EXPERIMENTAL TUBERCULOSIS OF THE ADRENALS IN DOGS

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UDC 616.45-002.5-092.9

The local Schwartzmann phenomenon was produced in the adrenals in experiments on dogs. A suspension of 3 mg Mycobacterium tuberculosis cells (strain $H_{37}RV$) in filtrate of Escherichia coli was injected. By the 21st-28th day after infection, a decrease in the concentration of 17-hydroxycorticosteroids and of sodium ions and an increase in the concentration of potassium ions were found in the peripheral blood plasma. At necropsy, destruction of a large part of the adrenals by a productive inflammatory process was found.

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The pathology of the adrenals is of great interest in practical and theoretical medicine. Chronic adrenal deficiency is most frequently found, and in 60-80% of cases its cause is tuberculosis of the glands [4-6, 8, 12]. It has hitherto been impossible to reproduce this pathological state experimentally, although the study of physiological functions and the course of pathological processes against the background of chronic adrenal insufficiency is of considerable interest. The few attempts to produce chronic experimental adrenal insufficiency have proved unsuccessful [6, 10, 11, 13, 14].

The object of this investigation was to produce experimental tuberculosis of the adrenals in dogs. Data indicating that infection of an organ if the reactivity of the body as a whole is modified leads to isolated lesions of that organ [1-3] served as the starting point.

EXPERIMENTAL METHOD

Twenty experiments were carried out on mongrel dogs weighing 12-18 kg. Reactivity was modified by producing the Schwartzmann phenomenon in the adrenals. To do this, a suspension of 3 mg of a moist 3-week culture of Mycobacterium tuberculosis strain $H_{37}RV$ in a 6-day filtrate of Escherichia coli was injected into the adrenals. A retroperitoneal approach to the adrenals was used as described by E. N. Speranskaya.

A further injection of the same filtrate in a dose of 0.1 ml/kg body weight was given intravenously 24 h later. As the disease developed, the glucocorticoid function of the adrenals was investigated by determining 17-hydroxycorticosteroids (17-HCS) in the peripheral blood plasma [9]. The mineralocorticoid activity was assessed from the absolute and relative concentrations of sodium and potassium ions in the plasma, studied by the flame photometry method [7]. The erythrocytes and leukocyte counts, ESR, and hematocrit index were determined. Backgound indices were studied for 10 days. The adrenals were fixed in 10% neutral formalin. Sections were stained with hematoxylineosin and by the Ziehl-Neelsen method.

EXPERIMENTAL RESULTS

Changes in behavior of the animals were observed in the course of the disease. They became lethargic and adynamic (sometimes periods of increased playfulness alternated with adynamia), their hair fell out and they lost weight.

The animals were sacrified 60 days after infection. At necropsy the adrenals were enlarged, their surface nodular, and they were surrounded by dense connective tissue. On section, the structure of the adrenal tissue was deformed: the whole central part of the glands consisted of a soft grayish-yellow mass. As a rule cortical substance was still present only at the periphery, in the form of an interrupted narrow

Department of Pathological Physiology, Rostov-on-Don Medical Institute. (Presented by Academician V. V. Parin.) Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 68, No. 8, pp. 43-45, August, 1969. Original article submitted September 12, 1967.

band from 1 to 3 mm in thickness, pale yellow in color with a grayish tinge. In some places the cortex consisted of grayish tissue merging with amorphous masses located in the center of the organ. Microscopic examination of sections through the adrenals showed that the structure of both medulla and cortex was completely destroyed as a result of extensive infiltration of these layers, and also of the capsule of the gland, by exudate composed mainly of lymphocytes, forming extensive homogeneous necrotic masses of caseous material. Staining by the Ziehl-Neelsen method revealed tubercle bacilli in various parts of the adrenals. No macroscopic evidence of tuberculosis was found in other organs.

Investigation of adrenocortical function showed that secretion of hormones was severely disturbed as the disease developed progressively. The 17-HCS concentration in the peripheral blood plasma, for instance, fell from 3.34 μg% (before infection) to 0.3 μg% by the 56th day of the disease. In most animals, moreover, the 17-HCS concentration could not be determined after the 21st day of the disease, and a slight increase in its level was obtained only by stimulation with ACTH (20 i.u.). Secretion of mineralocorticoids was also disturbed, as shown by a decrease in the sodium ion concentration in the plasma to 127.2 ± 1.95 meq/liter by the 56th day of the disease. At the same time the potassium ion concentration rose to 5.36 ± 0.13 meq/liter. The leukocyte count rose from 6927 to 15250. The ESR was increased. The erythrocyte count showed a tendency to decrease. The hematocrit index fell from 41.3 to 34.8.

The results demonstrate that tuberculosis of the adrenals was produced in these dogs, causing chronic insufficiency of these glands. In the course of development of the disease, gradual destruction of the adrenal tissue was observed, with a decrease in the secretion of gluco- and mineralocorticoids and changes in hematologic indices.

The local character of the tuberculous inflammation of the adrenals is the results of increased fixation of the mycobacteria at the site of development of hemorrhagic inflammation [1-3]. This prevents dissemination of the mycobacteria and generalization of the tuberculous process.

In control experiments in which a suspension of M. tuberculosis cells in physiological saline was injected into the adrenals, death of the animals from generalized miliary tuberculosis was observed.

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