Modification of Infarct Size

To the Editor:

The article by Maroko and his co-workers entitled "Factors Influencing Infarct Size Following Experimental Coronary Artery Occlusions" (Circulation 43:67, 1971) is indeed a very interesting one and an enthusiastic approach to the problem of modification of the size of an infarct. However, there are several points with regard to the methods that seem to need some clarification. The authors have assumed that infarct size can be determined from the amplitude and area of ST-segment change in epicardial, unipolar electrograms. I wonder whether this assumption is justified for the following reasons:

(a) The infarct is located intramurally and the recordings were made epicardially. It is doubtful whether the degree of averaging of changes in the ST segment recorded from the epicardium has anything but a qualitative relationship to the infarct size. This is particularly true for any conclusions based on the level of potentials.

(b) Variations in the amount of mechanical pressure applied to the epicardium by an electrode probably prevent any quantitative significance from being attached to the level of potentials. Ischemic tissue is particularly sensitive to variations in the amount of applied mechanical pressure. The use of an electrolyte cotton wick electrode, which the authors indicate they have used to some degree in these studies, would tend to minimize the ST-segment artifact and variation due to unequal pressure of the hand-held mechanical probe. It should also result in a lowered electrode-epicardial impedance.

(c) Most previous experiments using epicardial activation techniques have stressed the activation time, since it can be defined rather precisely and is not affected by variations in recording techniques or in recording systems. However, in attaching significance to absolute change voltage in addition to the previously enumerated restrictions, the physical characteristics of the recording system become extremely important. The authors do not state how the electrograms were recorded, i.e., what is the impedance of their electrode epicardial interface, and what attempt, if any, is made to minimize variations in input impedance which can markedly affect the amplitude of low frequency potentials such as the ST segment and T wave. The impedance characteristics of their recording system (i.e., input-output impedance and output capacitance) need to be spelled out since spurious levels of voltage of low frequency signals (i.e., ST-T) may occur unless a high impedance buffer stage is incorporated into the system between the electrode and the standard gain amplifier. Also, what was the low frequency level (time constant) at which these signals were recorded?

(d) The authors suggest that the variation in potentials between the control and post-occlusion data from the same locations eliminates those factors causing ST-segment elevation except for the effect of ischemia. This conclusion is doubtful. Unless the electrodes are permanently implanted, it is not possible to return to the precise location on the epicardium, and variation within the range of millimeters may demonstrate critical differences in the form and height of the ST-T in the ischemic myocardium. Also the problem of variation in the degree of electrode pressure in pre- and post-occlusion periods cannot be controlled.

Certainly these points do not disqualify the fine work by the group. However, I do believe that they require consideration before acceptance of the conclusions of the authors.

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The authors reply:

To the Editor:

Dr. Boineau's concern about the characteristics of the recording systems and validity of the results are important and were considered by us in detail.

The input impedance of the recording amplifier was 100 megohms and the frequency response of the system ± 0.5 db from 0.14 Hz to 70 Hz. The impedance of the electrode was maintained constant, as seen by reproducible tracings. The electrode had a 15 mm² area of contact through the saline-soaked cotton wick and was held by a cable perpendicular to the electrode. In this way the mechanical stress which, as noted by Dr. Boineau, may alter the extent of ST-segment elevation was minimized. Due to the rather large
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Circulation. 1971;43:317
doi: 10.1161/01.CIR.43.2.317
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/43/2/317.1.citation

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