There was no difference in the highest values of WI and Q between HT and p<0.0001) in HT, which suggests higher reflection from the head and neck.

Background: Wave reflection from the head and neck augments pressure and decelerates flow in the carotid artery. Wave intensity (WI) has the potential to separate peripheral (head and neck) effects from ventricular effects on pressure and flow waves. WI is defined as the product of the time derivatives of blood pressure (P) and velocity (U): WI=(dP/dt)(dU/dt). The negative value of WI indicates that the effects of reflected waves are predominant. Therefore, the integral of negative values (NA) of common carotid arterial WI in a cardiac cycle is attributed to reflection from the head and neck. To elucidate the characteristics of carotid arterial flow control in hypertensive subjects, we applied WI analysis.

Methods: We measured WI in 64 hypertensive patients (HT) (mean age 63±4 years, mean systolic/diastolic pressure 149±11/82±10 mm Hg) and 63 age-matched normal subjects (N) (mean age 63±7 years, mean systolic/diastolic pressure 121±17/70±10 mm Hg) with a noninvasive WI measuring system (SSD 6500, Aloka Co), which simultaneously measured common carotid arterial blood flow velocity and diameter change. The diameter change waveform calibrated by blood pressure by upper arm automated sphygmomanometry was used as the pressure waveform. The volume flow rate (Q) was calculated as the integral of the product of cross-sectional mean velocity and cross-sectional area of the artery over a cardiac cycle, multiplied by heart rate.

Results: The maximum diameter was larger (8.30±0.7 vs 7.85±0.7 mm, p<0.0001) and the maximum blood flow velocity was lower (50±14 vs 55±11 cm/s, p<0.05) in HT than N. NA was greater (38±19 vs 26±15 mm Hg m/s, p<0.0001) in HT, which suggests higher reflection from the head and neck. There was no difference in the highest values of WI and Q between HT and N (WI: 10.6±6.4 vs 8.6±3.6 mm Hg m/s; Q: 658±158 vs 680±178 ml/min).

Conclusions: The common carotid artery in HT had larger diameter and lower blood velocity, i.e. reduced shear stress. Q was maintained at the same values as N with enhanced reflection from the cerebral circulation.

384 Left atrial enlargement and aortic stiffness in newly diagnosed subjects with essential hypertension

P. Missoulou 1; C. Tsoulis 1; E. Taxiarchou 1; C. Katrasis 1; I. Skikas 1; I. Vlasseros 1; C. Stefanadis 1; I. Kallikazaros 1
1Ippokration General Hospital, Cardiology Dept., Athens, Greece
2Hippokration Hospital, Cardiology Dept., Athens, Greece

Purpose: Both, left atrial (LA) enlargement and aortic stiffness are early signs of hypertensive heart disease and are associated with adverse cardiovascular outcomes. The possible interrelationship between aortic stiffness and LA size in hypertensive subjects was investigated in this study.

Methods: We studied 98 consecutive newly diagnosed subjects (aged 51±8 years) with stage I-II untreated essential hypertension (office blood pressure 140±5/90±5 mm Hg) and 34 normotensives, matched for age, sex, body mass index and smoking status. All subjects underwent a complete echocardiographic study and 24-hour ambulatory blood pressure monitoring. LA volume was measured according to an established method and was indexed for body surface area to estimate LA volume index (LAVI). More-over, aortic stiffness was evaluated on the basis of the carotid-femoral pulse wave velocity (PWV) measurement by an automatic device (Compilo SP).

Results: Hypertensives compared to normotensives had increased left ventricular mass index (LVM) (105±4.26 vs 84.3±14.0 gr/m², p<0.0001), LA diameter 59.4±4 vs 36.5±5 mm, p<0.0001), left atrial volume (43.7±13.2 vs 36.0±8.8 ml, p<0.0001), and LAV (22.0±2 vs 19.5±5 ml/m², p<0.05). Hypertensives had also greater PWV compared to normotensives (8.5±1.3 vs 7.6±1.1 cm/sec respectively, p<0.001). In the entire study population, LA and PWV yielded equal values in both (110.15±0.46 vs 110.21±0.48, p=0.94). Data indexed for body surface area (subject height and systolic ejection time, was higher in women than in men (117.2±2.5 vs 112.8±2.0; p<0.001). In contrast, similarly adjusted AIX* yielded equal values in both (110.15±0.46 vs 110.21±0.48, p=0.94). Data analysis further demonstrated that, using AIX* and measured pulse wave velocity, the distance to the apparent reflection site (effective length of the arterial tree) moves towards the heart with age - as anticipated - while the opposite was true when using TI.

Conclusion: Our data demonstrate that analysis of wave reflection using a modified AIX*, with timing of the reflected wave obtained from the pressure wave front, provides a more correct timing of arrival of the reflected wave (and associated calculated AIX*) can be obtained using Doppler measurement of aortic flow in conjunction with the central pressure waveform.

385 Non-invasive assessment of arterial pressure wave reflection in evaluation of large artery function and cardiac load: can we do without ultrasound?

P. Segers 1; E.R. Reitschel 1; M.L. De Buyzere 1; D. De Bacquer 1; L.M. Van Bertel 1; G. De Backer 1; T.C. Gillebert 2; P.R. Verdonck 1 on behalf of: Asklepios Investigators
1Ghent University, Hydraulics Laboratory, Gent, Belgium; 2Ghent University Hospital, Cardiovascular Diseases Dept., Ghent, Belgium

Background: Early return of pressure wave reflection increases central (pulse) pressure and the load on the heart, and indices such as the augmentation index (AIX) allow quantifying the added contribution of the reflected wave to the pulse pressure. Computation of Aix, however, fully relies on the identification of characteristic landmarks on the pressure waveform that are associated with the timing of the reflected wave, such as an inflection point. We hypothesize that a more correct timing of arrival of the reflected wave (and associated calculated Aix*) can be obtained using Doppler measurement of aortic flow in conjunction with the central pressure waveform.

Methods: Carotid pressure (Pwf) and central flow (Qwf) waveforms were acquired non-invasively in 2132 apparently healthy subjects (1093 F/1039 M), aged between 35 and 55 at inclusion (a subgroup of the *Asklepios* population). Pwf was obtained using applanation tonometry at the common carotid artery; Qwf was assessed from Doppler flow velocities measured in the left ventricular outflow tract, multiplied with its cross-sectional area. Aix was assessed directly from Pwf, with the timing of the inflection point (Ti) detected automatically using a second order derivative algorithm. Alternatively, we used Pwf and Qwf to separate Pwf into its forward and reflected component, and the timing of the return of the reflected wave (T*) was defined as the moment where the reflected waves adds to the forward wave. Aix* was calculated.

Results: T* was systematically larger than Ti in both women (22.3±1.0 vs 21.6±0.9; p<0.001) as in men (12.8±1.3 vs 12.1±0.9; p<0.001). Aix, adjusted for subject height and systolic ejection time, was higher in women than in men (117±2.0 vs 112±2.5; p<0.001). In contrast, similarly adjusted Aix* yielded equal values in both (110.15±0.46 vs 110.21±0.48, p=0.94). Data analysis further demonstrated that, using T* and measured pulse wave velocity, the distance to the apparent reflection site (effective length of the arterial tree) moves towards the heart with age - as anticipated - while the opposite was true when using Ti.

Conclusion: Our data demonstrate that analysis of wave reflection using a modified Aix*, with timing of the reflected wave obtained from the pressure waveform is a feasible and more accurate tool to assess aortic stiffness and its associated cardiac load.