Usefulness of Echocardiography in the Prognostic Evaluation of Non–Q-Wave Myocardial Infarction

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Patients with non–Q-wave myocardial infarction (MI) are a heterogeneous population with a wide range of coronary disease severity and extent of myocardial necrosis, showing, therefore, different electrocardiographic findings and different outcomes. To evaluate the role of echocardiography in the management of non–Q-wave MI patients, 192 consecutive patients without previous MI were studied (78 with ST segment elevation, 56 with ST depression and 58 without ST modifications). All patients underwent 2-dimensional echocardiography (16-segment model) within 24 hours of admission to the coronary care unit. Wall-motion abnormalities, wall-motion score index, ejection fraction, and end-diastolic and end-systolic volumes were evaluated. In 35 patients, death, reinfarction, recurrent angina, or severe heart failure occurred during the in-hospital phase, whereas the remaining 157 patients had a good outcome. Patients with a poor prognosis were older (68 ± 6 vs 59 ± 5 years, p <0.01), had a worse left-ventricular function (wall-motion score index 1.4 ± 0.4 vs 1.25 ± 0.3, p <0.05; end-systolic volume 54 ± 25 vs 38 ± 12 mL/m^2, p <0.01; ejection fraction 50 ± 10 vs 58 ± 8%, p <0.01), and presented more frequently with ST segment depression (49 vs 25%, p <0.01). The positive and negative predictive values for early clinical events were, respectively: ST segment depression 0.30 and 0.87; wall-motion abnormalities in >3 segments 0.28 and 0.86; wall-motion score index >1.33 = 0.28 and 0.87; end-diastolic volume >46 mL/m^2 = 0.49 and 0.91; ST segment depression and wall-motion abnormalities in >3 segments 0.60 and 0.88. These results underline the usefulness of echocardiography in the early risk stratification of non–Q-wave MI patients, together with electrocardiographic data. Patients with ST segment depression and more extensive wall-motion abnormalities are at higher risk and their management needs a more aggressive approach. ©2000 by Excerpta Medica, Inc.

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The number of patients sustaining a non–Q-wave myocardial infarction (MI) has greatly increased in recent years and represents >30% of all patients with acute MI[1–3] or even 50% according to some investigators.[4] Non–Q-wave MI patients are a heterogeneous population with a wide range of coronary disease severity and extent of myocardial necrosis, showing, on one hand, different electrocardiographic findings (ST segment elevation or depression, only T wave inversion, no significant electrocardiographic abnormalities), and on the other hand, different outcomes. In fact, conflicting short- and long-term mortality rates are reported in the literature, especially in the prethrombolytic era. Many investigators found a more favorable early prognosis with respect to patients with Q-wave MI, but similar or worse long-term survival. This observation resulted in a more aggressive approach to diagnosis and treatment of non–Q-wave MI; in fact, the 1987 American College of Cardiology/American Heart Association (ACC/AHA) Joint Task Force Report on Guidelines for Coronary Angiography classified non–Q-wave MI in Class I (general agreement that coronary angiography is justified).[5] The present view, which takes into account the heterogeneity of non–Q-wave MI patients, must be quite different, as shown by recent studies[4,6] that have demonstrated a better outcome for noninvasive strategies, and by the recently published ACC/AHA Guidelines for the Management of Patients with Acute Myocardial Infarction, in which coronary angiography and possible percutaneous transluminal coronary angioplasty after non–Q-wave MI are indicated in Class IIb (usefulness/efficacy is less well established by evidence/opinion).[7]

In this complex clinical setting, it is very important to identify subgroups of patients at higher risk, in whom a more aggressive approach is justified. It is well recognized that non–Q-wave MI patients with initial ST segment depression have a worse prognosis than patients with ST segment elevation[8,9]; however, this subgroup of patients is very wide. More recently, some studies have evaluated the prognostic role of little electrocardiographic abnormalities[10] and of troponin T[11] in acute coronary syndromes, but their series consisted mainly of patients with unstable angina. Few studies have evaluated the prognostic value of echocardiography in the acute phase of non–Q-wave MI. Our previous results showed a useful role for echocardiography in the early risk stratification of MI,

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especially in patients without overt signs of left-ventricular dysfunction.[12–15]

In this study we focused our attention on non–Q-wave MI patients, evaluating the role of echocardiography in the early risk stratification and, therefore, in the decision making and management of these patients.

METHODS

In total, 217 consecutive patients with non–Q-wave MI (confirmed by enzymatic data) were analyzed: 21 patients were excluded because of prior MI and 4 patients died before 2-dimensional echocardiography was performed. Thus, the study group consisted of 192 patients (143 males and 49 females, mean age 60 ± 7 years: 78 with acute ST elevation, 56 with acute ST depression, and 58 without ST modifications). All patients underwent 2-dimensional echocardiography (16-segment model) within 24 hours of admission to the coronary care unit. Wall-motion abnormalities, wall-motion score index, ejection fraction, and end-diastolic and end-systolic volumes were evaluated, as previously reported.[16] The occurrence of in-hospital events (death, reinfarction, recurrent angina, or severe heart failure) was considered in risk stratification.

