VASCULAR FUNCTION

749 Heterogeneity of vessel distension within the common carotid artery wall: implications for functional analysis.

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We measured diameter distension (DD) and circumferential strain (DD/D) at the lumen-intima (inner wall) and intima-adventitia (outer wall) boundaries for the common carotid artery in 39 subjects covering a wide range of ages (18 – 83 years) and clinical conditions using a prototype 'wall tracking' system based on the Vivid7 scanner. Additionally, data were compared to Pie-medical Wall Track System (WTS) data. Results: Among the 20 patients without dissection or IMH at TEE and angiography, the linearization of the thoracic aorta raise a suspicion for IMH, especially if preceded by a TEE suspicion.

750 Geometrical linearization of aortic contour: angiographic sign in acute intramural aortic hemmorhage detected with transesophageal echo.

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Background: In suspicion of aortic dissection (AD), the presence of an intramural hematoma (IMH) may appear negative at aortic angiography, but visible at transesophageal echocardiography (TEE). We hypothesized that the linearization of an angiographic aortic contour can be considered an angiographic sign for ascending aortic IMH. Methods: We studied 83 patients with suspected thoracic aorta dissection with color Doppler TEE and, because of uncertain diagnosis, 69 of them with contrast angiography. In 48/69 patients the diagnosis of AD was confirmed at surgery, at autopsy or with the concordance of TEE and angiography. In a geometrical model of aortic angiography, measuring the tangential angles to the two circumference arches of the outer (AB and BC) and the inner (DE) contour, a linearization of the aorta was diagnosed if the sum of the two outer angles was <30° (figure left) or the inner angle was >130° (figure right).

Results: Among the 20 patients without dissection or IMH at TEE and angiography, only one patient showed linearization of the inner contour of the aorta (specificity 95%). All the 4 patients without overt AD at angiography, but showing IMH at TEE and at surgery, showed linearization of the aortic contour (sensitivity 100%): of the sum of outer angles (1pt), of the inner angle (1pt) of both inner and outer angles (2pt). Linearization was not calculated in the 45 patients with an angiographic diagnosis for AD.

Conclusions: 1) accuracy of TEE and MRI for measuring AD diameters is almost identical, 2) measurements of distal thoracic aorta are more precisely obtained with MRI, 3) because AR dilatation is the major risk factor for dissection of the aorta, TTE may be considered the method of first choice for screening purposes and to follow-up aortic disease in TS pts.
Aortic wall thickness and pulsatility - do they represent the same aspect of atherosclerosis?

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The ability to render the volume of a specified structure from three-dimensional (3-D) transesophageal echocardiography (TEE) provides the opportunity for quantification of atherosclerosis by measuring its two components: atherosclerosis (wall thickness) and stiffness (aortic pulsation). The purpose of the study was to quantify intima-media complex volume and the volume of selected aortic segments' lumen in systole and diastole.

Study group consisted of 38 consecutive patients referred for the routine TEE. Thoracic aorta was scanned by rotational 3-D TEE. Reformatted datasets were reviewed and the lumen-intima and media-adventitia interfaces were determined. Serial volumetric calculations of 2 cm segments at three levels of the thoracic aorta were performed.

The volume of lumen of two-centimeter segments measured at three levels of the thoracic aorta (30 cm, 35 cm and 40 cm from incisors) varied from 7.3 to 17.6 cm³ (mean 12.0 ± 3.2, 11.5 ± 3.1 and 10.9 ± 2.5 cm³ respectively). The volume of intima-media complex varied from 0.5 to 5.0 cm³ (mean 1.8 ± 1.0, 1.6 ± 1.0 and 1.7 ± 1.1 cm³ respectively). Aortic pulsation defined as the difference between the largest and the smallest lumen volume of the same aortic segment varied from 0.0 to 2.8 cm³ (mean 1.3 ± 0.5, 1.1 ± 0.7 and 1.1 ± 0.6 cm³ respectively). The intima-media complex volume was correlated with the aortic lumen volume (R²=0.55, p<0.001), but not with the aortic pulsation (R²=0.02, p=NS).

