time they were discharged. Less surprising was the finding that of those presenting without Q waves 47% developed them while in the unit.

When mortality was related to the appearance of the admission ECG those regarded as showing a definite myocardial infarct had the highest mortality (24.5%). More surprising and even disturbing was a death rate of 13.2% in those regarded as having doubtful myocardial infarct and of 12.5% in those showing no infarct.

Thus, of patients admitted to this coronary care unit because of suspected myocardial infarction, about half were suffering from this condition. Of this group 51% showed evidence of a recent myocardial infarct on the first ECG, with a further 27% in the probable group. The earlier an ECG is taken in a suspected case, especially if mild, the greater is the chance it will mislead the clinician, but as time goes on the tracings, and especially serial studies, become more reliable.

The ECG must be regarded as an important but not totally reliable diagnostic tool. Recent myocardial infarction is largely a clinical diagnosis helped by ECG or serial enzymes studies, or both.

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The elderly in a coronary unit

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Summary

The clinical features of myocardial infarction were compared in 104 patients over the age of 70 and 399 younger patients admitted to a coronary care unit. Absence of an age bar at 70 years has increased the number of admissions to the unit by 24%, and the number of patients with proved infarcts by 26%. Severe complications are more common and mortality is doubled in the elderly. Although immediate management of primary ventricular fibrillation is as successful in older as in younger patients, treatment of the elderly with less dramatic conditions is less successful. The elderly survivors tend to spend longer in the coronary unit and subsequently in the general medical ward.

Introduction

Clinical manifestations of heart attacks are considered to be more variable and atypical in elderly patients, and the concept of silent myocardial infarction is widely recognised.¹ Since the establishment of coronary care units much information has

been gathered about hospital care of patients with myocardial infarction, but little has been published about the condition in elderly patients, as coronary units have often set an age limit at 69 years because it was thought they could not cope with all age groups.² We compare here aspects of the admission, progress, and complications in patients above and below the age of 70 years suffering from acute myocardial infarction treated in the coronary care unit of the Victoria Infirmary, Glasgow.

Patients and methods

Over two years 918 patients were admitted to the unit with suspected myocardial infarction. Symptoms had begun within the previous 48 hours in all but a few cases. Seven hundred and forty patients were under the age of 70 years, and 178 were 70 years or older. We studied the 503 patients with confirmed acute myocardial infarction. World Health Organisation criteria³ were used to establish the diagnosis.

Patients with proved myocardial infarction were treated in the unit for at least 72 hours. All had an intravenous infusion throughout their stay, and heparin was administered in this infusion for the first 36 hours unless contraindicated. Continuous electrocardiographic monitoring was carried out using central display and alarm signals. Complications were treated conventionally and facilities for immediate defibrillation were available. On discharge from the monitoring unit survivors were transferred to other wards in the medical division.

All patients with suspected myocardial infarction were graded for severity on admission according to the Peel coronary prognostic index,⁴ and on transfer out of the unit by a simplified three-grade system. Case records, specially prepared for computer study, were kept for all patients.

Results

Table I shows the age and sex distribution of all 503 patients. The peak incidence was in men aged 60 to 64 years and in women

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TABLE I—Age and sex distribution of 503 patients with confirmed myocardial infarction

Age (years)				25-29	-34	-39	-44	-49	-54	-59	-64	-69	-74	-79	-84	-89	Total
Men	..	..	..	1	2	9	17	29	51	57	75	51	28	17	7	2	346
Women	..	..	..	0	0	3	3	7	9	22	27	36	24	15	9	2	157

aged 65 to 69. Men outnumbered women by over two to one (346:157), but among the 104 patients of 70 and over the ratio was 50:54.

More of the 104 elderly patients than of the 399 younger patients were referred by their family doctor (80.8%) and fewer were admitted via the casualty department (11.5%) or from clinics or other wards (7.7%). The proportions for the younger age group were 67.7%, 20.3%, and 12.0% respectively ($\chi^2=6.83$; $DF=2$; $P<0.05$).

The median delay from the onset of their attack until admission to the unit was 4.66 hours for the elderly patients; 77% were admitted within 12 hours; these figures were very similar to those for the younger group.

The provisional diagnosis of myocardial infarction, made before admission to the unit, was confirmed more often in the elderly than in the younger patients (104 out of 178 (58%) compared with 399 out of 740 (54%)). The difference, however, was not significant ($\chi^2=1.180$; $P>0.05$). In addition to the patients with infarction 34 (19%) of the older and 160 (22%) of the younger patients had evidence of acute myocardial ischaemia, short of infarction.

