Regional Myocardial Contractile Function Change Evaluated by Tissue Doppler Imaging after Primary Angioplasty

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Background: Myocardial strain and strain rate measurement derived by tissue Doppler imaging has been shown to be a sensitive method to quantify regional myocardial contractile function. However, the sequential changes of these parameters in the infarct area and remote zones, which may have tethering effect, after successful primary percutaneous coronary intervention (PCI) for acute myocardial infarction (AMI) have not been demonstrated.

Methods: Sixteen patients with acute ST-elevation myocardial infarction who underwent successful PCI were included in this study. We performed echocardiography soon, 24 hours and 72 hours after primary PCI, to measure the peak systolic strain rate (SSR), postsystolic shortening (PSS), peak strain rate in early diastole (ESR), late diastole (ASR) and peak systolic strain (Ssys) to characterize the myocardial contraction. Follow-up echocardiography or thallium-201 myocardial perfusion imaging were performed 6 months later to identify patients who showed persistent akinesia or fixed perfusion defect as group 1. Those patients who had imaging examinations implicating viable myocardium were classified as group 2.

Results: Soon after primary PCI, SSR was significantly lower in the infarct zones than in remote zones (P < 0.05), with concurrent development of PSS (P < 0.05). Furthermore, the reduction of SSR and development of PSS were observed in group 1, not in group 2. However, the PSS of infarct zones in group 1 recovered after 72 hours (P < 0.05 versus 24 hours after PCI) and reached no significant difference in comparison with that of remote zones when the SSR of the infarct zones remained significantly lower (P < 0.05).

Conclusion: The infarct zones can be precisely detected using strain and strain rate imaging. The more myocardium that has vanished, the more the systolic strain rate changes in the infarct zones. Remodeling process after AMI proceeds and can be observed with strain rate imaging, especially in infarct zones with prominent scar formation. However, the sequential PSS recovery could not serve as a surrogate marker of myocardial viability.

Key Words: Acute myocardial infarction • Primary angioplasty • Strain and strain rate imaging

INTRODUCTION

Myocardial infarction (MI) or ischemia is known to be a regional and evoluntional process that can induce alterations in local myocardial deformation and later cardiac remodeling. The traditional evaluation of myocardial contractile function has remained on the basis of visual assessment of regional wall motion and wall thickening. These routine methods are subjective and semiquantitative. Myocardial strain and strain rate imaging by tissue Doppler echocardiography may represent a sensitive and quantitative method to measure regional myocardial deformation. Acute myocardial infarction (AMI) is a dynamic process that does not occur instantaneously but evolves over hours. Strain and strain rate...