The differences in the measurements of aortic lumen volume, aortic pulsation and intima-media complex volume by the same observer were 0.22 ± 0.10 cm³, 0.07 ± 0.08 cm³ and 0.21 ± 0.06 cm³ respectively, whereas by two observers 0.23 ± 0.15 cm³, 0.14 ± 0.13 cm³ and 0.17 ± 0.03 cm³ respectively. Following risk factors were independently related to the intima-media complex volume: hypertension (p<0.001), hyperlipidemia (p=0.032) and cigarette smoking (p=0.045). Age (p=0.001), diabetes length of disease (p=0.014) and family history (p=0.014) were related to the aortic pulsation.

Conclusions: Aortic intima-media complex volume and aortic pulsation represent different aspects of aortic properties and are related to different clinical risk factors of atherosclerosis.

Impaired response of the brachial artery to nitroglycerine in patients with limb-girdle muscular dystrophy.

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Background: Sarcoglycan-deficient Limb-Girdle Muscular Dystrophies (SD-LGMD) are caused by mutations in one of the genes of the sarcoglycan (SG) complex [alpha, beta, gamma and delta], encoding for transmembrane proteins part of the dystrophin-glycoprotein complex. The alpha and gamma SGs are expressed in the skeletal muscle; the beta and delta are also expressed in smooth muscle cells (SMC), where they form a complex along with epsilon SG and sarcospan. Dilated cardiomyopathy is a frequent complication of the SD-LGMD, especially of the alpha and delta SGs, which leads to smooth muscle dysfunction could have a contributory role. This was also suggested by previous in vivo studies in animal models and in humans with SD-LGMD who showed abnormal coronary function. The aim of this study was to identify a vascular SMC dysfunction in SD-LGMD patients. In order to determine the maximum vasodilator response we used nitroglycerin (NTG) that served as an exogenous NO donor. That would be a measure of endothelial dysfunction.

Methods: The brachial artery was assessed in 6 patients with confirmed diagnosis of SD-LGMD (4 F, 2 M) mean age 20.5 yrs (range 7.5-32.5). Four patients had mutations in beta and 2 in gamma SG. They were compared to six age matched controls (4 F, 2 M). None of the subjects had history or risk factors for cardiovascular disease, were non-smokers and did not drink coffee or tea for at least 24 hours. They all had normal classic echocardiograms. A high dose of 0.8mg NTG spray was given sublingually. Imaging was performed using the HDI 5000 ultrasound system (Philips Medical Systems) with a 5-12 MHz linear transducer. The images were digitally stored and analysed off-line using dedicated software (HD1-lab, Philips Medical Systems). The ECG was recorded during image acquisition and all measurements were performed at end diastole.

Results: NTG induced dilatation was impaired in patients with LGMD when compared to controls (10.2 vs.23% vs.22.7±12%, p=0.01).

Conclusion: Vasodilator response to NTG is impaired in patients with LGMD irrespective of the primary genetic defect. These results might indicate a vascular SMC dysfunction in SD-LGMD.

Evaluation of the association between intima-media thickness and stiffness of the common carotid artery.

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Background: Intima-media thickness (IMT) and stiffness of the common carotid artery are indices of atherosclerosis and arteriosclerosis. Both indices increase with age. However, the relationship between IMT and arterial stiffness is not clear. The purpose of this study was to investigate whether an increase in IMT is associated with an increase in stiffness.

Methods: We obtained carotid arterial IMT and stiffness parameter, beta, from 171 subjects (total:311 sites, age, 16-80 years). With an echo-tracking system (Aloka SSD-5500, Japan), we measured pulsatile changes in carotid arterial diameter, systolic (Ps) and diastolic (Pd) pressure in the brachial artery, and calculated beta, which is defined as beta = (1/Ps/Pd)/(Ds-Dd)/Dd. Here, Ds is the maximum di- meter and Dd the minimum diameter. After the measurements, we calculated the mean IMT in the whole study group, and defined subgroup A as having an IMT greater than the mean IMT.

Results: IMT was 0.70 ± 0.25 mm and beta was 12.0 ± 5.1. IMT and beta were correlated with age (IMT: r= 0.62, beta: r= 0.72), and IMT was correlated with beta (r=0.52, p = 0.001) in the whole study group. However, in subgroup A (148 sites), IMT did not correlate with beta (r= 0.08, P = 0.3)(Figure).

Conclusions: In the group with IMT greater than 0.7mm, IMT did not correlate with arterial stiffness.

Endothelial function, blood pressure and lipids in pre-eclamptic patients one year after delivery.

