REFLEXES FROM MECHANORECEPTORS OF THE UPPER RESPIRATORY TRACT TO THE HEART DURING EXPERIMENTAL TUBERCULOSIS OF THE LARYNX

R. A. Fel'berbaum

From the Laboratory of Experimental Pathology and Therapy (Head - G. S. Kan) of the Leningrad Scientific Research Institute of Tuberculosis (Director - Prof. A. D. Semenov) and the Leningrad Scientific Research Institute of the Ear, Throat, Nose and Speech (Director - Prof. I. A. Lopotko; Scientific Director - Active Member of the Akad. Med. Nauk SSSR V. I. Voyachek)


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Many works have been devoted to studying the reflex influences from various organs and systems on the heart [8, 9, 18, 20, 31, 32]. It has been established that, in the majority of cases, reflex reactions of the heart are limited to changes in the frequency of the cardiac contractions. Reflex changes in the conductivity and functional state of the myocardium arise only with disease in the cardiovascular system, or in those cases where the reflexes originate from the receptors of organs involved in a pathological process [8, 7, 9, 10, 16, 31, 35, 38, 41].

Reflexes in the heart also arise from stimulation of the receptors in the mucosal membrane of the tonsils and of the upper respiratory tract [18, 15, 31, 36, 40]. It is widely recognized that the upper respiratory tract are a manifest reflex zone [1-4, 6, 11, 12, 14, 19, 21, 23, 30, 37, 39, 41, 42]. We demonstrated certain principles in the reflex reactions from the mechanoreceptors in the upper respiratory tract of healthy animals [24, 25, 27].

With various experimentally induced pathological conditions of the organism (radiation sickness, hematogenous tuberculosis), as well as with local disease of the upper respiratory tract (tubercular nidus, aseptic inflammation in the region of the larynx), we noted a phasic change in the properties of reflexes from the mechanoreceptors of the upper respiratory tract [26, 27, 28, 29].

Investigation of mechanoreception in the upper respiratory tract of healthy and diseased animals was carried out previously, using blood pressure and respiration as the effectors. It was necessary to clarify whether or not the principles which we established extend to the reflex connections between the receptors of the upper respiratory tract and the heart.

We investigated reflexes from mechanoreceptors in various sections of the upper respiratory tract - the trachea, the subligamental space of the larynx, the larynx and the pharynx - to the heart, using healthy cats and cats with a tubercular, inflammatory nidus in the region of the larynx.

EXPERIMENTAL METHOD

We used 21 cats in the experiment. In 11 of the animals we injected tuberculous culture (Valle strain) into the extrinsic muscles of the larynx, using a dose of 0.2 mg in a volume of 0.2 ml of physiological saline. On the 12th-13th day after the inoculation, along with changes in the general condition of the cats (sluggishness, poor appetite, hoarseness), a dense, lobular inflammatory infiltrate arose in the region of the larynx’s exterior, lateral walls, bearing a specific character, white color, and a size equal to that of a large pea (Fig. 1). On histological investigation, it was shown to consist of lymphoid cells, leukocytes, and epitheloid cells, with areas of caseous necrosis (Fig. 2). The mucosal lining of the larynx was initially unchanged, but after the 24th day it manifested a subacute inflammatory process, without signs of specificity: congestion and dilatation of the blood vessels, the presence of scanty infiltrates consisting of lymphoid and plasma cells and segmented leukocytes. On the 28th day of illness, signs of specific...
inflammation were noted in the mucous membrane of the larynx. After the 20th day of illness, along with the appearance of the infiltrate in the region of the larynx, we observed specific changes in the lungs, spleen, and lymph nodes, in the form of miliary, epitheloid cell, tubercular tubercles. Thus, the pathological process underwent a transition from local to generalized.

Short term experiments were carried out under light urethane narcosis. The trachea was exposed and transected at the level between the 7th and 8th tracheal ring. In order to apply measured mechanical stimulations to the cranial end of the transected trachea, we inserted a small balloon made of thin rubber and connected to a rubber bulb and a mercury manometer. After mechanical stimulation was applied in the trachea, the balloon was moved to the subligamental, and then to the supraligamental space of the larynx, and into the pharynx.

The EKG was taken with the EKP-4 electrocardiograph, in lead II (amplification: 1 mv corresponded to a beam deflection of 10 mm), using needle electrodes inserted into the thickness of the muscles in the right anterior and left posterior extremities of the cat. On film we recorded the EKG, time markings, and stimulation markings. In analyzing the EKG obtained with stimulation of the upper respiratory tract, we determined the statistical significance of the cardiac reactions according to a special formula [17], and considered only those reactions which were shown to

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Fig. 1. Tubercular infiltrate in the region of the larynx and the perilaryngeal soft tissues. Normal larynx on the right.

Fig. 2. Microscopic structure of the infiltrate: caseous necrosis and tubercular granulation tissue. Stained with hematoxylin-eosin, obj. 20 x, ocul. 15 x.