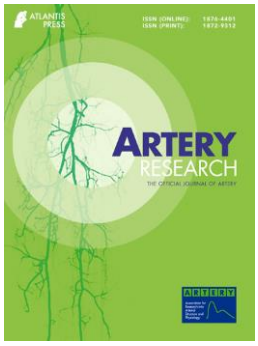

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P10.06: IS THE BACKWARD REFLECTED WAVE DETRIMENTAL TO LEFT VENTRICLE PERFORMANCE?

C.M. Park, M.Y. Henein, A.D. Hughes, A.W. Khir

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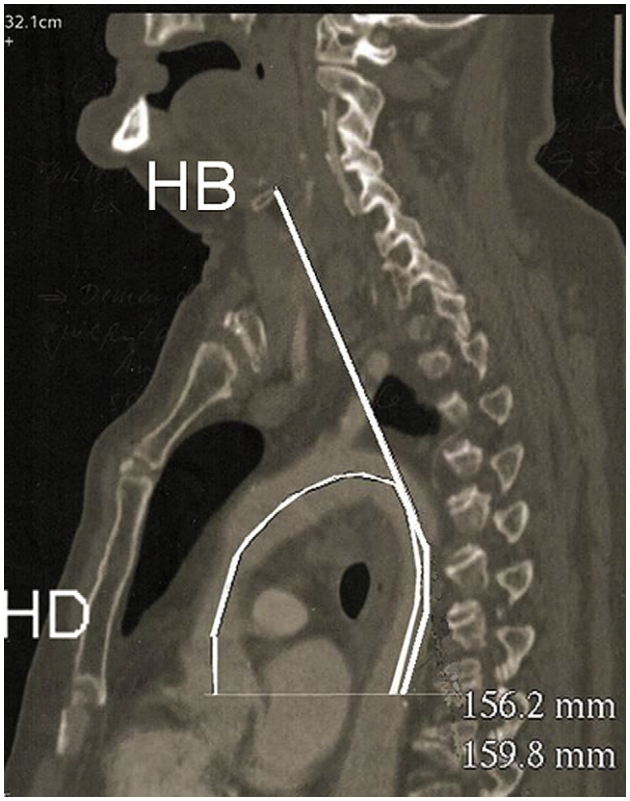
and crossing the descending aorta at mark HD (see figure), and 2) the distance between the HD mark to the Hyoid Bone (HB).



Results: There was a correlation between the AV-HD distance and the HD-HB distance (non parametric $r = 0.66$, $p < 0.0001$) and the AV-HD distance were positively correlated to the height of the subjects ($r = 0.60$, $p < 0.002$).
Conclusions: 1- The AV-HD distance projects to a constant anatomical landmark (i.e. the hyoid bone) 2- The size of this arterial segment is significantly correlated to the height of the subjects. These preliminary results could be useful for a more accurate determination of the pulse wave velocity.

P10.06
IS THE BACKWARD REFLECTED WAVE DETRIMENTAL TO LEFT VENTRICLE PERFORMANCE?

