

# Prospective Doppler study of maternal renal interlobar venous flow during normal pregnancy

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## Background:

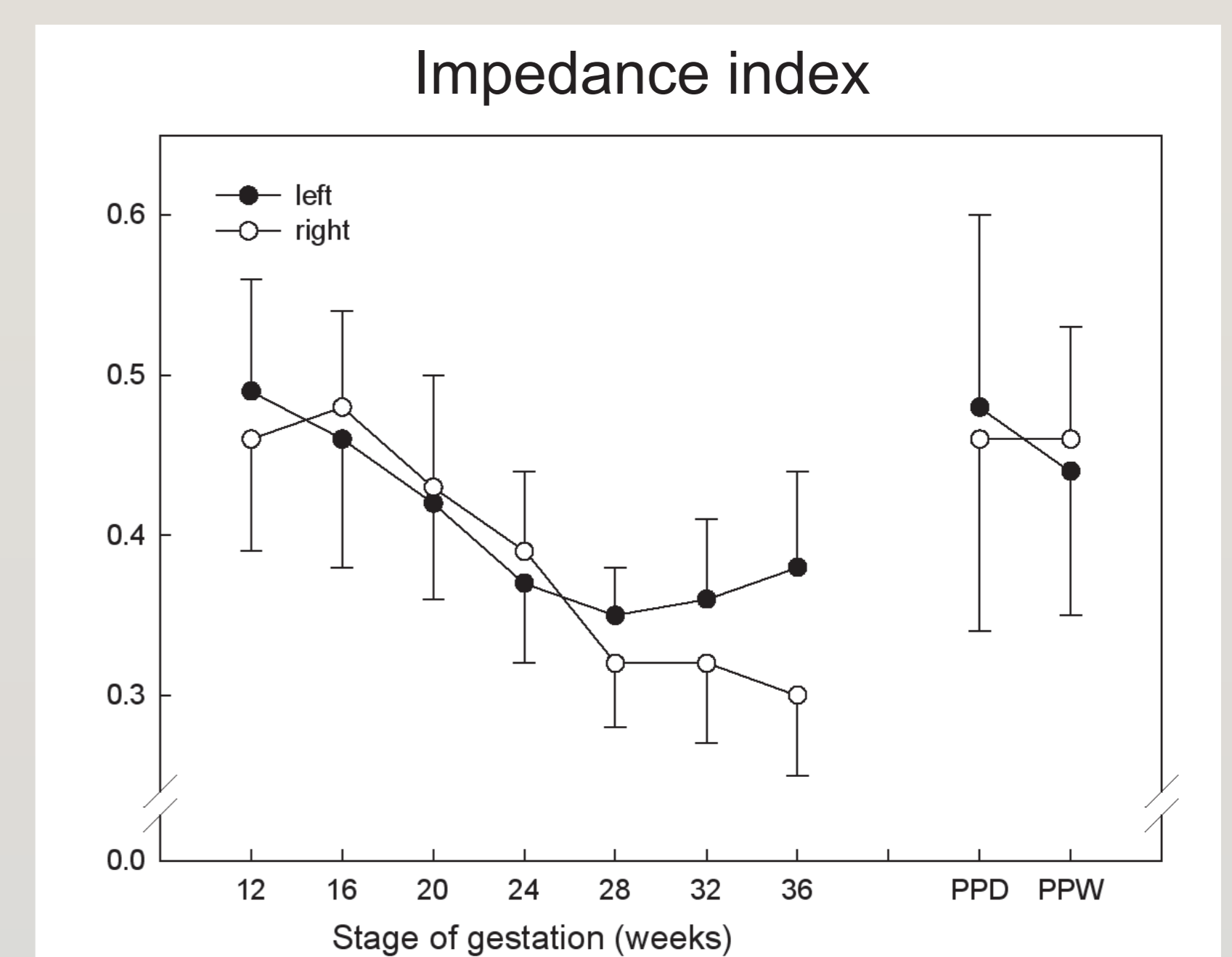
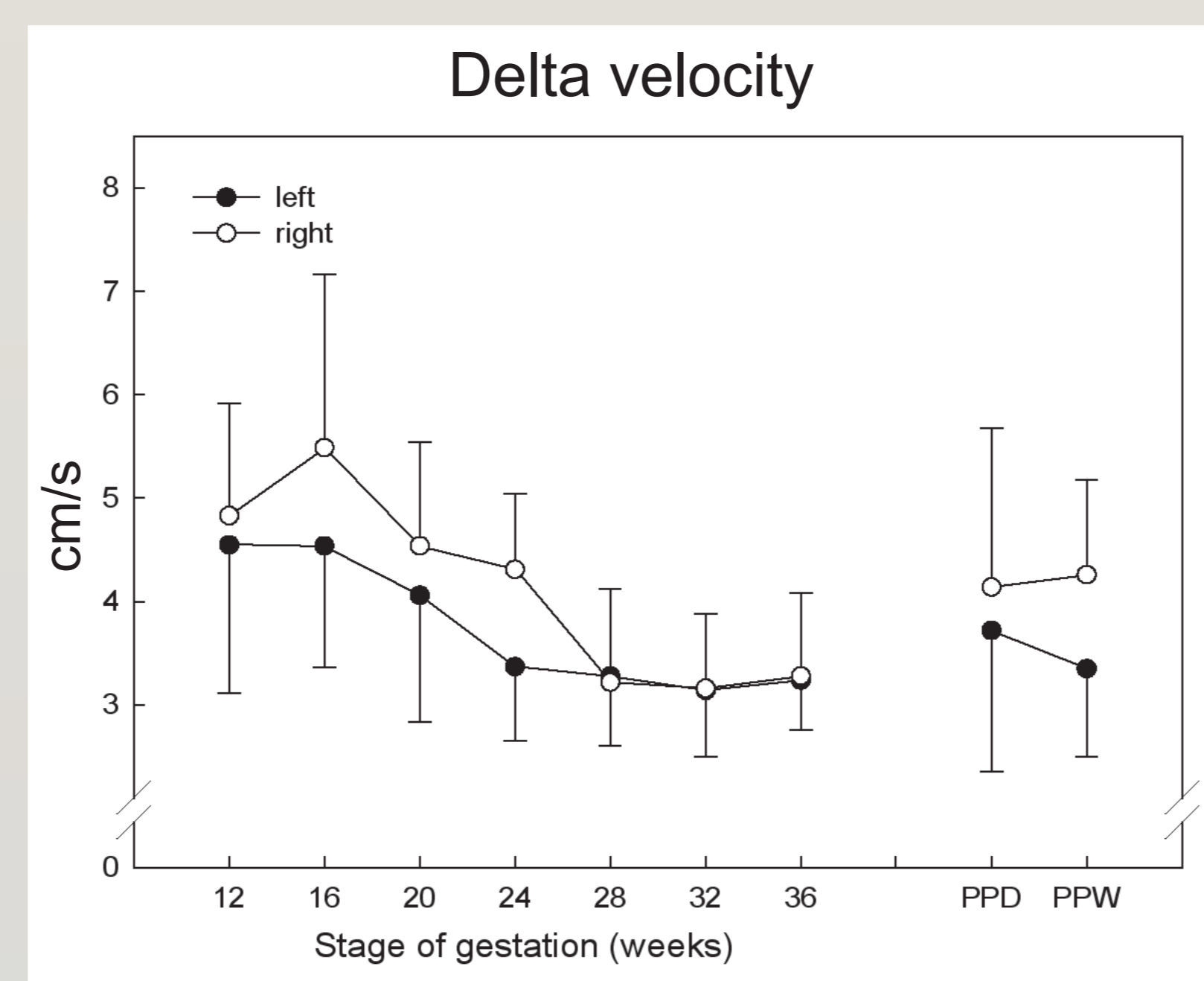
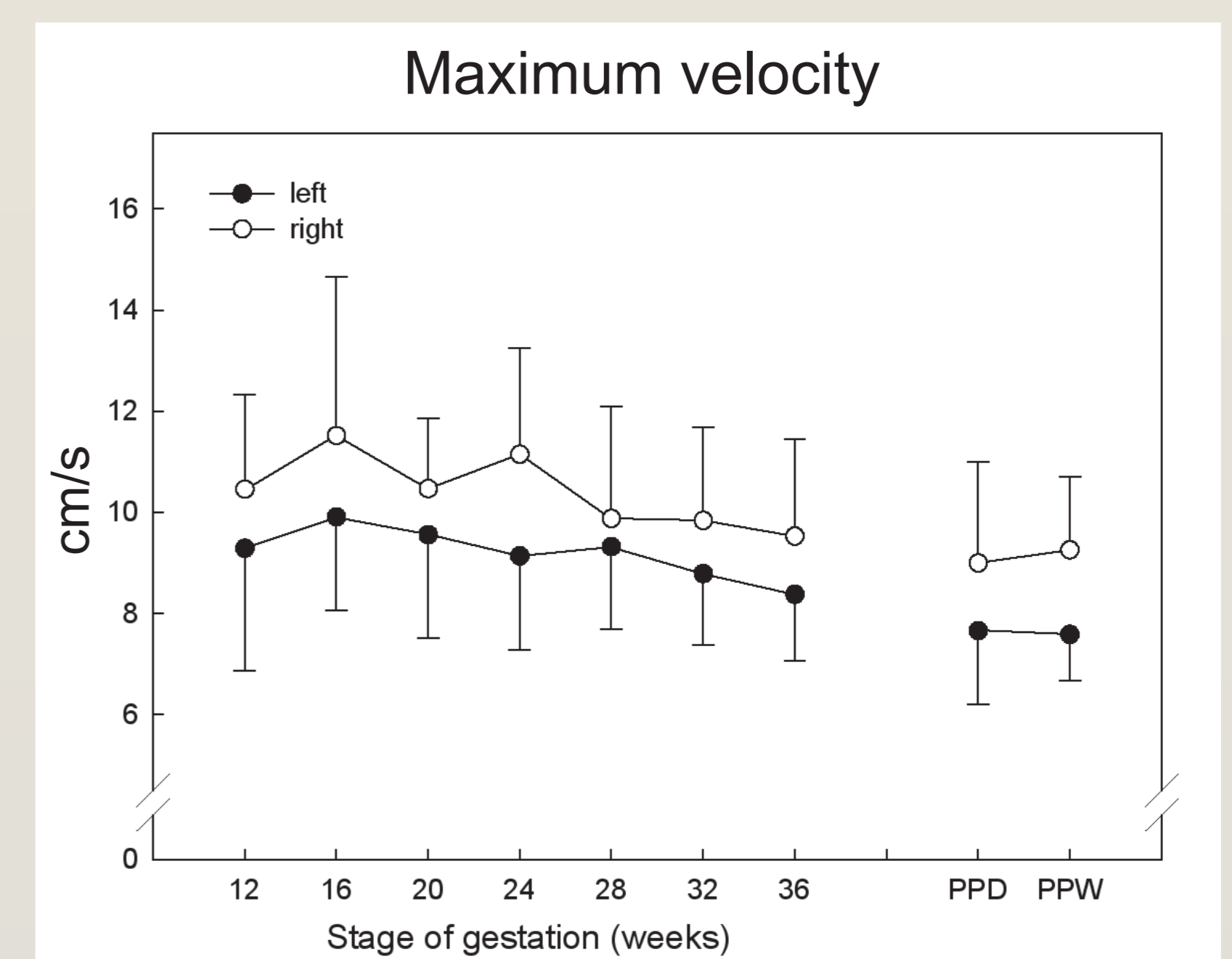
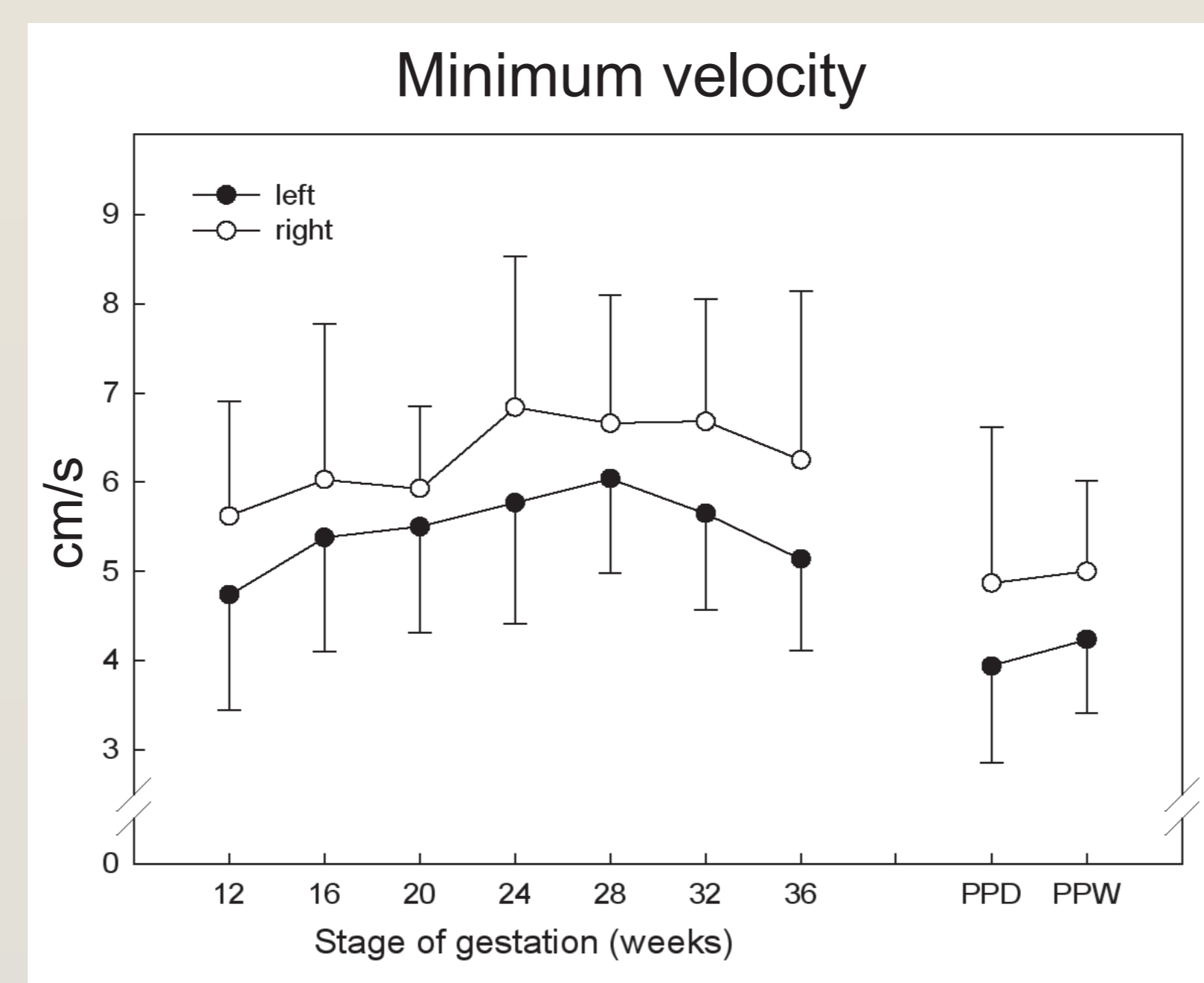
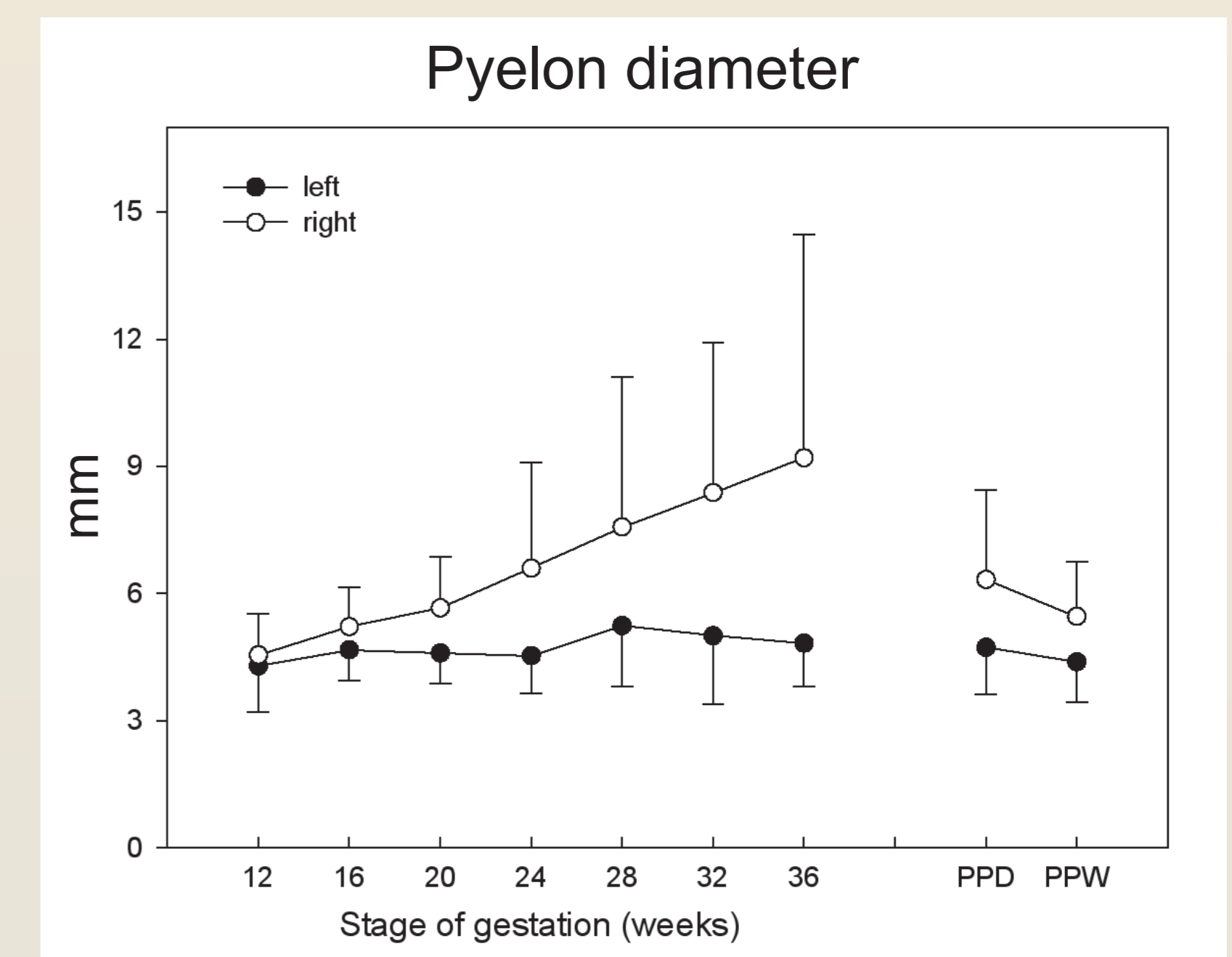
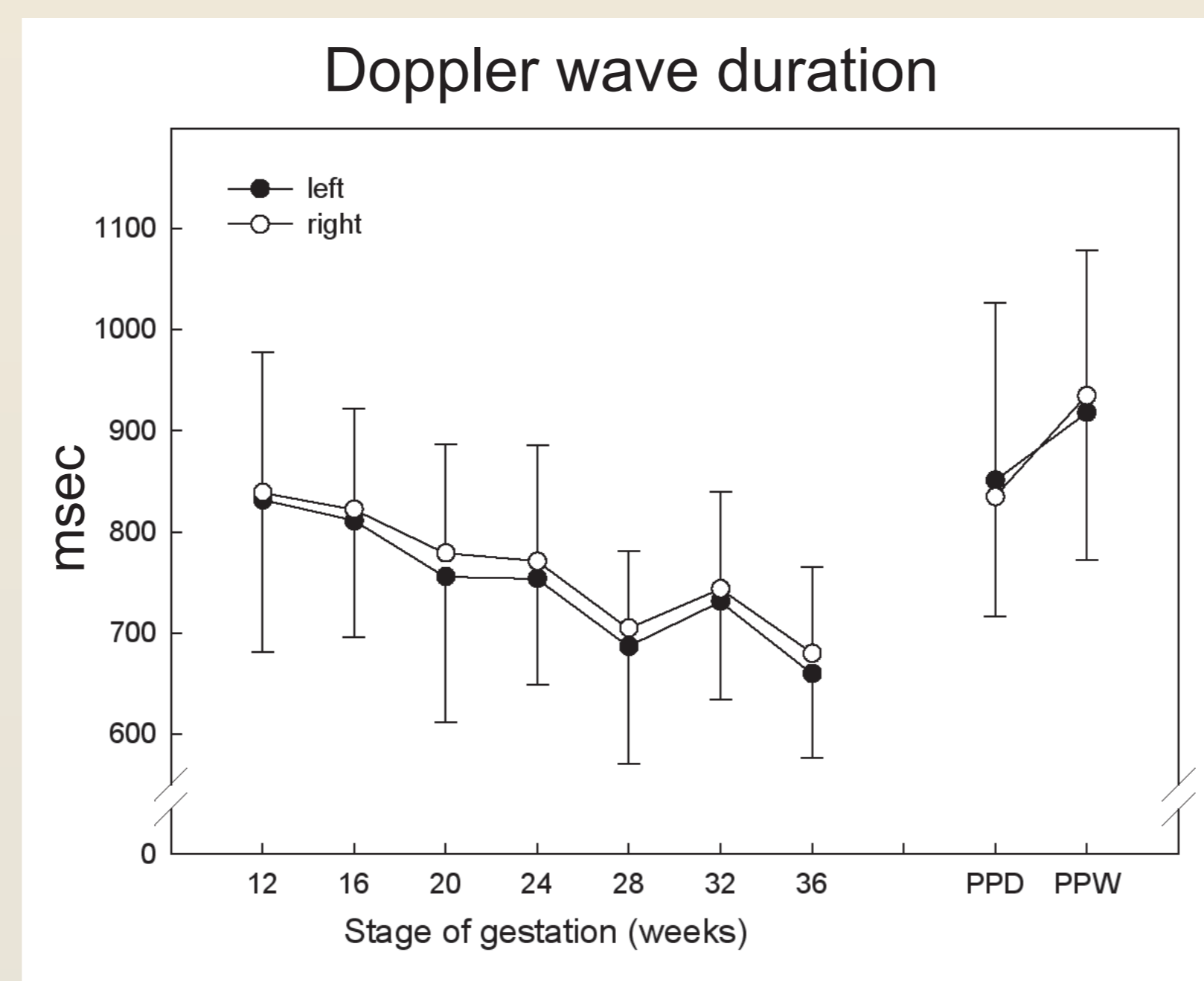
Venous Impedance Index (VI) is considered the Doppler equivalent of arterial Resistance Index. In a former study, we found a decrease of Renal Interlobar Vein (RIV) VI during pregnancy; this effect was significantly stronger in the right than in the left kidney. The physiologic background mechanisms behind this observation are not well understood.

## Aims:

To evaluate gestational evolutions of different components of RIV VI, in order to (1) better understand RIV hemodynamics during pregnancy, and to (2) establish a normal reference range for RIV Doppler parameters relative to gestational age.

## Methods:

Prior to this study, we evaluated reproducibility of our protocol by measuring VI twice in a set of 24 women and calculating intrakidney correlation using restricted maximum likelihood estimation. After this, we evaluated prospectively 20 women during pregnancy and postpartum. Every 4 weeks, we measured Doppler Wave Duration (DWD), anteroposterior intrarenal pyelondiameter (PD), RIV Maximum Velocity (MxV) and Minimum Velocity (MnV), and we calculated Delta Velocity (DeltaV) and VI respectively as  $MxV - MnV$  and  $\Delta V / MxV$ . We registered mean values of three consecutive measurements per kidney. We calculated gestational evolutions of DWD, PD, MxV, MnV, DeltaV and VI using a repeated-measures model of the so-called mixed-model type. Median, 5th and 95th percentiles were defined relative to gestational age and plotted graphically.



**Results:** Intra-kidney correlation coefficient was 0,88. Throughout pregnancy, DWD decreased and right PD increased whereas left PD did not change significantly. Right RIV velocities were consistently higher than on the left side. In both kidneys, MxV increased to a maximum at 16w, after which there was a gradual decrease until term. MnV increased until 24 weeks in the right and until 28 weeks in the left kidney, after which there was a slight decrease until term. DeltaV decreased in both kidneys but then showed stable and low values until term. VI decreased until 28 weeks in the left kidney and further until 32 weeks on the right side. Apart from DWD, gestational evolutions of all parameters were significantly different between both kidneys.

**Discussion:** Gestational RIV hemodynamics and normal reference ranges of RIV Doppler parameters are significantly different between left and right kidney. This should be taken into account when studying RIV hemodynamics in pathologic pregnancies. These differences relate both to known morphologic interkidney differences and to a larger compression-effect from the gravid uterus on the right than on the left side, illustrated in our data by increase of right but not left PD. Gestational evolutions of MxV and MnV are very similar to known evolutions of respectively cardiac stroke volume and effective renal plasma flow.

**Our data illustrate that changes of Renal Interlobar Vein hemodynamics during pregnancy relate to both intra- and extrarenal gestational adaptation mechanisms.**