Computed tomography derived left ventricular inward displacement as a novel tool for quantification of segmental wall motion abnormalities

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Clinical case description

A 60 years old patient with a history of myocardial infarction five years prior presented to the outpatient clinic for evaluation of atypical chest pain. The patient underwent a CCTA to further evaluate coronary anatomy. A CCTA was performed using a dual-source scanner (256 slices, Siemens Definition Flash, Siemens Healthcare, Forchheim, Germany), with a rotation time of 280 ms, temporal resolution of 75 ms, 0.6-mm collimation, tube current of 320 mAs, and 100-kV tube voltage was used.

Multiphase datasets were reconstructed at 5% steps from early systole (0% of the RR interval) to the late diastole (95% of the RR interval), resulting in 20 phases of the cardiac cycle.

After visual inspection of the cine loops (LINK to video) dyskinesia was found present in the basal and mid inferolateral and anterolateral segments. Quantitative analysis of global and regional function was performed using Feature Tracking CT cine loops on the endocardial borders of the reconstructed apical 2,3 and 4 chamber views using Medis Suite software (Medis Medical Imaging BV, Leiden, The Netherlands) (Fig. 1).

For global function %EF, GLS and GCS were measured. Regional function was quantified using two different parameters:

1. Conventional: Regional Longitudinal Strain
2. Novel: Inward Displacement. This novel parameter is quantified by measuring the distance travelled by the endocardial tracked points towards their corresponding center of the left ventricle during Systole. The displacement is expressed in % after normalization with the distance at end diastole between the endocardial points and the corresponding LV center.

Global function was found to be reduced with EF 36%, GLS 14% and GCS 15%. On the other hand, regional longitudinal strain was not able to confirm and quantify what was observed visually. The new Inward Displacement parameter clearly demonstrated dyskinesia in the mid anterolateral segment and in the mid and basal lateral segments, confirming in a quantitative manner the qualitative results by the visual assessment.

Conclusion

Inward Displacement is a promising new quantitative parameter, that correlates well with visual assessment of segmental wall motion abnormalities in an objective and quantifiable manner. Of course, more validations need to be carried out, but this is a very interesting case that demonstrates the potential benefit of this new approach for regional wall motion assessment.

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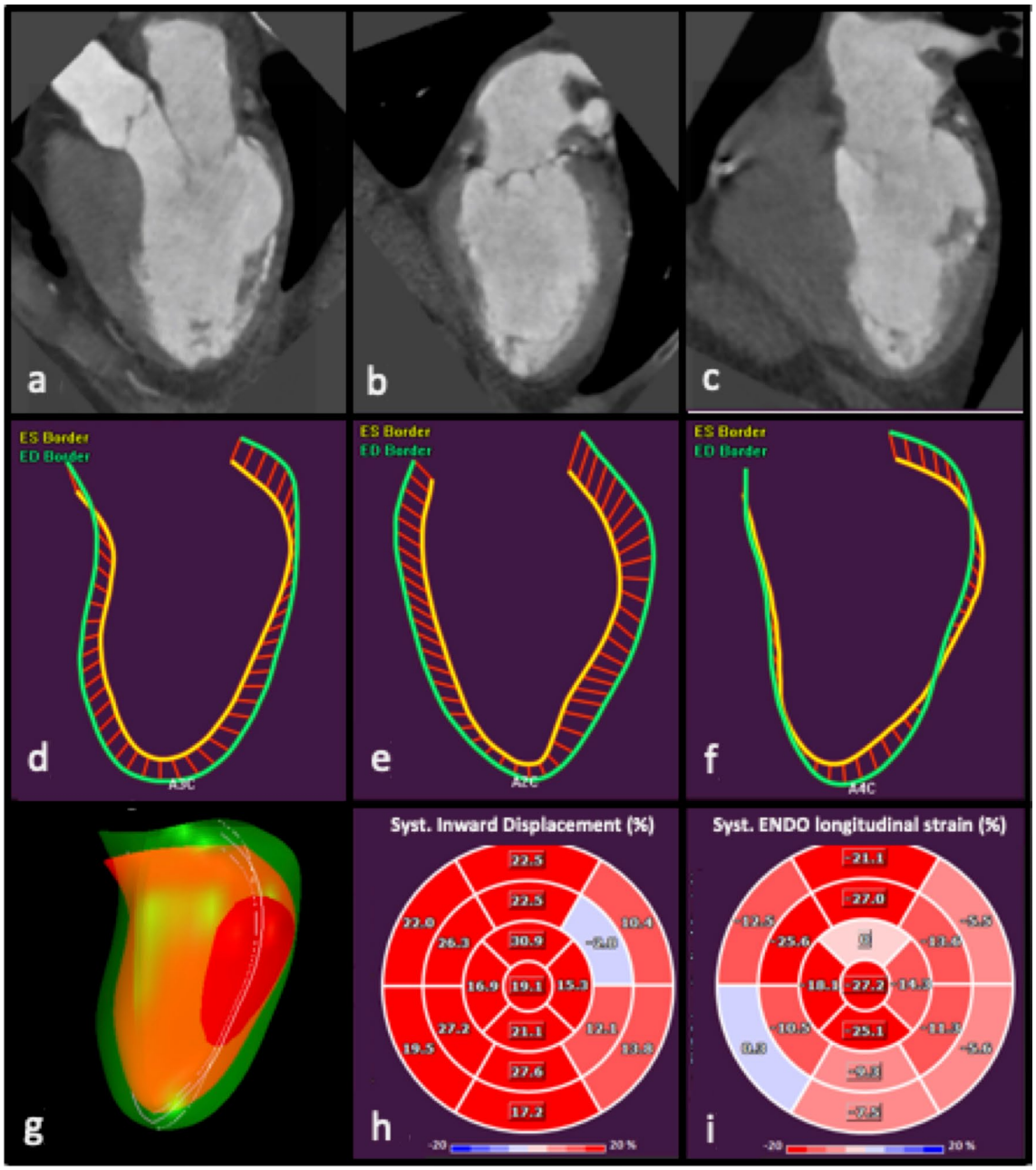

Fig. 1 **a**–**c** A3C, A2C and A4C reconstruction of the CT data, respectively, used for global and regional function assessment. Cine loops van be found in the supplemental video via this link **d**–**f** The inward displacement of the endocardial border is visualized in 2D with border in End Systole (Yellow) and in Diastole (Green) for the A3C, A2C and A4C views respectively. **f** displays clearly the region of dyskinesia in the mid inferolateral segments and **g** displays the same region in 3D (in red) **h** bull's eye with the novel regional quantitative parameter inward displacement clearly confirming the visual diagnosis. **i** bull's eye with regional longitudinal strain, that does not seem to align with the regional dysfunction observed in this case.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.