Assessment of Mitral Valve Regurgitation at Electron-Beam CT: Comparison with Doppler Echocardiography


Purpose
To prospectively compare mitral valve regurgitation fractions calculated at electron-beam computed tomography (CT) (Doppler echocardiography as reference standard) and to evaluate accuracy of electron-beam CT volume and flow measurements compared with magnetic resonance (MR) imaging results.

Materials and Methods
Institutional review board approval and informed consent were obtained. Volume and flow measurements were performed at electron-beam CT in 219 patients (197 men, 22 women; mean age, 61.5 years ± 10.4 [standard deviation]), of whom 157 had known isolated mitral valve regurgitation. Regurgitation volume was calculated as the difference between left ventricular total and forward stroke volumes. Regurgitation fractions were compared with corresponding echocardiographic grades (grades 0 - IV) by using Spearman rank correlation and a weighted k test. In 22 patients, CT volume and flow measurements were compared with MR results by using intraclass correlation.

Results
Regurgitation fractions at CT correlated well with echocardiographic grading (rank correlation coefficient, rs = 0.82; p < 0.05). Mean regurgitation fractions for echocardiographic grades 0, I, II, III, and IV were 3.1% ± 6.2, 12.7% ± 9.9, 25.3% ± 12.3, 40.4% ± 11.5, and 55.9% ± 13.7, respectively. The most suitable thresholds for differentiating echocardiographic grades were calculated regurgitation fractions of 6%, 20%, 30%, and 44%; with these thresholds, individual echocardiographic grades were differentiated (grades 0 vs I-IV, 0-I vs II-IV, 0-II vs III-IV, and 0-III vs IV, respectively) with sensitivities of 89%, 87%, 86%, and 93%, and specificities of 81%, 87%, 92%, and 91% respectively. There was perfect agreement in classification of mitral valve insufficiency between electron-beam CT and echocardiography in 134 (61%) patients and a mismatch by one grade in 72 (33%) and by two grades in 13 (6%) (k = 0.84). Intraclass correlation coefficients between CT and MR imaging for total and forward stroke volumes and regurgitation volume and fraction were 0.88, 0.79, 0.93 and 0.89, respectively.

Conclusions
Electron-beam CT provides quantitative information on severity of mitral valve regurgitation, but semiquantitative classification of regurgitation showed mismatch between electron-beam CT and Doppler echocardiography by at least one grade in more than one-third of all patients.

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