Most (83%) of the elderly patients developed their symptoms at rest. Rather more were asleep and significantly fewer were active than in the younger group (table II). The commonest presenting symptoms were central chest pain or breathlessness, or both (table III). Chest pain, or severe discomfort, occurred in 89% of the elderly patients. Other symptoms such as breathlessness alone, syncope, etc were the presenting feature in 12%, which was a significantly higher incidence than in the younger group (5%).

TABLE II—Onset of main attack

	At rest	Sleeping	Exertion	Other
No (%) aged ≥ 70 ..	55 (53)	31 (30)	12 (12)	6 (6)
No (%) aged < 70 ..	221 (55)	78 (20)	83 (21)	17 (4)

$\chi^2=4.621$; $DF=1$; $P<0.05$.

TABLE III—Main symptoms

	Chest pain and breathlessness	Chest pain only	Breathlessness only	Neither pain nor breathlessness
No (%) aged ≥ 70 ..	47 (45)	45 (43)	8 (8)	4 (4)
No (%) aged < 70 ..	159 (40)	220 (55)	16 (4)	4 (1)

$\chi^2=5.880$; $DF=1$; $P<0.02$.

The medical history was very similar in both groups. There was no significant difference in the prevalence of angina, definite myocardial infarction, systemic hypertension that had required treatment, or diabetes mellitus (table IV). When the 104 elderly patients were compared with the 210 patients aged under 60, however, rather than the 399 aged under 70, there was a substantial difference in the prevalence of longstanding angina, more of the elderly (22%) than of the young (6%) having had it for longer than five years.

The Coronary prognostic index, or Peel index,⁴ on admission showed a progressive rise with age, even after allowance was made that age was one of its weighting factors. The elderly patients who survived to leave the unit still included a substantial proportion (22%) with severe (grade 3) infarcts after a high mortality in the unit. The corresponding figure for the younger patients was 12.8%.

The contrast in severity was reflected in the considerable difference in hospital mortality between the older and younger groups. Within the unit the overall mortality was 14.7%—26% for those 70 years and over and 12.3% for those under 70 ($P<0.001$). Corresponding figures for the mortality during their hospital stay were 21.3% overall

TABLE IV—History

	Angina	Definite myocardial infarction	Systemic hypertension	Diabetes mellitus
No (%) aged ≥ 70 ..	55 (53)	22 (21)	26 (25)	3 (3)
No (%) aged < 70 ..	193 (48)	96 (24)	82 (21)	16 (4)

χ^2 analysis showed no significant differences.

(107 deaths in 503 patients)—37.5% for the elderly and 17.0% for the younger patients ($P<0.001$).

Complications, some of which contributed to this difference in severity and mortality, are listed in tables V and VI. Heart block and other conduction defects were much more common in the older patients and carried a high mortality rate. Five out of 10 elderly patients with complete heart block died, while 13 out of 25 younger patients died. Atrial fibrillation and atrial flutter were the only arrhythmias to show an increased incidence in the elderly, but the increase was not significant. Primary ventricular fibrillation occurred in four elderly patients, one of whom died in the unit, and in 22 younger patients, 10 of whom died in the unit. Systolic blood pressure on admission, which is important in prognosis,⁵ was below 100 mm Hg in 17.3% of the elderly and in only 9.5% of those under 70 ($\chi^2=5.05$; $P<0.05$). Pulmonary oedema, the "shock picture," and congestive cardiac failure, which are all strong determinants of severity and mortality, were more common in the elderly, while detectable pericardial friction, without such a grave reputation,⁶ showed no such predominance (table VI). During their stay in hospital two elderly patients developed a hemiplegia and died.

TABLE V—Dysrhythmias and conduction defects

	Heart block and conduction defects	Atrial flutter or fibrillation	Ventricular fibrillation
No (%) aged ≥ 70 ..	36 (35)	15 (14)	4 (4)
No (%) aged < 70 ..	84 (21)	33 (8)	22 (6)
χ^2 analysis	$P<0.01$	NS	NS

TABLE VI—Other complications

	Pulmonary oedema	"Shock picture"	Congestive cardiac failure	Pericarditis
No (%) aged ≥ 70 ..	77 (74)	26 (25)	23 (22)	9 (9)
No (%) aged < 70 ..	209 (52)	58 (15)	34 (8)	42 (11)
χ^2 analysis	$P<0.001$	$P<0.05$	$P<0.001$	NS

Of the 39 deaths in the elderly group, 27 occurred in the unit and 12 (31% of the deaths) in the wards. Nineteen (28%) of the 68 deaths in the young group were late (ward) deaths. The mean stay in hospital of the elderly survivors was significantly longer (31.3 days) than that of the younger survivors (25.9 days) ($P<0.01$).

