The nitroblue-tetrazolium test following acute myocardial infarction

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SYNOPSIS The percentage nitroblue-tetrazolium (NBT) leucocyte levels were evaluated daily in the 10 days following a first attack of coronary thrombosis. In 12 uncomplicated cases the peak increase was on the second or third day; thereafter the level declined and was below 10% by the tenth day. Three other patients did not conform to this pattern of NBT behaviour. They had experienced a second myocardial infarction and this was attended by a secondary rise in the NBT score; in the two survivors the score remained elevated on the tenth day. Comparison of the score on the second-third and tenth-fourteenth days is a possible useful index of a further complication.

The association of a leucocyte response with acute myocardial infarction suggested that an investigation be carried out of the NBT score during the earlier phase of the disorder to ascertain whether a concomitant altered functional status of these cells was taking place.

Materials and Methods

Daily counts of NBT positive cells were carried out on the venous blood sample taken at 9 a.m. during the first 10 days. The first sample was taken at 9 a.m. after admission, so that there was a variation of some hours from the actual onset of the attack. The procedure was that described by Park, Fikrig, and Smithwick (1968). Since there is no correlation between the NBT score and the white cell count, the results are expressed as a percentage. Leucocytosis and left shift depend on an accelerated release of cells from the bone marrow combined with increased myelopoiesis and so are necessarily delayed, whereas alteration of the NBT status develops within a shorter time—less than 30 minutes *in vitro* (Vickers and Hayes, 1973). Values obtained from 20 apparently normal hospital and laboratory staff ranged between 3 and 12% with a mean of 7% and a standard deviation of 2.64.

Acute transmural infarction was diagnosed on the basis of electrocardiographic and serum enzyme changes. Only those without evidence of a former episode were included. Anticoagulant therapy was not adopted in any of the cases. In all, 15 patients were studied and these are separately considered as 12 whose course was uncomplicated, requiring no

significant medication or special procedures, and three in whom a second episode of myocardial infarction developed. There were 11 males and four females with an age range of 45 to 68 years.

Results

The findings in the 12 uncomplicated episodes are presented graphically in figure 1. All the patients

Fig 1 Percentage NBT in 12 uncomplicated cases.

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demonstrated a raised value in the first few days after the infarction, the peak being on the second or third day. The level then fell to below 10% by the eighth, ninth, and tenth days. Figure 2 illustrates the behaviour of the NBT index in the three patients whose course was interrupted within the 10-day period by a second infarction. In one of those the expected decline in the score occurred on the fifth day, and then, coinciding with the further attack, the values rose well above the 25% level on the second day, being 35% on the tenth day. In the second patient no such abrupt or conspicuous change occurred but on the tenth day the reading was still over 20%. The changes in the patient who succumbed to the second attack were those of a sharply progressive increase in the score after the seventh day reaching a level of 35% in contrast to the second day reading of 24%.

Fig 2 Percentage NBT in the three complicated cases.

Discussion

A similar study to our own has been conducted by Lauter, el Khatib, Rising, and Robin (1973) with analogous results. Their subjects all showed elevated NBT scores in the acute phase, and were largely maintained in the first seven days, thereafter falling slowly during the second week to reach normal

levels. In our series the fall occurred earlier, and normal values were reached on the eighth day. They also made the important observation that in two patients the fall in the NBT score was delayed. One had sustained a pulmonary embolism and the other an extension of the myocardial infarct. Our own results in the three complicated cases were similar: a secondary rise, and a delayed attainment of normal values being evident.

The list of conditions giving rise to a positive NBT test is expanding, and Segal, Trustey, and Levi (1973) found such considerable variability as to suggest that it reflects an acutely stressful situation rather than its underlying cause. In myocardial infarction one can speculate more precisely about the underlying mechanism. In serial observations with a uniform behaviour pattern, as presented here, observer error can be discounted. The most pronounced NBT elevation in the first few days corresponds to the period of most intense leucocyte activity in the infarcted area, which disappears during the second week (Mallory, White, and Salcedo-Salgar, 1939). The role of neutrophils in coronary thrombosis is the removal of fibrin by phagocytosis and release of fibrinolytic enzymes (French and Macfarlane, 1970), and, within the infarcted area itself, degradation and removal of the ensuing products. Barnhart (1965) found intracellular fibrin in the leucocytes of patients suffering from cerebral and myocardial infarction. The NBT score seems to reflect this activity of the neutrophils precisely. This would accord with the concept that an increase in scavenger-like activity of the neutrophils leads to a rise in the NBT score (Allen, 1973). It is significant that raised levels have been reported in thromboembolic phenomena in women receiving contraceptive medication (Norden and Reese, 1972).

A secondary rise in the NBT score, and failure to reach normal values during the second week, should indicate a complicating incident and is of prognostic significance. We believe that it would be a useful procedure to estimate the NBT score on the second or third days of the disease and again between the tenth and fourteenth days.

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Requests for reprints should be addressed to J.S.

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