

## **Umbilical vein flow in monochorionic twins for predictive model of selective growth restriction**

Malčák M, Hašík L, Hanulíková P, Kalivodová D, Macková K, Halaj M, Brandejsová A, Heřman H, Feyereisl J, Krofta L  
Institute for the Care of Mother and Child, Prague, Czechia

### **Objective**

Selective fetal growth restriction (sFGR) affects about 12-25% of monochorionic (MC) twin pregnancies and is recognized as an important complication, with a high risk of intrauterine demise and neurological adverse outcome. Fetal nutrition is the result of the balance between fetal demands and maternal-placental availability of nutrients and oxygen. Altered availability of nutrients can lead to fetal growth trajectory alterations. The umbilical vein (UV) is the only conduit of blood from the placenta to the fetus. This vessel carries blood rich in oxygen and nutrients. It is not surprising that umbilical vein blood flow (UVF) may be altered in fetuses who suffer from sFGR. The presented study aims to establish a normal UVF parameters in monochorionic diamniotic (MCDA) twin pregnancies in order to provide a theoretical basis for predicting sFGR.

### **Methods**

This was a single centre prospective longitudinal cohort study. We measured sono-graphically the UV time-averaged maximum velocity (TAMX) and diameter (UVD) of the fetal intra-abdominal UV segment. The measurements were performed three times at fetal rest with the angle of insonation as close as possible to 0, with a maximum correction of the angle below 30°. For modelling of UV TAMX and fetal growth Mixed Linear Model including heteroscedasticity was used. Intraobserver agreement was obtained for all parameters in a test/retest series. The intraclass correlation coefficient (ICC) was used for this purpose.

### **Results**

The study population consisted of 204 MCDA twin pregnancies where we successfully acquired 1295 measurements in both fetuses. In 62 pregnancies (30.4%) developed sFGR in one twin and in 12 cases (5.9%) in both twins. The average maternal age was 32.2 years (min. 16, max. 47, SD 5.4). The median gestational age of this population was 24 weeks (min. 13, max. 36). For the intraobserver variability ICC for the TAMX was 0.928. In the physiological MCDA twin cohort the UV TAMX increased with gestational age. Daily increase in UV TAMX is 0.0876 cm/s. The Fetal growth increase with UV TAMX, if the UV TAMX increases by 1 cm/s, the change of fetal weight in 24 hours increases by 0.836g. The preliminary algorithm for prediction was created. The average relative error of is 12.6% of fetal weight.

### **Conclusion**

The estimated values have potential to predict future fetal growth from current value of UV TAMX. The model for UV TAMX establishes typical value in a given gestational age. Model with addition of the chosen quantile dependency on gestational age can be used to determine which values are low. Together with model of dependency of daily change of fetal weight on UV TAMX the model can predict future weight of fetus including of probability of sFGR in future weeks of gestation.