patients with renal FMD resulted in revealing relatively high prevalence of FMD lesions and vascular complications in cervical and/or intracranial arteries.

PP.19.11 COMPUTATIONAL ASSESSMENT OF MODEL BASED WAVE SEPARATION USING A DATABASE OF VIRTUAL SUBJECTS

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Objective: An important area of interest in arterial pulse wave analysis is the quantification of arterial wave reflection. It can be achieved by wave separation analysis (WSA) if both the aortic pressure waveform and the aortic flow waveform are known. For better applicability, several mathematical models have been established to estimate aortic flow solely based on pressure waveforms. The aim of this study is to investigate and verify the model based wave separation of the ARCSolver method on virtual pulse wave measurements.

Design and method: The study is based on a virtual database generated via simulations at the King's College London. Seven cardiac and arterial parameters were varied within physiological healthy ranges, leading to a total of 3325 virtual healthy patients. Hemodynamic data is available at 11 locations within the arterial tree. For assessing the ARCSolver computationally, this method was used to perform WSA based on the aortic root pressure waveforms of the virtual patients. As a reference, the values of WSA using both the pressure waveforms and flow waveforms (scaled to 100 arbitrary units) provided by the virtual database were taken. For evaluating the performance of the modeling approach, the results of wave separation analysis using the mathematical model of the ARCSolver were compared against the reference.

Results: The investigated parameters showed a good overall agreement between the model based method and the reference, see table. Mean differences and standard deviations were -0.05 ± 0.02 AU for characteristic impedance, -3.93 ± 1.79 mmHg for forward pressure amplitude, 1.37 ± 1.56 mmHg for backward pressure amplitude and 12.42 ± 4.88 % for reflection magnitude.

Conclusions: The results indicate that the mathematical flow model of the ARCSolver method is a feasible surrogate for a measured flow waveform and provides a reasonable way to assess arterial wave reflection non-invasively.

	Virtual Database Mean ± STD	ARCSolver Mean ± STD	Difference Mean ± STD
Z_c [AU]	0.22 ± 0.08	0.18 ± 0.06	-0.05 ± 0.02
P_f [mmHg]	35.44 ± 11.24	31.51 ± 9.92	-3.93 ± 1.79
P_b [mmHg]	23.19 ± 7.48	24.55 ±7.74	1.37 ± 1.56
RM [%]	65.62 ± 6.45	78.04 ± 5.57	12.42 ± 4.88

Z_c, characteristic impedance; P_f, forward pressure wave amplitude; P_b, backward pressure wave amplitude; *RM*, reflection magnitude

PP.19.12 ASSOCIATION OF ISOLATED MORNING HYPERTENSION WITH ARTERIAL MEASURES IN UNTREATED CHINESE PATIENTS

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Objective: Morning hypertension was suggested to be closely associated with target organ damage and cardiovascular events. However, the independent contribution of morning hypertension to cardiovascular damage remains controversial. The purpose of our study was to investigate the association of isolated morning hypertension with measures of arterial stiffness and microalbuminuria in an untreated outpatient cohort.

Design and method: We recruited consecutive outpatients who was suspected of having hypertension but not taking antihypertensive drugs for at least 2 weeks and referred to our hypertension clinic from November 2010 to June 2015. Home BP was self-measured with the Omron 7051 monitors for 7 days. Hypertension was defined as a mean home BP of at least 135/85 mmHg either in the morning or in the evening. We assessed carotid-femoral pulse wave velocity (cfPWV) and central augmentation index (cAIx) with the SphygmoCor system as measures of arterial stiffness, and the morning urinary albumin/creatinine ratio (ACR) as measures of microalbuminuria.

Results: In the 1537 untreated outpatients (mean age, 51.0 years; women, 51.9%), 200 (13.0%) had isolated morning hypertension. Patients with isolated morning hypertension compared to normotensive subjects had faster cfPWV (8.1 vs 7.5 cm/s, P < 0.001), increased urinary ACR (0.76 vs 0.65 mg/mmol, P = 0.049), but similar cAIx (26.7 vs 25.3%, P = 0.14). After adjustment for age, sex, body height and weight, heart rate, current smoking and alcohol intake, serum total cholesterol and fasting glucose, the between-group difference in cfPWV (8.0 vs 7.5 cm/s, P < 0.001), cAIx (25.8 vs 23.5%, P < 0.001) and ACR (0.72 vs 0.62, P = 0.037) were statistically significant. In continuous analysis, home morning systolic BP was significantly (P < 0.001) associated with cfPWV and ACR after adjustment with aforementioned variables and evening SBP. In addition, for cfPWV and ACR, morning systolic BP explains the greatest part of the variations in the model.

