

# PROGNOSTIC SIGNIFICANCE OF REVERSE BLOOD FLOW IN DUCTUS VENOSUS IN A FETUS DURING THE FIRST TRIMESTER OF PREGNANCY FOR EARLY CHD DIAGNOSIS CLINICAL OBSERVATION

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**ABSTRACT** — Considering the low detection rate of CHD in the first trimester of pregnancy, and often in the second one, as well as a high postnatal mortality rate, there is need to develop new methods for early diagnosis. A large number of researches is devoted to developing additional methods for early CHD detection in fetuses with normal nuchal translucency thickness and normal karyotype. According to pooled data from the world literature, the anomalous blood flow in ductus venosus in early pregnancy may be a marker of CHD.

One clinical CHD observation in a fetus with normal nuchal translucency thickness, but with abnormal blood flow in the ductus venosus in the first trimester of pregnancy is presented in our paper.

**KEYWORDS** — fetus, pregnancy, fetal CHD, common open atrioventricular canal, prenatal diagnosis, ductus venosus.

## INTRODUCTION

Ductus venosus (DV) is direct communication between the umbilical and the central venous system, through which well oxygenated blood is flowing bypassing the hepatic circulation [1]. Diameter of fetal DV at 11–14<sup>th</sup> gestation weeks is several times smaller than that of umbilical vein, and its length is approximately 2–3 mm. However, despite such a small size, the DV has an important role in regulating arterial blood volume flowing through it. At Doppler scanning, unidirected flow in the form of the three-phase curve should be recorded in DV into all phases of car-

diac cycle. Anomalous blood flow in ductus venosus in early pregnancy in fetuses with normal nuchal translucency thickness may be a marker of CHD [2]. Firstly this diagnosis method was used by T. Huisman et al. in 1997 [3]. The study was performed in a fetus of twins with trisomy 18 and dilated nuchal translucency.

Currently, DV blood flow study is carried out in fetuses at high risk of chromosomal abnormalities or CHD only, particularly in thoses with dilated nuchal translucency. We present the observation of CHD screening based on the detection of reverse blood flow in DV in the absence of other prognostic factors.

## CASE HISTORY

29-year-old gravida with assumption of fetal rhythm disturbance was examined at the 12th gestation week. From history, her husband is known to have underwent the Fallot's tetralogy correction in early childhood.

According to biochemical screening, low risk of developing chromosomal abnormalities was determined in this fetus.

US and Doppler ECG fetal examination (GE VOLUSON 730 Pro, Fetal Cardio and Obstetrics Program) with convex probe 3.5–5 MHz in the mode of 2D+Doppler from abdominal approach on the base of measuring the coccyx-parietal size showed

gestational age corresponded to 12–13 weeks. Nuchal translucency thickness was 2.1 mm, being the norm for this gestational age. Furthermore, anomalous (reverse) blood flow in DV was found (Fig. 1). Fetal nasal bone length was 3.1 mm, being the norm for this gestational age; other fetal parameters corresponded to gestational age.

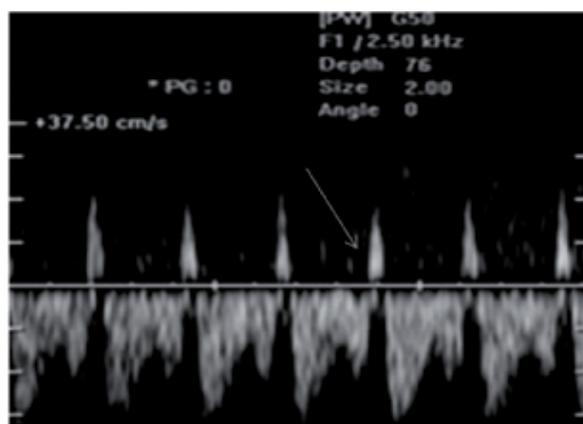
Sighting Doppler ECG revealed common open atrioventricular canal in the fetus (Fig. 2).

Considering great percentage of compatibility of this heart disease with the presence of chromosomal abnormalities in the fetus, the woman was recommended to make fetal karyotyping, which she refused, citing the high risk of miscarriage.

Despite the heart disease complexity and the risk for fetal chromosomal pathology, the family had decided to prolong the pregnancy. Previously established diagnosis was confirmed by the number of dynamic examinations at 16–17, 21–22 and 30–31 weeks, as well as postnatally and intraoperatively.

## DISCUSSION

Given the high prevalence as well as low detectability of the CHD in early pregnancy in fetuses with normal nuchal translucency thickness, the need for introduction of new diagnosis methods increases. The literature describes a large number of studies on the development of additional predictive methods for early detection of heart defects [2]. According to pooled data, anomalous blood flow in the ductus venosus in early pregnancy may be a marker of chromosomal abnormality in a fetus, as well as presence of the CHD in it. The above described clinical case demonstrates that Doppler blood flow in DV may be considered as an additional criterion, allowing more efficient US-screening in the first trimester of pregnancy for early CHD diagnosis in a fetus. This method is particularly actual in cases of borderline and normal values of nuchal translucency thickness. Echographic study of blood flow in ductus venosus is methodologically available that allows to introduce it in standard obstetric US-examination to identify fetuses at risk for developing CHD.



*Fig. 1. Dopplerograms of blood circulation curves of blood flow in the ductus venosus. Arrow – the reversible blood flow in the ductus venosus. Pregnancy 12 weeks*



*Fig. 2. US scanning in grayscale. The projection of the four heart chambers. White double-headed arrow, common open AV canal in the fetus of 22 gestation weeks, black arrow – ventricular septum defect, dotted arrow – primary interatrial septum defect.*