Prognosis in unstable angina¹

Ming-Kiat Heng, Robin M. Norris, Bramah N. Singh, and John B. Partridge

From the Departments of Cardiology, Coronary Care, and Radiology, Green Lane Hospital, and the Department of Medicine, University of Auckland, New Zealand

A retrospective study was made of 158 patients with unstable angina admitted to a coronary care unit over a 4-year period. Twenty patients (13 per cent) had myocardial infarcts while in hospital, and of these 3 died; three others died without preceding evidence of myocardial infarction. There was thus an acute mortality rate of 4 per cent. Patients with persisting angina after the first 24 hours and those without a previous history of myocardial ischaemia were more likely to develop a myocardial infarct or to die in hospital.

Follow-up information, ranging from 3 to 7 years, was available in 144 of 152 hospital survivors. Patients older than 60 years (P<0.05), with cardiomegaly (P<0.01) and with pulmonary venous congestion (P<0.05) were found to have significantly increased long-term mortality. Long-term mortality was also found to rise with increasing coronary prognostic index. The average mortality rate for the whole group of hospital survivors was about 5 per cent per annum. Of the 111 patients who were alive at follow-up, 19 (17%) had had a myocardial infarct after leaving hospital, and a similar number had moderate or severe angina.

Many patients with acute myocardial infarction describe a change in the character of angina before the event (Sampson and Eliaser, 1937); the symptom either deteriorates from a previously stable pattern, or recurs after a period of freedom from chest pain. Interest in this phenomenon has arisen because of the possibility that it may herald impending myocardial infarction, the consequences of which might be averted by prompt treatment. Thus, there have been previous trials with anticoagulation therapy (Nichol, Phillips, and Casten, 1959; Wood, 1961); more recently, attention has been directed at emergency myocardial revascularization (Dunkman et al., 1974). At present, however, the place of surgery in unstable angina is uncertain, in part because the long-term prognosis of patients with the condition has not been well documented. Only one previous study has described a follow-up of over 5 years (Gazes et al., 1973). In order to obtain more information on the short and long-term outlook of patients with unstable angina, and the clinical factors that might influence prognosis, we have retrospectively studied a group of such patients admitted to a coronary care unit.

Patients and methods

Hospital records of patients admitted to the Green Lane Hospital Coronary Care Unit (CCU) over a four-year period (March 1967 to March 1971) were examined for patients who satisfied our criteria for unstable angina.

Unstable angina was considered to be present if patients had ischaemic cardiac pain at rest or with minimal exertion occurring within 4 weeks before admission, either for the first time, or after a period of stable angina. In all patients, the symptoms had been sufficiently severe to warrant admission to the hospital, and were either crescendo in nature, or associated with one or more prolonged bouts of chest pain lasting up to 30 minutes. These patients were all admitted to the CCU. Patients with significant arrhythmias, severe valvular disease, or evidence of myocardial infarction occurring less than 4 weeks before admission or for up to 48 hours after admission were excluded. Myocardial infarction was diagnosed if, in addition to the characteristic ischaemic pain, at least one of the following two criteria were fulfilled: (a) pathological Q waves, ST segment elevation, or T wave inversion with

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evolutionary changes; (b) rise in serum aspartate aminotransferase to over 40 units/ml. Patients who had previous myocardial infarction or angina for more than 4 weeks were considered to have a previous history of ischaemic heart disease.

From the case notes of these patients details were noted of the following: previous history of ischaemic heart disease, cigarette smoking, hypertension, and diabetes; admission chest x-ray film; serial electrocardiograms; biochemical data; persistent chest pain in hospital; and details of medical treatment. The chest x-ray films, the majority of which were standard five-foot anteroposterior films taken using portable apparatus, were all obtained within 24 hours after admission, and were examined for heart size and presence of pulmonary congestion by one radiologist (J.B.P.) who had no knowledge of the clinical outcome of the patients in the study; the presence of cardiomegaly was assessed by a method described previously (Norris et al., 1969). Persisting chest pain was considered present if the records indicated that chest pain was present for three or more days after the first 24 hours in hospital, despite adequate bed rest and in most cases administration of nitroglycerin and beta-adrenergic blocking drugs.

