The relationship between agatston calcium score and global longitudinal strain in patients suspected of stable angina pectoris

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Background: Cardiac computed tomography (CT) scan is often performed to evaluate coronary artery status in patients with stable angina pectoris (SAP). Echocardiography may assist the selection of patients in need of cardiac CT.

Purpose: To investigate the relationship between layer-specific global longitudinal strain (GLS) by speckle tracking echocardiography and Agatston calcium score.

Methods: In a clinical registry study of 592 patients suspected of SAP (mean age of 59 years, 43.6% male, mean body mass index (BMI) of 26, 15.5% with diabetes, 26.3% with hypertension) where everyone underwent both an echocardiographic (JCEM) and CT scan, the latter was used for measurement of the calcium score and layer specific longitudinal strain. The calcium score was stratified into tertiles and the strain was calculated as the averaged strain in the endocardium, mid-wall, and epicardium.

Results: GLS decreased incrementally with increasing tertile of calcium score (1st tertile: -19.6%, 2nd tertile: -19.2%, 3rd tertile: -18.4% for trend p<0.01). GLS was significantly greater in the 1st tertile compared to the other two tertiles (p<0.05 vs control), LVEF in HFrEF was associated with LV dilation, decreased strain and SR at all 3 layers and in all 3 directions, and decreased torsion (LVEF: 67±6% in HFrEF, 77±12% in HFpEF). Longitudinal strain and SR were decreased in HFpEF (longitudinal strain at endocardium: 19±3, 15±5%, *p<0.15 vs control, LVEF at epicardium: 36±13, 30±8, 20±7%, *p<0.01). Torsion was preserved in the left mid-wall and epicardium.

Conclusions: LV endo-diastolic dimension increased in HFrEF (control: 45±5, HFrEF: 56±7mm, *p=0.05 vs control), LVEF in HFrEF was associated with LV dilation, decreased strain and SR at all 3 layers and in all 3 directions, and decreased torsion (LVEF: 67±6% in HFrEF, 77±12% in HFpEF, 80±16%) by 3D-STE. LV twist was defined as a difference divided by long axis length for every instant in time. Significant valvular disease, prior cardiac surgery, coronary artery disease, irregular rhythm and Diabetes Mellitus were excluded.

Results:

- GLS decreased incrementally with increasing tertile of calcium score (1st tertile: -19.6%, 2nd tertile: -19.2%, 3rd tertile: -18.4% for trend p<0.01).
- GLS remained a significant independent predictor of high calcium score after adjustment for clinical risk factors being age, gender, hypertension, hypercholesterolemia, smoking, diabetes, BMI, family history of cardiovascular disease and heart rate (OR 1.09 [1.02; 1.16], p<0.01).

Conclusion: In patients suspected of having SAP, GLS becomes incrementally more predictive than Agatston calcium score and remains an independent predictor of high calcium score. Performing an echocardiogram may aid in the selection of those with high calcium score and thereby assist in identifying those in need of invasive coronary angiography.