

Time-interval between maternal electrocardiogram and venous Doppler waves in normal pregnancy and pre-eclampsia: a pilot study.

Peer-reviewed author version

TOMSIN, Kathleen; Mesens, Tinne; MOLENBERGHS, Geert; Peeters, Louis & GYSELAERS, Wilfried (2010) Time-interval between maternal electrocardiogram and venous Doppler waves in normal pregnancy and pre-eclampsia: a pilot study.. In: ULTRASCHALL IN DER MEDIZIN, 2010(31). p. 1-7.

Handle: <http://hdl.handle.net/1942/12094>

## **The time-interval between corresponding characteristics of maternal electrocardiogram and venous Doppler waves is shorter in pre-eclampsia than in normal third trimester pregnancy**

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**Introduction:** In normal pregnancy (NP), the increase of blood volume and cardiac output is accommodated by a pronounced decrease of peripheral vascular resistance. In pre-eclampsia (PE), a disease defined as gestational proteinuric hypertension, signs of maternal cardiovascular maladaptation are present, such as a reduced expansion of plasma volume, an increased total peripheral vascular resistance and a decreased venous distensibility. Venous Doppler waveforms (DW), as obtained by Doppler Ultrasonography, are a reflection of the cardiac cycle in the right atrium.

The aim of this study is to evaluate whether the time-interval between DW and electrocardiogram (ECG) in PE is different from NP.

**Hypothesis:** A different DW-ECG time-interval between PE and NP may be a potential new parameter in the work-up of maternal cardiovascular (mal)adaptation.

**Methods:** A total of 20 women were evaluated, 10 with PE and 10 with NP. Renal interlobar vein and hepatic vein DW- and ECG-analyses were performed according to a standard protocol, as we reported elsewhere. The interval between the ECG P-wave and its corresponding Doppler A- wave (PA) and the length of the cardiac cycle in the ECG (RR) were measured. Statistical analyses were conducted using conventional F-tests for linear mixed-effects models (SAS procedure MIXED).

**Results:** Gestational age was not significantly different between PE and NP ( $32.96 \pm 5.06$  versus  $30.30 \pm 0.39$  weeks;  $p = 0.1318$ ). In the liver of women with PE, PA, RR and PA/RR were significantly different from NP ( $213 \pm 68$  versus  $297 \pm 93$  msec,  $p=0.0345$ ,  $881 \pm 125$  versus  $717 \pm 115$  msec,  $p=0.0068$  and  $0.25 \pm 0.09$  versus  $0.42 \pm 0.14$  msec,  $p=0.0042$  respectively). Similar results were found in both left and right kidneys.

**Discussion & Conclusion:** PA and PA/RR are significantly shorter in PE than in NP. From the data presented, It is unclear whether this observation results from PE-related reduced plasma volume expansion and/or reduced venous distensibility.

Our data show that the time-interval between maternal ECG and venous doppler waves is a potential new parameter in the work-up of maternal cardiovascular (mal)adaptation in normal and pathological pregnancies.