To obtain follow-up information, a standard questionnaire was sent to the referring doctors in June 1974 inquiring about the symptomatic status of the hospital survivors with particular regard to angina, or the date and cause of death. If this approach failed, either the patients or their relatives, friends, or neighbours were traced, and information obtained by either interviewing or writing to them. In cases where the details of death were incomplete, further information was obtained from death certificates at the Registry of Deaths in Auckland. Of the survivors who were traced in this manner, the median follow-up was 5 years, range 3 to 7 years.

Results were analysed statistically using the $\chi^2$ test and differences were considered significant when $P < 0.05$ for the two-tailed test.

Results

There were 1757 admissions to the CCU during the four-year period; 158 patients (9%) had unstable angina by our criteria. Of these, 109 were men and 49 women; the average age was 55 years. Thirty-four patients had no previous history of ischaemic heart disease; of the 124 patients who had such a history, 40 had no past history of myocardial infarction, while 84 had had one or more myocardial infarcts in the past.

![Fig. 1 Clinical factors related to the occurrence of myocardial infarction or death in hospital. Shaded bars refer to patients with the factors under consideration, and unshaded bars to patients without these factors. The number of patients at risk are indicated above, and the number with complications inside each bar.](http://heart.bmj.com/)

**Table** Serious complications in hospital

<table>
<thead>
<tr>
<th>Complications</th>
<th>No. of cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocardial infarction</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Sudden death without preceding evidence of myocardial infarction</td>
<td>3</td>
<td>3</td>
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</tbody>
</table>

Complications in hospital

The incidence of myocardial infarction and death in hospital is shown in the Table. Twenty patients (13%) had myocardial infarcts occurring from 48 hours to 3 weeks after admission to hospital, and of these 3 died. Three other patients died without preceding evidence of myocardial infarction, 2 suddenly and 1 from pulmonary embolism. Necropsy of these 3 patients showed no evidence of fresh myocardial infarction in the first 2 patients, and confirmed massive pulmonary embolism in the third. The mortality rate in hospital was thus 4 per cent.

Fig. 1 examines some clinical factors which
might be associated with the occurrence of either myocardial infarction or death in hospital. Patients who had persisting pain after the first 24 hours (P < 0.05), and those without a previous history of ischaemic heart disease (P < 0.01) were more likely to have a bad short-term prognosis. A history of hypertension or cigarette smoking, however, was not associated with increased risk.

**Long-term follow-up**

Follow-up information was available in 144 of 152 hospital survivors (95%). This was examined for the presence of factors which might influence the long-term prognosis (Fig. 2). The risk of dying after leaving hospital was found to be associated with age greater than 60 years (P < 0.05), cardiomegaly (P < 0.01), and pulmonary congestion (P < 0.05) as judged from the admission chest x-ray film. A history of previous myocardial infarction, hypertension, and the presence of persistent chest pain in hospital were also associated with increased long-term mortality, but the differences did not reach statistical significance.

Since 4 of these factors (age, cardiomegaly, radiological evidence of pulmonary congestion, and a past history of myocardial infarction) are used in a previously described coronary prognostic index (CPI) for long-term survival (Norris et al., 1970), it was of interest to relate the long-term mortality to the CPI of the hospital survivors. Fig. 3 shows the cumulative annual mortality rate for 3 groups of patients with increasing CPI. It is apparent that mortality rises with increasing CPI. The cumulative mortality of the group with CPI greater than 9 (n = 25) was significantly greater than that of the group with CPI 1 to 4+ (n = 65) after 2 years (P < 0.01) and that of the group with CPI 5 to 8+ (n = 54) after 3 years (P < 0.005). The difference in the cumulative mortality rates between the group with CPI 1 to 4+ and that with CPI 5 to 8+ did not reach statistical significance. The yearly mortality rate was about 2 per cent for patients with CPI 1 to 4+, 5 per cent for patients with CPI 5 to 8+, and 13 per cent for patients with CPI > 9. The average mortality rate for the whole group was about 5 per cent over the 6-year period of follow-up.

Of the 111 hospital survivors who were alive at the time of follow-up, 19 (17%) have had a subsequent myocardial infarct. Nineteen patients were found to have moderate to severe angina, i.e. angina occurring with mild exertion or interfering with work or normal activities.

