The trend in the myocardial perfusion parameters in the T + T group was consistent with that in SDF-1; both peaked at 1 w, after which they began to decline. The A and A × b values were correlated with SDF-1 in the T + C group (r = 0.547 and 0.506; P < 0.05); the A, b, and A × b values were correlated with SDF-1 in the T + T group (r = 0.887, 0.892, and 0.942; P < 0.05 and P < 0.01). Regression equations were established for the relations of the A, b, and A × b values (X) with SDF-1 (Y): Y = 0.6993 × + 0.048, Y = 0.4698 × + 0.2252, and Y = 0.0945 × + 0.6689, respectively (R² = 0.722, 0.7937, and 0.8871; P < 0.05 and P < 0.01).

CONCLUSIONS A targeted microbubble ultrasound contrast agent could be used to evaluate the characteristics of the variation in SDF-1 over time and for the analysis of SDF-1 content in vivo after acute myocardial infarction.

GW26-e2186
Application of combined echocardiography STIC and computational fluid dynamics (CFD) technique in the study of fetal aortic isthmus coarctation hemodynamics
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OBJECTIVES To explore the digital model of normal fetal aortic arch(Aar) and arterial duct(AD) by combined fetal echocardiography STIC (spatio-temporal image correlation) and CFD/Computational Fluid Dynamics) technique, and through establishing the model of coarctation, to provide a more detail hemodynamic data information for deep insight into its biological physical state.

METHODS Collecting fetal echocardiography 4D volume and the consecutive ultrasonic tomography images of short axis and long axis of fetal Aar and AD were obtained by using 4D Volume with STIC; after extracting its border by the Havan software, the 3D digital model reconstruction of above structure was completed by the CAD software, and the CFD method was used to omnidirectional display the fetal blood flow pressure, streamline and wall shear stress(WSS) within the Aar and AD, and to simulate and demonstrate the complex hemodynamics model of coarctation.

RESULTS The fetal echocardiography STIC can provide the ultrasonic tomography image to realize the 3D digital model of Aar and AD by CFD technique. This CFD digital model showed that the obvious vortex flow existed in the dorsal part of the initial segment of aortic arch branches arteries, the abouchement of arterial duct and the greater curvature side wall of the original segment of descending aorta, and displayed the fetal blood flow pressure, streamline and WSS in coarctation was significantly higher than other vessel walls.

CONCLUSIONS Based on the Aar and AD multiplanar images of fetal echocardiographySTIC, the 3D CFD digital model can be reconstructed and the complex blood flow model showed by the 3D CFD digital images of coarctation can provide hemodynamic explanation to its pathogenesis.

GW26-e2356
Appraise Risk of Plaque Using a Bimodal Gamma Statistical Model Base on Gray-level Distribution of Carotid Plaque Ultrasound Images
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OBJECTIVES The purpose of this study was to classify plaques between different echogenicity using a bimodal Gamma statistical model base on gray-level distribution of carotid plaque ultrasound images.

METHODS Ultrasound images were obtained from a total of 127 carotid plaques and cross validation was implemented in this study. After images were normalized, gray level distribution of carotid plaque ultrasound images were obtained in Photoshop software. In Matlab, an internal fitting function base on nonlinear least square method, called lscurvefit, was used to get the curve of bimodal Gamma distribution base on gray-level distribution of carotid plaque ultrasound images. Lastly, plaques between different echogenicity were classified according to the error between gray level distribution curve of carotid plaque and the statistical model curves.

RESULTS The classification accuracy of hypoechoic, intermediate and hyperechoic plaques were 75%, 55% and 100% respectively.

CONCLUSIONS The bimodal Gamma distribution was reasonable fit to the pixels of carotid plaque ultrasound images, and it had a high accuracy in identifying hyperechoic plaques. It is a promising tool for risk assessment of atherosclerosis.

GW26-e2956
Quantitative Analysis of The Blood Flow Fields in Aortic Arch by Vector Flow Mapping in Normal Humans
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OBJECTIVES To visualize and quantify the hemodynamics of the aortic arch in normal individuals using velocity distribution, vortex formation, energy loss at different cardiac cycles.

METHODS VFM analysis was performed using echocardiography in 87 healthy volunteers(40males), mean age 35.2 ± 19.4 years (range9-69), and focused on the velocity vector fields of the ascending aorta, 4-5cm below the opening of the brachiocephalic trunk, as well as the descending aorta, 4-5cm below the left subclavian artery. Both of them were divided into 3 sections equally: the proximal section, the middle and the distal section.

