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Ventricular Torsion: Research Tool or Novel Clinical Indicator?

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Concept of ventricular torsion has long history and valuable concepts were established for ventricular torsion contributing to left ventricular (LV) diastolic relaxation and early diastolic filling to generate rapid "suction" power during diastole. However, ventricular torsion had been recognized as only interesting research tools for clinicians because of hard to assess the ventricular torsion *in vivo*; only available method was tagging magnetic resonance image for a while.

Recently interests for ventricular torsion increased after two dimensional (2D) speckle tracking methods has been introduced. Velocity vector imaging is also an equipped image analysis technique and provides strain, strain rate and LV torsion. Basal and apical rotation curve is derived by simple off-line analysis and ventricular torsion is automatically calculated by equipped software.[1] Non-invasive, bed-side approach using transthoracic echocardiography can provide better information for change of ventricular torsion according to patient's clinical situation.

Easier assessment attributed to increase number of researches and clinical trials to apply the ventricular torsion to clinical field to improve the understanding for myocardial mechanics. Further approaches to LV torsion were made as a clinical indicator for decision making and prognostic indicator. Various studies about ventricular torsion in recent studies have suggested clinical implication.[2]

To measure LV function accurately, many noninvasive echocardiographic parameters have been developed. LV ejection fraction (LVEF) is a good parameter for ventricular function and even though it has numerous limitations, still it is the best clinical indicator to evaluate the ventricular function in most of clinics. Doppler and tissue Doppler follows to LVEF and then, strain is now suggested as a better marker to evaluate the ventricular function but still stands between clinician and researchers. To be used as a clinical indicator, predominant accuracy beyond other functional markers as well as easy approach and reproducibility for measurement. In observational cohort study, to prove higher accuracy of ventricular torsion can be hard to be achieved; however can be suggested with multivariate statistical analysis or subgroup analysis. Ventricular torsion is as far as it goes with other ventricular functional parameters, especially ejection fraction,[3] harder to discriminate its superiority as a clinical indicator especially in patients group with dramatic change of LVEF during observational periods.

This study by Deng et al.[4] investigated about the change of ventricular torsion before and after kidney transplantation. Ventricular torsion was improved but also global ventricular function including LVEF was improved. Poor ventricular function in patients with end-stage renal disease (ESRD) on dialysis has been described previously.[5] ESRD patients often encounter chronic volume and pressure overload. Higher incidence of ischemic heart disease is also associated with poor cardiac function in ESRD patients. Neurohormonal activation or uremic toxicity is also suggested as cause of poor cardiac function.[6]

After kidney transplantation, LV systolic function represented as LVEF increased in more than 86% of patients and was associated with an improvement in functional status in more than two-thirds of patients. Even in patients with severe LV systolic dysfunction (LVEF less than 20%), most of patients showed LVEF improvement after kidney transplantation.[5] In this work by Deng et al.,[4] LVEF increased as previous other clinical studies and but LV torsion was also increased. Therefore change of torsion is true in this study; however clinical implication is hard to be understood for clinician based on this study. Measurement of ventricular torsion can provide information for detecting and follow-up of cardiac abnormality as authors insisted; however the time and cost for measurement

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are much higher than conventional parameters. Selection of specific subgroup of patients is needed to apply this "additional" parameter which overwhelms LVEF. Preserved LVEF group with ventricular hypertrophy with diastolic dysfunction in Doppler parameter can be possible candidate in ESRD, because in previous studies, LV torsion was shown to be generated power for ventricular diastolic suction and early diastolic filling.[7] Or future studies is needed to evaluate LV torsion as indicator of to improve LVEF in pre-transplantation work-up (or to select the poor prognostic groups) beyond LVEF and other Doppler parameter.

Furthermore, LV torsion analysis technique based on 2D speckle tracking has several unsolved problems by itself. First of all, determining levels of base and apex have great influence to result of LV torsion. Far apex has higher rotation and when true apex is missed, lower rotation parameter can be derived. Little change of level of plane can distort the final results. Second, there is longitudinal motion of basal LV septum. 2D speckle tracking methods based on 2D images, and level of LV base can moves through 2D plane. To prevent artifacts or to improve quality of basal rotation curve, three dimensional (3D) speckle tracking has been developed and introduced. However, limited image quality and complex analysis process is problems to be solved. In recent study about feasibility and reproducibility of LV rotation,[8] feasibility of 2D speckle tracking was low in elderly individuals in clinical setting. Reproducibility was poor between different version of software even in 3D echocardiography and agreement was better when using newer software. Therefore, LV torsion has still technically imperfect methods and it is getting better with technical development. It means with better measurement technique, we can expect much clinical relevance from LV torsion. And researchers should keep going to investigate its clinical relevance.

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