

# Doppler monitoring significance of middle cerebral artery at over 38 weeks pregnancies in pre-labour

## Abstract

The existence of gestational diabetes mellitus (GDM) induce morphological and physio-pathological modifications to fetal heart as long as fetal vessels beginning with the first trimester of pregnancy it appears that exist a correlation between the level of glycated haemoglobin (HbA1c) and the rate of fetal malformations. HbA1c value above >10.1% increase fetal malformation incidence, GDM being associated with the increase of fetal morbidity and mortality. Congenital malformations incidence of fetuses provided from diabetes mellitus pregnancies is from 3% to 6%, incidence increased in compared to normal pregnancy. GDM produce hypertrophic cardio-miopathy in approximately 40-50% cases. The purpose of this study is to determine the role of Doppler monitoring on middle cerebral artery (MCA) before the onset of labor in case of pregnant women with term pregnancies as a method of debut labor estimation. There were ultrasound examined 27 pregnant women with gestational age over 38 weeks without maternal or fetal pathology. We search the resistance index of MCA value and try to correlate these values with the moment of labor debut. Doppler screening of MCA to fetuses at term before the onset of labor can become a way to predict the debut of labor.

**Keywords:** Doppler, pregnancy, diabetes mellitus, fetal anemia

## Introduction

Diabetes mellitus represents one of the most common complications of pregnancies. About 2-3% of fertile women are diagnosed with mellitus diabetes, from which 0.5% has diabetes mellitus insulin necessitated). From total cases of diabetes mellitus associated to pregnancy, approximately 90-95% represents gestational diabetes mellitus (GDM).

Diabetes mellitus is a chronic metabolic disease, characterized by disturbing mainly the carbohydrate metabolism, along with damaging of other metabolism (i.e. protean, carbohydrate) having as principal cause the absolute or relative insulin deficit in organism<sup>(6)</sup>. Pregnancy complicates the evolution of a pre-existent diabetes mellitus, and diabetes mellitus represents a major risk factor for the fetus. GDM is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy<sup>(1)</sup>.

The purpose of this study is to determine the role of Doppler monitoring on middle cerebral artery (MCA) before the onset of labor in case of pregnant women with term pregnancies as a method of debut labor estimation. From any point of view, both the diabetes and the obstetrician, pregnancy in diabetic women is a major risk factor (risk for both mother and fetus). Diabetogenic stress posed by pregnancy, decompensate an endocrine pancreas that does not have sufficient reserves to cope. Risk of pregnancy (late) loss and risk of fetal malformations are significantly increased in

diabetic pregnant women<sup>(2)</sup>. Therefore, a major risk for fetal development is the risk of prenatal death during pre-labor and labor itself.

Thus, we investigated whether there are changes in MCA flow that can be considerate predictive for pre-labor period.

In this regard, we took into account the following factors:

- Doppler examination is anon-invasive method for monitoring pregnancy development, and to detect fetal distress;
- Doppler monitoring of MCA is a optimum method for monitoring fetal anemia;
- there are few studies on Doppler examination in labor;
- abnormal pregnancies, the cerebral vessel system has a high resistance; the tele-diastolic flow value being 16% of the systolic flow value;
- causes of decreased diastolic flow: oligoamnios and transducer compression;
- if heart rate remains constant then the flow in the MCA does not suffer modifications during labor;
- some studies have shown a slight increase in vascular resistance at the internal carotid artery during the initial phase of dilatation;
- during Braxton-Hicks contractions cerebral flow value doesn't change;
- Doppler method maybe a method of evaluating hypoxia in complicated pregnancies during labor<sup>(3)</sup>.

