

Completing the Picture From Image Enhancement to Improved Accuracy and Prognostic Insight

Thomas H. Marwick, MBBS, PhD, FRACP

Contrast Stress Echocardiography

The opinions expressed in this article are not necessarily those of the editors or of the American Heart Association.

From the Department of Medicine, University of Queensland, Brisbane, Australia.

Correspondence to Prof T.H. Marwick, University of Queensland, Dept of Medicine, Princess Alexandra Hospital, Ipswich Road, Brisbane, Q4102, Australia. E-mail tmarwick@sms.uq.edu.au

(Circulation 2005;112:1382-1383.)

© 2005 American Heart Association, Inc.

Circulation is available at http://www.circulationaha.org

DOI: 10.1161/CIRCULATIONAHA.105.566133

The article by Tsutsui et al8 in this issue of Circulation represents another landmark in the clinical evaluation of myocardial contrast echocardiography. These investigators evaluated the prognostic value of myocardial perfusion imaging in 788 patients undergoing myocardial contrast echocardiography. The use of myocardial perfusion imaging significantly increased the proportion of studies recognized as abnormal, from 26% to 41%, with not only an increased recognition of ischemia but also a recognition of ischemia within areas thought to have infarction. As in previous literature, the extent of multivessel disease was better appreciated with contrast echocardiography. During a median follow-up period of nearly 20 months, 58 patients died and 17 suffered a nonfatal myocardial infarction, giving an overall event rate of 9.6%. The 3-year event-free survival rates in patients with ischemia and fixed perfusion defects were 84% and 86%, respectively, compared with 95% in patients with normal myocardial perfusion. As expected, patients with multivessel perfusion defects fared particularly badly. The most interesting survival findings were obtained by combining wall motion and perfusion, with a survival rate of 68% in patients with both abnormal wall motion and perfusion, 82% in patients with abnormal perfusion but normal wall motion, and 95% in patients with normal perfusion and normal wall motion. Multivariate analysis showed that abnormal perfusion was an independent predictor of adverse outcome, with wall motion excluded from the model. Moreover, abnormal perfusion added significant incremental value to clinical analysis, resting, and stress wall motion assessment.

These results are important on two levels. On clinical grounds, they document the incremental value obtained from adding myocardial contrast to stress echocardiography, defining not only a diagnostic but also a prognostic benefit. The combination of both this and the previous diagnostic work suggests that rather than contrast only being applied to selected stress echocardiograms, in which image quality is imperfect, it may add significantly to the diagnostic and prognostic content of all stress echocardiograms. On a pathophysiological level, the results of the study provide some provocative information about the relative prognostic impact of myocardial perfusion and function. Previous studies with stress echocardiography have suggested that left ventricular function responses to stress are prognostically powerful, and in comparisons with myocardial perfusion assessment using SPECT both in head-to-head trials9,10 and meta-analyses,11 the prognostic significance of abnormal wall motion responses to stress and abnormal perfusion have been considered analogous. In contrast, the results of the study of Tsutsui et al8 suggest that the perfusion data are prognostically more meaningful and indeed appear to outweigh the wall motion data.

This discrepancy with the previous literature with regard to the prognostic implications of abnormal flow and function may reflect the superiority of myocardial contrast over SPECT or the inferiority of wall motion analysis in this trial as compared with the previous literature. From a prognostic standpoint, there is little evidence to suggest the superiority of echo assessment of perfusion compared with SPECT assessment, with a negative SPECT scan conferring a <1%/year annualized risk,11 less than that reported in this study. The wall motion analysis in this study, which gave a 2.4%/year annualized event rate in patients with normal wall motion, does exceed that in recent reports (Table).* There may be two important explanations for this. First, low mechanical index imaging was used for both interpretation of wall motion and perfusion. Despite the authors’ recent report that high and low mechanical index imaging have similar sensitivity,18 this modality has potentially poorer endocardial resolution and frame rate as compared with standard imaging. Second, the criteria for positivity with wall motion were
conservative (wall motion abnormalities were only identified if they were present in ≥2 segments), which would have reduced the number of positive scans by wall motion and led to patients with 1 abnormal segment being included in the group with normal wall motion. The perfusion data gathered from myocardial contrast echocardiography vary from the data reported from SPECT imaging. It is possible that information gathered about the microvasculature using myocardial contrast echocardiography is incremental to wall motion in a way that SPECT perfusion data are not. Such a finding is at odds with our present understanding of the relative normalities and needs to be evaluated further in subsequent studies. In the meantime, however, the study of Tsutsui et al defines for the first time that myocardial contrast echocardiography is predictive of outcome in patients with known or suspected coronary artery disease.

**Disclosure**

Dr Marwick has received research support from Bristol-Myers Squibb and Amersham Biosciences.

**References**


**Key Words:** Editorials contrast media coronary artery disease echocardiography
Contrast Stress Echocardiography: Completing the Picture From Image Enhancement to Improved Accuracy and Prognostic Insight
Thomas H. Marwick

Circulation. 2005;112:1382-1383
doi: 10.1161/CIRCULATIONAHA.105.566133

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/112/10/1382

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation is online at:
http://circ.ahajournals.org//subscriptions/