

Relation of Ultrasonic Tissue Characterization with Integrated Backscatter to Contractile Reserve in Patients with Chronic Coronary Artery Disease

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Summary

Background: Previous studies have shown that viable but stunned myocardium displays contractile reserve and exhibits cardiac cycle-dependent variations of integrated backscatter (CVIB), whereas infarcted myocardium does not.

Hypothesis: This study was designed to clarify whether assessment of the acoustic properties of the myocardium can predict contractile reserve in patients with chronic coronary artery disease (CAD).

Methods: In all, 21 patients with chronic CAD and 19 normal control subjects were studied. The magnitude of CVIB of the myocardium was measured in the basal and mid segment of the anterior septum and posterior wall of the left ventricle, using a real-time, two-dimensional integrated backscatter imaging system. The results were compared with the percent systolic wall thickening and the wall motion before and after revascularization. The wall motion was graded as normal, hypokinetic, or akinetic, and contractile reserve was considered present when an akinetic or hypokinetic segment improved after revascularization.

Results: The average magnitude of CVIB was lower among dysfunctional segments of CAD than among normal segments of controls (3.73 ± 1.71 vs. 6.35 ± 0.69 , $p < 0.001$). Of the 77 segments examined, 38 showed reversible dysfunction. Before revascularization, percent systolic wall thickening was similar among segments showing contractile reserve compared with those with persistent dysfunction myocardium (17.97 ± 8.41 vs. $16.83 \pm 6.37\%$, $p = 0.19$), and the mean CVIB was significantly greater in segments with than in those without contractile reserve (4.73 ± 1.47 vs. 2.75 ± 1.31 , $p < 0.001$). The CVIB above 3 dB before percutaneous transluminal coronary angioplasty predicted segments with contractile reserve with a sensitivity and specificity of 84.2 and 79.5%, respectively.

Conclusions: Cardiac cycle-dependent variations of integrated backscatter reflected myocardial contractility and functional capacity of the myocardium. They predicted segmental contractile reserve in patients with CAD.

Key words: echocardiography, acoustic properties of myocardium, contractile reserve, cyclic variation of integrated backscatter, chronic coronary artery disease, left ventricle, wall motion

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