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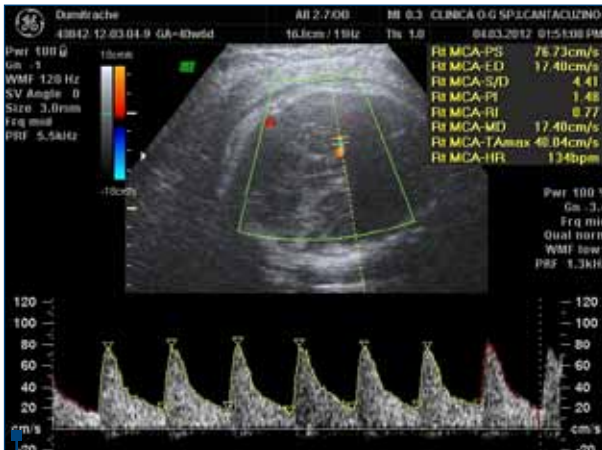


Figure 1. Doppler examination at 37 weeks with normal spectrum and parameters



Figure 2. Doppler spectrum 36 hours before the onset of spontaneous labor

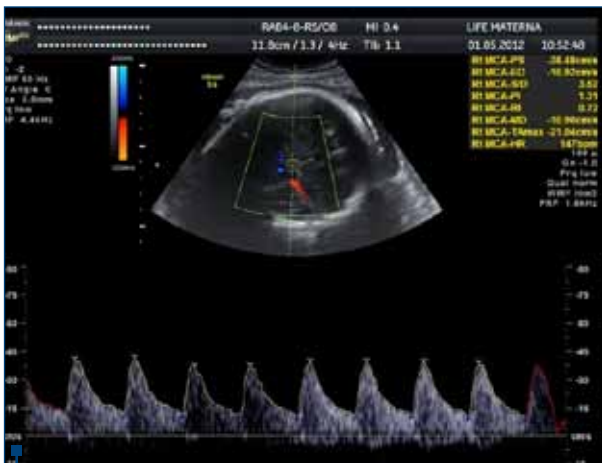


Figure 3. Doppler examinations at 40 weeks with normal spectrum and parameters

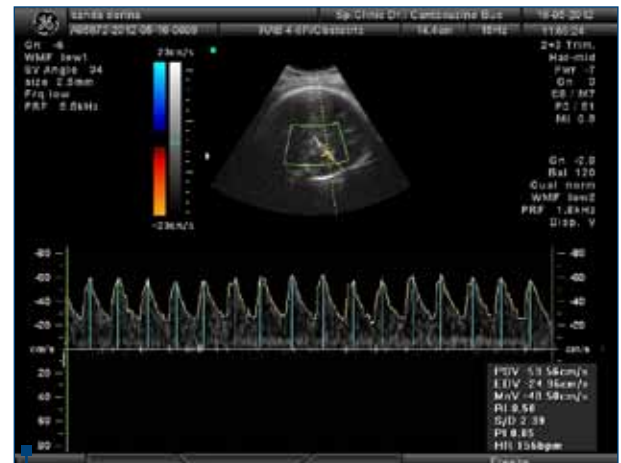


Figure 4. Spectral changes that precede labor by 48 hours

### Measurement of Doppler parameters in MCA

- in accordance with the criteria Collaborative Group for Doppler Assessment of the Blood Velocity in anemic fetuses;
- cerebral transversal image/cross-section which view of thalamus and septicavum pellucidum;
- viewing of Willis polygon and MCA;
- speed flow value measurement in MCA, preferably at distance at an angle of 0 degrees (or less than 20 degrees with correction of the angle);
- peak flow value in MCA is measured in cm/sec;
- in the absence of fetal movements and obviously respiratory fetal movements (Figures 1, 2, 3, 4 and 5).

### Methods

There were monitored both the parameters and aspects of Doppler spectrum on MCA before the onset of labor in uncomplicated pregnancies at term. Ultrasound

examination was performed on 27 pregnant women with gestational age over 38 weeks without maternal or fetal pathology. Appreciation of Doppler indices values and spectrum was achieved according to the 'Collaborative Group for Doppler Assessment of the Blood Velocity in anemic fetuses'. Furthermore, ultrasound monitoring of pregnant women was determined in the dynamics, starting with 38 weeks of pregnancy every 72 hours. It was calculated the time running from spectral changes appearance until spontaneous onset of labor. The equipment used was Voluson 730 Pro V Ultrasound System (General Electrics Kretztechnik, Austria).

