

COMPARISON OF ECG CHANGES IN CATS WITH RESULTS OF HISTOLOGICAL INVESTIGATION OF THE HEART MUSCLE

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Foci of round-cell infiltration and fatty degeneration of the heart or, less frequently, fibrosis and constriction of the coronary arteries (1 case), were observed in the heart muscle of 21 of 52 intact cats. Where these changes were present in the myocardium, displacement of the S-T interval and various changes in the T wave were recorded in the ECG in standard leads.

According to the literature on the ECG in cats [1, 2, 5, 7], sometimes variations in the position of the T wave and S-T interval are observed in the ECG of healthy animals. Histological investigation of the heart muscle of intact rabbits [6, 8] and mice [4, 6] has revealed in some cases residual phenomena after spontaneous lesions of the myocardium. Similar pathological changes are also evidently possible in cats.

The object of this investigation was to compare the results obtained by analysis of the ECG in cats with the results of histological investigation of the heart muscle of these animals.

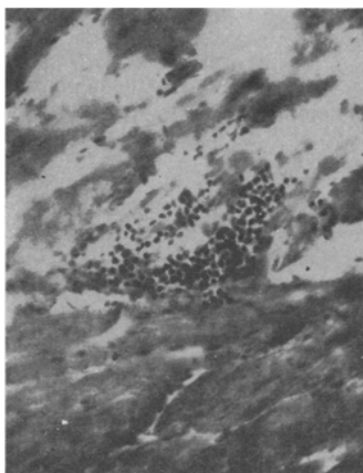


Fig. 1

Fig. 1. Focus of round-cell infiltration in wall of right ventricle of intact cat. Hematoxylin-eosin, 140 \times .

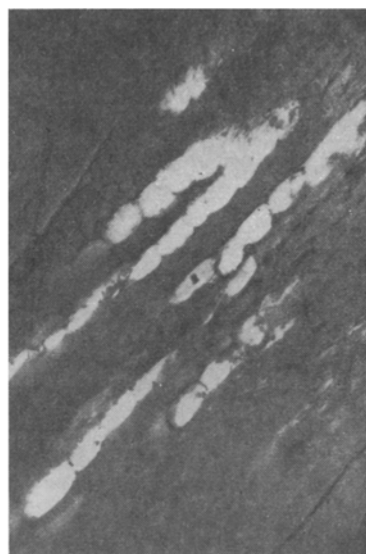


Fig. 2

Fig. 2. Adipose tissue in wall of right ventricle of castrated male cat. Hematoxylin-eosin, 140 \times .

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EXPERIMENTAL METHOD AND RESULTS

Altogether 52 male cats (of which 7 were castrated) and 3 female cats were investigated. The ECG was recorded with foil electrodes, in 3 standard leads, once a day for 3 days in a screened chamber. On the 4th day the cats were killed by intramuscular injection of 10% thiopental-sodium solution (0.5-1 ml/kg). The tissues were fixed in 10% formalin solutions. Topographic histological sections were cut through both ventricles, 1.5-2 cm away from the annulus fibrosus. The material was stained with hematoxylin-eosin and embedded in celloidin.*

In 21 cats with a normal histological picture of the myocardium, the amplitude of the waves, the duration of the intervals, the position of the S-T interval, and the ratio between the amplitudes of the T and R waves were indistinguishable from those recorded in most cats in the investigations of Angarskaya et al. [1] and Ekshibarov [2].

Upward displacement of the S-T interval in leads II and III, inversion, a biphasic character, or a marked increase in voltage of the T wave, and left (2 cases) or right (1 case) axis deviation of the heart were observed in the ECG of 9 animals whose left ventricle showed foci of round-cell infiltration (Fig. 1), differing in size and number, in the posterior wall, evidently as a result of myocarditis.

The same pathological changes were found in all parts of the heart in another 5 cats. In these animals the S-T interval was above the isoelectric line in all leads, while the T wave in leads I and II was inverted in 2 cases and greatly increased in amplitude in 3 others. No correlation could be found between the position of the foci of round-cell infiltration and changes in the T wave. Clinical experience shows [3] that a variety of changes in the T wave may be frequently observed in the presence of various pathological changes in the myocardium masquerading under the name of chronic myocarditis.

In 1 cat with thickening of the intima of the coronary arteries and foci of homogenization and basophilia, accompanied by marked constriction of the lumen of the vessel, upward displacement of the S-T interval in lead II, inversion of the T wave in leads II and III, and marked right axis deviation (angle $\alpha = 100-104^\circ$) were observed on the ECG. In 2 cats with myocardial fibrosis, the ECG revealed not only right axis deviation, but also a biphasic or distorted T wave in lead III and elevation of the S-T interval in leads II and III.

In 17 animals with a mean body weight of 4.29 ± 0.17 kg (principally males, of which 7 were castrated), histological examination of the heart revealed considerable proliferation of adipose tissue in the deep layers of the myocardium, the amount being greatest in the castrated male animals. In 10 cases excessive development of adipose tissue was found in the wall of the right ventricle (Fig. 2). In 2 cats the ECG was normal, in 4 animals upward deviation of the S-T interval and high T waves in leads II and III were observed, while in another 4 animals the T wave was inverted in these same leads. The electrical axis of the heart in most animals was between $+70$ and $+80^\circ$, while right axis deviation was observed in 2 cases. In 3 cats with proliferation of adipose tissue predominantly in the anterior wall of the left ventricle, inversion of the T wave was found in leads I and II of the ECG. In 3 of 4 cases with diffuse proliferation of adipose tissue in all parts of the ventricle, the S-T interval was above the isoelectric line in leads II and III, while in 2 cases the T waves were negative; in 1 cat the T waves were of high amplitude in all leads.

Hence, in a large proportion of intact cats, morphological investigation of the heart revealed definite pathological changes, and the ECG showed displacement of the S-T interval and various changes in the T wave in standard leads.

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