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Surface-Length Index (SLI): a novel index to predict right ventricle dysfunction by cardiac MRI

Laurent Bonnemains (1), Damien Mandy (2), Anne Menini (3), Bertrand Stos (4), Francois Marcon (5), Nicolas Sadoul (5), Jacques Fehlinger (6), Pierre Yves Marie (7), Pierre Andre Vuisoz (3)

(1) CHU Nancy, cardiological infantility, Nancy, France – (2) CHU Nancy, Pole imagerie, Nancy, France – (3) Inserm, IADI, U947, Nancy, France – (4) CCML, Le Plessis Robinson, France – (5) CHU Nancy, cardiologie, Nancy, France – (6) CHU Nancy, CIC-IT, Nancy, France – (7) Université de Lorraine, Nancy, France

Purpose: Short axis CineMRI has become the gold standard to measure Right Ventricular Ejection Fraction (RVEF). However, it requires a time-consuming manual contouring of the endocardium. Therefore, many examinations do not include complete RV study. We hypothesized that a simple index could be used to detect patients with abnormal RVEF requiring a precise RV study. Two classical RV function indices were tested: 1/ RV fractional area change (FAC) measured in a mid-ventricular short-axis slice and 2/ RV shortening fraction (SF) corresponding to the longitudinal contraction measured to have a higher LV mass index (170±55 vs 133±23 g/m², p=0.05) and a higher SI (0.46±0.1 vs 0.37±0.07, p=0.039). Peak systolic apical rotation (7.9±4.7 vs 12.5±4.5°, p=0.015) and peak diastolic apical rotation rate (-55.4±33.0 vs -102.9±40.3°/s, p=0.003) were lower in AR pts with hypertension.

Conclusions: Hypertension impacts not only LV mass but especially shape and systolic and diastolic LV function in pts with significant chronic AR.

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Comparison of multidetector row computed tomography to echocardiography for evaluation of patients with mechanical and biological prosthetic valves

Nataliya Hrynchyshyn (1), Archid Azarine (2), Alirezza Samadi (3), Ludwine Perdrix (4), Rabia Khedim-Touati (2), Benoît Diebold (4), Alban Redheuil (4), Elie Mousseaux (4)

(1) Hôpital Européen Georges Pompidou, cardiology, PTNI, Paris, France – (2) Georges Pompidou European Hospital, Paris, France – (3) Villeneuve Saint George Hospital, Villeneuve, France – (4) University of Paris Descartes, Georges Pompidou European Hospital, Paris, France

Objective: Our objective was to evaluate whether ECG gated multidetector-row computed tomographic (MDCT) imaging could detect the abnormalities of prosthetic heart valves.

Methods: We reviewed the image sequences of 35 patients who underwent a MDCT and a echocardiography (TTE) with a total of 46 prosthetic valves (PV) in different position: 27 bileaflet PV, 2 tilting disc, 2 caged ball PV, and 15 biological PV. According to TTE data, 21 were abnormal and 25 normal. MDCT data were retrospectively reconstructed and analyzed using reformating in anatomically adapted planes.

Results: The abnormalities on CT were following: 12 obstructions, 14 dehiscences and 1 vegetation. MDCT identified obstruction with a sensitivity of 92% and specificity of 91%. The causes for obstruction were subprosthetic tissue (pannus) (n=3), thrombus (n=2), leaflets calcifications (n=4), periprosthetic and annulus calcifications (n=6). A good correlation was found between the mean prosthetic gradient on TTE and difference of angles for bileaflet PV on MDCT (r=0.7, p=0.0005). 4 patients with PV obstruction were re-operated and the MDCT imaging was confirmed by surgery. MDCT identified dehiscence of PV with a sensitivity of 100% and specificity of 84%. MDCT detect the false aneurysms (n=4) and sequels of ancient abscesses (n=6). 5 patients were re-operated and the MDCT imaging of dehiscence was confirmed by surgery. In 6 cases, MDCT showed abnormalities that were not seen during TTE: 3 dehiscences of PV and 3 opening dysfunction of PV without significant obstruction (1 pannus, 1 calcification of prosthetic annulus and 1 asymmetry of opening. The ECG-gated MDCT cannot be examined on MDCT because of numerous artifacts.

Conclusion: This experience demonstrates that MDCT have additional value because it can show paravalvular structures as well as cardiac and mediastinal abnormalities and can identify causes of PV dysfunction that constitute indications for surgery, but could be are missed at TTE.

