Wall motion score index predicts mortality after coronary artery bypass grafting in patients with viable non-functioning myocardium.

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Abstract

Coronary artery bypass grafting (CABG) has better survival than medical treatment in patients with left ventricular (LV) dysfunction. Assessment of myocardial viability is crucial to predict survival benefit after CABG. Our recent work determined higher prognostic value of echocardiographic wall motion score index (WMSI) than left ventricular ejection fraction (LVEF) in patients underwent CABG with viable myocardium and LVEF <50%. Thus, it is important to determine the extent of non-viable as well as viable myocardium in patients with low LVEF. Also, in the absence of high modality imaging studies like cardiac magnetic resonance (CMR) and to avoid the radiation hazards of radionuclide studies, assessment of WMSI in addition to LVEF can give accurate data of the magnitude of myocardial damage and can predict survival after CABG in patients with systolic LV dysfunction.

Keywords: Myocardial revascularization, left ventricular dysfunction, Low ejection fraction, Myocardial viability.

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Commentary

Coronary artery disease (CAD) is a leading cause of left ventricular (LV) systolic dysfunction which results in higher mortality rates than non-ischemic etiologies [1]. Also, LV systolic dysfunction is known as a predictor of in-hospital mortality after CABG, and associated with multiple perioperative risk factors that affect the survival benefit of CABG [2]. However, in patients with LV systolic dysfunction, coronary artery bypass grafting (CABG) provides the potential for incremental survival benefit compared to medical treatment [1,3]. Moreover, a recent study demonstrated a greater post-procedural short and long-term survival benefit of CABG over PCI in patients with poor LV function (ejection fraction <30%) [4].

The predominance of tissue viability has a good impact on safety and efficacy of CABG in patients with LV dysfunction. Thus, myocardial viability is crucial for selection of patients with nonfunctioning myocardium to undergo CABG [5]. The use of noninvasive techniques to determine the myocardial viability, particularly echocardiography, provides important information to guide clinicians in selecting patients with LV dysfunction likely to receive benefit from CABG [6].

Recently, we published a study aiming to determine the perioperative predictors of adverse outcome after coronary artery bypass grafting (CABG) in patients with reduced left ventricular ejection fraction (LVEF; <50%) [2]. All of our patients had viable nonfunctioning myocardium. Wall motion score index (WMSI) determined on dobutamine stress echocardiography (DSE) in patients undergoing CABG with viable non-functioning myocardium had a good prognostic value (Figure 1).

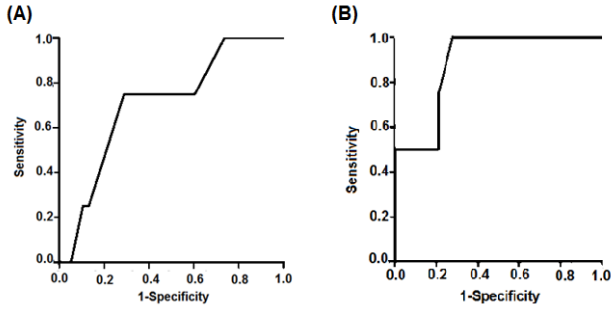

Figure 1. *Receiver operating characteristic (ROC) curve shows prognostic accuracy of: (A) left ventricular ejection fraction (LVEF), Areas under curve (AUC) of 0.70; and (B) wall motion sore index (WMSI), AUC of 0.88, in patients undergoing CABG with ejection fraction <50%.*

Wall motion score index (WMSI) reflects the magnitude of myocardial damage and total extent of wall motion abnormalities. Our results indicate that not the presence of viable myocardium or improved LVEF on stress echocardiography but the magnitude of myocardial damage, has a positive impact on survival after revascularization. In other words, measurement of regional variability of LV function by WMSI predicts in-hospital mortality after CABG, but not a global measurement using end-systolic and end-diastolic volume indices.

As recommended by the American Society for Echocardiography a 16-segment model was used for left ventricular segmentation. Each segment was analyzed individually and scored on the basis of its motion and systolic thickening. Each segment's function was confirmed in multiple

views. Segments were scored are as: normal or hyperkinesis=1, hypokinesis=2, akinesis=3 and dyskinesis (or aneurysmatic)=4. WMSI was derived as the sum of all scores divided by the number of segments visualized [7].

It has been described that a combined analysis of LVEF and WMSI seems preferable to the measurement of LVEF alone. The presence of hypercontractile segments may limit the reduction in systolic function measured by LVEF without limiting it when measured with WMSI since it is based on the contractility of each segment and scores equal the hypercontractile and normal segments. The main difference between WMSI and LVEF is that the WMSI rates equally normokinesia and hyperkinesia, avoiding the compensation that hypercontractile segments make on the dysfunctional ones in the measurement of LVEF and therefore assessing more directly the intensity and extent of the myocardial damage [8].

It was postulated that non-invasive methods should identify and assess non-viable myocardium as well as viable myocardium since the combined data appear to provide a more accurate and comprehensive evaluation of myocardial viability [9]. The new imaging techniques, such as strain and cardiac magnetic resonance imaging (CMR) are more precise for determining myocardial damage. However, these are less accessible techniques for daily practice. A good correlation of the echocardiographic WMSI with the strain has been reported [8]. Thus, in the absence of CMR, assessment of WMSI by echocardiography provides important data about the magnitude of regional myocardial damage.

In conclusion, preoperative assessment of WMSI using stress echocardiography has an important prognostic role in patients with LV dysfunction undergoing CABG, and it helps identify patients who may benefit most from CABG. However, our finding is limited by small size of our patients, which indicates further large-scale studies with the same concern.

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