PROGNOSIS IN ACUTE MYOCARDIAL INFARCTION

By R. M. Norris

In no branch of medicine is prognosis so difficult as it is in the patient with coronary heart disease. Occasionally a patient may survive for 25 years after the onset of first symptoms of cardiac ischaemia, but in other cases, sudden death is the first clinical event. The studies to be described are an attempt to measure and assess the relative importance of clinical factors which are relevant to short and long-term survival in patients admitted to hospital with myocardial infarction, and the effect of the coronary-care unit on hospital mortality.

Two groups of patients have been studied prospectively to determine which factors are relevant to acute mortality in hospital, and to survival over the subsequent three years. The first group comprised 757 patients, who were all the cases admitted to the three main general hospitals in Auckland over one year (1966/1967). The second group of 300 patients were consecutive cases under 70 years of age, admitted to the Coronary-Care Unit at Green Lane Hospital, Auckland, during 1967 and 1968. It should be noted that the first group of 757 patients were studied before coronary-care became available in Auckland, so that these patients had routine Ward treatment, but no monitoring of arrhythmias.

Each patient had a record made at the time of admission to hospital of important clinical factors, including details of the 12 lead cardiogram and chest x-ray. These records were transferred in numerical form to punch cards, and a preliminary survey was made to see which clinical factors correlated with mortality. Those that did correlate were given values designated X which could be between 0 and 1, the value for X being proportional to the degree of severity of that factor. By the method of discriminant analysis, we calculated further numbers, designated Y, such that by adding the products of X and Y for each factor we would arrive at a number or coronary prognostic index. The higher the coronary prognostic index, or C.P.I., the higher the mortality. Y is obviously a weighting which expresses the severity of the factor under consideration in relation to the other factors. For our short-term coronary prognostic index we selected six factors and for the long-term or three year index, four factors.

This shows the values for Y; that is the relative importance of each of the clinical factors we used for predicting short-term and long-term survival. You can see that age, cardiac enlargement, and the presence of heart failure in the chest x-ray on admission to hospital, are of approximately equal relevance for predicting hospital survival, and three year survival of the hospital survivors. The next factor, a history of previous infarction, is much more relevant for long-term survival than for short-term survival. The next two factors, admission systolic blood pressure, and position of infarct as assessed from the 12 lead E.C.G., were more relevant to short-term than to long-term survival, and consequently they were not included in the long-term index. Other factors which we studied —a past history of hypertension or diabetes, or the presence of obesity, were not clearly relevant either to short-term or to long-term survival, and therefore they were not included in either index. I should say that there was a tendency towards shorter survival for patients with hypertension or diabetes in the long-term. It is likely that if we had followed the patients for longer than three years this tendency would have become statistically significant. To summarize, the factors included in the coronary prognostic index for short-term survival are age, cardiac enlargement, the presence of left ventricular failure (both assessed from the chest x-ray), a history of previous myocardial infarction, a low systolic blood pressure, and the position of infarct on the E.C.G., (anterior infarction being more serious). The factors were the same for long-term survival, except that admission systolic blood pressure and position of infarction were not included. The increasing mortality with increasing C.P.I. number is shown by the increase in size of the bar histograms from left to right. The percentage of patients falling within each C.P.I. group is given below the C.P.I. figures. On the right of the slide, to remind you, are the six clinical factors on which the index was constructed.

This shows the coronary prognostic index for three year survival, and the slide is constructed in the same way. The four factors used in constructing this index are shown, and you can see as before a gradually increasing percentage mortality from a low C.P.I. of less than 3 up to a high C.P.I. of more than 12. The latter group, would include elderly patients who had cardiac enlargement, heart failure, and probably a recurrent myocardial infarct.

