Utility of longitudinal strain imaging by speckle tracking in predicting obstructive CAD in patients with no wall motion abnormality in 2D echocardiography

Kiran Gopinath, Sajan Ahamed, A. George Koshy, Sunitha Viswanathan
Department of Cardiology, Government Medical College, Thrissur, Kerala, India

Background: Abnormalities in strain imaging appear before wall motion abnormalities in the ischemic cascade. Strain imaging is yet to find definite practical utility in the routine evaluation of CAD. This study is to define the utility of strain imaging in predicting obstructive CAD in a subset of patients who do not have RWMA in routine 2D echocardiography.

Methods: Prospective study enrolling patients with no RWMA in routine 2D echo being taken up for CAG. Longitudinal strain imaging by speckle tracking using automated functional imaging was done by a single operator, using a VIVID E9 machine, prior to CAG. All angiograms were read by a second operator who was unaware of the strain imaging findings. Obstructive CAD was defined as >70% luminal diameter narrowing of any epicardial coronary artery and abnormal strain was defined as a value less than 20%. Strain values were calculated for each ventricular segment. The sensitivity, specificity, positive and negative predictive values for each artery as well as each coronary segment were obtained.

Results: 129 consecutive patients were enrolled over a 7 month period from Nov 2013 to May 2014. Strain imaging had a high sensitivity- 97% for LAD, 90.69% for RCA, 91.6% for LCX, a high negative predictive value-81.81% for LAD, 91.3% for RCA, 92.3% for LCX but a poor specificity- 15.2% for LAD, 34.5% for RCA and 21.3% for LCX territories.

Conclusion: Strain imaging has a high sensitivity and high negative predictive value when compared to CAG (gold standard) in identifying obstructive CAD, thus making this a good test to rule out obstructive CAD in a low risk population. Though, in this study, strain imaging has not been compared to TMT, as these tests represent different physiological states of rest and exertion, strain imaging may be used in patients who cannot undergo TMT. CAG may be avoided in patients with normal strain values.

Effect of balloon mitral valvotomy on left ventricular function in rheumatic mitral stenosis

Pradeep Sreekumar, G. Rajesh, M.N. Krishnan
Government Medical College, Kozhikode, India

Background: Mitral stenosis (MS) is found to produce left ventricular dysfunction in some studies. Even in the presence of preserved global LV function as measured by ejection fraction, there can be impairment in long-axis function as shown by tissue Doppler echocardiography. We sought to study the left ventricular function in patients with rheumatic MS undergoing balloon mitral valvotomy (BMV).

Methods: In this prospective cohort study, we included 43 patients with severe rheumatic mitral stenosis undergoing BMV. They were compared to twenty age-matched healthy controls. The parameters compared were left ventricular (LV) ejection fraction (EF) by modified Simpson’s method, mitral annular systolic velocity (MASV), mitral annular plane systolic excursion (MAPSE), mitral annular early diastolic velocity (E’), and myocardial performance index (MPI).

Results: Mitral annular systolic velocity, MAPSE and E’ and EF were significantly lower and MPI was higher in mitral stenosis group compared to controls. Impaired longitudinal LV function was present in 77% of study group. Within the study group, atrial fibrillation patients had a higher MPI with other parameters being similar. Mitral annular plane systolic excursion and EF did not show significant change after BMV while MPI, MASV and E’ improved significantly. Mitral annular systolic velocity and E’ showed improvement immediately after BMV, while MPI decreased only at 3 month follow up.

Conclusions: There was significantly lower mitral annular motion parameters and higher myocardial performance index in patients with rheumatic mitral stenosis. Those with atrial fibrillation had higher MPI compared to those in sinus rhythm, indicating a worse global LV function. Immediately after BMV, there was improvement in LV long axis function with a gradual improvement in global LV function.

Diagnostic performance of echocardiography in cases of hypothyroidism

D.P. Singh, Kundan Sinha, Anand Kumar Srivastava, S.S. Singh
S S Hospital, IMS, Banaras Hindu University, Varanasi, India

Background: The aim of this study was to assess the diagnostic validation of myocardial performance parameter by
echocardiography in overt and subclinical primary hypothyroidism and its further use in the diagnosis of primary and central subclinical hypothyroidism.

**Methods:** 60 patients with overt hypothyroidism (OH-High TSH/Low FT4) and 40 patients with subclinical hypothyroidism (SH-High TSH/normal FT4) were submitted to echocardiography and thyroid evaluation (i.e. serum TSH, FT4, T3 measured by routine assay), before and after 4-6 weeks of L-thyroxin replacement therapy. 90 age and sex matched normal controls were also submitted to echo & thyroid evaluation, Myocardial Performance Index (MPI) & Isovolumetric Contraction Time (ICT) recorded by echocardiography results.

