Methods: We studied a new technique based on a tissue tracking algorithm that is ultrasound beam angle independent for automated detection of tricuspid annular displacement (TAD) (QLAB, Philips Medical Imaging). Twenty six patients (pts) with pulmonary arterial hypertension (n= 13), heart failure (n= 9), valvulopathy (n= 5) or myocarditis (n= 1) were referred for magnetic resonance imaging (MRI) and underwent a complete transthoracic echocardiography (TTE). MRI was performed on a 1.5 T MR scanner. MRI RV ejection fraction (RVEF) was correlated by linear regression with TAD, peak systolic tricuspid annular velocity (Sa) and RV fractional area change (FAC). Sixteen pts (61.5%) exhibited right ventricular systolic dysfunction (RVEF < 40%). TTE was performed in 44 healthy subjects in order to assess normal TAD value.

Results: In the pts group, MRI RVEF was positively correlated with TAD (R² = 0.65; p< 0.0001), Sa (R² = 0.56; p< 0.0001) and FAC (R² = 0.39; p= 0.0025). The strongest relation was observed with TAD. A value of TAD< 14 mm predicted right ventricular dysfunction with a sensitivity of 87.5 % and a specificity of 90%. Most of (90%) healthy subjects exhibited TAD values exceeding this cut-off point (mean 16.9 +/- 1.64 mm, range 13.3 to 24.8 mm). Negative correlation was found between TAD and age (R²=0.36 ; p<0.0001).

Limitations: the echocardiographic and MRI parameters were not obtained simultaneously but at an interval of 24 hours.

Our study is the first to correlate TAD with MRI RVEF.

We conclude that TAD provides a simple, rapid, and non-invasive tool for assessing right ventricular systolic function.

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Assessment of Microvascular Obstruction after Acute Myocardial Infarction using Cardiac Magnetic Renoncance (CMR) imaging

Marc Sirol (1), Philippe Malzy (2), Patrick Henry (1), Roland Rymer (3), Philippe Soyer (2)

(1) AP HP – Hopital Lariboisiere, Cardiologie, Paris, France – (2) APHP-Lariboisiere, Radiologie, Paris, France – (3) AP HP – Hopital Lariboisiere, Radiologie, Paris, France

Background: Infarct size (IS) and presence of microvascular obstruction (MO) detected by cardiac magnetic resonance imaging (CMR) are of prognostic relevance in ST-elevation myocardial infarction (STEMI) patients. We sought to evaluate different cardiovascular magnetic resonance techniques for detection of MO to predict LV remodeling, in patients with first AMI who were treated within 12 hours with primary stenting.

Methods: Forty-three patients with first STEMI underwent cine CMR at 4 days and 6 months after AMI to calculate LV volumes and ejection fraction (LVEF). Presence of MO was qualitatively evaluated at baseline 1) using a classic first pass perfusion sequence (FP-MO); single shot SR GE at 1’09±0’07 min, 2) using a 2D segmented IR GE pulse sequence (DHE-MO) at 8’± 30 min after contrast administration. CNR’s were calculated from the SNR of infarcted myocardium and the MO region.

Results: MO was detected by both methods in 24% of patients (n= 11). DHE-MO was the strongest predictor of change in LV end-diastolic and end-systolic volumes over time (p<0.01), whereas FP-MO and DHE-MO had a comparable predicted value of change in LVEF (β=3.1, p=0.03 and β=2.8, p=0.04). CNR corrected for spatial resolution was significantly higher for detection of DHE-MO, compared to first pass defect (104±51 vs 8±4, p<0.001).

Conclusions: DHE-MO is the best prognostic marker of LV remodeling, as determined by CMR within the first week of acute STEMI patients.

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Monitoring of the treatment by betablocker in cardiac failure: interest of mitral flow and these variations after modification of the conditions of loads

Hasna Faresse, Anass Assaïdi, Fatima Ezzahra Labbi, Kawtar Benni, Maria Zahrassou, Leila Azzouzi, Ahmed Benni

CHU ibm roch casablanca, cardiology, Casablanca, Maroc

Background: Post-systolic shortening (PSS) is considered as a marker of viability in ischemic left ventricular dysfunction. However, experimental data suggest that PSS can be observed in viable and non viable segments. The aim of the study was to provide a longitudinal evaluation of the normal maternal cardiac function through echocardiography.

Methods: Twenty-seven pregnant women (mean age 30.7±2.9y) and 14 age and sex-matched non-pregnant controls (30.2±4.4y) were included. Echocardiography with conventional and speckle tracking based myocardial deformation imaging were performed longitudinally at 11-14, 22-24 and 32 weeks during pregnancy, and at inclusion for the control group. Total vascular resistance (TVR), aortic distensibility (ADi) and arterial elastance (Ea) were calculated for characterization of vascular adaptation. Beside conventional echocardiographic parameters, LV end-systolic wall stress (ESWS) and end-systolic elastance (Ees) were calculated, and ventriculo-arterial coupling index was derived.

