

CHANGES IN THE EKG IN OCCLUSION OF THE ABDOMINAL AORTA

(UDC 616.12-073.97-02:616.136-089.812-092.9)

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Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 59, No. 1,

pp. 47-48, January, 1965

Original article submitted September 10, 1963

After compressing or ligating the abdominal aorta many authors noted in animals at autopsy hypertrophy of the left ventricle and infarcts and anemization of the myocardium. However, experimental data on the functional changes of the heart in occlusion of the abdominal aorta close to its bifurcation are absent. Therefore, we studied the changes in the EKG in occlusion of the rabbit aorta.

EXPERIMENTAL METHOD

The EKG of 18 rabbits was recorded at standard leads by means of a cathode-oscillographic device before, during compression (for 30 min), and after release of the aorta for 15-30 days. Isolation of the abdominal aorta was done under ether, after which anesthesia was stopped, and the experiment was started an hour after this. The arterial pressure was recorded at the carotid artery.

EXPERIMENTAL RESULTS

Compression of the abdominal aorta caused an immediate slowing down of the heart rhythm by 20-70 beats per min (by 11-25%) and an increase in the amplitude of the R wave. After 5-10 min flattening of the T wave and sometimes a downward shift of the S-T segment occurred (see figure). The increase in the amplitude of the R wave and bradycardia were combined with an increase of the arterial pressure by 10-20 mm.

Bradycardia was observed for the next 3 days, and then the frequency of the heart beat increased; from the 12 to the 20th day bradycardia again occurred. The character of the EKG also changed: on the first day the amplitude of the R wave at the II lead remained high; during the next 2-3 days we observed a drop in the amplitude of the R wave, then it again increased (with a maximum on the 12-15th day), after normalization of the EKG occurred.

Similar changes of the EKG ensued when we applied to the aorta an "irritating" ligature which did not cause any noticeable decrease of its lumen. Bradycardia under these conditions was less evident (6-10%) and lasted 3-5 days. The increase in the R wave was negligible, flattening of the T wave was variable; other changes of the EKG were not noted. Changes in the arterial pressure upon ligation of the aorta did not exceed 10 mm.

The rate of the heart beat of vagotomized animals upon compression of the aorta dropped by only 3% (fluctuations of the rhythm without occlusion did not exceed 1.15%). The changes in the amplitude of the R wave were also negligible, in spite of the fact that the arterial pressure upon compression of the aorta sometimes rose higher than in animals with intact vagus nerves.

After administering hexamethonium (1.5 mg/kg) which blocks the transmission of impulses in the sympathetic and parasympathetic ganglia, compression of the aorta caused only a small increase of the R wave. The arterial pressure rose 10-15 mm and remained at this level for an hour.

The changes of the EKG upon occlusion of the abdominal aorta demonstrate the reflex changes of the heart activity which are mainly brought about by stimulation of the vagus nerves. These changes apparently depend on hemodynamic disorders caused by exclusion of a large vascular region from circulation [1]. However, a major role is



Changes in the EKG during compression of the abdominal aorta (III lead). From top to bottom: time marker (50 per sec) and amplification (140 μ V). 1) Before compression of aorta; 2) 5 min after compression; 3) after 15 min; 4) after 25 min; 5) 3 min after removing clamp.

played by reflex influences from receptors of the abdominal aorta, in particular from the place of its compression, since irritation of the aortal wall (without its stenosis) also causes reflex changes of cardiac activity.

It is important to note that the changes in the heart activity caused by compression of the abdominal aorta for 30 min lasted for a long time after removing the clamp from the aorta.

SUMMARY

The occlusion of the aorta above the bifurcation for 30 min caused a slowing down of the cardiac rhythm in rabbits, with an increase of the R wave amplitude, flattening of the T wave and at times a downward shift of the S-T interval; after a temporary occlusion of the aorta the changes of the cardiac activity continued for about 20 days. The occlusion of the abdominal aorta in the vagotomized animals and in rabbits to which hexamethonium was preliminarily administered caused but mild EKG changes. Placing upon the aorta of the "irritating" ligature (with the least possible stenosis) provoked bradycardia, a slight increase of the R wave and flattening of the T wave.

LITERATURE CITED

1. A. A. Rusanov, *Vestn. khir.*, 9, p. 105 (1957).

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.