**Results:** In control group, FT4 is 1.08±0.12 ng/dl, TSH is 1.04±0.2 mu/l, MPI is 0.42±0.06 and ICT is 38±9 ms. In overt hypothyroidism group, FT4/TSH/MPI and ICT were 0.30±0.12 ng/dl, 93.6±48.6 mu/l, 0.65±0.15 and 76±21 ms respectively before L-thyroxin and 1.12±0.16 ng/dl, 2.6±1.4 mu/l, 0.43±0.12 and 42±14 ms respectively after L-thyroxin therapy.

In subclinical hypothyroidism group, FT4/TSH/MPI and ICT were 0.92±0.24 ng/dl, 16±4.5 mu/l, 0.5±0.09 and 55±12 ms respectively before L-thyroxin replacement and 1.13±0.18 ng/dl, 2.5±1.4 mu/l, 0.41±0.07 and 42±14 ms respectively after L-thyroxin replacement.

Diagnostic sensitivities and specificities of MPI>0.45 and ICT>55 ms for OH were 95% and 93% and for SH 85% and 96% respectively. MPI correlated (P<0.01) with TSH (r=−0.55), FT4 (r=−0.60) and T3 (r=−0.63), ICT correlated (P<0.01) with TSH (r=−0.51), FT4 (r=−0.59) and T3 (r=−0.66). MPI and ICT measurements were able to confirm the diagnosis of OH and SH in 100% and 70% of cases respectively.

**Conclusions:** MPI and ICT measurements by echocardiography were sensitive and specific for diagnosing both overt and subclinical tissue hypothyroidism. This gives additional support for using echocardiography in the diagnosis of mild/subclinical hypothyroidism.

### Assessment of RV function in patients with CTEPH, both pre and post pulmonary thromboendarterectomy, at tertiary care centre

P. Rudrappa, G. Cherian
Narayana Hrudayalaya Institute of Cardiac Sciences, India

**Background:** Chronic thromboembolic pulmonary hypertension (CTEPH) has emerged as one of the leading causes of severe pulmonary hypertension. The natural history and frequency of chronic thromboembolic pulmonary hypertension (CTEPH) remain uncertain. However, it is evident that CTEPH occurs more frequently than previously thought, and unlike other types of pulmonary hypertension, CTEPH has the potential to be cured. Echocardiography is most useful and feasible tool to assess RV function and look for improvement in RV function in post pulmonary thromboendarterectomy patients. This study was done.

**Methods:** 23 patients (42.0±12.42 years) with confirmed diagnosis of CTEPH who underwent pulmonary thromboendarterectomy admitted at Narayana hrudayalaya institute of cardiac sciences between 2011 to 2013 underwent detailed 2D transthoracic echocardiographic assessment of right heart function both pre PTE and 3months post PTE. Out of these 23 patients, 10 patients also had RVEF evaluation by first pass metabolism. The parameters of right ventricle were compared with baseline data.

**Results:** In all cases, the RV was enlarged and systolic function was impaired before surgery. RAESA decreased from 19.35±5.16 cm2 to 13.68±2.52cm2 (p<0.001); Mean pre-op RVBD decreased from 4.07±0.81cm to 3.32±0 (p<0.001); RVOTd pre and post PTE reduced to 2.32±0.34 cm from 2.69±0.29 cm (p<0.001); RVFW thickness did not normalize, but decreased from 0.99±0.21 cm to 0.84±0.59 cm (p<0.001); LV eccentricity index (DR) was >1.0 in 100% patients pre-op and had reversed in 12(52.2%) patients post-surgery; there was decrease in RVEDA from 26.29±4.66 to 20.23±3.41 (p<0.001); RVESA from 18.70±4.72 to 11.46±2.07 (p<0.001) and improvement of RVFAC from 33.09±8.25 to 49.52±7.45 (p<0.001). The tricuspid annular plane systolic excursion increased from 12.96±2.99 mm to 15.00±2.88mm (p<0.001). RVSP (TRPp) fell from 64.33±11.32 mmHg to 23.85±9.53 mmHg post operatively (p<0.001). Mean PAP fell from pre PTE value of 32.68±8.28mmHg to 12.82±5.55 mmHg post PTE.

**Conclusions:** In patients with CTEPH who undergo PTE, 2D echocardiography is a useful tool for the evaluation of RV function. Echocardiographic measurements of RV size, systolic pressure, systolic function, and TR show significant improvement post PTE.