urinary tract infection must be suspected, diagnosed, and treated rapidly in infancy and childhood and further infection prevented during follow up. It is also essential to identify vesicoureteric reflux early by investigation with cystography in infants with antenatal dilatation of the urinary tract, infants and young children after a first urinary infection, and siblings and offspring of patients with renal scarring. These measures will reduce the risk in children of the later development of reflux nephropathy and its complications.

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Ten year mortality in patients with suspected acute myocardial infarction

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Abstract

Objective—To describe the 10 year mortality in patients with suspected acute myocardial infarction.

Design—Follow up of all patients below 76 years of age admitted with acute chest pain to 16 coronary care units participating in the Danish verapamil infarction trial in 1979-81.

Subjects—Of the 5993 patients included, 2586 had definite infarction, 402 had probable infarction, and 3005 did not have infarction.

Main outcome measures—Death and cause of death. Standardised mortality ratio (observed mortality/expected mortality in background population).

Results—The estimated 10 year mortalities were 58.8%, 55.5%, and 42.8% in patients with definite, probable, and no infarction, respectively ($P < 0.0001$). Stratified Cox's analysis identified a hazard ratio for mortality of 1.25 (95% confidence interval 1.08 to 1.44) for probable infarction compared with no infarction and of 1.15 (1.00 to 1.32) for definite compared with probable infarction. The standardised mortality ratio in the first year was 7.1 (6.5 to 7.8) for definite infarction, 5.0 (3.6 to 6.3) for probable infarction, and 4.7 (4.2 to 5.2) for no infarction. From the second year and onwards the annual standardised mortality ratio in the three groups did not differ significantly. Cardiac causes of deaths were recorded in 89%, 84%, and 71% of the deaths in patients with definite, probable, and no infarction, respectively.

Conclusions—The 10 year mortality of patients with and without infarction is significantly higher

than in the background population. Most deaths are caused by coronary heart disease, and these patients should consequently be further evaluated at the time of discharge and followed up closely.

Introduction

The short and long term mortalities in patients who have recovered from an acute myocardial infarction have previously been evaluated.¹⁻⁷ During the past decade increasing attention has been paid to patients admitted to coronary care units with suspected infarction but in whom the diagnosis is ruled out (no infarction). The short term prognosis has been the subject of several studies,⁸⁻¹² whereas long term studies are few, with observation periods up to five years and mainly retrospective.¹³⁻¹⁵ These studies indicated that the mortality in patients without infarction continues to be high for several years after discharge; in the first three years it is almost three times higher than that in the background population.¹⁶

We compared the 10 year mortality from day 15 after admission in patients with no infarction with the mortality in patients with infarction and with the expected mortality in the general population in Denmark.

Patients and methods

From 1 June 1979 to 15 August 1981, 6631 patients below 76 years of age were consecutively admitted with suspected myocardial infarction to one of 16 coronary

care units participating in the first Danish verapamil infarction trial.¹⁷ The catchment population was about 1 million people—that is, a fifth of the population. The patients were included in this study on their first admission during the trial.

DIAGNOSIS OF INFARCTION

If patients were admitted with chest pain compatible with infarction; electrocardiographic changes with development of Q waves, bundle branch block or ST segment elevation or depression of at least 0.1 mV lasting for at least 24 hours; and increased activity of cardiac enzymes (that is, lactate dehydrogenase, aspartate transaminase, or creatinine kinase total to above 50% of upper normal limits) they were considered to have a definite infarction.^{17,18} Of the 6631 patients, 40 were foreigners and 598 died before day 15. Among the remaining 5993 patients, 2586 fulfilled all three diagnostic criteria for infarction and were classified as having definite infarction.

Patients with only two of the criteria were not considered for the verapamil trial but were registered in the central country patient registry as having infarction according to the criteria of the World Health Organisation.¹⁸ By combining the central country patient registry with database from the verapamil trial we identified 402 (12%) patients without definite infarction who had a diagnosis of infarction at the index admission according to the registry and thus fulfilled two criteria. These 402 patients were classified as having probable infarction in this study.