RESULTS AND DISCUSSION

Admission echocardiography showed no wall-motion abnormalities in 56 patients (29.2%), a mild left-ventricular dysfunction (wall-motion abnormalities in ≤3 segments) in 76 patients (39.6 %), and a more extensive left-ventricular dysfunction in 60 patients (31.2%). For more detailed wall-motion abnormalities distribution, see Figure 1.

During the in-hospital period, 35 patients had a new clinical event (death [9], fatal [1] and nonfatal [2] reinfarction, recurrent angina [19], and severe heart failure [5]), whereas 157 patients showed a good outcome.

Anamnestic, clinical, electrocardiographic, and echocardiographic findings in patients with poor and good prognosis are reported in Table I.

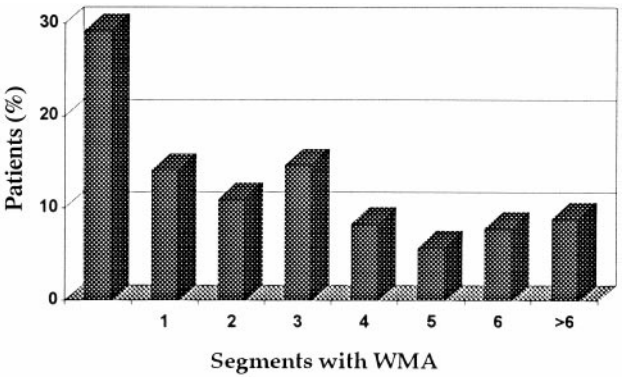

FIGURE 1. Admission 2-dimensional echocardiography. WMA = wall-motion abnormalities.

These results show that several echocardiographic parameters, indicative of myocardial dysfunctioning areas (wall-motion score index, wall-motion abnormalities, ejection fraction), may be useful in the early risk stratification of non–Q-wave MI patients. It may be observed that wall-motion abnormalities detected in the acute phase are not the expression of myocardial necrosis because myocardial stunning or hibernation may be involved. Indeed, this observation supports the prognostic role of these parameters, because large areas of viable but dysfunctioning myocardium may be at risk of new ischemic events at follow-up.

Furthermore, it may be argued that echocardiographic data do not add any incremental prognostic value to electrocardiographic data (i.e., ST segment depression). Indeed, both electrocardiographic and echocardiographic data (using an arbitrary cutoff) can identify subgroups of patients (23–37% of all patients) with a higher rate of events (28–49%) but with a very low positive predictive value. The association of 2 simple findings (i.e., ST depression at admission electrocardiogram and the presence of wall-motion abnormalities in >3 segments) allow the detection of a

TABLE I Anamnestic, Clinical, Electrocardiographic, and Echocardiographic Findings in Patients with Poor and Good In-hospital Prognosis

	Poor Prognosis (n = 35)	Good Prognosis (n = 157)	p
Age (years)	68 ± 6	59 ± 5	<0.01
Sex (male/female)	23/12	120/37	NS
Hypertension	27 (77%)	88 (56%)	NS
Diabetes	7 (20%)	24 (15%)	NS
CK peak (U/L)	696 ± 189	774 ± 237	NS
ST segment depression	17 (49%)	37 (25%)	<0.01
Number of segments with WMA	4.1 ± 1.6	2.6 ± 1.1	<0.05
WMSI	1.4 ± 0.4	1.25 ± 0.3	<0.05
EDV (mL)	102 ± 35	93 ± 14	NS
ESV (mL)	54 ± 25	38 ± 12	<0.01
EF (%)	50 ± 10	58 ± 8	<0.01

CK = creatine kinase; EDV = end-diastolic volume; EF = ejection fraction; ESV = end-systolic volume; NS = not significant; WMA = wall-motion abnormalities; WMSI = wall-motion score index.

TABLE II Predictive Values of Electrocardiographic and Echocardiographic Parameters

	Patients		Events				
	n	(%)	n	(%)	p	PPV	NPV
ST segment depression	56	(29)	17	(30)	<0.01	0.30	0.87
WMA in >3 segments	57	(30)	16	(28)	<0.05	0.28	0.86
WMSI >1.33	72	(37)	20	(28)	<0.05	0.28	0.87
ESV >46 mL	45	(23)	22	(49)	<0.01	0.49	0.91
ST segment depression and WMA in >3 segments	25	(12.5)	15	(60)	<0.01	0.60	0.88

ESV = end-systolic volume; NPV = negative predictive value; PPV = positive predictive value; WMA = wall-motion abnormalities; WMSI = wall-motion score index.

small subgroup of patients (12.5%) with a very high rate of in-hospital events (60%), by increasing the positive predictive value and maintaining a good negative predictive value (Table II).

CONCLUSION

Our results suggest that echocardiography may be a useful prognostic tool in non–Q-wave MI patients, together with electrocardiographic findings. In patients at higher risk (ST segment depression and more extensive wall-motion abnormalities), a more aggressive diagnostic and therapeutic approach is needed.

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