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Editorial

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Strain Measurement for Assessment of Treatment Response: One Step Closer to Routine Clinical Practice

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▸ See the article "Changes in Cardiac Structure and Function After Kidney Transplantation: A New Perspective Based on Strain Imaging" in volume 31 on page 98.

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Numerous studies have shown the better diagnostic and prognostic value of the left ventricular (LV) global longitudinal strain (LV-GLS) in comparison with the LV ejection fraction (LV-EF), especially for cardiovascular diseases in which conventional LV-EF has limitations in assessing LV function, such as heart failure (HF),[1)2)] valvular heart disease,[3)] LV bundle branch block,[4)] and certain diseases with thick myocardium, including hypertrophic cardiomyopathy[5)] and cardiac amyloidosis.[6)] In particular, thickened LV myocardium can augment LV-EF despite reduced actual LV systolic function, suggesting the usefulness of LV-GLS under this condition.[7)] The relevance of LV-GLS for thickened myocardium can be observed in various conditions; among these, one of the common clinical situations is end-stage renal disease (ESRD).

In the present *JCVI* study, the authors investigated changes in LV-GLS and other echocardiographic parameters from baseline to 3 years after kidney transplantation (KT) in 488 patients with ESRD.[8)] While there was a significant correlation between LV-EF and LV-GLS, there were a substantial number of patients with impaired LV-GLS despite preserved LV-EF. Patients with the lowest tertile of LV-GLS (T1; LV-GLS < 12.5% in the present study)[8)] had the largest LV mass index and worst diastolic function parameters; however, LV-GLS showed the most obvious difference among all echocardiographic parameters. These findings highlight the better sensitivity of LV-GLS for detecting subclinical LV dysfunction in patients with thick myocardium. After KT, as observed in daily clinical practice, the echocardiographic parameters impaired by ESRD were restored, regardless of the baseline LV-GLS. More importantly, improvements in LV function parameters, including both LV-EF and LV-GLS, were more prominent in patients with severely impaired pre-KT LV-GLS (T1).

The post-KT improvements in LV-GLS shown in the present study should be interpreted in the context of a recently published study in *JACC Cardiovascular Imaging* by the same group, which expands the clinical implications of the present *JCVI* study.[9)] In the *JACC Cardiovascular Imaging* study, the authors investigated the prognostic value of post-KT LV-GLS, and found that it showed the most satisfactory predictive value for event-free survival after KT. Specifically, an increase of 1% in post-KT LV-GLS was associated with a 17% reduction in post-KT clinical outcomes, including hospitalization for HF and cardiovascular mortality, and the achievement of a post-KT LV-GLS ≥17% was associated with a significantly lower risk of study outcomes compared to that for lower values. When considered with the present study in *JCVI*, important clinical implications can be recognized: 1) LV-GLS provides better diagnostic performance than other echocardiographic parameters in patients with ESRD; 2) the restoration of renal function by KT can reverse LV pathologic remodeling across the full spectrum of pre-KT LV-GLS; and more importantly, 3) the measurement of LV-GLS can reflect the clinical course of patients with ESRD undergoing KT and provide prognostic information.

Given the better sensitivity and prognostic value, temporal changes in LV-GLS could be assumed as an ideal indicator to capture the treatment response. According to the Strain Surveillance of Chemotherapy for Improving Cardiovascular Outcomes (SUCCOUR) trial, LV-GLS-guided cardioprotective therapy resulted in significantly less LV-EF reduction compared to that with LV-EF-guided management, confirming that the better sensitivity of LV-GLS over LV-EF can be translated to a meaningful clinical benefit, and supporting the use of LV-GLS in surveillance for cancer therapy-related cardiac dysfunction.[10] In addition, several studies have demonstrated the potential of LV-GLS for monitoring the treatment response in other cardiac diseases. In patients with HF with reduced EF receiving optimal medical therapy including sacubitril/valsartan, the temporal changes in LV-GLS reflected the treatment response and provided a better diagnostic performance compared to that with conventional echocardiographic parameters, such as LV-EF and LV volume.[11] Additionally, in patients with cardiac amyloidosis, the time trajectory of LV-GLS reflected the treatment response and clinical course.[12][13]

Although there is little remaining doubt regarding the diagnostic and prognostic performance of LV-GLS, the use of LV-GLS in daily clinical practice has not been as widespread as expected because of the additional time and effort required for routine LV-GLS assessment, as well as the lack of evidence for direct applications to clinical practice. However, recent studies using LV-GLS (and also strain measurements of other cardiac chambers) as an indicator of the treatment response have expanded our understanding of the pathophysiology of various cardiac diseases, facilitating the application of strain measurements in real-world practice. Given the rapid progression of automated measurements of echocardiographic parameters using artificial intelligence, the use of LV-GLS and other strain measurements will become even more accelerated in the near future. Strain measurements can be directly applied in routine practice, or might be applied to novel hemodynamic indicators, such as myocardial work or myocardial stiffness indices (**Figure 1**).[14] Thus, researchers should move beyond simply assessing the relationship between a strain value measured once and the prognosis, and more effort and attention should be devoted to researching how strain measurements can be effectively used in clinical practice and improve the prognosis of patients.

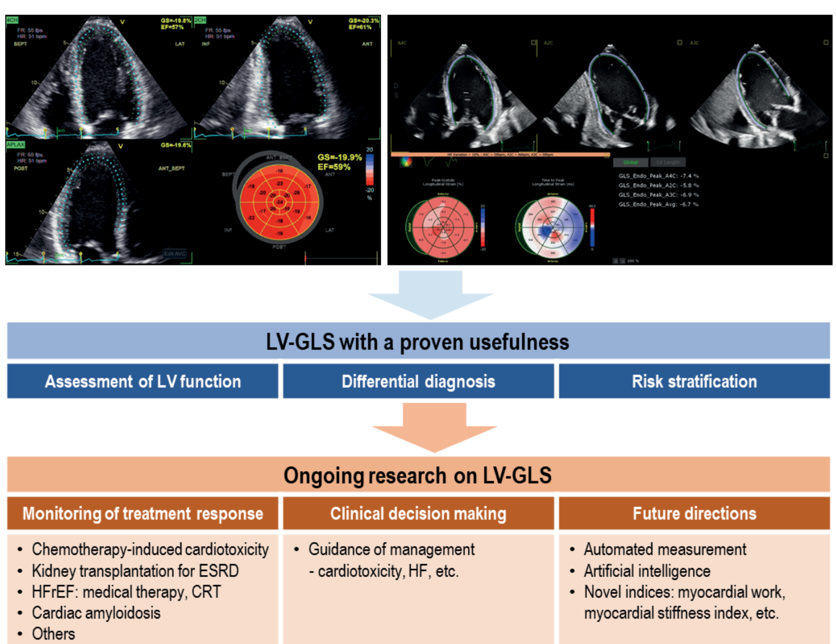

Figure 1. Current and future clinical utilization of LV-GLS.
CRT: cardiac resynchronization therapy, ESRD: end-stage renal disease, GLS: global longitudinal strain, HFrEF: heart failure with reduced ejection fraction, HF: heart failure, LV: left ventricular.

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Conflict of Interest

The author has no financial conflicts of interest.

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