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Left ventricular remodelling and regional wall motion abnormalities as determinants of functional ischemic mitral regurgitation

Leila Bazdah, Emna Allouche, Hédi Baccar, Wejdène Ouechtati, Slim Sidhom, Imène Fradi, Hbib Ben Ahmed, Sami Marouène

Hôpital Charles Nicolle, cardiology, Tunis, Tunisia

Introduction: Functional ischemic mitral regurgitation (IMR) is common in patients with ischemic left ventricular dysfunction after myocardial infarction, and significantly worsens prognosis. The aim of this study is to determine the relative importance of the global and regional left ventricular (LV) remodelling in the occurrence of IMR.

Methods: 81 patients (mean age=61±11 years) admitted with acute myocardial infarction (AMI) were screened. Patients with atrial fibrillation and organic valvular diseases were excluded from the study. Echocardiography (two-dimensional and Doppler echocardiograms) was performed in the first week after admission. The 81 patients were divided in 2 groups: with IMR (group1=39 patients) and...
without IMR (group 2=42 patients). LV volumes were calculated by apical biplane Simpson’s rule. The LV wall-motion score (WMS) index was obtained in a 17 segment model according to established methods. To identify the influence of regional wall-motion impairment for each individual LV segment, the mean WMS was calculated for each segment and compared between the 2 groups.

Results: The echocardiographic parameters that were associated with IMR were: LV dilatation and sphericity (p<0.0001), reduced ejection fraction (p<0.0001), inferior (p=0.001) interlateral (p=0.01) and anterolateral (p= 0.02) asynergy.

Conclusion: The results of this study indicate the importance of abnormalities of both LV geometry and regional wall motion in the pathogenesis of IMR by myocardial infarction. Clinically, these findings imply that myocutaneous salvage by early coronary revascularization may improve outcome by preserving LV function and decreasing the incidence of IMR.

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Accuracy of mitral valve planimetry assessed from trans-thoracic Real-Time 3-Dimensional echocardiography

Priscile Jurzak, Julien Ternacle, Delphine Hayat, Jean Luc Monin, Jean Luc Dubois Randé, Pascal Guéret, Pascal Lim
CHU Henri Mondor, cardiologie, Créteil, France

Background: Mitral valve planimetry obtained from a transverse parasternal view may be particularly challenging, even with the use of a 3-Dimensional (3D) biplane imaging. This issue may be resolved by trans-thoracic echocardiography using real-time full volume 3D datasets that allow mitral valve planimetry from the apical view.

Methods: This study included 26 patients (69% women, aged 67±20 years, 45% degenerative etiology) referred for mitral valvular stenosis assessment. Mitral valve area computed from real-time 3D datasets (apical views) was compared to the results of 2D planimetry (parasternal transverse view), proximal isovelocity surface area (PISA), the continuity equation and patient’s clinical status. For functional status assessment, the following events were considered: previous heart failure, history of systemic embolic event or systolic pulmonary hypertension defined by systolic pulmonary artery pressure >50mmHg at rest or >60mmHg during exercise.

Results: Mitral valve area assessed from real time 3D planimetry was feasible in all patients (100%), while the feasibility from other methods ranged from 76% to 92%. Mitral valve area obtained from 3D planimetry correlated well with 2D planimetry (r=0.9, P<0.0001), PISA (r=0.77, P<0.0001) and the Continuity Equation (r=0.67, P=0.0003). Interestingly, 89% (17/19, concordance=0.88, kappa=0.59) of patients with significant mitral valve stenosis (1.5cm²) by real time 3D were symmetric versus 80% (concordance=0.68, kappa=0.17) by 2D planimetry. Finally, inter-observer reproducibility for real time 3D planimetry was excellent (0.15±0.02 cm²).

Conclusion: Trans-thoracic real time 3D planimetry obtained from apical view provides an accurate and reproducible assessment of mitral valve area, fairly related to other methods and patient’s clinical status.

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Predicting factors of aortic expansion in cardiovascular imaging after surgery for a type-A aortic dissection or hematoma

Gilles Barone-Rochette (1), Frédéric Thony (2), Laetitia Bobbitt-Graham (1), Olivier Chavanon (3), Mathieu Rodière (2), Jean Louis Pepin (4), Estelle Vautrin (5), Renaud Tamisier (4), Jean Philippe Baguet (6)

(1) CHU Grenoble, USIC, Grenoble, France – (2) CHU de Grenoble, radiologie, Grenoble, France – (3) CHU Grenoble, service de chirurgie cardiaque, Grenoble, France – (4) CHU de Grenoble, laboratoire du sommeil, Grenoble, France – (5) CHU Grenoble, cardiologie, Grenoble, France – (6) CHU de Grenoble, service HTA, Grenoble, France

Background: The monitoring of patients undergoing dissection (AD) or hematoma (HD) aortic type A is essential to detect complications, especially those related to aortic expansion. The objective of this study was to determine the parameters favoring the aortic expansion.