### Results

Doppler spectrum changes were observed during pre-labour, by increasing diastolic velocity by preserving the peak flow value on MCA, therefore causing the decreasing of the resistance index. Diastolic velocity

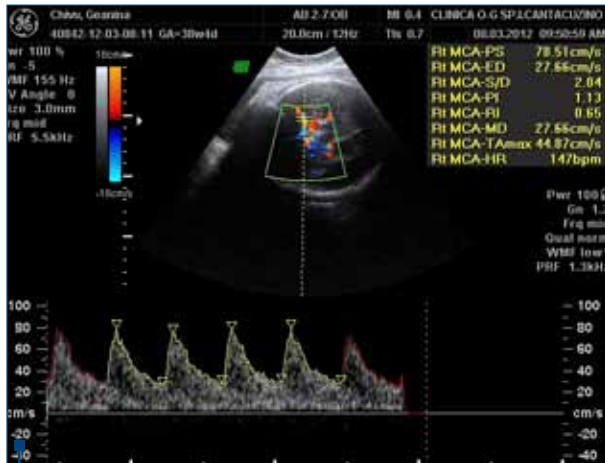


Figure 5. Low ACM resistance index by increasing diastolic velocity flow reveals labor debut after 24 hours

value in the MCA ranged between 35-47% of maximum systolic velocity. There were no Doppler parameters changes observed in umbilical artery level and spontaneous onset of labor occurred in a period of maximum 72 hours from the occurrence of spectral changes.

## Discussion

Doppler assessment of the umbilical arteries is a commonly used method in the evaluation of the fetus in high - risk pregnancies. A cochrane systematic review found a trend to reduction in perinatal deaths (OR 0.71, 95% CI 0.50-1.01) with the use of Doppler ultrasound in high - risk pregnancies, especially those complicated by hypertension or presumed impaired fetal growth. In diabetes, however, the fetal hemodynamic and metabolic response to maternal hyperglycemia is complex and dependent on the duration of insult<sup>(3)</sup>.

The fetus increases its oxidative metabolism, becoming more hypoxic. Perfusion of the brain and kidneys increase even in the absence of any changes in the fetoplacental perfusion. In maternal diabetes, umbilical arteries Doppler velocimetry therefore remains unchanged despite fetal hypoxemia (unless there is also vasculopathy or placental insufficiency and fetal growth restriction) and the presence of normal Doppler index does not exclude fetal compromise<sup>(4)</sup>.

There is conflicting evidence regarding the value of umbilical artery in the assessment of fetal well - being in pregnancy with diabetes. Three studies, involving a total of 249 patients, found that UA Doppler is not helpful in predicting adverse outcome in diabetic pregnancy in the absence of growth restriction or preeclampsia<sup>(5,6,7)</sup>. One study including 207 pregnancies with diabetes suggested that umbilical artery Doppler ultrasound (systolic - to - diastolic ratio >3) within 1 week of delivery was associated with a raised relative risk of adverse outcome (RR 2.6, 95% CI 1.9-3.5) compared with non - reactive cardiotocography (RR 1.7, 95% CI 1.2-2.5).

However, the main endpoints relate to growth restriction is prematurity, and preeclampsia. Pregnancies complicated by accelerated growth were excluded, and there was no correlation between outcome and diabetic control<sup>(8)</sup>.

## Conclusions

In conclusion, there is no evidence that umbilical artery Doppler velocimetry is of routine value in pregnancy with diabetes. It should only be used in pregnancy with diabetes when this is complicated by growth restriction or preeclampsia. Doppler screening of MCA to fetuses at term before the onset of labor can become a way to predict the debut of labor. ■

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