We believe that these indices are a valuable method for assessing new forms of treatment. Of course it is desirable in any trial of treatment for patients to be randomized and if possible treated double-blind. To do this with coronary-care unit treatment is obviously impossible. This slide* shows, however, an attempt to use the short-term C.P.I. in assessing results from our coronary-care unit. You will remember from the first slide that we studied 300 monitored patients the year after we studied the non-monitored patients on whom we constructed the two C.P.I.'s. This slide summarizes the result of the second study. Here the patients are divided into three C.P.I. groups—respectively mild, moderate and severe cases. The lightly shaded histograms represent the patients from the first group who did not have E.C.G. monitoring while the second darkly shaded histograms represent patients treated in the coronary-care unit. The bottom set of histograms shows the percentage of the total in each C.P.I. group, and the top set shows the percentage mortality. You can see that there is a striking decline in mortality in the monitored patients who had a moderately high C.P.I. The decline was from 31 to 12%. This was statistically highly significant, and we interpreted this result as suggesting that coronary-care is particularly effective in patients who have had moderately severe infarcts.

The next slide shows the result of our most recently completed study, which is a three year follow-up of hospital survivors from the 300 patients shown in the last slide. This shows the three year mortality for survivors from the coronary-care unit compared to that for survivors from the general medical wards. It is seen that survival is as good or slightly better for patients treated in the coronary-care unit. It certainly does not show an increased tendency towards subsequent mortality of patients whose lives have been saved by coronary-care.

The final slide also refers to this last study, and is an attempt to find out whether arrhythmias during the acute stage are of any relevance to subsequent survival after the infarct has healed. This particular slide shows the effect of ventricular arrhythmias on late mortality. Again, the bottom set of histograms

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*Slides not submitted.

shows the incidence of arrhythmias, and the top set the association with late mortality. You will see that ventricular arrhythmias considered together do increase mortality from approximately 20% to 30%. The four histograms on the right of the slide show what we would regard as increasing severity of ventricular arrhythmias, and it is surprising that there is no higher mortality for the more serious ventricular arrhythmias than for the minor arrhythmias (mainly ventricular ectopics. Another difficulty in interpreting this data is that ventricular arrhythmias were more common with more severe infarcts, judged by other criteria. Our conclusion from this study is that there is no good evidence that ventricular arrhythmias by themselves make the late prognosis worse. Supraventricular arrhythmias and heart block were also considered in this study, and again there was no evidence that any of these arrhythmias, considered independently of the other prognostic factors, were of importance in predicting late mortality.

To summarise, we have tried to define easily measurable clinical factors which are of importance for prognosis in patients admitted to hospital, and to compare their relative importance. The resulting coronary prognostic indices are, we believe, of value in assessing new forms of treatment. Use of the indices in patients treated in our own coronary-care unit suggests that survival is improved for patients with moderately severe myocardial infarction, compared with survival following treatment in general medical wards.

CARDIOGENIC SHOCK

By H. J. C. Swan

Shock is a clinical syndrome associated with an acute depression of cardiac pump function to a level at which normal metabolic processes cannot be maintained and acidosis and death results. If infection, arrhythmias, blood loss and hypovolemia are excluded as causative conditions or treated when present and the syndrome persists, mortality approaches 100%. The common cardiac cause is acute myocardial infarction associated with coronary atherosclerosis.

A retrospective analysis of 100 patients with cardiogenic shock was carried out to identify the immediate mechanical causes of this profound depression of cardiac performance. Fifty-three patients were found to have acute occlusion of the left main or proximal anterior descending coronary artery (Group I). Shock occurred early in the illness and no case had serious cardiomegaly. Group II included 16 patients in whom an additional mechanical lesion such as mitral incompetance or perforated ventricular septum was identified. The time of onset was variable and some cases of significant cardiomegaly were noted. The remaining 31 patients (Group III) invariably had long standing disease with several infarctions, episodes of cardiac failure, and cardiomegaly. The onset of shock was often late. These patients were regarded as exhibiting terminal heart disease. Of the autopsied patients in Group I the great majority had lesions in the proximal coronary vessels with adequate distal coronary arteries capable of accepting a vein bypass graft. Hence these as well as patients in Group II should be regarded as potential candidates for vein bypass grafting. Although in our small experience operation carried a mortality of 40% this represents a substantial improvement over the current mortality associated with medical management.

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