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P81: DISARRAY AND REMODELING OF THE RADIAL ARTERY IN WOMEN WITH SPONTANEOUS CORONARY ARTERY DISSECTION: THE FUCHSIA STUDY

Rosa Maria Bruno, Nicole Di Lascio, Abtehale Al Hussaini, Daniela Guarino, Saverio Vitali, Piercarlo Rossi, Davide Caramella, Bernardo Cortese, Francesco Faita, Stefano Taddei, Lorenzo Ghiadoni, David Adlam

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Conclusions: *ob/ob* mice presented a premature cardiac dysfunction without a further age-related deterioration and a reduction in the abdominal aorta and carotid artery mean diameter in adult age.

P79

ULTRASONOGRAPHIC CHARACTERIZATION OF THE *db/db* MOUSE, AN ANIMAL MODEL OF METABOLIC ABNORMALITIES

Nicole Di Lascio², Chiara Rossi¹, Claudia Kusmic², Anna Solini³, Francesco Faita²

¹Department of Clinical and Experimental Medicine, Italy

²Institute of Clinical Physiology, CNR, Pisa, Italy

³Department of Surgical, Medical, Molecular and Critical Area Pathology, University of Pisa, Pisa, Italy

Purpose/Background/Objectives: The availability of an animal model that, beside common blood parameters like hyperglycemia or high lipid levels, reliably mirrors organ damage occurring in metabolic diseases, is an urgent need. These animals have not been fully characterized in terms of cardiovascular, renal and hepatic ultrasound parameters, and only sparse and discordant values can be found in literature. Aim of this paper is to provide a detailed, non invasive description of heart, vessels, liver and kidneys of the *db/db* mouse by ultrasound imaging.

Methods: 16 wild type and 34 *db/db* 11 week-old male mice were studied. State of the art ultrasound technology was used to acquire images of cardiovascular, renal and hepatic districts. A full set of parameters describing function of the selected organs was evaluated.

Results: *db/db* mice are characterized by systolic and diastolic dysfunction, confirmed by strain analysis. On the contrary, abdominal aortic and carotid stiffness seem to be not increased in these diabetic rodents; furthermore, they are characterized by a smaller mean diameter for both vessels. Renal microcirculation is significantly compromised, while liver steatosis is only borderline higher in *db/db* mice than in control animals.

Conclusions: We offer here for the first time an *in vivo* detailed ultrasonographic characterization of the *db/db* mouse model, providing a useful tool for a thoughtful choice of the right rodent model for any experimental design.

P80

IDENTIFICATION OF RADIAL VASCULAR WALL ABNORMALITIES BY VERY-HIGH FREQUENCY ULTRASOUND IN PATIENTS WITH FIBROMUSCULAR DYSPLASIA: THE FUCHSIA STUDY

Rosa Maria Bruno¹, Nicole Di Lascio², Daniela Guarino¹, Saverio Vitali¹, Piercarlo Rossi¹, Davide Caramella¹, Stephane Laurent³, Pierre Boutouryie³, Stefano Taddei¹, Lorenzo Ghiadoni¹, Francesco Faita²

¹University of Pisa, Pisa, Italy

²Institute of Clinical Physiology – CNR, Pisa, Italy

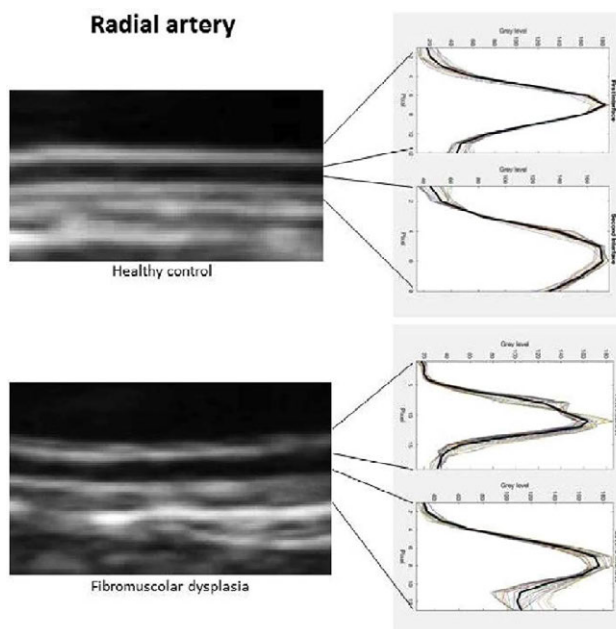
³Hôpital Européen Georges Pompidou, INSERM, Paris, France

Aim: This case-control study is aimed at identifying radial vascular wall abnormalities in patients with fibromuscular dysplasia (FMD).

