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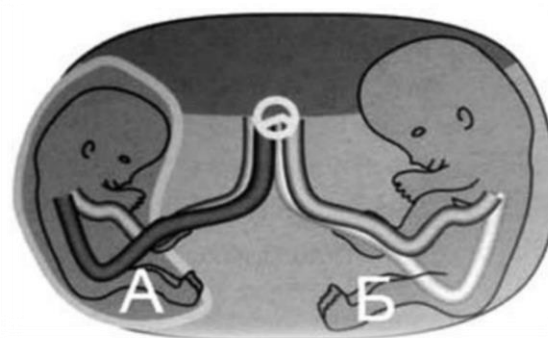
## LASER COAGULATION OF VASCULAR PLACENTAL ANASTOMOSES AT FETAL FATAL TRANSFUSION SYNDROME.

**Abstract.** *The fetal-fetal transfusion syndrome criteria are the difference in body weight of more than 20% and different concentrations of hemoglobin in the fruits. As a result, one fetus from which the blood is pumped becomes a donor of blood, the other - the recipient, as a result of the fetus papiraceus and, conversely, overload of the recipient's circulation (fetus acardiacus). The survival of one and two fruits was 77 and 57% as a result of laser therapy (results of the study Eurofetus). Children who survived newborns after FFTS treatment may have a brain injury in the form of periventricular leukomalacia. The perspective of the development of technologies of laser fetoscopic interventions is, of course, an optimal solution to the problem of FFTS provided early and adequate diagnosis. It makes it possible not only to improve the incidence of the disease among the fruits with monochorial multi-fertility, but also is safe for the mother's health.*

**Key words:** *fetal-fatal transfusion syndrome, multiple pregnancy, monochorous double, fetus-donor, recipient fetus.*

**Introduction.** The fetal-fetal transfusion syndrome (FFTS) is one of the leading places among the most significant complications of multiple pregnancy. The FFTS was first described by Schatz in 1982. Its morphological substrate is an anasthetic vessel between two fetal circulatory systems. Monocular multiproliferation refers to high-risk pregnancy due to the presence of specific complications, based on the presence of vascular placental anastomosis. With monochorous double as a result of uneven distribution of blood between the fruits through arterio-venous anastomosis there is a fetal-fetal transfusion syndrome (FFTS). That is, this is a specific complication that is observed with a monozygotic double with a monochorous type of placentation. Fetal-fetal transfusion syndrome (FFTS) occurs in 5-20% of monochorous pregnancies and leads to significant perinatal mortality and morbidity.

The FFTS criteria are the difference in body weight of more than 20% and different concentrations of hemoglobin in the fruits. One fetus from which the blood is pumped becomes a donor of blood, the other – the recipient, of the fetus papiraceus and, conversely, overload of the recipient's circulation (fetus acardiacus) (Fig. 1).



*Fig. 1 Fetal Syndrome - Fetal Transfusion  
A the fetus is a donor; B fetus is the recipient*

The mechanisms of the SFFT disinfection are to lower the blood pressure of the fetus donor due to the uneven distribution of the joint placenta between the twins, and the placental insufficiency that occurs in the fetus that has gotten a smaller part of it; and in the emergence of a number of symptoms, as for the fetus - the donor, delayed fetal growth, general underdevelopment, anemia; and for the fetus-recipient - an increase in blood pressure, cardiomegaly, hydramnion, hypervolemia, polycythemia.

In the absence of adequate treatment and the detection of signs of this pathology up to 25 weeks in 80% of cases FFTS causes the death of the fruit.

Survival thanks to the method of laser coagulation of vascular anastomoses (FLKAA) is about 53-56% (Sichinova L.G.).

**Aim.** Whether to determine whether laser coagulation of anastomoses is a "gold standard" of FFTS treatment in the European experiment Eurofetus, as it is a highly effective operation for antenatal treatment of FFTS. The survival of one and two fruits was 77 and 57% as a result of laser therapy (results of the study Eurofetus). Children who survived newborns after FFTS treatment may have a brain injury in the form of periventricular leukomalacia.

**Materials and methods.** Patients with monochorous twins, complicated by FFTS, with a pregnancy less than 26 weeks. Before conducting FLC, an ultrasound examination was carried out (Pic. 2, 3) to evaluate the fetometric parameters, to exclude fetal abnormalities, placenta localization, and the number of amniotic fluid, and a dopplerometric study to evaluate hemodynamics in the arteries of the umbilical cord, middle cerebral artery and venous duct of both fruits. Also, the dopplerometric evaluation of hemodynamics of both fruits was carried out before intervention, after 1 hour and the next day.

FLK of the surface anastomoses of the placenta was performed under conditions of long-term epidural anesthesia. An amniotic cavity of the recipient fetus through the anterior abdominal wall under ultrasonic control was performed on an operating tubule with two separate channels for a 1 mm fetoscope and 0.6 mm Nd: YAG diode laser (A.V. Mikhailov, A.N. Romanovsky).

When localization of the placenta on the anterior wall of the uterus, a curved operating



*Pic.2 Monochrome Double*



*Pic. 3 Interstitial vascular Anastomosis*

tube and a flexible fetoscope of the same diameter were used. In some cases, in order to improve the visualization, an amniofusion of warm physiological solution was performed. Surface arterio-venous anastomosis was detected at visual inspection and coagulated. After FLC, an amniocentesis was performed under ultrasound control through an operating tubule until normal indexes of the amniotic index were reached. In the case of a successful outcome of the FLC, the patient was observed outpatient with an interval of 1-2 weeks with the obligatory conduction of ultrasound and dopplerometric study.