Results: During pregnancy we found a progressive increase in LVEDV (93.8± 7.0 vs 88.8± 6.0 ml in 3rd vs 1st trimester, p<0.01) and stroke volume (78.7± 14.8 vs 68.7± 12.5 ml, p<0.05), associated to decreased TVR (982.7±284 vs 1189.1±158 dynes/cm5, p<0.05), which was significantly lower than in controls (1372.9± 212 dynes/cm5, p<0.01). End-systolic wall stress decreased longitudinally during pregnancy (29.4± 5.6 vs 41.9± 9.6 g/cm2, p<0.01) with a peak during the 3rd trimester and lower values than in control during the whole pregnancy, while ADs progressively increased reaching the peak during the 3rd trimester (7.55± 2.5 vs 6.25± 2.1 mmHg-1, p<0.05). The ventriculo-arterial coupling index was stable throughout pregnancy (0.79± 0.11 vs 0.75± 0.11, NS).

Conclusions: Pregnancy is associated with increased preload and decreased afterload, with progressively decreased total vascular resistance and increased aortic compliance, decreased end-systolic wall stress, increased cardiac output and preserved ventriculo-arterial coupling.

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Peak Strain Rate using Longitudinal Speckle Tracking Imaging with dobutamine stress echocardiography to identify viable Post-systolic shortening segments

Alexandre Bensaid, Laurens Mitchell-Heggs, Julien Nahum, Laurent Macron, Leslie Deal, Jean-Luc Dubois-Randé, Pascal Guéret, Pascal Lim

Hôpital Henri-Mondor, Département de cardiologie, Créteil, France

Background: Post-systolic shortening (PSS) is considered as a marker of viability in ischemic left ventricular dysfunction. However, experimental data suggest that PSS can be observed in viable and non viable segments. The aim of the present study was to differentiate PSS segments with and without contractile reserve (CR) using longitudinal strain derived from speckle tracking analysis.

Methods: Twenty seven patients (22 males, 5 females; mean age 59± 13 yrs.) with ischemic LV dysfunction (mean LVEF 44± 12 %) underwent low-dose dobutamine echocardiography for viability assessment. Longitudinal strain (ε) and strain rate (SR) were assessed at rest and under dobutamine in the 16 segments using speckle tracking analysis. PSS was defined as peak strain occurring after the end-systole. We sought to determine: 1) PSS prevalence according to CR 2) the best indice to predict CR in PSS segments.
Results: Of the 415/432 analysable segments, 148 (38%) exhibited normal and 267 (62%) abnormal contractility at rest (147 hypokinetic, 120 akinetic). PSS was more prevalent in segments without CR than with CR [61% (50/82) vs. 45% (84/185), p=0.002]. Importantly, only peak systolic SR under dobutamine differed between PSS with and without CR (-0.54 ±0.02 s' vs. -0.37±0.02 s', p=0.001), while baseline peak ε and SR did not.

Conclusion: PSS is not a specific marker of viability and longitudinal peak strain rate by speckle tracking under dobutamine could be used to differentiate PSS segments with contractile reserve.

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In vivo reduction of radiation exposure with a single-source coronary CT angiography: effects of optimal parameters settings in real life conditions
Alain Tavildari, Luc Maillard, François Vochelet
Clinique AXIUM, Cardiologie, Aix En Provence, France

Background: Coronary computed tomographic angiography (CCTA) has become a key diagnostic exam for coronary artery disease (CAD); however, radiation exposure as a result of the exam has been deemed too high.

Objectives: The purpose of this study was to assess the feasibility of in vivo radiation reduction using optimal parameters during a CCTA with a single source 64-slice computed tomography (CT): General Electric Healthcare VCT XT.

Methods: Acquisition of 137 consecutive patients for examination of native coronary arteries with suspected CAD was performed with optimized parameters. Prospective acquisition mode, called snap shot pulse (SSP), was performed when a heart rate under 65 bpm was obtained, retrospective acquisition mode was used otherwise. Coronary artery segments were systematically analyzed. Stenosis of 50% or more were considered as obstructive.

Results: Examination of all segments was feasible. Mean dose length product (DLP) of 56+/-22 mGy.cm (0.7+/-0.3 mSv) with SSP (n=117) was significantly lower than mean DLP of retrospective acquisition mode: 532 +/- 130.8 mGy.cm (7.4 +/- 1.8 mSv) (n=20), p<0.0001. Compared to conventional coronary angiography, SSP significantly reduced irradiation exposure with respectively 8.54 +/- 2.16 mSv versus 0.87 +/- 0.42 mSv in 13 patients, p<0.0001.

Conclusions: Coronary CT using very low X-ray dosage is feasible and accurate. SSP with optimal parameters settings delivered the lowest radiation dose, up to ten times lower than conventional coronary angiography.

