3D Strain Analysis: Is it Better Than 2D Strain?

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Because accurate quantification of LV function has important prognostic implication and affects clinical decision making, new techniques has been developed in recent years. 3D strain has been introduced as a new method to quantify myocardial contraction and relaxation, and validated by sonomicrometry. It has more benefit over 2D strain in assessment of global LV function. LV ejection fraction based on endocardial excursion is most widely used, but it is limited by loading condition, geometry assumption, subjective interpretation and subclinical dysfunction. 2D strain provides incremental and beyond ejection fraction to predict cardiac events in various cardiac disorder. However, 2D strain also has potential limitations, like out of plane motion, which affects myocardial deformation by loss of speckle, and limited measurement of plane. 3D strain has the potential to overcome the limitations of 2D strain for myocardial contraction, which track the motion of speckles within the scan volume, allowing more complete assessment of contraction in all three dimensions by avoiding loss of speckle. Furthermore, 3D strain can overcome the geometry assumption inherent in 2D imaging and provide all kinds of strain in a single data set. To be a robust parameter in assessment of myocardial function in a near future, 3D strain has to overcome its potential limitations; 3D strain is predominantly related to image quality and acoustic window. Image acquisition is performed over multiple stitches, usually 4-6 cycles, allowing adequate the temporal resolution. 3D strain may not be useful in dilated LV because it is not easy to get adequate volume ratio in the setting of wide sector angle. To date, the spatial resolution of 3D imaging is significantly inferior to 2D imaging. Finally, measurement can be impossible in the presence of arrhythmia such as atrial fibrillation or ectopic beats and severe LV dilatation because of frame rates, sector width.