Methods: High-frequency ultrasound scans of radial arteries were obtained by VevoMD (70 MHz probe, FUJIFILM, VisualSonics). Radial wall showed two echogenic interfaces: the 1st (lumen-media) and the 2nd (media-adventitia). Intima-media (IMT), adventitia (AT), and global thickness (IMAT) and wall cross-sectional area (WCSA) Measured. Vascular wall disarray was assessed calculating the root mean square error (RMSE) between 20 gray-level profiles crossing the two interfaces and the profile obtained averaging them, normalized for the maximum value of the corresponding mean profile (RMSE/mean).

Results: 11 treated hypertensive female FMD patients and 8 healthy controls (C) were enrolled (age 52 ± 5 vs 45 ± 13 years, $p = 0.51$; BMI 26 ± 3 vs 23 ± 3 kg/mg, $p = 0.12$; mean BP 97 ± 7 vs 85 ± 10 mmHg, $p = 0.01$). Radial lumen was similar; IMT (0.166 ± 0.037 vs 0.128 ± 0.022 mm, $p = 0.03$), AT (0.114 ± 0.029 vs 0.083 ± 0.019 mm, $p = 0.008$) and IMAT (0.281 ± 0.042 vs 0.211 ± 0.027 mm, $p = 0.003$) were higher in FMD. Wall/lumen ratio was similar and WCSA increased in FMD.

The maximum values of 1st (121 ± 43 vs 157 ± 22 , $p = 0.09$) and 2nd interface (109 ± 44 vs 133 ± 18 , $p = 0.09$) tended to be lower, whereas RMSE/mean was higher in FMD (1st 1.31 ± 0.24 vs 0.83 ± 0.32 , $p = 0.006$; 2nd 1.37 ± 0.38 vs 0.94 ± 0.32 , $p = 0.03$). The difference was attenuated for the 1st but not for the 2nd interface when considering age and mean BP as covariates ($p = 0.054$ and $p = 0.016$ respectively).



Conclusions: The radial artery wall of hypertensive FMD patients shows increased thickness and its ultrastructure is characterized by loss of echogenicity and inhomogeneity of the two echogenic layers.

P81

DISARRAY AND REMODELING OF THE RADIAL ARTERY IN WOMEN WITH SPONTANEOUS CORONARY ARTERY DISSECTION: THE FUCHSIA STUDY

Rosa Maria Bruno¹, Nicole Di Lascio², Abtehele Al Hussaini³, Daniela Guarino¹, Saverio Vitali¹, Piercarlo Rossi¹, Davide Caramella¹, Bernardo Cortese⁴, Francesco Faita², Stefano Taddei¹, Lorenzo Ghiadoni¹, David Adlam³

¹University of Pisa, Pisa, Italy

²Institute of Clinical Physiology – CNR, Pisa, Italy

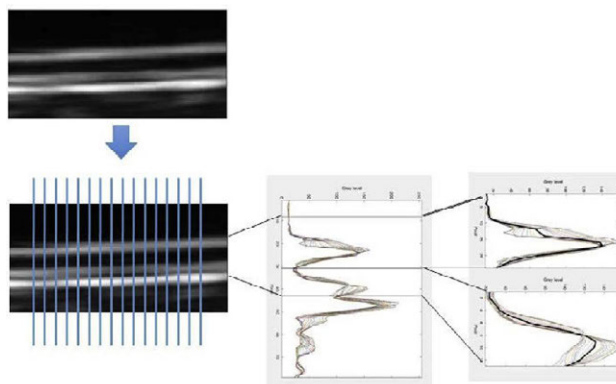
³University of Leicester, Leicester, UK

⁴ASST Fatebenefratelli-Sacco, Milano, Italy

Background: Spontaneous coronary dissection (SCAD) may represent a manifestation of fibromuscular dysplasia (FMD); thus, preclinical lesions might be found in extracoronary vessels with similar size and wall ultrastructure, such as the radial artery.

