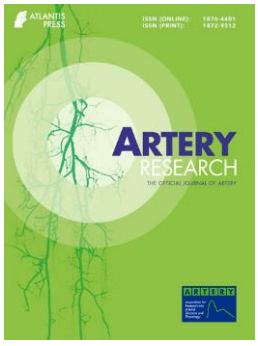

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P142: EARLY VASCULAR PARAMETERS IN THE MICRO- AND MACROCIRCULATION IN TYPE 2 DIABETES

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ARTERIAL WAVE DYNAMICS IN THE HORSE: INSIGHTS OBTAINED FROM A 1D ARTERIAL NETWORK MODEL SIMULATION

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Background: Relatively little is known about equine arterial hemodynamics because it is technically and ethically challenging to investigate a large number of arteries. Pulsed-wave Doppler images of arterial flow velocities typically display patterns of a higher oscillatory nature than in humans, but the background of these oscillations is not well understood. The aim of this study is to gain insight into equine arterial hemodynamics and physiology through 1D arterial network simulations.
Methods: Anatomical data of lengths, diameters and branching angles collected post-mortem from five horses, were used as the input for a previously validated (in humans) 1D arterial network model [1]. Cardiac and arterial parameters were tuned to equine physiology at rest (heart rate 40 bpm, cardiac output 36 l/min, mean arterial pressure 92 mmHg). Pressure and flow waveforms were simulated for the ascending aorta, right common carotid and median (in the front limbs) arteries. Simulated flow velocities were compared with ultrasound data from one horse and wave intensity analysis (WIA) was used to study wave dynamics.
Results: Figure 1 shows that simulated flow velocities are quantitatively close to ultrasound data. Ultrasound images show a high level of oscillations, also present in the simulations. The most prominent feature revealed by WIA is the existence of a mid-systolic forward expansion wave and prominent wave activity throughout diastole.
Conclusions: Initial model simulations indicate a great activity of wave reflection and a quantitative match of intra-arterial waveforms with ultrasound data. Simulations are also able to capture the oscillatory patterns observed in ultrasound data.

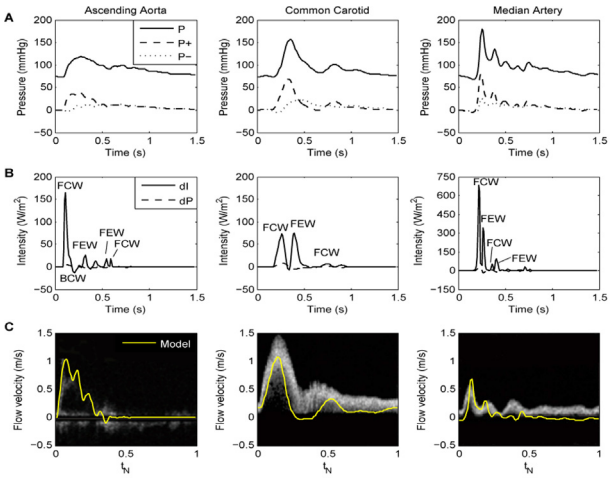

Figure 1. **A**: Pressure signals and forward (P+) and backward (P−) components. **B**: Wave intensity analysis. **C**: In−vivo measurements from one horse compared with model simulations. (FCW: forward compression wave, FEW: forward expansion wave, BCW: backward compression wave, dI: wave intensity, dP: change in pressure, t_N: normalized time).

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Poster Session II — Diabetes, Obesity and Kidney
P141
TELOMERE DYNAMICS RELATION WITH OBESITY

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Background: The relation between telomere dynamics and obesity remains unclear. Cross-sectional studies found associations between short leukocyte telomere length (LTL) and high body mass index (BMI) but longitudinal studies did not find any association between LTL attrition and BMI. In two parallel studies, we aimed to assess the relationship between obesity and telomere dynamics in different tissues.
Methods: Study 1: Measurements of LTL and TL in skeletal muscle (MTL) were performed in 53 subjects with severe obesity (BMI $>$ 35) and in 53 age- and sex-matched without obesity (21 $<$ BMI $<$ 30). MTL is a proxy of TL at birth and the LTL/MTL ratio represents life-long telomere attrition. Study 2: Measurements of TL in subcutaneous fat (SCF), a high proliferative adipose tissue, and visceral fat (VF), a low proliferative one in 50 severe obese bariatric patients. TL measurements were performed by Southern blot.
Results: Study 1: In younger ($<$55 years), but not in older, LTL and LTL/MTL were shorter in obese patients vs controls (7.16 kb vs 7.54 kb, $p < 0.05$ for LTL and 81% vs 84%, $p < 0.05$ for LTL/MTL). Study 2: Within obese bariatric patients, SCF/VF TL ratio was lower in those with early onset obesity (96% for obesity since childhood vs 97% since adolescence vs 100% for adult development of obesity; $p < 0.05$).
Conclusions: Early life obesity is associated with higher TL attrition leading to shorter TL in high proliferative tissues.

P142
EARLY VASCULAR PARAMETERS IN THE MICRO- AND MACROCIRCULATION IN TYPE 2 DIABETES

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Background: Diabetes converts from a metabolic disorder into a predominantly vascular disease, once its duration extends over several years or/and when additional cardiovascular risk factors such as hypertension coexist. We analyzed various vascular parameters in the renal, retinal and systemic circulation, with the goal to identify which vascular parameter of early organ damage is the earliest that can be clinically detected.
Methods: In 111 patients with type-2 diabetes (T2DM) (off any anti-diabetic medication for at least 4 weeks) and 54 subjects without T2DM we assessed urinary albumin-to-creatinine ratio (UACR) and estimated glomerular filtration rate (eGFR), retinal capillary flow (RCF), intercapillary distance (ICD) as parameters of capillary rarefaction, wall-to-lumen ratio (WLR) of the retinal arterioles [all assessed by Scanning Laser Doppler Flowmetry], and central systolic blood pressure (cSBP) and central pulse pressure (cPP) [assessed by Syphygmocor] both reflecting vascular stiffness of large arteries.
Results: Compared to subjects without T2DM, patients with T2DM were older, more females but 24-hour systolic and diastolic BP did not differ between the two groups (129.3 $\pm$ 11.4/78.9 $\pm$ 8.3 vs. 130.4 $\pm$ 10.8/77.4 $\pm$ 5.6 mmHg). The analysis adjusted for age, gender and cardiovascular risk factors showed that ICD, cPP were significantly higher and eGFR was significantly lower in patients with T2DM than in subjects without T2DM (Figure).
Conclusion: These data suggest that at similar BP capillary rarefication in the retinal circulation (ICD), eGFR in the renal circulation and cPP of large arteries are earlier detectable than vascular remodeling of the micro- (WLR, RCF, UACR) and macrocirculation (cSBP) in patients with T2DM.