

(GE, Austria) was used for multiplanar analysis to measure the spatially correct UV cross-section, and PixelFlux software was used to measure individual pixel color hue within the UV and correct for 3 dimensional spatial angles of insonation. UV blood flow was indexed to fetal weight. Subsequently, 11 volumes were analyzed by one local investigator and Chameleon software Co., Germany, in blinded fashion. Statistical analyses used: *t*-test, Spearman correlation, and coefficient of variation.

Results: Mean calculated UV blood flow ranged from 565 ml/kg/min (range: 263–1362) to 422 ml/kg/min (range: 119–1320) at 18 and 21 weeks, respectively. Spearman correlation with gestational age was -0.080 ($P = 0.4934$). Mean differences between raters across the 11 blinded samples from the same fetus were significantly different ($P < 0.001$), with a coefficient of variation of 32%, and ranged from 234–654, and 199–492 ml/kg/min for raters 1 and 2, respectively. 75.8% of the variation was due to differing calculations derived from repeated volumes obtained from the very same fetus.

Conclusions: UV blood flow calculation using pixel hue analysis and spatial correction for Doppler insonation is not sufficiently precise or reproducible to allow for meaningful UV blood flow measurements.

OP21.07

Significant differences of fetal blood supply in fetuses of different weight classes demonstrated by the novel method of three-dimensional pixelwise fetal volume flow measurements (PixelFlux-method)

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Objectives: Global fetal volume perfusion measurements were hampered in the past by the difficult spatial arrangement of the umbilical vessels and the variable shape of the umbilical vein. We developed a new method based on three-dimensional data and applied this to fetuses of different fetal weight classes.

Methods: 736 standardized color Doppler sonographic three-dimensional datasets of the umbilical cord in 206 singleton fetuses (23–40 gestational week) were recorded with a Voluson E8 (GE) and evaluated by the PixelFlux-software (www.chameleon-software.de). 27 fetuses belonged to the IUGR, 47 to SGA, 135 to the normal weighted and 5 to the hypertrophic group (8 fetuses changed their group during follow up). The PixelFlux-measurement consists of a pixelwise calculation of the flow volume [ml/min] after automatic spatial angle correction of the umbilical vein's transsectional area and color coded flow velocities inside a horizontal cut of the vein (Ultraschall Med. 2011 Dec;32 Suppl 2:E122–8).

Results: We detected a significantly reduced global fetal perfusion per gram body weight in IUGR fetuses (141 ml/kg*min) compared to SGA fetuses (253 ml/kg*min) and normal weighted (226 ml/kg*min) ones. Hypertrophic fetuses had a comparable low flow volume of 95 ml/kg*min. One measurement took about 1 min.

Conclusions: The novel three-dimensional fetal perfusion measurement with the PixelFlux-technique is able to detect a fetal malperfusion in IUGR and is thus a tool for studies on fetal development. Further studies are needed to plumb the potential for prognostic and differential diagnostic questions.

OP21.08

Influence of the Doppler sample gate location in the uterine artery Doppler waveform analysis

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Objectives: Correct placement of the Doppler sample gate is essential for reproducible uterine artery (UtA) waveform analysis; however, maternal BMI and anatomical variation in the trajectory and branching of the UtA can affect the optimal location for Doppler recordings. The objective of this study was to evaluate the effect of the anatomical location on UtA waveform analysis.

Methods: Women with uncomplicated, singleton gestations were included and grouped according to their gestational age (GA) as: 11–14 weeks ($n = 102$), 20–24 weeks ($n = 140$) and ≥ 25 weeks ($n = 325$). The mean pulsatility index (MPI) and the presence of unilateral or bilateral notches were recorded in transabdominal (TA) and transvaginal (TV) views. For the TA recordings, 3 anatomic locations were defined in relation to the virtual crossing with the external iliac artery: 1 cm below, 1 cm above, and approximately 3 cm above the iliac artery. UtA-MPI values were transformed into Z-scores. ANOVA and post-hoc pairwise comparisons were performed at each GA period.

Results: Significant differences among the anatomic sites were documented in the 3 GA groups (11–23 weeks: $F = 4.33$, $P = 0.02$; 20–24 weeks: $F = 8.1$, $P < 0.001$; ≥ 25 weeks: $F = 35.6$, $P < 0.001$). UtA-MPI values and the prevalence of unilateral and bilateral notches obtained in TV views were higher than all other locations ($P < 0.001$). Similarly, UtA-MPI values and the prevalence of notching in waveforms obtained 3 cm above the iliac artery crossing were lower than all other locations ($P < 0.05$). No differences were observed in UtA-MPI or prevalence of notching in recordings obtained 1 cm above or 1 cm below the crossing with the iliac artery in any gestational group.

Conclusions: To optimize consistency and risk screening performance of UtA Doppler measurements, recordings should be obtained either 1 cm above or below the crossing of the external iliac artery in transabdominal views. UtA Doppler parameters obtained transvaginally must be compared with nomograms obtained by transvaginal ultrasound.

OP21.09

Doppler examination of uterine artery blood flow among pregnant women and histological changes of placenta in stress

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Objectives: Evolution of the uterine artery blood flow of pregnant women and histological study of women placenta in stress.

Methods: 50 women with gestational age 24–28 weeks were examined. The patients were divided into 2 groups: 1-st – 20 women with normal gestation course without history of emotional problems and Spilberger questionnaire scores (20–46), 2-nd group (base) – 30 pregnant with/without history of emotional problems and scores (46–80). Uterine blood flow waveform patterns as assessed by color Doppler ultrasound, with measurement of resistance index (RI). Measurement of maternal and fetal heart rate, maternal systolic and diastolic arterial blood pressure were performed. We perform the histological study of 30 placentas of women of base group.

Results: The final study of mothers' psychological state of the 2-nd group revealed that the state anxiety score was lower than the trait anxiety score. In 100% of cases we revealed high level of trait anxiety, in 43% of cases high level of state anxiety. The comparative analysis of uterine artery RI in both groups revealed elevation of RI in 2-nd group from 0.48 ± 0.01 to 0.62 ± 0.01 ($P < 0.05$). Elevation of maternal and fetal heart rate from 87.15 ± 1.69 to 100.83 ± 2.11 ($P < 0.05$) and from 142 ± 1.37 to 146 ± 0.06 ($P > 0.05$) was observed respectively. An association was found between the maximum resistance index and both state anxiety and trait anxiety scores. In 83% of cases we revealed placental insufficiency symptoms, such as morphological changes in blood vessels, as well as immunological alteration of placental tissue.