Methods: Two 5'-clips from the left radial artery were obtained by Vevo MD (70 MHz probe, FUJIFILM, VisualSonics). Radial wall showed two echogenic interfaces: the 1st (lumen-media) and the 2nd (media-adventitia). Intima-media (IMT), adventitia (AT), and global thickness (IMAT) and wall cross-sectional area (WCSA) Measured.

Vascular wall disarray was assessed calculating the root mean square error (RMSE) between 20 gray-level profiles crossing the two interfaces and the profile obtained averaging them, normalized for the maximum value of the corresponding mean profile (RMSE/mean).



Results: 5 female SCAD patients and 9 healthy controls (C) were enrolled (age 45 ± 9 vs 45 ± 13 years, $p = 0.95$; BMI 21 ± 3 vs $23 \pm \text{kg/m}^2$, $p = 0.22$; mean BP 77 ± 5 vs 85 ± 10 mmHg, $p = 0.053$). 2nd interface peak was reduced in the SCAD group (97 ± 29 vs 130 ± 19 , $p = 0.04$), whereas RMSE/mean was increased (1.89 ± 0.68 vs 0.97 ± 0.30 , $p = 0.02$). Similar values were found for the 1st interface. IMT (0.165 ± 0.031 vs 0.125 ± 0.022 mm, $p = 0.03$), but not AT (0.095 ± 0.020 vs 0.081 ± 0.020 mm, $p = 0.20$) and IMAT (0.260 ± 0.049 vs 0.206 ± 0.030 mm, $p = 0.053$), was significantly higher in SCAD.

Radial internal diameter and wall/lumen ratio were similar; conversely WCSA was increased in SCAD (1.69 ± 0.48 vs 1.07 ± 0.37 mm², $p = 0.02$).

Conclusions: Radial arteries of SCAD patients were characterized by increased wall thickness. Furthermore, the 2nd echogenic layer exhibited loss of echogenicity and inhomogeneity, features similar to FMD patients.

P82 IMAGE-BASED CHARACTERIZATION OF PLAQUE LIPID CONCENTRATION CHANGES IN TIME AND THE ROLE OF STATIN THERAPY

Kristen Meiburger¹, Gianfranco Varetto², Pietro Rispoli², Filippo Molinari¹
¹Dipartimento di Elettronica e Telecomunicazioni, Politecnico di Torino, Italy

²Dipartimento di Scienze Chirurgiche, AOU Città della salute e della scienza di Torino, Italy

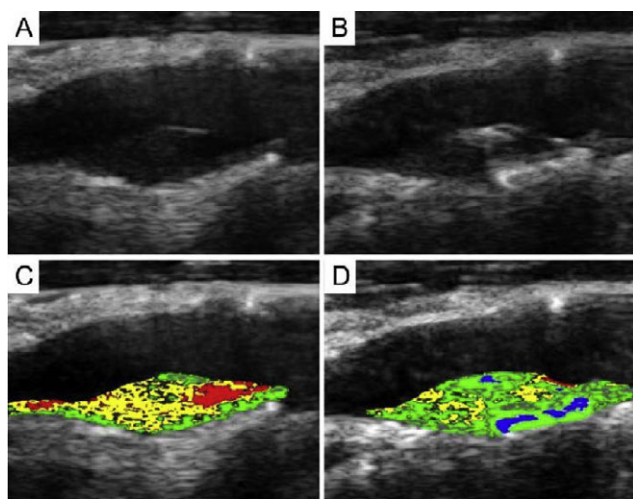
Introduction: Carotid artery atherosclerosis is an established risk factor for cerebrovascular events. Core lipid-rich plaques are considered at a higher risk of embolization compared to fibrous or calcified lesions. Contrast enhanced ultrasound (CEUS) is effective for studying carotid plaques, providing a virtual histology [1]. Here we assess the behavior of non-surgical carotid plaques in terms of lipid variation over time.