The 3005 remaining patients fulfilled only one of the criteria (chest pain) and were classified as patients without infarction.

Of the patients with definite infarction 1401 were included in the verapamil trial and randomly assigned to six months' treatment with verapamil or placebo, whereas the remaining patients with definite infarction were excluded for various reasons, mainly congestive heart failure, hypotension, or bradycardia.¹⁷

FOLLOW UP

Information on death was obtained from the National Person Registration Office at 1 October 1990. Causes of death were registered from the death certificates and

TABLE I—Demographic data on study population with definite or probable infarction and no infarction. Values are numbers (percentages) of subjects

Variable	Definite infarction	Probable infarction	No infarction
Men	1974 (76)	299 (74)	2049 (68)
Women	612 (24)	103 (26)	956 (32)
Age:			
< 50 Years	289 (11)	43 (11)	580 (19)
50-65 Years	1326 (51)	192 (48)	1469 (49)
> 65 Years	971 (38)	167 (41)	956 (32)

TABLE II—Causes of death during follow up in patients with definite infarction, probable infarction, and no infarction according to sex. Values are numbers (percentages) of subjects

	No of subjects	No of deaths	Cause of death			
			Acute myocardial infarction	Cardiac death	Not cardiac death	Unknown
Definite infarction*:						
Men	1974	1158	651 (56)	325 (28)	114 (10)	68 (6)
Women	612	373	203 (54)	112 (30)	43 (12)	15 (4)
Total	2586	1531	854 (56)	437 (28)	157 (10)	83 (5)
Probable infarction**:						
Men	299	174	84 (48)	55 (32)	26 (15)	9 (5)
Women	103	51	22 (43)	18 (35)	8 (16)	3 (6)
Total	402	225	106 (47)	73 (32)	34 (15)	12 (5)
No infarction***:						
Men	2049	916	336 (37)	293 (32)	230 (25)	57 (6)
Women	956	375	110 (29)	115 (31)	123 (33)	27 (7)
Total	3005	1291	446 (35)	408 (32)	353 (27)	84 (7)

Comparison between men and women in 3 × 2 tables by means of χ^2 test, *P=0.55, **P=0.82m ***P=0.007.

FIG 1—Kaplan-Meier curves of 10 year mortality in patients with definite infarction, probable infarction, and no infarction and expected mortality in age and sex matched subgroups of background population (— Observed mortality for definite infarction (three of WHO criteria); --- observed mortality for probable infarction (two of WHO criteria); observed mortality for no infarction (one of WHO criteria); ——— expected mortality for definite infarction; - - - expected mortality for probable infarction; . . . expected mortality for no infarction)

classified as new infarction (code 410); other cardiac death (codes 411-4 and 427-9); any other cause.

STATISTICAL ANALYSIS

The survival curves of the three study populations were calculated by the Kaplan-Meier method and compared by the Tarone-Ware test, a test related to the log rank test. Proportions were compared by means of the χ^2 test. Survival in the three groups was analysed by means of stratified Cox's analysis by using six divisions according to age and sex—that is, men below 50 years of age, between 50 and 65 years, and above 65 years and women in the same three age groups. The results of the analyses in the six divisions were summarised into hazard ratios for mortality between the three study groups.

Based on the annual mortality data for all age and sex groups in the general population the expected mortality in three subpopulations comparable with the three study populations with respect to age and sex was calculated.¹⁹ The standardised mortality ratio—that is, the observed mortality/the expected mortality—was then calculated for the patients with definite, probable, and no infarction.^{10,16}

Results

Table I shows the demographic data on the study population. The estimated 10 year mortality was 58.8% in patients with definite infarction, 55.5% with probable infarction, and 42.2% without infarction ($P<0.0001$), but the difference between definite and probable infarction was not significant; the corresponding expected mortalities in the background population were 27.0%, 28.4%, and 23.5% respectively (fig 1). Table II shows the causes of death. There was no significant relation between cause of death and sex in the two groups with definite and probable infarction, whereas a cardiac cause of death was significantly associated with male sex in the group with no infarction ($P=0.007$).