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Impact of 2D echocardiography on Longitudinal Global Strain by Speckle Tracking for Assessing Left Ventricular Systolic Function
Laurent Macron (1), Alexandre Bensaid (1), Julien Nahum (1), Laurens Mitchell-Heggs (1), Leslie Deal (1), Jean-François Deux (2), Pascal Guéret (1), Pascal Lim (1)
(1) Hôpital Henri mondor, cardiologie, Créteil, France – (2) Hopital Henri mondor, radiologie, Créteil, France

Objective: To evaluate the impact of echocardiography 2D image quality on longitudinal global strain for assessing left ventricular (LV) systolic function.

Methods: The study was conducted in 54 patients, 29 with a poor acoustic window (mean=5 non analyzable segments/patient) and 25 with a good 2D image quality. LV ejection fraction (LVEF) by Simpson biplane and longitu- dinal global strain by speckle tracking were compared to LVEF by MRI.

Results: Global strain was closely correlated to LVEF by MRI both in patients with (r=0.79, p<0.0001) and without (r=0.81, p<0.0001) a poor acoustic window. In contrast, 2D LVEF was strongly affected by images quality (95% CI agreement with MRI at 12% and 26% in patients with and without a good image quality, respectively). Importantly, reproducibility remained low for global strain (10%) independently of the image quality.

Conclusion: In patients with a poor acoustic window, longitudinal global strain by speckle tracking remained closely correlated with LVEF by MRI and may be used as an alternative to 2D LVEF for assessing LV function.

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Usefulness of helical computed tomography for the detection of free floating thrombi in right heart in acute pulmonary embolism
Nicolas Mansencal, David Attias, Vincent Callie, Julie Guiader, Imad Abi Nasr, Pascal Lacombe, Antoine Vieillard-Baron, Olivier Dubourg
AP-HP, Hôpital Ambroise Paré, Service de Cardiologie, Boulogne, France

Background: Pulmonary embolism (PE) may be associated to free floating thrombi in right heart (FFTRH), with a worse prognosis. Echocardiography was the single imaging tool for their detection, allowing to initiate appropriate treatment. The aim of this study was to assess the prevalence of FFTRH by a systemic use of transthoracic echocardiography in a large series of patients with acute PE and the accuracy of helical computed tomography (CT) for their detection.

Methods: We studied 340 consecutive patients presenting with acute PE. All patients underwent CT and echocardiography. Echocardiography was the gold standard for the detection of FFTRH and CT was systematically used for their detection.

Results: Prevalence of FFTRH was 3.5% in our population of PE. Dyspnea, cardiogenic shock, cardiac arrest and tachycardia were more frequently found in patients with FFTRH. Measurements of right ventricle was well-correlated between echocardiography and CT (r = 0.76 for the right to left ventricular area ratio, with good agreement). Sensitivity and specificity of CT for the detection of FFTRH was respectively 100% (95% CI: 74% to 100%) and 97% (95% CI: 95% to 99%), whereas positive and negative predictive values were 57% (95% CI: 34% to 78%) and 100% (95% CI: 99% to 100%), respectively.

Conclusion: In the present study, prevalence of FFTRH was 3.5% and clinical presentation of FFTRH differs from PE without FFTRH. Helical CT is an accurate for the detection of FFTRH. An FFTRH detected by CT should lead to urge echocardiography.

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Single or Multibeat Modality for 3D Echocardiography LV Volumes Assessment. Comparison study with MRI
Laurent Macron (1), Alexandre Bensaid (1), Julien Nahum (1), Laurens Mitchell-Heggs (1), Leslie Deal (1), Jean-François Deux (2), Pascal Lim (1), Pascal Guéret (1)
(1) Hôpital Henri mondor, cardiologie, Créteil, France – (2) Hopital Henri mondor, radiologie, Créteil, France

Objective: To compare single and multi beat 3D echocardiography for the assessment of left ventricular (LV) volumes and function.

Methods: LV end-diastolic (LVEDV), end-systolic (LVESV) volumes and ejection fraction (LVEF) computed from one and multi-beat (2, 3 and 4) 3D echocardiography (GE-E9, 4DLVQ) were compared to cine-MRI measurements in 50 consecutive patients.

Results: Among patients with analyzable 3D echocardiography (n=35; LVEDV=155±54mL, LVESV=84±49mL, LVEF=49±14%), single and multi-beat modality provided a fair correlation with MRI for LVEDV (r ranged from 0.8 to 0.85) with no difference for the 95%CI agreement (2SD ranged from 42-50mL). However, agreement for LVESV volume was broader for one beat [2SD=41mL] than for multi-beat [2SD=31mL for 2, 35mL for 3 and 4 beat]. Consequently, the best accuracy for LVEF measurement was obtained using two beat modality (r=0.85; p<0.0001; 2SD=11%) with a good inter-observer variability (10%).

Conclusion: Multi-beat remained superior to single beat modality for the assessment of LV volumes and ejection fraction.