Discussion

Other studies¹⁷ have reported a high incidence of painless myocardial infarction in the elderly. In Pathy's series,¹ when confused patients were excluded, 60% had apparently painless infarction. Ristic *et al*⁸ suggested that pain is rare in elderly patients with this condition. In contrast our results show that in those admitted to a coronary care unit chest pain or discomfort was usually present, although in almost half of the patients it was accompanied by breathlessness. Admitted in this way, however, all the patients might be expected to have a more classical presentation. Only a few in this study, and very few of the younger group, had an atypical presentation without chest pain (table III).

The severity and mortality of this disease increases with age but is not sex related.^{5,9} Coronary care units have reduced mortality in patients with acute myocardial infarction and the elderly are no exception. Hospital mortality for the whole series of 503 patients was 21.3%—37.5% for those aged 70 or over and 17% for those under 70. It is perhaps justifiable to compare these figures with those obtained from 2074 patients with acute myocardial infarction admitted directly to general medical wards of this hospital in the five years before the opening of the unit. Hospital mortality then was 28.0%—43% for those aged

70 and over and 23.5% for the younger group⁹—a mortality ratio (about 2:1) similar to that in the present study.

Like Linn and Yurt¹⁰ we found that both synchronised DC shock and immediate defibrillation can be performed with considerable success in elderly patients, confirming the impression of Chaturvedi *et al*¹¹ that this group benefits to some extent from early treatment in a coronary care unit.

The study has shown many other similarities and a few important differences between the groups. Older patients did not give rise to more “false alarms” by their admission to the unit. Myocardial infarction, diagnosed before admission, usually by the family doctor or a deputy, was confirmed in similar proportions of both groups (elderly 58%; younger group 54%). A smaller proportion of the elderly were exerting themselves and a larger proportion were asleep at the onset of the attack, compared with younger patients, but this might have been simply a reflection of their pattern of life. Medical history was surprisingly similar in the two groups. Almost exactly half had suffered angina, quite apart from build-up and crescendo angina. More of the older people had had this for over five years. There was no appreciable difference in the proportions who had had infarcts, ischaemic attacks, pre-existing hypertension, or diabetes (table IV).

Complications related to severity and ultimate prognosis were more common in the aged. These included atrial fibrillation, atrial flutter, conduction defects, the “shock picture,” admission systolic blood pressure under 100 mm Hg, and left and right heart failure. Complications unrelated to late prognosis, such as pericarditis and other arrhythmias, showed no such increased incidence (tables V and VI).

Looking at the economics of the elderly in a coronary care unit, we found that the absence of an age bar at 70 years increased the admissions by nearly a quarter (24%) and the number of proved infarcts by just over this proportion (26%). These elderly patients have more severe infarction and death is twice as common as in those under 70. Serious complications are more prevalent, mild and reversible ones not so. The average

for monitoring time is about the same in the two groups, but when survivors only are considered the elderly spend a longer mean time in the unit and in hospital. Admitting the aged to a unit is less rewarding and necessarily entails later transfer and discharge of surviving patients, who, because of more extensive disease or for social reasons, tend to occupy general medical beds longer than younger subjects. Keeping them at home when possible, at the expense of a few lives in the mild group not saved by immediate defibrillation, may often be kinder, sounder from the psychological point of view, and beneficial therapeutically. In economic terms such a policy would contribute to coronary care unit cost-benefit efficiency by helping to ensure that these facilities are not denied to wage-earning patients. Ethical and moral considerations, however, as always, must modify admission policy, the ideal being to afford the best standards of care to all patients, irrespective of age or work potential.

We thank Miss Kathleen Scott and the nursing staff of the unit; our junior medical colleagues who contributed so much to the care of these patients and to the compilation of their clinical data; and Miss Monica Jordan, of the bioengineering department, Strathclyde University, for the computer analysis.

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Effect of atenolol on ventilatory and cardiac function in asthma

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Summary

The effects on ventilatory and cardiac function of atenolol, a new cardioselective beta-adrenoceptor blocking agent, were compared with those of practolol in a double-blind trial in 12 patients with asthma. Both drugs impaired ventilatory function—atenolol insignificantly and practolol significantly. Atenolol was if anything more cardioselective than practolol. Neither drug interfered signifi-

cantly with the bronchodilator response to inhaled isoprenaline. Atenolol is suitable for use in patients for whom practolol would formerly have been chosen because of its cardioselectivity.

Introduction

There is a risk in giving beta-blockers to asthmatics. The value of practolol for such patients has, however, been clearly shown,¹⁻³ but it is no longer available for general use.

Atenolol is a new beta-adrenoceptor blocking agent that appears from animal studies to possess a degree of cardioselectivity equivalent to that of practolol.⁴ Studies in man have confirmed that atenolol has beta-blocking properties⁵ and have shown it to be potentially useful.⁶⁻⁹ Our trial was designed to measure the effect of atenolol on ventilatory and cardiac function in patients with chronic asthma and to compare these effects with those of practolol.

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