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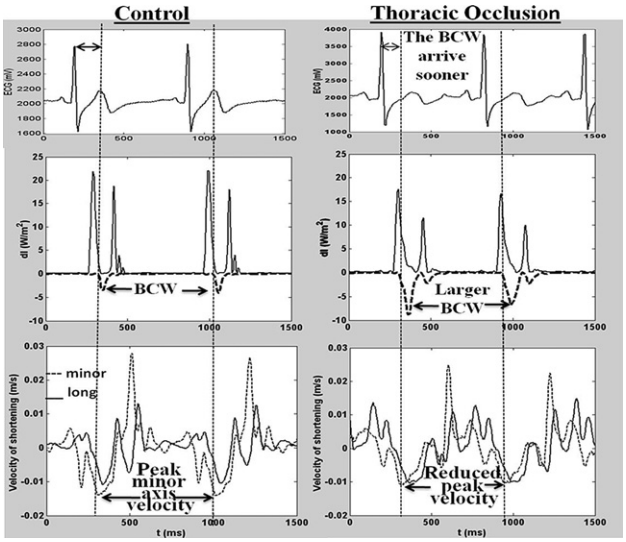
The effect of the backward reflected wave (BCW) on left ventricular (LV) performance is a highly debated area. The aim of this study was to establish whether the arrival of a BCW has a detrimental effect on LV axis shortening.
Methods: Invasively acquired ascending aortic velocity, pressure and LV long and minor axes dimensions were measured simultaneously in 11 open-chest anaesthetised dogs. LV axes dimensions were measured by sonomicrometry and differentiated with respect to time to identify maximum shortening velocity. Wave Intensity analysis was used to identify the arrival time of BCW. Data were acquired during control and during occlusion conditions of the proximal thoracic aorta, created using a snare. Statistical agreement was assessed using the concordance correlation coefficients (CCC).
Results: During control the BCW arrived back at the heart at the time of LV minor axis maximum velocity of shortening (difference 3 ± 4ms, CCC $= 0.96$). Aortic occlusion was associated with a large increase in the magnitude and earlier arrival of the BCW. LV minor axis' maximum velocity of shortening was attenuated by 20% and also occurred earlier, at the time of BCW arrival (mean difference 3 ± 5ms, CCC $= 0.98$). The LV long axis was less affected by arrival of BCW (Figure).
Conclusions: The arrival of BCW results in deceleration of the rate of shortening of the LV minor axis but does not cause deceleration of the long axis. The BCW appears to be detrimental to the canine LV minor axis function.



P10.07
VERIFYING THE NEWTONIAN ASSUMPTION FOR BLOOD FLOW IN ANEURISMAL GROWTH MODELLING

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A few number of studies have examined the effect of hemodynamic factors on the initiation and growth procedure of cerebral aneurysms. The Newtonian behaviour is assumed for blood flow in almost all of the mentioned investigations. Since the majority of intracranial aneurysms occur at bifurcations, to verify this assumption, we constructed a 3D model of the basilar artery bifurcation that includes the luminal hemodynamics and the arterial wall response within a computational fluid-structure interaction (FSI) framework. The arterial wall was assumed to be elastic and isotropic. The flow was considered steady, laminar, and incompressible. The blood flow was assumed to behave both Newtonian and no-Newtonian following Carreau model (Cho, YI, Kensey, KR, Biorheology, 28:241–262, 1991). The fully coupled fluid and structure models were solved with the finite elements package ADINA 8.5. The blood pressure and velocity and the wall shear stress (WSS), effective stress and deformation distributions were compared in two cases. The results show similar patterns except the WSS magnitudes which were under-estimated with the Newtonian assumption. This difference was evident in the low velocity regions like the apex of the bifurcation (about 20%) which is a probable position for the aneurysm formation. WSS is one of the critical hemodynamic factors affecting aneurismal initiation and development. Therefore, we believe that it is worth to consider the non-Newtonian behaviour of blood flow in order to investigate the detailed relationship between hemodynamic factors and vascular diseases, and it may affect the growth procedure of cerebral aneurysms.

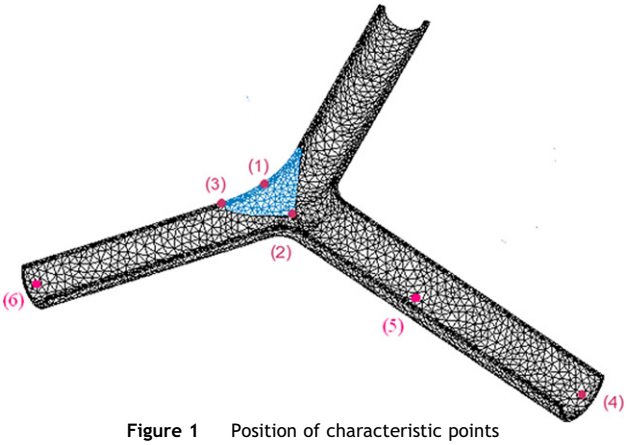

Figure 1 Position of characteristic points