SCIENTIFIC LETTER

Coronary care unit admission of very old patients with acute myocardial infarction

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Admission to the coronary care unit (CCU) has been shown to provide benefit to elderly patients with acute myocardial infarction (AMI); however, its effectiveness has not been evaluated among the oldest patients.[1] AMI in very old patients has a high mortality.[2] Recent studies have questioned the benefit of standard treatments for these patients, so it is relevant to determine whether these patients should be systematically admitted to the CCU.[3] We evaluated CCU admission and its relation with prognosis in the MI MORE 89 (myocardial infarction management: observation and registry in elderly patients aged 89 years or older) registry.

METHODS

MI MORE 89 has been described previously[4] and comprises 100 consecutive cases of ST segment elevation AMI in patients ⩾ 89 years old. To assess the independent predictors of CCU admission, a backwards stepwise logistic regression analyses was performed with all relevant clinical variables. To assess the potential survival benefit associated with CCU admission logistic regression and Cox regression analyses were used. All analyses were performed with SPSS 11.0 statistical software (SPSS Inc, Chicago, Illinois, USA).

RESULTS

Patients admitted to the CCU (n = 60) had a mean (SD) length of CCU stay of 3.2 (2.7) days, were younger, and more of them performed daily activities independently (20% v 60%, p < 0.001), presented with chest pain, and had shorter time delays from onset of symptoms than patients not admitted to the CCU (table 1). Co-morbidity and risk factors were similar in both groups. Independent predictors of non-admission to the CCU were age (odds ratio (OR) per year 1.5, 95% confidence interval (CI) 1.2 to 2.0), lack of chest pain (OR 7.3, 95% CI 2.1 to 25.8), time delay (OR per hour 1.07, 95% CI 1.02 to 1.13), and dependency (OR 4.3, 95% CI 1.4 to 13.3).

More of the patients admitted to the CCU received β blockers, inotropic agents, intravenous nitrates, heparin, and glycoprotein IIb/IIIa inhibitors; fewer received diuretics. More of them were studied by echocardiography (93% v 60%, p < 0.001) and their left ventricular systolic function was better. Invasive interventions were used only for patients admitted to the CCU: 19 had primary angioplasty, five intra-aortic counterpulsation, four a transvenous pacemaker, two a Swan-Ganz catheter, and two mechanical ventilation. Primary angioplasty failed in two patients (11%), one with persistent coronary occlusion and one with coronary rupture; both patients died.

Thirty three patients died during hospitalisation, 28.3% of patients admitted to the CCU and 40.0% of those not admitted. The main causes of death were cardiogenic shock (76%) and cardiac rupture (15%). Although there were no spontaneous episodes of ventricular fibrillation in the whole group, one patient had ventricular fibrillation during a percutaneous coronary intervention. CCU admission had no independent effect on in-hospital mortality (OR 1.2, 95% CI

Table 1 Patients' baseline clinical characteristics, infarct features, and treatment according to coronary care unit (CCU) admission

| | Admitted to the CCU | | |
	Yes (n = 60)	No (n = 40)	p Value
Age (years)	90.7 (1.9)	92.2 (2.2)	<0.001
Infarct features			
Chest pain	54 (90.0%)	20 (50.0%)	<0.001
Killip class >I	17 (28.3%)	28 (70.0%)	<0.01
Time delay (hours)	6.3 (7.5)	14.9 (16.4)	0.002
LBBB	5 (8.3%)	10 (25.0%)	0.04
LVEF <30%	22 (39.3%)	15 (62.5%)	0.05
Heart failure	32 (53.3%)	36 (90.0%)	<0.001
Complete AV block	6 (10.0%)	3 (7.5%)	0.67
Treatment			
β Blockers	33 (55.0%)	9 (22.5%)	0.001
Intravenous nitrates	36 (60.0%)	15 (37.5%)	0.03
GP IIb/IIIa inhibitors	7(11.7%)	0 (0%)	0.08
Diuretics	30 (50.0%)	31 (77.5%)	0.009
Heparin	47 (78.3%)	26 (65.0%)	0.001
Inotropic agents	13 (21.7%)	3 (7.5%)	0.001
Thrombolysis	9 (15.0%)	0 (0%)	0.03

AV, atrioventricular; GP, glycoprotein; LBBB, left bundle branch block; LVEF, left ventricular ejection fraction.