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Background: Pre-eclampsia (PE) remains a major cause of maternal and fetal mortality. It is believed that inadequate trophoblast invasion of uterine spiral arteries leads to placental ischemia and release of factors that damage maternal vascular endothelium. The aim of this study was to investigate vascular endothelial function, lipid profile and ambulatory blood pressure one year after delivery, in patients with previous PE and in age-matched healthy controls (CON).

Methods: Flow-mediated vasodilatation (FMD) of the brachial artery was determined non-invasively by ultrasound technique, in 18 patients with previous PE and 16 age-matched, healthy CON, one year after delivery. FMD, blood pressure and lipids were examined during the follicular and luteal phases of the menstrual cycle. Results: FMD was decreased in the PE group, 3± 3% versus Con 10±2% (p=0.001), while the diameter of the artery and flow response did not differ between the two groups. There was no difference in FMD or NTG between the two phases of the menstrual cycle. The systolic and the diastolic blood pressure was higher in the PE group, 111/74 mm Hg, versus 102/65 mm Hg in Con, (p=0.011 and p=0.003). Total cholesterol was higher in the PE group, but only in the luteal phase. Conclusion: Our results showed that PE is associated with higher blood pressure and decreased endothelial-dependent vasodilatation, one year after delivery in patients with previous PE. These findings suggest that the impairment of the endothelial function is prolonged and may be of clinical importance for future cardiovascular events.
High doses of simvastatin in acute coronary syndromes and flow mediated dilatation in long-term observation.

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Background: There is an increasing evidence that statins exert pleiotropic effects, e.g., they may modify vascular dysfunction observed in CAD. Flow-mediated dilatation (FMD) in brachial artery (BA) is a non-invasive measure of endothelial function.

The aim of our study was to compare the influence of standard and high doses statin therapies on the FMD in CAD patients in long-term follow-up.

Material and Methods: We examined 44 patients with CAD randomized in two groups: Group S (+): 22 patients with acute coronary syndromes who were administered high doses of simvastatin (80mg per day) over a period of one month from caroloid and ascending aorta.

Group H (+): 22 patients with acute coronary syndromes treated by standard doses of other statins according to lipid profile. After one year observation clinical data, pharmotherapcy, concomitant diseases, and FMD were all assessed.

FMD was measured as the percent change of BA diameter after 3 min occlusion (FMD%), and after nitroglycerin administration (FMD-NITG%).

Results: In one year-follow up we did not find any difference between clinical data of the groups examined. Pharmatherapy were also comparable in study groups - all subjects were treated with standard doses of statins and their lipid profiles were within normal range. However, differences in FMD% were noted (see Table 1). The FMD-NITG% were comparable in the study groups.

Conclusions: High doses of simvastatin used in acute coronary syndrome regardless of serum lipids are of positive value for endothelial function improvement in long-term observation.

Distal, but not proximal, aortic dissection is associated with severe thoracic aortic atherosclerosis. A transoesophageal echocardiographic study.


Background: Aortic dissection (AD) is the most frequent fatal disease in the spectrum of the chest pain syndromes, and all mechanisms that weaken the aortic wall may result in this condition. The aim of our study was to evaluate the association between thoracic aortic atherosclerosis (TAA) and AD.

Methods: We assessed TAA in 71 patients (pts) (49 males, 22 females, mean age 62 years) with aortic dissection, who underwent transoesophageal echocardiography at our laboratory during a 10-year period.

Forty eight pts had proximal (Stanford type A) and 23 pts had distal (Stanford type B) dissection. Results: Severe TAA, with plaques thicker than 3mm were detected in 30/71 (42%) pts, while the others had mild (40%) or no (18%) TAA. Thick plaques were found in 18/23 (78%) of type B and only in 12/48 (25%) of type A dissection (p=0.00002). In addition, pts with distal dissection were older (70 vs 58 years, p=0.00007), more frequently hypertensive (85 vs 38%, p=0.03) and did not differ (p=NS) in smoking (30 vs 44%) and diabetes (13 vs 17%). In both groups there was a high incidence of hypertension (83 and 63% respectively), but without statistical significant difference (p=NS).

Conclusions: Severe TAA is associated mainly with distal and not with proximal aortic dissection. These findings indicate that atherosclerosis, which is a lesion of the intima, possibly contributes to the increased vulnerability of the descending thoracic aorta in this group of patients.

Stentless aortic bioprosthesis competence and aortic root geometry.

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Background: Long term competence of stentless aortic bioprosthesis is critical to its clinical durability. We prospectively assess the incidence of stentless valve regurgitation and its relation to the changes in aortic root geometry.