Conclusions: The prevalence of isolated morning hypertension is 13% in our untreated Chinese outpatients. Isolated morning hypertension is associated with arterial stiffness and increased wave reflections in untreated Chinese patients. Home morning BP was independently associated with arterial damage.

PP.19.13 POST OCCLUSIVE REACTIVE HYPEREMIC RESPONSE OF SKIN MICROCIRCULATION IN EXTREMELY OBESE HYPERTENSIVE AND NON-HYPERTENSIVE PATIENTS AFTER BARIATRIC SURGERY

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Objective: Bariatric surgery is an effective therapeutic method to lose weight and improve metabolism in extremely obese patients. However, little is known about reactivity of skin microcirculation after bariatric surgery. The aim of this study was to assess changes of post occlusive reactive hyperemic (PORH) response in skin microcirculation among extremely obese patients after six months after bariatric surgery.

Design and method: Study population consisted of patients with severe obesity who met the eligibility criteria and underwent bariatric surgery (sleeve gastrectomy and Roux-en-Y gastric bypass). Skin blood flow was measured using PeriFlux laser Doppler flowmetry (Periflux System 5000; Perimed, Järfälla/Stockholm, Sweden). Resting flow and PORH were registered before and six months after bariatric surgery. Fast Fourier Transformation of LDF signal of reactive hyperemia was also performed. Data were analyzed in two groups: without (group I) and with hypertension (group II). Statistical analysis was performed with median test.

Results: Data from 89 patients (mean age 42.1 ± 11.2 years, 40,4% men) were analyzed. Age and weight loss were similar in group I (n = 28) and in group II (n = 61). Peak flow increased in group I [44,5 (35,5–64,7) vs 51,2 (33,4–71,6) AU, p < 0,02] after surgery, but it was unchanged in group II [35,0 (24,4–60,4) vs 45,7 (37,1–60,3) AU, p = 0,24]. Power of endothelium activity significantly increased and power of neurogenic activity was unchanged in both groups. On the other hand, power of myogenic activity remained unchanged in group I [0,208 (0,144–0,470) vs 0,230 (0,148–0,441) AU2/Hz, p = 0,72] and increased in hypertensive subjects [0,190 (0,114–0,257) vs 0,209 (0,162–0,354) AU2/Hz, p = 0,001].

Conclusions: Reactivity of skin microcirculation improved in different way in hypertensive and non-hypertensive obese patients after bariatric surgery, but those changes were not associated with improvement of peak flow in patients with hypertension.

PP.19.14 THE BODY SHAPE INDEX IS ASSOCIATED WITH THE VASCULAR STRUCTURE AND FUNCTION IN CAUCASIAN ADULTS. MARK STUDY

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Objective: The body shape index (ABSI)—has been introduced as a marker of the association between body composition and all-cause mortality. However, until now, associations between ABSI and vascular structure and function have not been evaluated.

The aim of this study was to investigate the association of ABSI with the vascular structure and function in Caucasian adults with intermediate cardiovascular risk.

Design and method: We performed a cross-sectional study. This study analyzed 2354 subjects, aged 35 to 74 years (mean, 61.4 ± 7.7 years), 61.9% males, enrolled into the MARK study. ABSI was calculated by ABSI = WC (m)/body mass index (BMI)2/3 × height (m)1/2. Vascular function was assessed by measuring cardio-ankle vascular index (CAVI) with the VaSera device and brachial ankle pulse wave velocity (baPWV) by using a validated equation. Vascular structure was assessed by measuring carotid intima-media thickness (IMT) by ultrasonography.

Results: Mean values of ABSI (0.083 ± 0.001), CAVI (8.8 ± 1.2), and IMT (0.738 ± 0.093), were higher in males. ABSI was positively associated with CAVI, baPWV and with average mean IMT after adjusting for confounders. Thus, for each unit increase in ABSI, CAVI increased by 0.12 units, baPWV by 0.21 m/sec, and IMT by 0.037 mm. In the logistic regression analysis, the OR of the ASBI was >1 for high CAVI > 9, baPWV > 15 m/sec and IMT > 0.90 mm, in the overall subjest, and by sex and age (>62, < 62 years), after adjusting for confounders.

