FUNCTIONAL AND STRUCTURAL CHANGES IN THE ADRENAL CORTEX OF RABBITS WITH CHRONIC PROSTATITIS

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UDC 616.65-002.2-092.9-07:616.453-07

Investigation of the state of the adrenal cortex of rabbits during inhibition of the internal secretory activity of the testes caused by chronic inflammation of the prostate gland revealed progressive hyperplasia of the zona reticularis of the adrenal cortex, whereas the zona glomerulosa showed no marked pathological changes and the zona fasciculata showed hypoplasia. Consequently, a normal or increased excretion of androgens observed in the experimental males, despite a reduction in the synthesis of testosterone in the testes, is maintained by increased activity of the zona reticularis of the adrenal cortex.

KEY WORDS: *prostate gland; testes; adrenal cortex; androgens.*

The prostate gland has close anatomical and functional connections with the testes and it is the target organ for testosterone [6, 11]. Removal of the gonads causes atrophy of the prostate and administration of testosterone restores its normal structure and function [1, 2, 7, 9]. Prostatic insufficiency, in turn, affects testicular function and depresses the secretion of testosterone [3].

The object of this investigation was to study the response of the adrenal cortex to testosterone deficiency caused by prostatic insufficiency developed as a result of chronic inflammation.

EXPERIMENTAL METHOD

Experiments were carried out on 30 young, sexually mature chinchilla rabbits. Chronic aseptic prostatitis was produced by passing a silk thread through the gland [5]. The animals were observed in the course of chronic experiments for a period of six months after the operation, when the necessary tests were carried out. Androgenic activity was judged from the testosterone concentration in blood flowing from the testes [8, 10] and also from the excretion of the individual androgen fractions in the urine [4]. The state of prostatic and adrenocortical function was judged on the basis of histological studies of sections cut 2, 4, and 6 months after the beginning of the experiments. Material was fixed in 10% formalin and embedded in celloidin; sections 5 μ thick were stained with hematoxylin and eosin or, in some cases, with picrofuchsin by Van Gieson's method.

EXPERIMENTAL RESULTS

The results of the experiments showed that the introduction of a silk thread into the prostate gland causes acute reactive inflammation which, 1-2 months after the operation leads to the development of dystrophic and later (3-4 months) to atrophic changes in the cells of the glandular epithelium and the myoepithelial cells. After 6 months, microscopic examination of the prostate gland of the experimental rabbits revealed sclerotic changes,

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Laboratory of Physiology and Pathomorphology, Khar'kov Scientific-Research Institute of Endocrinology and Hormone Chemistry. (Presented by Academician of the Academy of Medical Sciences of the USSR L. T. Malaya.) Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 83, No. 3, pp. 276-277, March, 1977. Original article submitted August 30, 1976.

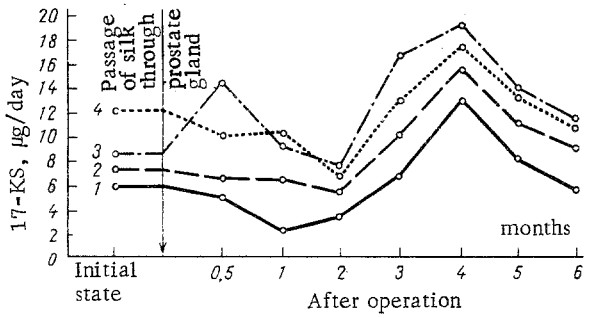

Fig. 1. Daily excretion of 17-KS fractions with urine of rabbits after passage of silk thread through prostate gland. 1) Androsterone; 2) etiocholanolone; 3) dehydroepiandrosterone; 4) 11-hydroxy-17-KS.

characterized by proliferation of strong bands of coarse, fibrous connective tissue, leading ultimately to total loss of prostatic function.

Under these conditions of prostatic insufficiency, the testosterone concentration in blood flowing from the testes was sharply reduced 2 and 4 months after the beginning of the experiments (3.05 and 27.50 μg/100 ml plasma, normally 95.53 μg/100 ml plasma), and after six months it was below the limit of sensitivity of the method and was virtually zero. Meanwhile, determination of the 17-ketosteroid (17-KS) fractions in the 24-hour sample of urine from the experimental animals, showed that the secretion of androsterone — the most active metabolite of testosterone — was reduced only during the first 2 months after the operation, and thereafter (third to sixth months) it was the same as initially or, in some cases, it actually was higher (Fig. 1). Excretion of the dehydroepiandrosterone, etiocholanolone, and 11-hydroxy-10-KS fractions with the urine was within normal limits for the first 3 months after the operation, after 4 months the excretion of these androgen fractions with the urine was increased, and later (after 5-6 months) it returned to normal.

The data reflecting the hormonal changes suggested that the normal or increased excretion of androgens with the urine observed in the experimental animals could have been due to stimulation of adrenocortical function. To test this hypothesis, structural changes in the adrenal cortex were studied in the rabbits at different times after insertion of a silk thread through the prostate.

No abnormalities were found in the zona glomerulosa of the cortex. In the zona fasciculata, in the initial period of the experiment (2 months), its width was appreciably increased, but later (after 4 and 6 months) this increase was replaced by progressive hypoplasia and by some degree of stagnation of lipoid inclusions in the cytoplasm. The greatest changes were observed in the zona reticularis. As early as 2 months after the operation, its cells became large, irregular, or polygonal in shape, with a palely stained cytoplasm containing an excess of lipoid drops, and with juicy hyperchromic nuclei. Having once begun, the hyperplasia of the zona reticularis increased progressively and by the sixth month of observation in some places bands of pale cells could be seen invading the zona fasciculata. Evidence of the intensive hyperplasia of the zona reticularis was given by the frequent mitoses in its cells. These structural changes confirm that the normal or increased excretion of androgen fractions with the urine of the experimental animals in a state of testosterone deficiency was due to stimulation of the androgenic function of the zona reticularis of the adrenal cortex.

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