The Cox's analyses identified a hazard ratio for mortality of 1.25 (95% confidence interval 1.08 to 1.44) for probable infarction compared with no infarction and of 1.15 (1.00 to 1.32) for definite infarction compared with probable infarction.

Figure 2 shows standardised mortality ratios with

95% confidence intervals specified for each year of follow up.

Discussion

The one year and long term mortality of the patients with infarction in our study accord well with those described in previous studies of myocardial infarction.^{1-7 15-16} Also the first and second year mortalities of the patients without infarction are in keeping with the results of other smaller and retrospective studies⁸⁻¹⁵ and with the three year mortality of patients without infarction recorded in the second Danish verapamil trial.¹⁶

Our study prospectively compared the long term mortality in patients with definite, probable, and no infarction with that in the corresponding background population. We have shown that all three subgroups are at increased risk of death. In the first year the mortality and standardised mortality ratio of the patients with no infarction and probable infarction were significantly lower than in patients with definite infarction. From the second year and onwards the annual standardised mortality ratios of patients with no infarction and probable infarction did not differ significantly from those of patients with definite infarction (fig 2). Stratified Cox's analysis showed that the risk of mortality, even when adjusted for age and sex, increased significantly in patients without infarction to those with probable infarction to those with definite infarction.

Reasons for chest pain among patients without infarction are various clinical manifestations of coronary heart disease and other clinical syndromes in which central chest pain is a major symptom—for example, pulmonary embolism, gastroesophageal dysfunction, pericarditis, and musculoskeletal disorders.^{20 21} Patients who fulfilled two criteria for infarction (possible infarction)¹⁸ have an impaired prognosis, with a first year mortality of 12%²² and a five year mortality of about 20%,³ but the annual standardised mortality ratio in these patients did not differ significantly from that in the patients who fulfilled only one criterion (fig 2). Another subgroup with increased risk is patients with unstable angina, with a first year mortality of 9%,²³ and a five year mortality of 25%.²⁴ This is close to the mortality in patients with confirmed infarction, but the subgroup with unstable angina is small, about 10% of all patients without infarction,^{12 22} and the high mortality in the entire group without infarction cannot be explained solely by an increased mortality in patients with unstable angina.

Compared with the patients with infarction the men who had no infarction had a significantly poorer prognosis than the women. Furthermore, a cardiac cause of death was significantly more common among

FIG 2—Annual standardised mortality ratio—that is observed mortality/expected mortality of age and sex matched subgroup of background population—with 95% confidence intervals for 10 years of follow up in patients with definite infarction (●), probable infarction (○), and no infarction (■)

men (table II). This is in accordance with previous short term studies.^{9 16} Wielgosz *et al* found that severe chest pain in patients with minimal or no coronary heart disease was significantly associated with being female.²⁵ These findings indicate that a higher proportion of women was admitted with chest pain of non-coronary origin.

The most common causes of death in patients in all three groups were later infarction and other cardiac causes (table II). Our findings indicate that the three groups basically suffered from the same disease—coronary heart disease.

As a considerable number of patients admitted to the coronary care unit with chest pain but without infarction have coronary heart disease we now as a consequence of our studies perform an exercise test at the time of discharge.^{10 12 16-26} When results are positive—for example, development of angina pectoris or ST segment changes, or both—treatment with β blockers or calcium antagonists is started. Patients with signs or symptoms of severe coronary heart disease are referred for coronary angiography. Furthermore, we are conducting a prospective study on the value of a detailed diagnostic examination of patients without infarction.²¹

In conclusion, patients suspected of infarction both with and without confirmed diagnosis have a high risk of death after discharge. The annual mortality is about twice that of the general population for at least 10 years, and most deaths are related to coronary heart disease. Patients without infarction should consequently be regarded as a high risk group and undergo further evaluation of risk and classification with respect to coronary heart disease at the time of discharge.