RESULTS The following main features were observed: 1(i): In different sections of the aortic arch, a skewed peak flow velocity (Vp) always appeared in the period of rapid ejection but in different distribution. Vp arose towards the inner wall curvature in the proximal section of the ascending aorta. However, it appeared along the outer wall of the ascending aorta in the middle and distal sections. Vp in the three different sections of the descending aorta all showed along the inner wall. Vp in the proximal, middle, and distal section of the aorta are respectively 72.78 ± 12.58cm/s, 64.62 ± 17.80cm/s, 48.22 ± 11.67cm/s, which of the descending aorta are respectively 58.20 ± 13.55cm/s, 74.25 ± 12.49cm/s, 59.93 ± 12.90cm/s. (ii): The systolic flow in the entire aortic arch rose rapidly from near-zero at the point of isovolumic contraction to the peak velocity at the period of rapid ejection, then decreased gradually in the residual systole. Whereas, compared with systolic flow, the diastolic flow in the aortic arch was much lower, and there was no obvious change of the flow velocity in diastole. 2. In the period of isovolumic relaxation, vortex formation were observed in almost all subjects in the descending aorta but occasionally in the ascending aorta. 3. The energy loss was 13.50 ± 8.07 J/(m² s) during systole and 2.83 ± 3.56 J/(m² s) during diastole in ascending aorta and 15.29 ± 12.26 J/(m² s) and 2.61 ± 2.00 J/(m² s) in descending aorta.

CONCLUSIONS VFM can provide insights into the intra-aortic arch flow patterns, and offer essential fundamentals about flow features associated with common aortic diseases.

GW26-e3961
Correlation between the degree of plaque inflammation and adventitial perfusion in the carotid artery: a combined 18F-fluorodeoxyglucose positron-emission tomography and dynamic contrast-enhanced magnetic resonance imaging study
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OBJECTIVES Recently an increasing body of evidence has suggested that the plaque inflammation was influenced by the adventitial perfusion, and which has been confirmed to be quantified by 18F-fluorodeoxyglucose positron-emission tomography (PET/CT) and dynamic contrast enhanced magnetic resonance imaging (DCE-MRI) respectively in the carotid artery. However, there were no studies to confirm the relationship between plaque inflammation and its adventitial perfusion by invasive imaging modalities. The purpose of this investigation was to use PET/CT and DCE-MRI to determine whether the adventitial perfusion is associated with plaque inflammation in the carotid artery.

METHODS 49 patients with transient ischemic attack or minor stroke in the carotid territory and the intimal-medial thickness of ipsilateral carotid artery ≥ 2mm (detected by ultrasound) were included. All patients underwent both PET/CT and DCE-MRI within 2 weeks. Kinetic modeling of the DCE-MRI time series was performed to estimate the adventitial plasma volume (vp) and transfer constant.
RESULTS TBR value significantly correlated with adventitial $K^\text{trans}$ ($r=0.698$, $P < 0.01$) and plaque $K^\text{trans}$ ($r=0.492$, $P < 0.01$) in the symptomatic plaques ($n=49$), but not in the contralateral asymptomatic ones ($n=32$) ($r=0.17$, $P > 0.3$, adventitial $K^\text{trans}$, $r=0.262$, $P > 0.107$, plaque $K^\text{trans}$). The significance correlation between adventitial $K^\text{trans}$ and TBR remained after adjusting for some confounding factors (ApoB, age) ($r=0.377$, $P = 0.012$). In addition, in the symptomatic plaques the correlation coefficient between adventitial $K^\text{trans}$ and TBR is larger than that between plaque $K^\text{trans}$ and TBR ($r=0.689$ vs. $r=0.492$, $P < 0.01$). difference in $r$, (Steiger's $Z$ test).

CONCLUSIONS Adventitial perfusion is independently associated with the carotid plaque inflammation in symptomatic plaques, but not in asymptomatic plaques. Compared to plaque perfusion, its adventitial perfusion get by DCE-MRI may be a better surrogate for FDG imaging of plaque inflammation in the symptomatic plaques.

GW26-e3992
Long-term Effects of Pericardiectomy on Left Ventricular Mechanics in Patients with Constrictive Pericarditis
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OBJECTIVES The purposes of this study were to evaluate long-term changes in left ventricular (LV) mechanics after pericardiectomy in patients with constrictive pericarditis (CP); to correlate postoperative LV mechanics determined by speckle tracking echocardiography with clinical symptoms.

METHODS A total of 24 patients with CP underwent speckle tracking echocardiography 1 week before and 1, 6 and 12 months after pericardiectomy; and 23 healthy subjects were served as control subjects. The procedure was performed to obtain global and regional LV longitudinal, circumferential, radial strain, LV torsion and LV lateral/septal longitudinal strain ratio.