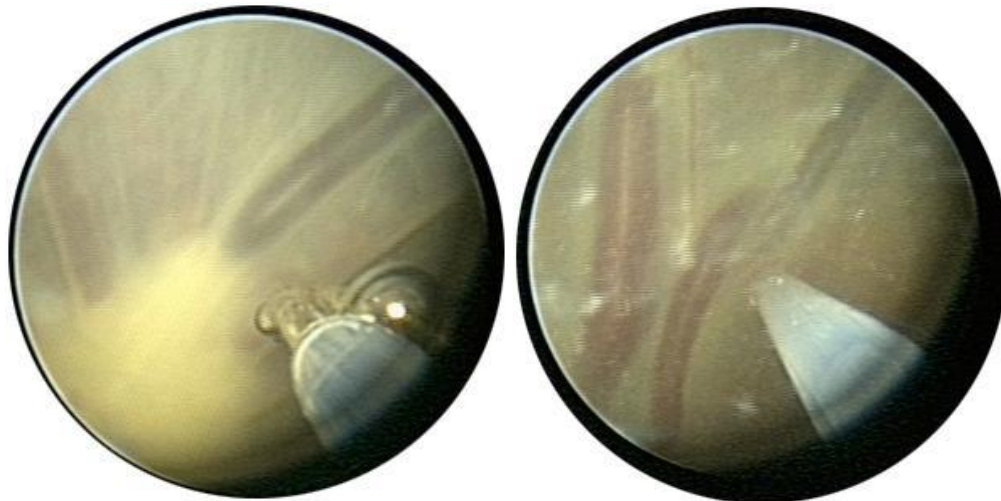
#### **Results of the research and their discussion.**

After laser coagulation of placental anastomoses in the case of FFTS, there is a significant decrease in mean blood pressure, increased cardiac output and systolic volume in the mother. Also, after laser coagulation, possible complications, such as the development of the syndrome TAPS (anemia-polycythemia of twins) to 13%. In such cases, the former recipients after the operation are anemic, and twin twins are polycythemic.

A particularly dangerous situation in the prognostic plan under FFTS is the intrauterine death of one of the fruits observed in monochoric pregnancy in 25% of cases. The main factors influencing the prognosis are the term of pregnancy, which indicates the death of the fetus. If the death of a twin is diagnosed in the first trimester, then more than 90% of the fruits will have a favorable prognosis. If the death of the fetus occurred in the second or third trimesters, then the favorable prognosis for the living fetus will be 50-60%. (Guseva OV) In the case of the

death of one of the fetus, the presence of the circle of blood circulation significantly impairs the livelihoods of another twin. Live fetus begins to shed blood from the dead through vascular anastomosis, which leads to the development of hypovolemia, severe damage to parenchymal organs due to hypoperfusion and death from hypovolemic shock. Studies show that the risk of

death of the second twin in the antenatal or early neonatal period reaches 38%. In the fetus, which was born after the fetal death of its twin, there are often pathologies of the central nervous system, urinary system, liver, and gastrointestinal tract. In 20% of these newborns, there is multicystosensecephalomalacia (N. Harkevich, V. L. Semenchuk, S. K. Kletsky.)



A: to coagulation

B: after coagulation of anastomosis

Fig.4 Arterio-venous anastomosis and tip of a laser conductor

The twin death causes a dilemma regarding the benefits of early delivery over expectancy tactics, which in turn threatens the death of a second fetus in 25% of cases and increases the risk of its disability.

**Conclusions.** The perspective of the development of technologies of laser fetoscopic interventions is, of course, an optimal solution to the problem of FFTS provided early and adequate diagnosis. It makes it possible not only to improve the incidence of the disease among the fruits with monochorial multi-fertility, but also is safe for the mother's health. When solving the problem of conducting phthoscopic laser coagulation, careful ultrasound scans should be carried out to find possible combinations of anomalies, taking into account the prognosis of the child's life and health, depending on the defects found and the possibilities for their correction.

#### References:

1. Vestbo J, Hurd SS, Agusti AG, Jones PW, Vogelmeier C, Anzueto A, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: GOLD executive summary. *Am J Respir Crit Care Med.* 2013;187:347–365. doi: 10.1164/rccm.201204-0596PP.
2. Hou G, Yin Y, Han D, Wang QY, Kang J. Rosiglitazone attenuates the

metalloprotease/anti-metalloprotease imbalance in emphysema induced by cigarette smoke: involvement of extracellular signal-regulated kinase and NFkappaB signaling. *Int J Chron Obstruct Pulmon Dis.* 2015;10:715–724.

3. Zanini A, Chetta A, Imperatori AS, Spanevello A, Olivieri D. The role of the bronchial microvasculature in the airway remodelling in asthma and COPD. *Respir Res.* 2010;11:132. doi: 10.1186/1465-9921-11-132.

4. John G, Kohse K, Orasche J, Reda A, Schnelle-Kreis J, Zimmermann R, et al. The composition of cigarette smoke determines inflammatory cell recruitment to the lung in COPD mouse models. *Clin Sci.* 2014;126(3):207–221. doi: 10.1042/CS20130117.

5. Solleti SK, Simon DM, Srisuma S, Arikan MC, Bhattacharya S, Rangasamy T, et al. Airway epithelial cell PPARgamma modulates cigarette smoke-induced chemokine expression and emphysema susceptibility in mice. *Am J Physiol Lung Cell Mol Physiol.* 2015;309:L293–L304. doi: 10.1152/ajplung.00287.2014. [PMC free article] [PubMed] [CrossRef] [Google Scholar].

6. Kaplaushenko AH, Panasenko OI, Knysh YeH, et al. [Anti-inflammatory activity of 5-R-4-R1-1,2,4-triazol-3-Tion and their S-derivatives]. *Med khim.* 2008;4:59-64.