Methods and Results: In a cohort of 311 patients operated on for a DA or HD type A, 69 received a measure of progression of aortic diameter (Vmax Ao) calculated by cardiovascular imaging. Patients were divided into three groups: group 1 (no progression, N=25), group 2 (Vmax Ao < 2 mm / year, N=27), and group 3 (Vmax Ao >2 mm / year, N=17). Each patient underwent the following investigations: clinic and 24-hour blood pressure measurement, determination of hs-CRP and polysomnography. The distribution of aortic diseases were 60 DA and 9 HD, 77% of subjects were men, mean age=67±11 years. The Vmax Ao was significantly higher in patients with a circulating false lumen completely (1.7 [0.4 to 2.8] vs 0 [0 to 1.1] mm / year, p=0.001). In patients with a Vmax Ao positive (group 2 +3), the Vmax Ao was positively correlated with systolic blood pressure of 24 hours (p=0.026) and hs-CRP (p=0.005) and negatively to the nocturnal SaO2 average (p=0.026). In multivariate analysis, the relationship persists with systolic blood pressure of 24 hours (p=0.046) and hs-CRP (p=0.038).

Conclusion: The factors associated with aortic expansion after surgical treatment of a DA or HD type A are the persistence of a circulating false lumen, systemic inflammation, a high systolic blood pressure by ABPM and nocturnal SaO2 low.

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Impact of the method used for aortic annulus measurement on TAVI results – A transesophageal echocardiography and multislice computed tomography comparison.

Martina Sordi, David Messika-Zeitoun, Dominique Himbert, Jean-Michel Serfathy, Andrea Chiampan, Aziza Touati, Eric Brochet, Bernard Iung, Alec Vahanian
Hôpital Bichat Paris, cardiologie, Paris, France

Background: Accurate measurement of the aortic annular diameter (AD) is critical for successful implantation of transcatheter aortic valve (TAVI) but the best method is still debated. We sought to compare the results of TAVI according to the method finally used for the choice of the prosthesis size: transesophageal echocardiography (TEE) or multislice computed tomography (MSCT).

Methods: AD was measured using both TEE and MSCT in 177 patients who underwent TAVI using either the Edwards Sapien or the Medtronic Corevalve prosthesis between January 2008 and April 2011. AD was measured from the long-axis view using TEE and at the level of the virtual basal ring in MSCT (mean of long and short axis). Agreement was defined as the use of the same prosthesis size with both TEE and MSCT according to manufacturers’ recommendations.

Results: Overall, mean AD was significantly larger using TEE than MSCT (24.6±2.2 vs. 23.2±1.93 mm, p<.0001). An agreement between TEE and MSCT was observed in 118 patients. Among the 59 patients with TEE and MSCT disagreement, prosthesis size was chosen according to TEE measurement in 54 and according to MSCT in 5. The Table summarized complications and in-hospital mortality. There was no significant difference between groups except for annulus rupture which occurred in one patient in whom MSCT measurements were used.

Conclusion: The present study shows that a TEE-based choice of the prosthesis size provided excellent clinical results not significantly different than when both MSCT and TEE agreed. Thus, in patients undergoing TAVI, the best imaging modality for the measurement of the aortic annulus diameter remains still not established but our data do not support the use of CT as the first line method.

Table – Complications and in-hospital mortality

<table>
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<tr>
<th>Complications</th>
<th>TEE/MSCT agreement</th>
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<th>MSCT-based strategy</th>
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<tr>
<td></td>
<td>N=118</td>
<td>N=54</td>
<td>N=5</td>
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<tr>
<td>Aortic regurgitation ≥2/4, n (%)</td>
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<td>3 (6%)</td>
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<tr>
<td></td>
<td>P value</td>
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<tr>
<td>Second baloon inflation, n (%)</td>
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<td>3 (6%)</td>
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<tr>
<td></td>
<td>P value</td>
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<td>0.57</td>
</tr>
<tr>
<td>Second prosthesis implantation, n (%)</td>
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<td>P value</td>
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<td>Annulement rupture, n (%)</td>
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<td>Prosthetic migration, n (%)</td>
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<td>In hospital mortality, n (%)</td>
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<td>1 (2%)</td>
<td>1 (20%)</td>
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<td></td>
<td>P value</td>
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