Conclusions: ABSI shows a positive association with vascular structure and function, which is independent of BMI and other confounders that may influence weight and fat mass distribution in Caucasian subjects at intermediate cardiovascular risk.

PP.19.15 RETINAL ARTERIOLES HYPERTROPHIC REMODELING IN UNCONTROLLED ACROMEGALY

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Objective: Acromegaly is characterized by an increased cardiovascular risk. Hypertrophic effects of Growth Hormone (GH)/Insulin-like Growth Factor 1 (IGF1) system on the heart and large arteries are known but little data on microcirculation exist. Our aim was to assess retinal arteriolar remodeling in acromegaly patients using adaptive optics camera.

Design and method: Adaptive Optics RTX1® Camera (ImagineEye, Orsay, France) was used to measure Wall Thickness (WT), Internal Diameter (ID) and to calculate Wall Cross Sectional Area (WCSA) and Wall-to-Lumen Ratio (WLR) on retinal arterioles of patients with acromegaly. As IGF1 is gender and age-dependent, an IGF1/normal value ratio (IGF1r) was generated for each patient. Acromegaly patients were then stratified according to their IGF1r: patients with IGF1r> = 1 were defined as uncontrolled, patients with IGF1r < 1 were defined as having controlled acromegaly. Moreover, non-acromegaly control subjects matched for age/gender/diabetes/blood pressure levels and antihypertensive treatments were also recruited.

Results: 80 patients and controls were recruited. Mean age was 51 ± 12 years and 54% were men. Subjects with uncontrolled acromegaly exhibited hypertrophic remodeling with increased WLR, WT and WCSA compared to both controlled patients and control subjects (Table).

Microvasculature	Controls (n=40)	Controlled Acromegaly (n=20)	Uncontrolled Acromegaly (n=20)	Across groups p value
Retinal WLR	0.280 ± 0.043	0.274 ± 0.040	0.323 ± 0.053*	0.0001
Retinal arteriolar Internal diameter - µm	76.1 ± 8.9	79.5 ± 9.3	74.4± 11.8	NS
Retinal arteriolar Wall Thickness - µm	21.1± 2.8	21.6 ± 3.3	23.7. ± 3.3*	0.0044
Retinal arteriolar Whole Cross Sectionnal Area -µm²	2886 ± 576	3098 ± 711	3234 ± 734*	0.02
Blood Pressure				
Systolic BP- mmHg	124.2 ± 18.8	123.9 ± 16.9	124.9 ± 21.4	NS
Diastolic BP-mmHg	71.7 ± 11.2	71.6 ± 11.7	70.4 ± 10.7	NS

*p<0.01 between controlled acromegaly patients and controls

No differences in ID were found between controls and patients with controlled acromegaly. Mean IGF1r was higher in uncontrolled subjects compared to subjects with controlled acromegaly (1.3 ± 0.46 vs 0.72 ± 0.18, p < 0.001). Moreover, IGF1r value was positively associated to WLR (r^2 = 0.3, p < 000.1) and negatively to lumen (r^2 = 0.1, p = 0.02) while there was a trend towards a positive association with WCSA and WT.

Conclusions: Subjects with uncontrolled acromegaly exhibit hypertrophic arteriolar retinal remodeling associated with IGF1 levels increase. Normal retinal arteriolar anatomy has been found in patients with a controlled disease suggesting a potential reverse remodeling under treatment.

PP.19.16 SHORT-TERM RETINAL ARTERIOLAR LUMEN CHANGES ARE UNRELATED TO PERIPHERAL VASCULAR RESISTANCE CHANGES IN TREATED HYPERTENSIVE PATIENTS

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Objective: The microcirculation is the major site of the total peripheral resistance (TPR); the arteriolar vasomotricity is its determinant. While some correlations between TPR and retinal arteriolar remodeling have been shown in a chronic setting, no prospective data exists regarding short-term changes in retinal arteriolar lumen and total resistances.
Our aim was to evaluate the relations between changes in TPR and retinal microvasculature anatomical indices in uncontrolled hypertensive patients.

