lympho-subsitute for local maintaining viability of organs and tissues in hypoxia and ischemia". RU Patent No. 2586292. 10.06 (2016).

19. Urakov AL. "Hydrogen peroxide can replace gaseous oxygen to keep fish in hypoxia". *International Research Journal* 5.59 (2017): 106-108.