

PATHOLOGICAL PHYSIOLOGY AND GENERAL PATHOLOGY

CHARACTER OF THE INTERCORONARY REFLEX RELATIONSHIPS AFTER ARTIFICIAL DISTURBANCE OF THE BLOOD SUPPLY TO THE MYOCARDIUM

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Opposing views are held on the character of the intercoronary reflexes in myocardial infarction. The supporters of the coronary spasm theory consider that the zone of ischemia and necrosis is transformed into a special kind of focus which acts as the source of pathological afferent impulses, distorting the normal dilator character of the intercoronary reflexes [1, 2, 6]. Other authorities support the idea that the focus of necrosis is the source of chemical vasodilator influences [7]. It is assumed that the metabolites formed in the zone of necrosis—carbon dioxide, histamine, lactic acid, and adrenalin—play an important role in determining the character of the intercoronary relationships in myocardial infarction. All the substances mentioned can cause dilatation of the coronary vessels.

A theory which differs in some respects from both these views is that which states that spasm of the vessels lying next to a compressed coronary artery is caused by the partial deafferentation of the heart arising in infarction as a result of destruction of the ischemic receptors [3], and there is histological evidence to support this suggestion [4].

The object of the present investigation was to study the character of the intercoronary reflexes in the rabbit's heart in experimental myocardial infarction.

EXPERIMENTAL METHOD

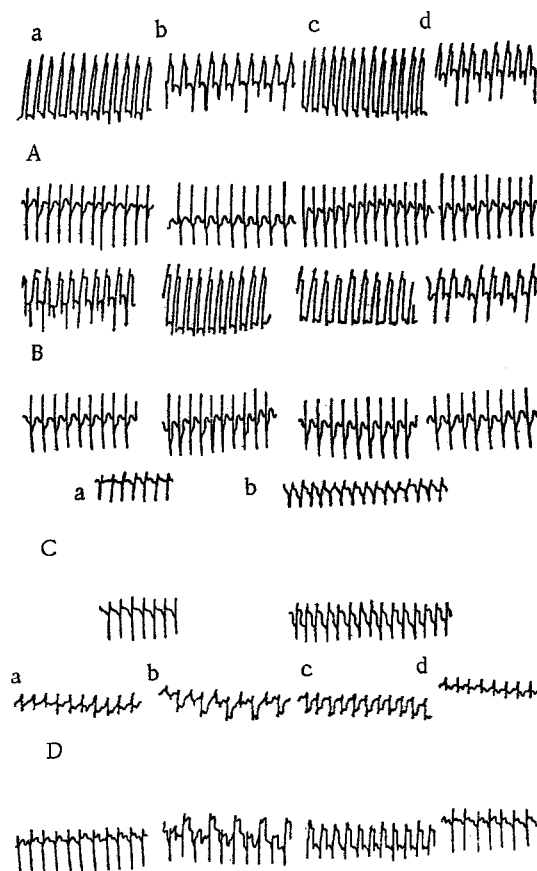
In aseptic conditions the operation of tying a "loop" around the lower third of the anterior descending branch of the left coronary artery so as to produce a reversible occlusion of the vessel was performed on all the experimental animals. The peripheral branches of the right coronary artery were ligated, and a miniature flat thermoelectrode was sutured to the lateral region of their territory of supply. A platinum electrode was sutured to the apex of the left ventricle for recording the local electrogram. The experiments were carried out on the 2nd-3rd day after the operation; simultaneous recordings were made of the velocity of the blood flow, the ECG, and the systemic arterial pressure measured in the carotid artery before and after occlusion of the left coronary artery.

Altogether nine chronic experiments were performed on five rabbits (27 ligations of the coronary arteries).

EXPERIMENTAL RESULTS

The occlusions of the coronary artery at the chosen level caused no changes in the systemic arterial pressure and heart rate. In no experiment was any abnormality observed in the direction of the vascular reactions of the "infarcted" heart. In most of the experiments periodic fluctuations of vascular tone were detected.

Comparison of the results obtained in animals with myocardial infarction and earlier findings published by the author, obtained with normal rabbits [5], showed that the intercoronary reflexes of the heart when its blood supply



Electrocardiographic effects of occlusion of the lower third of the anterior descending branch of the left coronary artery of a rabbit with an experimentally produced infarct in the territory of supply of the right coronary artery, typical of the 2nd-4th day after ligation of the right coronary artery. A) After 2 days. Effects of occlusion carried out against the background of a relatively high elevation of the ST interval in standard lead III: a) background; b) 30 min after occlusion; c) 4 min after occlusion; d) removal of occlusion. B) after 2 days. Effects of occlusions carried out against the background of a relatively low elevation of the ST interval in standard lead III. C) 3 days after ligation of the right coronary artery. D) 4 days after ligation of the right coronary artery: a) background; b) 30 sec after occlusion; c) 3 min after beginning of occlusion; d) removal of occlusion. In each tracing: top—standard lead of ECG, bottom—electrogram of apex of the heart.

is disturbed, are similar in character to the intercoronary reflexes of the normal heart. Differences were observed only in the degree of constriction caused during the first 30 sec, which was appreciably weakened in the animals with a disturbed coronary circulation.

The results of the electrocardiographic observations are shown in the figure. Occlusion of the left coronary artery, carried out on the 2nd day after ligation of the branch of the right coronary artery, although not causing local ischemic changes in the electrogram, led to depression of the elevated, and elevation of the depressed, ST interval (see figure, A and B).

On the 3rd day pathological Q waves were observed on the ECG in standard lead III and in the local lead, indicating the onset of the necrotic stage. In this stage occlusion of the coronary artery now produced ischemic changes in the ECG of local type in the form of a comparatively slight elevation of the ST interval in the apical lead combined with displacement in the standard lead (see figure, C).

On the 4th day a pathological Q wave was observed only in the local lead. Occlusion of the coronary artery then caused a series of bigeminal extrasystoles, replaced after 2-3 min by a persistent elevation of the ST interval in the apical lead, combined with depression of this interval in the standard lead (see figure, D).

In the later stages of "infarction" (5th-6th days) occlusion of the coronary artery in the absence of a pathological Q wave in both leads caused only a slight change in the ST interval in the standard lead, usually unaccompanied by ischemic changes in the ECG in the local lead. In three experiments at this period constriction of the coronary artery led to the development of ventricular fibrillation against the background of the total absence of any ischemic changes in the ECG.

The electrocardiographic observations thus showed that the main difference between the reaction to occlusion of the infarcted heart and the reaction of the normal heart is a weakening of the local electrocardiographic effect of ischemia arising in response to compression of the artery, accompanied by an intensification of the signs of ischemia in the region of the basal coronary arteries. It thus becomes clear that the reduction of the relative magnitude of the reflex vascular reaction by comparison with its magnitude in the normal heart is the direct result of a decrease in the local ischemic effect. This could be explained on the assumption that the collateral vessels of the myocardium are opened in the juxtaneurotic zone, a feature which is especially obvious in the early stages of necrosis, in the period of acute myocardial ischemia (the 2nd-3rd day after operation).

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All abbreviations of periodicals in the above bibliography are letter-by-letter transliterations of the abbreviations as given in the original Russian journal. *Some or all of this periodical literature may well be available in English translation.* A complete list of the cover-to-cover English translations appears at the back of this issue.