RESULTS Patients with CP had decreased global LV longitudinal, circumferential and radial strains, and decreased LV torsion when compared with control subjects. Although global LV longitudinal and circumferential strains obtained 1 month after pericardiectomy increased when compared with those for pre-pericardiectomy, they were still significantly lower than those for control subjects. Further improvements in global LV longitudinal, circumferential and radial strains occurred with time with normalization of global LV longitudinal and radial strains 12 months after pericardiectomy, but global circumferential strain obtained 12 months after pericardiectomy was still lower than that for control subjects. LV torsion remained unchanged after pericardiectomy. In addition, the change in global LV circumferential strain after pericardiectomy correlated well with clinical symptoms.

CONCLUSIONS Global LV longitudinal, radial and circumferential strains presented gradual increases over time with normalization of global LV longitudinal and radial strains 12 months after pericardiectomy, but global LV circumferential strain obtained 12 months after pericardiectomy was still lower than that for control subjects. LV torsion remained unchanged after pericardiectomy. In addition, the change in global LV circumferential strain after pericardiectomy correlated well with clinical symptoms. These findings suggest that the global LV circumferential strain may be a promising parameter in the evaluation of the effectiveness of pericardiectomy.

GW26-e4695
The value of three-dimensional spherical index in assessing different type of left ventricular remodeling
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OBJECTIVES To investigate the value of three-dimensional spherical index (3D SpI) in assessing different type of left ventricular (LV) remodeling in patients with different cardiovascular diseases; and to find a suitable reference intervals of 3D SpI in identifying LV remodeling.

METHODS One hundred and seven patients with 4 different diseases: aortic regurgitation ($n=27$); aortic valve stenosis ($n=20$); hypertension ($n=20$); acute myocardial infarction ($n=20$); non-acute myocardial infarction ($n=20$); and 46 healthy controls were recruited. All 153 subjects underwent conventional and real-time 3-dimensional echocardiographic examination. 3D SpI was measured using an auto 4D LVQ software.

RESULTS We found 3D SpI were significant higher in the AR (0.46±0.12, $P < 0.001$) and N-AMI group (0.42±0.05, $P < 0.001$) than in controls (0.31±0.06). But there were no significant differences observed in other groups. The reference critical value of 3D SpI in AR or N-AMI for identifying LV remodeling was >0.302, >0.321 respectively.

CONCLUSIONS This study estimated 3D SpI can detect left ventricular eccentric remodeling due to volume overload or the chronic global left ventricular remodeling after myocardial infarction, but cannot reflect concentric hypertrophy caused by pressure overload or regional myocardial injury caused by AMI.

GW26-e4746
Quantification of Compacted Myocardial T1 in Isolated Left Ventricular Non-compaction and Its Relation to Disease Severity: A 3.0T MR Imaging Study
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OBJECTIVES To investigate the characteristic of isolated left ventricular non-compaction (LVNC) using non-contrast myocardial T1 mapping and its relationship with the severity of the disease.

METHODS Twenty-nine patients (mean age, 41±15 years) and 8 healthy volunteers (mean age, 51±19 years) were recruited in this study. All subjects underwent CMR on a Philips 3.0T MR scanner with 32-channel cardiac coil. Whole LV short axis cine and non-contrast T1 mapping utilizing modified look-locker inversion recovery sequence (MOLLI) were acquired. The left ventricular ejection fraction (LVEF) was measured from cine images using commercialized software (Qmass, Medis, Leiden, the Netherlands).

Statistical analysis of T1 values between control subjects, normal LVEF patients and reduced LVEF patients was performed using an unpaired, two-tailed Student’s t test with a significance level of 0.05.

RESULTS All patients fulfilled the Petersen’s CMR diagnostic criteria of LVNC. Compacted myocardial T1 value of patients with reduced LVEF was significantly higher than that of patients with normal LVEF, and that of the control subjects.

The mean LVEFs (T1 values) of the control and patient groups were 61% (1157.8±4.3 ms) and 49% (1156.8±4.9 ms), respectively. In the patients, the mean LVEFs (T1 values) of normal and reduced LVEF groups were 57.6±4.2% (1132.3±42.8 ms) and 32.4±11.2% (1174.0±49.0 ms), respectively.

Statistical difference of mean myocardial T1 was found between patient and control groups with $P < 0.001$. $P$-value between normal LVEF patients and control groups was 0.012. In addition, significant difference was found between normal and reduced LVEF patient groups with $P < 0.001$

CONCLUSIONS CMR with non-contrast T1 mapping enables characterization of myocardial tissue changes in patients with LVNC as compared to healthy volunteers. The difference of the compacted myocardial T1 value between normal LVEF patients and control groups shows that T1 value is potentially more sensitive for detecting early tissue changes than LVEF. In addition, the difference of myocardial T1 value between LVNC patients with normal and reduced EF indicates that myocardial T1 quantification may have the potential to stratify the severity of LVNC.