Methods: Aortic root geometry and valve competence were studied in 50 patients (mean age 60±5 years) who received a stentless bioprosthesis between 1992 and 1996. Doppler echocardiographic studies were performed at 2.5±0.6 and 6.1±1.4 years after the aortic valve replacement. The degree of aortic regurgitation was graded 1-4/4 using color Doppler. The diameters of aortic annulus, sino-tubular junction and ascending root were measured from 2D echo at peak systole and indexed to the valve size implanted.

Results: Of 50 patients studied, 12 patients had AR with 2.0±1.7 grade at late echo follow up. This group of patients were associated with significant increase in the diameter of sino-tubular junction (14±13 vs 4±18, % of prosthesis size, p=0.001) and ascending root (5±24 vs 4±19, % of prosthesis size, p=0.001) than those with no late AR. Preoperative valve disease (AS vs AR), early post-operative AR, and the presence of bicuspid cusp did not affect the late changes in aortic root geometry.

Conclusion: Long term incompetence of stentless aortic bioprosthesis results in a significant dilatation of native aortic root which can further trigger more severe AR and thus bioprosthesis dysfunction. Given the significant incidence of late AR with unclear underlying clinical mechanism, an annular echo follow up appears necessary for patients received a stentless aortic bioprosthesis.

Role of imaging techniques in diagnosis of aortic intramural haematoma.

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Aortic intramural haematoma forms part of the acute aortic syndrome and early diagnosis is required.

Purpose: The aim of the present study was to assess the role of imaging techniques in intramural haematoma (IMH) diagnosis.

Methods: Of 325 consecutive patients with suspected acute aortic syndrome, 78 were diagnosed by transoesophageal echocardiography (TEE), computed tomography (CT), magnetic resonance imaging (MRI) or anatomically of IMH. Two imaging techniques were indicated in all cases and a third if disparity existed. The imaging technique diagnosis was blinded.

Results: TEE yielded 4 false positive diagnoses in type B IMH (2 laminar atheromas of the lung and 2 intraluminal thrombi) and 2 false negatives in the upper third os ascending aorta. CT gave a false positive and false negative type B IMH in descending aorta due to intraluminal aortic thrombosis. MRI made no false positive or negative diagnoses.

Conclusions: In the diagnosis of intramural haematoma, CT and mainly MRI are superior to TEE. These data should be borne in mind when acute aortic syndrome is suspected.

Aortic atherosclerosis-association with carotid and valvular aortic sclerosis in elderly.

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Nowaday aortic sclerosis is considered to be a form of atherosclerosis and the main substrate for the development of aortic stenosis.It is associated with a great risk in cardiovascular morbidity and mortality

Aim: To analyse the relation between transthoracic and transesophageal measurements of the aortic cusps.To investigate the relation between the severity of aortic sclerosis, the transvalvular flow velocity and aortic area assessed by transesophageal echocardiography.To analyse the prevalence and the degree of carotid atherosclerosis, the prevalence and the degree of aortic sclerosis compared to normal values.

Method: 41 pts >60 years were examined by transthoracic and transesophageal echocardiography, aortic valve abnormalities were examined and thickness of the cusps was determined at base,median level and tip for each cusp. Presence of aortic sclerosis was the inclusion criteria for group A (30 pts),normal valve morpholoy was included in group B (11pts). We also measured aortic area (planimetric) and transvalvular flow velocities using Doppler method.

The ascending aorta, aortic arch and descending thoracic aorta were imaged by TEE in multiplane long and short axis.Aortic atherosclerosis was defined as irregular intimal thickening (IMT) > 2mm-with increased echogenicity. Carotid atherosclerosis -defined as an intima-media thickness ≥ 1 mm has been evaluated by bilateral bidimensional echographic of the common carotid artery and bifurcation.

Results: There is a good correlation (r=0.85) between transthoracic measurements of right and noncoronarian cusp compared to transeosaglarian method; for the left cusp the correlation index is low (r=0.61). Group A has greater transvalvular vleolociy compared to group B although aortic area and cuspal movement is not restricted.Aortic and carotid atherosclerosis had a higher incidence in group compared to group B.

Conclusion: Transsthoracic echocardiography is a good and available method for the assessment of the aortic valvular morphology. Aortic valvular sclerosis is associated with carotid and aortic atherosclerosis and considered to be a form of valvular atherosclerosis.