**Discussion**

One of the particularly difficult areas in clinical cardiology today is the management of unstable angina. Recently, Fowler (1971) called for a widely acceptable objective definition of the condition, and stressed that this should include recent onset angina from a background of good health, a change in the symptomatic pattern of previously recognized ischaemic heart disease, and angiographic confirmation of coronary artery obstruction. The patients in our study satisfy the clinical criteria suggested,
but must be regarded as a selected group in that
the nature of the symptoms was such that admission
to the hospital was considered necessary. The lack
of angiographic data in our study is a disadvantage,
but many of these patients were admitted when
coronary angiography was either not performed in
Green Lane Hospital or was in its infancy there.
Furthermore, we were interested in long-term
follow-up information, and to have this in conjunc-
tion with angiographic data would obviously have
required many more years to obtain.

For a number of years, interest in unstable angina
has resulted from the possibility that the pattern of
changing symptoms might be a warning of impen-
dring myocardial infarction. Four weeks after
admission, 13 per cent of our patients had develop-
ed acute myocardial infarcts, and 4 per cent had died.
These results are comparable with those reported
recently by others (Fulton et al., 1972; Krauss,
Hutter, and De Sanctis, 1972; Gazes et al., 1973)
who observed an incidence of myocardial infarction
varying from 6 to 17 per cent and an acute mortality
rate from 1 to 8 per cent. Our study showed that
patients without a previous history of ischaemic
heart disease, and those with persisting angina in
hospital, appeared to be at increased risk from
either infarction or dying in hospital. The former
finding was unexpected, and may be the result of a
tendency in our centre for patients with known
heart disease to be referred preferentially for
admission. The observation that patients with
persisting angina unrelieved by medical treatment
form a high risk group has been made previously
(Gazes et al., 1973; Fischl, Herman, and Gorlin,
1973).

The mortality rate of patients with unstable
angina in our study was about 5 per cent annually.
This might have been higher if coronary angi-
ography had been performed, and patients with
normal coronary arteries excluded. The only other
study with a long-term follow-up (Gazes et al.,
1973) reported an annual mortality of 8 per cent
in the first 5 years, and 5 per cent over 10 years.
The mortality rate for unstable angina is thus not
dissimilar to the annual mortality of 4 per cent
reported for patients with stable angina (Frank,

The results of the present study have shown that,
as in the case of patients with completed infarc-
tion (Norris et al., 1970), long-term survival of
patients with unstable angina can be predicted
by analysis of clinical factors measurable on ad-
mission to hospital. Thus, increasing age, cardiac
megaly, and left ventricular failure significantly
and adversely affected long-term prognosis, while
there was also a tendency for a previous history of
ischaemic heart disease and hypertension to predict
an unfavourable outcome.

Despite minor differences in the definition of
unstable angina, our results agree with those of
recent studies (Fulton et al., 1972; Krauss et al.,
1972; Gazes et al., 1973) with regard to long-term
mortality and incidence of myocardial infarction
and death in the acute stage. These results indicate
that in the context of ischaemic heart disease the
prognosis of patients with unstable angina is not
particularly grave. The mortality rate in the acute
stage is also comparable with that described for
patients treated surgically, which ranged from no
mortality (Auer et al., 1971; Bolooki et al., 1974) to
10 per cent (Miller et al., 1973). In studies where
randomization of surgical and medical treatments
was attempted (Bertolasi et al., 1974; Kloster
et al., 1975), no significant difference in acute
mortality between surgery and conservative manage-
ment was noted. The effect of surgery on the long-term
mortality of unstable angina, however, is at present
uncertain, but compared with medical treatment a
higher proportion of surgically-treated patients
with unstable angina was reported to be symp-
tomatically improved on follow-up in randomized
(Bertolasi et al., 1974; Kloster et al., 1975) and
non-randomized studies (Scanlon et al., 1973;
Conti et al., 1973). These considerations suggest
that there is no strong indication for emergency
myocardial revascularization for such patients, and
that elective surgery should be reserved for patients
whose symptoms are unresponsive to medical
treatment.

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Requests for reprints to Dr. R. M. Norris, Coronary Care Unit, Green Lane Hospital, Auckland 3, New Zealand.