For each group, means and SD were calculated and compared statistically: conventional F-tests for linear mixed-effects models (SAS procedure MIXED) for 3 consecutive venous DWs recorded simultaneously with ECG-DW (2) evaluate RIV and HV CVCT at different stages of gestation.

(1) evaluate feasibility and sensibility of the combined ECG-DW methodology in hemodynamic studies

Figure 2: Atypical DW ≠ figure 1a

Venous Doppler waves (DW) = reflection of cardiac right atrial function (~jugular vein)

Pregnancy induces major adaptations of the maternal cardiovascular system

• increased venous distensibility
• PA & PA/RR gradually ↑

Further studies:

• PA
• PA/RR (with correction for gestation-induced changing heart rate)

Study results (1)

Figure 2: Atypical DW ≠ figure 1a

Atypical HV patterns in this study

(1) 20.00% (6/30)
(2) 60.00% (18/30)
(3) 86.67% (26/30) (term) 93.33% (28/30)

(1 vs 2) p = 0.0043
(2 vs 3) p = 0.0430
(3 vs term) p = 0.6700

• ECG facilitated identification of individual venous DW characteristics in atypical DW

Discussion & Conclusion (1)

At advancing gestation: # atypical DW patterns ↑

Simultaneous depiction of ECG and venous DW
• Frequent in hemodynamic studies
• Necessary to correctly identify venous DW characteristics

Discussion & Conclusion (2)

CVCT in late ± CVCT in early pregnancy

Venous return needs more time to respond to cardiac stimuli with advancing gestation

Gestational cardiovascular adaptation
Further studies:
• relate observed changes in CVCT to blood volume expansion and/or increased venous distensibility

Discussion & Conclusion (3)

In early gestation

• CVCT shorter in L than in RK and LK

• typical vasculature of organ
• anatomical distance to the heart
• liver = closer than kidneys

= characteristic of normal physiology
= gestation-dependent: ΔCVCT disappears near term, probably due to maternal cardiovascular adaptation mechanisms (see above).

The time-interval between ECG and DW, the so-called Cardio-Venous Communication Time (CVCT), is organ-specific and shows typical changes during normal and pathological pregnancy.

Our study illustrates that CVCT is a promising new parameter to study maternal venous hemodynamics.