

# Left ventricular shape index assessed by gated stress myocardial perfusion SPECT: Initial description of a new variable

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**Background.** Ventricular remodeling is predictive of congestive heart failure (CHF). We aimed to automatically quantify a new myocardial shape variable on gated myocardial perfusion single photon emission computed tomography (SPECT) (MPS) and to evaluate the association of this new SPECT parameter with the risk of hospitalization for CHF.

**Methods and Results.** A computer algorithm was used to measure the 3-dimensional (3D) left ventricular (LV) shape index (LVSI), derived as the ratio of maximum 3D short- and long-axis LV dimensions, for end systole and end diastole. LVSI normal limits were obtained from stress technetium 99m sestamibi MPS images of 186 patients (60% of whom were men) (control subjects) with a low likelihood of CAD (<5%). These limits were tested in a consecutive series of 93 inpatients (85% of whom were men) having MPS less than 1 week after hospitalization, of whom 25 were hospitalized for CHF exacerbation. Variables associated with CHF hospitalization were tested by receiver operating characteristic curve and multivariate logistic regression analyses. LVSI repeatability was assessed in 52 patients with ischemic cardiomyopathy who had sequential stress MPS within 60 days after the initial MPS without clinical events in the interval between MPS studies. Control subjects had lower end-systolic and end-diastolic LVSI compared with patients with CHF and those without CHF ( $P < .001$ ). Receiver operating characteristic curve areas for the prediction of hospitalization as a result of CHF were similar for LV ejection fraction and end-systolic LVSI. End-systolic and end-diastolic LVSI were independent predictors of CHF hospitalization by multivariate analysis; however, end-systolic LVSI had the greatest added value among all tested variables. Repeatability was excellent for both end-systolic LVSI ( $R^2 = 0.85$ ,  $P < .0001$ ) and end-diastolic LVSI ( $R^2 = 0.82$ ,  $P < .001$ ).

**Conclusion.** LVSI is a promising new 3D variable derived automatically from gated MPS providing highly repeatable ventricular shape assessment. Preliminary findings suggest that LVSI might have clinical implications in patients with CHF. (J Nucl Cardiol 2006;13:652-9.)

**Key Words:** Diagnostic application • gated myocardial perfusion single photon emission computed tomography • left ventricular geometry • congestive heart failure

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Previous imaging studies, mostly based on echocardiography, have revealed the clinical and prognostic importance of left ventricular (LV) geometry in the pathophysiology and symptomatology of congestive heart failure (CHF).<sup>1-6</sup> It has been assumed that LV shape is closely related to cardiac performance and that, as the normally ellipsoid LV shape transforms into a spherical shape in LV failure,<sup>4</sup> the pattern of LV contraction changes and mitral regurgitation often develops or worsens. However, almost all echocardiographic descriptions of these geometric changes have been 2-dimensional (2D) and do not take into account the actual 3-dimensional (3D) changes in LV geometry.<sup>7</sup>