0.3 to 4.7, p = 0.93). When only the 80 patients who underwent an echocardiography were considered and left ventricular ejection fraction was included in the model, CCU admission remained not associated with mortality (OR 3.3, 95% CI 0.5 to 22.9, p = 0.23).

At the end of follow up (mean nine months), 74 patients had died. Although crude survival was lower among patients admitted to the CCU, Cox regression analysis did not select CCU admission as an independent predictor of late survival (hazard ratio 0.7, 95% CI 0.4 to 1.4, p = 0.31; hazard ratio in the model with ejection fraction 1.0, 95% CI 0.5 to 2.1, p = 0.97).

DISCUSSION

Our data show that the oldest and more dependent patients, those without chest pain on admission, and those with longer time delays are usually denied admission to the CCU. However, an important proportion of patients treated conservatively—that is, without reperfusion or other invasive interventions—are actually admitted to the CCU.

The main reasons for routine CCU admission of patients with AMI is to treat lethal arrhythmias, and to provide reperfusion therapy or life support devices. No patients developed spontaneous ventricular fibrillation in our group. A low proportion developed complete atrioventricular block, some of them

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Abbreviations: AMI, acute myocardial infarction; CCU, coronary care unit; CI, confidence interval; MI MORE 89, myocardial infarction management: observation and registry in elderly patients aged 89 years or older; OR, odds ratio

requiring a temporary pacemaker, but in all cases the disorder was present on admission. Therefore, routine CCU admission of these patients would have yielded no benefit in terms of cardiac rhythm monitoring. The modest benefit of reperfusion therapy in these patients has been previously discussed.[4]

Care must be taken when evaluating the incidences of events and the differences between groups, given the relatively low number of patients studied. The lack of statistical differences between death rates may reflect low statistical power and not a true lack of significance. Admission bias may have influenced the results, as admission to the CCU was not allocated randomly. Patients in this age group, however, are very unlikely to be taking part in randomised controlled trials in the near future. Moreover, our data show that even when the physician in charge felt that CCU admission was appropriate, this did not have a significant impact on the survival of the patient.

In conclusion, AMI in very old patients is associated with a very high mortality regardless of CCU admission. Our findings do not support a policy of routine admission to the CCU of patients 89 years of age or older with AMI, but rather to optimise resources with individual decision making.

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2 **Maggioni AP**, Maseri A, Fresco C, et al. Age-related increase in mortality among patients with first myocardial infarctions treated with thrombolysis. The investigators of the gruppo Italiano per lo studio della sopravvivenza nell'infarto miocardico (GISSI-2). N Engl J Med 1993;**329**:1442–8.
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IMAGES IN CARDIOLOGY ....

Human coronary circulation mimicking reptilian cardiac physiology
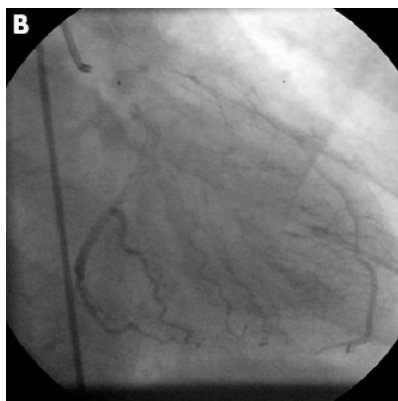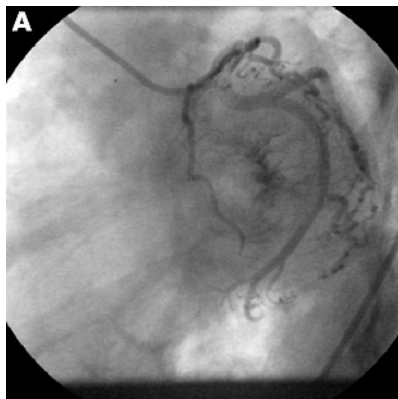
A 54 year old woman was admitted with a history of central chest pain. She was a smoker and had a family history of ischaemic heart disease. Examination was unremarkable and her resting ECG revealed sinus rhythm with no acute changes. Her cardiac troponin T was negative and she had a standard Bruce protocol exercise tolerance test, which was equivocal. She subsequently underwent coronary angiography, which revealed a normal dominant right coronary artery and mild disease in the left coronary system with an interesting finding of drainage of blood from the left coronary system directly into the left ventricular cavity (panels A and B). This pattern of cardiac drainage is similar to reptilian cardiac physiology in which transmural channels enable dual blood supply to the myocardium.

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