EFFECT OF PRECEDING HYPERFUNCTION AND HYPERTROPHY OF THE HEART ON INJURY TO THE MYOCARDIUM ARISING IN EXPERIMENTAL MYOCARDITIS

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In human pathology, forms of myocarditis of different etiology frequently develop against the background of existing heart defects, hypertension, and so on, i.e., against the background of prolonged hyperfunction and hypertrophy of the heart.

Previous investigations have shown that the contractile power of the myocardial tissue of the left ventricle is disturbed both in animals with prolonged hyperfunction and hypertrophy of the heart and also in animals with experimental myocarditis [1,4]. However, the problem of how the developing myocarditis influences the structure of the hypertrophied heart maintaining compensatory hyperfunction for long periods of time, has not been investigated.

In the present investigation, to study this problem, experimental myocarditis was reproduced in animals with experimental coarctation of the aorta and a hypertrophied heart.

**EXPERIMENTAL METHOD**

Coarctation of the aortic orifice was reproduced in female rabbits weighing 2.0-2.5 kg by the technique described previously [1]. On the 45th day after the operation, the animals were sacrificed in acute experimental conditions. Myocarditis was also reproduced in female rabbits by single and repeated intravenous injections of theophylline (1%, 2 ml/kg) and adrenalin (0.2 ml of a 1:1000 solution). Five series of experiments were performed. Experiments were carried out on 41 rabbits, 16 of which were investigated histologically.

In the experiments of series I, experimental myocarditis was reproduced in eight hitherto intact rabbits: the animals were sacrificed four days after injection of theophylline and adrenalin (single acute myocarditis). In the experiments of series II, experimental myocarditis was also reproduced once in seven hitherto intact animals sacrificed on the 30th day after injection of theophylline and adrenalin (single chronic myocarditis). In series III myocarditis was reproduced twice in seven hitherto intact animals. The interval between the first and second injection of the substances causing myocarditis was one month: the animals were sacrificed four days after the second injection of these substances (repeated myocarditis). In the experiments of series IV, experimental coarctation of the aortic orifice was reproduced in ten rabbits: the animals were then sacrificed on the 45th day. In the experiments of series V, nine animals were subjected to the combined procedure (stenosis and myocarditis), for which purpose myocarditis was reproduced once on the 45th day after coarctation of the aorta, i.e., against the background of hyperfunction and hypertrophy of the myocardium: the animals were sacrificed on the 4th day after injection of theophylline and adrenalin.

In all the series of experiments, a histological investigation was performed; pieces from the same parts of the myocardium (the wall of the left ventricle with the papillary muscle) were taken for this purpose. Sections cut on a freezing microtome were stained with Sudan III, hematoxylin-eosin by Van Gieson's method, and with toluidine blue for the metachromasia reaction.

**EXPERIMENTAL RESULTS AND DISCUSSION**

In single acute experimental myocarditis (see figure, a), no essential changes were found in the muscle fibers. In the connective-tissue stroma of the myocardium of the left ventricle of the rabbits' heart isolated small focal clusters of cells were present, consisting mainly of histiocytes and lymphocytes. Both in the clusters of cells and in other areas of the myocardium the intermuscular septa of the stroma were slightly thickened and showed basophilic staining properties, indicating the accumulation of mucoid substances in these areas.

The observed changes, taken as a whole, indicate that the doses of the pharmacological preparations used led to the development of a moderate focal myocarditis, as other authors [5,6] have described.

It has previously been shown that in this pathological state the relative weight of the left ventricle is increased by 15% compared with the weight of the left ventricle in intact animals, while the maximal attainable intensity of function of the structures (IFS), characterizing the contractile function of the heart muscle, is lowered by 18% [1].

In the case of single chronic myocarditis (see figure, b), changes in the muscle fibers were almost absent. In the connective-tissue stroma of the myocardium, only very slight thickening of the intermuscular septa was observed in the subepicardial layer and in the region of the papillary muscle.

In the pathological state described above, the relative weight of the left ventricle likewise was increased by 15%, and the contractile function of the heart muscle was lowered by 16% [1].

In the case of repeated experimental myocarditis (see figure, c), initial necrobiotic changes were found in the muscle fibers of the wall of the left ventricle (homogenization of the cytoplasm, pycnosis of the nuclei). In the