Design and method: 29 hypertensive patients (16 males, 13 females, mean age 48 ± 14) underwent Adaptive Optics imaging using RTX1 camera ® (Imagine-Eye, Orsay, France) to measure Wall Thickness (WT), Internal Diameter (ID), Wall Cross Sectional Area (WCSA) and Wall-to-Lumen Ratio (WLR) of retinal arterioles.
The Integrated Hemodynamic System (Hotman System®) was used to calculate Stroke Systemic Vascular Resistance Index (SSVRI), an index of TPR.
Among them, 10 uncontrolled hypertensive subjects (6 males, 4 females, mean age 50 ± 12) had a follow-up assessment 1 month after introduction or increase of an antihypertensive therapy.

Results: At baseline, mean Systolic BP (SBP) and Diastolic BP were 147 ± 21 and 84.9 ± 13 mmHg respectively.

Retinal WT, ID, WLR and WCSA were 21.8 ± 3.6 µm, 74.5 ± 12 µm, 0.299 ± 0.060 and 2954 ± 765 μm^2, respectively. Mean SSVRI was 142.4 ± 40 dyn*sec/cm^5.
In the whole population, no correlation was found between ID and SSVRI (Spearman's ρ=0.292, p = 0.124).
Baseline and follow up BP levels, retinal arteriolar anatomical indices and resistance characteristics are shown in Table 1.

N=10	Baseline	Follow-up	p
Demographics			
Age - *years*	48.5 (44-60)		
Sex - *(M/F)*	6/4		
Retinal microvascular remodeling			
Wall-to-Lumen Ratio	0.287 (0.251-0.321)	0.242 (0.235-0.309)	0.253
Internl Diameter- *µm*	**71.2 (61-82)**	**78.2 (71-92)**	**0.018**
Wall Thickness- *µm*	19.9 (18.9-23.8)	20.5 (18.6-23.5)	0.794
Wall Cross Sectional Area -*µm²*	2487 (2095-3457)	3003 (2439-3715)	0.131
Peripheral Resistance assessment			
Stroke Systemic Vascular Resistance Index - *dyn*sec/cm⁵*	133.7 (123-177)	124.9 (95-143)	0.127
Pressure			
Systolic BP- *mmHg*	**150.5 (136-172)**	**135 (119-154)**	**0.008**
Diastolic BP-*mmHg*	**90.5 (79-96)**	**78 (74-90)**	**0.052**
Antihypertensive therapy (n)			
Calcium Channel Blockers	3	7	
ACE-Inhibitors/Angiotensin Receptor Blockers	4	6	
Diuretic	4	4	
Beta Blockers	2	2	

**ACE, Angiotensin Converting Enzyme*

At follow-up, a significant decrease in SBP was observed (-13 ± 7.5% p = 0.008) in association with a significant lumen dilatation of retinal arterioles (+11.6 ± 7.6 %, p = 0.018). No significant changes were observed in other retinal parameters or in SSVRI although vasodilator drugs were used.

Conclusions: Retinal arteriolar lumen dilatation was observed after short-term brachial BP reduction, and was not related to TPR decrease.
This suggests that 1) the changes in retinal arteriolar network may be more easily detected than TPR changes, and/or that 2) lumen dilatation or retinal arterioles changes occur to a greater extent than at the peripheral level.

PP.19.17 AORTIC RESERVOIR FUNCTION, REGIONAL ARTERIAL STIFFNESS AND AORTIC-TO-BRACHIAL STIFFNESS GRADIENT IN DIALYSIS POPULATION

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Objective: A decreased aortic reservoir function is associated with increased cardiovascular events. Patients with chronic kidney disease in need of dialysis have an accelerated progression of aortic stiffness and reversal of the aortic-to-brachial stiffness gradient. We previously observed an annual reduction in brachial stiffness which was partly explained by a greater stiffness of the aorta. The aim of this study was to determine the relationship between aortic reservoir pressure, regional arterial stiffness and aortic-to-brachial stiffness gradient.

Design and method: Among 310 patients with chronic kidney disease on dialysis, aortic and brachial stiffness were measured by determination of pulse wave velocity of carotid-femoral (cf-PWV) and carotid-radial (cr-PWV) segments (Complior). The aortic-to-brachial stiffness gradient was calculated by the ratio of cf-PWV to cr-PWV (PWV ratio). Reservoir pressure (RP), its integral (AUC-RP) and excess pressure parameters (XSP, AUC-XSP) were derived from radial pressure waveforms (radial tonometry-without generalized transfer function).