Methods: Eleven patients were enrolled (University of Turin) with a 50–69% (ECST) carotid asymptomatic stenosis. Seven patients were on statin therapy. All patients signed an informed consent and underwent standard carotid ultrasound (MyLab25 Gold, Esaote). A 1.5ml bolus of SonoVue (Bracco Spa) was injected; then a 5ml saline flush. Post-contrast Bmode images (180s after injection) were saved and analyzed offline. All patients repeated this protocol after 6 months.

The plaques were segmented, intensity normalized [2], and characterized according to a previous method [3].

Results: We evaluated small cohorts according to lipid concentration changes, identifying four categories. One patient had a plaque showing no lipid variation; four patients showed a slight decrease; four patients a remarkable decrease; two patients an increase.

Seven patients with a decrease in lipid concentration were on statin therapy, while both patients with an increase in lipids were not.



Example of image-based characterization. (A) B-mode post-contrast agent injection at t1. (B) B-mode post-contrast agent injection at t2, 6 months after t1. (C) Characterization of B-mode image at t1 (40% lipids). (D) Characterization of B-mode image at t2 (13% lipids). Red: blood, Yellow: lipids, Green: fibrous, Blue: Calcified, Black: non-classified.

Conclusions: A method for asymptomatic carotid plaque characterization using CEUS is presented. We focused on plaque lipid variations and the possible influence of statin therapy. We showed that carotid plaques are rarely stable, but rather continuously change composition over time and how statins could play an important role in this process.

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P83 A PILOT STUDY TO ASSESS PEAK SYSTOLIC VELOCITY AS A POSSIBLE MARKER OF ATHEROSCLEROTIC BURDEN USING ULTRASOUND

Carola Koenig¹, Mark Atherton¹, Marco Cavazzuti¹, Sudarshan Ramachandran², Corinna Gomm², Richard Strange³, Ian Halliday⁴, Torsten Schenkel⁴

¹Brunel University London, UK

²Heart of England Foundation NHS Trust, UK

³Keele University, UK

⁴Sheffield Hallam University, UK

Introduction: Ischemic heart disease (IHD) has been associated with lower peak systolic velocity (PSV) on penile Doppler measurements [1]. This study establishes whether carotid ultrasound (US) PSV was associated with computational fluid dynamics (CFD) outputs, which in turn may contribute to IHD pathogenesis.

Methods: A sample of 57 subjects (with IHD: 27, without IHD: 30) had US velocity profiles (left- common carotid artery) determined between 10–12 equispaced points. Bezier curve fitting was used to fit the profile through the measured velocity points for a normalised diameter. PSV was correlated against CFD results such as wall shear stress (WSS) [2]. Difference in PSV between individuals with/without IHD was studied via t-test. Linear regression was carried out to see if peak systolic velocity was associated with CFD outputs. Any significant associations were analysed within stratified groups (with/without IHD).

Results: PSV was significantly lower ($p = 0.042$) in subjects with IHD (with IHD: 53.6 ± 17.3 cm/s, without IHD: 62.8 ± 16.1 cm/s). PSV was associated with carotid bulb average pressure drop ($p < 0.001$), area of average bulb WSS (<1 Pa: $p = 0.016$, <2 Pa: $p = 0.006$, <3 Pa: $p = 0.001$). All the above associations remained significant in individuals with IHD (average bulb pressure drop: $p = 0.001$, average bulb WSS (<1 Pa: $p = 0.013$, <2 Pa: $p = 0.008$, <3 Pa: $p = 0.003$). In subjects without IHD, PSV was associated with only average bulb pressure drop ($p = 0.016$).

Conclusions: This study suggests that further work on PSV and its associations with CFD outputs is required in individuals with and without IHD in various vascular beds.

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P84 HIGH-FRAME RATE VECTOR FLOW IMAGING: RELATIONSHIP BETWEEN CAROTID BIFURCATION GEOMETRY AND FLOW PATTERNS

A. Alfredo Goddi¹, L. Luca Aiani¹, Y. Yigang Du², X. Xujin He², Y. Yingying Shen², L. Lei Zhu²

¹Centro Medico SME – Diagnostica per Immagini (SME Medical Center – Diagnostic Imaging), Varese, Italy

²Shenzhen Mindray Bio-Medical Electronics Co. Ltd., Shenzhen, China

Background: The laminar flow movement in straight arteries is affected by anatomical factors such as bifurcation, lumen diameter changes or plaques.