Clinical implication

- Patients with suspected myocardial infarction both with and without confirmed diagnosis are at increased risk of death in the short term
- Patients with and without infarction are also at increased risk for up to 10 years discharge
- The annual mortality continues to be about twice as high as in the background population
- Most of these deaths are caused by coronary heart disease
- Patients with and without infarction should undergo further evaluation regarding coronary heart disease at the time of discharge to optimise risk stratification, treatment, and prognosis

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Effects of case management after severe head injury

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Abstract

Objectives—To examine the effects of early case management for patients with severe head injury on outcome, family function, and provision of rehabilitation services.

Design—Prospective controlled unmatched non-randomised study for up to two years after injury.

Setting—Four district general hospitals and two university teaching hospitals, each with neuro-surgical units, in east central, north, and north east London and its environs.

Subjects—126 patients aged 16-60 recruited acutely and sequentially after severe head injury. All received standard rehabilitation services in each of the six hospitals and districts: case management was also provided for the 56 patients admitted to three of the hospitals.

Main outcome measures—Standard measures of patients' physical and cognitive impairment; disability and handicap; and affective, behavioural, and social functioning and of relatives' affective and social functioning. Relatives' perception of burden; changes in patients' and relatives' housing, financial, vocational, recreational, and medical needs; and ongoing requirements for care and support; and the amount and type of paramedical input provided were assessed with structured questionnaires.

Results—For a given severity of injury, case management increased the chance and range of contact with inpatient and outpatient rehabilitation services. However, duration of contact was not increased by case management, and there was no demonstrable improvement in outcome in the case managed group. Any trends were in favour of the control group and could be accounted for by group differences in initial severity of injury.

Conclusions—Widespread introduction of early case management of patients after severe head injury is not supported, and early case management is not a substitute for improvement in provision of skilled and specialist rehabilitation for patients.

Introduction

There is increasing evidence that the effect of residual problems after severe head injury can be ameliorated by rehabilitation.¹ Despite this, there is a considerable shortfall in the provision of rehabilitation

for victims of head injury in the United Kingdom.^{2,3} The services that do exist provide early rehabilitation in the acute sector,^{4,5} when physical deficits (which usually recover rapidly and completely) are most obvious.⁶ On later re-entry to the community, cognitive, behavioural, and emotional disturbances cause psychological and vocational failure, social isolation, and a burden on carers, and these often increase over time.⁶ Despite this, little or no rehabilitation is provided more than six months after injury.^{4,5}

Newcombe *et al* proposed that fragmentation of responsibility obstructed the successful rehabilitation of such patients.⁷ We proposed that service shortfalls and a tendency for patients to fall through the net of existing services may also result from inertia in the system, patients' inertia, and carers' and professionals' confusion about the nature of the problems requiring treatment after head injury.⁸ Coordination of services that are potentially available, particularly in the community, by a case manager has proved effective in other vulnerable populations such as psychiatric patients in the United States^{9,12} and the frail elderly in the United Kingdom.¹³ In Britain case management has also been advocated, though not evaluated, for people with mental handicap¹⁴ and is expected to underpin the coordination of community care for several client groups in this country.¹⁵

In principle, therefore, there is good reason to expect that case management would provide flexible and cost effective improvement in service provision in the United Kingdom for patients after head injury. However, there is no empirical evidence to show this, and our paper describes the first prospective controlled study to evaluate the effectiveness of one model of case management in improving service input and patient outcome after severe head injury.

Patients and methods

Between March 1987 and March 1988 we established working practices to be adopted by a case manager.^{8,16} Briefly, after an assessment the case manager formulated a proactive rehabilitation plan, for which detailed clinical knowledge of problem areas after severe head injury was crucial, and facilitated cooperation and involvement of patients, relatives, and professionals. Other than giving general information about head injury and acting as an informal counsellor and a

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