A Tumor of the Adrenal Medulla in a Castrated Male Rat

W. C. Hueper, M.D., and Gustav J. Martin, Sc.D.

(From the Warner Institute for Therapeutic Research, New York, N. Y.)

(Received for publication January 7, 1942)

Adrenal tumors in man are of interest not only because of their relative rarity, but also because of their relation to hypertension and thus to arteriosclerosis and because of their influence upon the secretion of the sex hormones resulting in precocious "puberty" and masculinization.

The occurrence of spontaneous neoplasms of these glands in animals is apparently highly exceptional. Peyron (3) observed adrenal paragangliomas in 3 cows, 1 sheep, and 5 horses. Løwenthal (2) recorded the presence of several cortical adenomas and of a medullary pheochromocytoma in mice. Three morphologically similar tumors in the medulla of the adrenals of mice, diagnosed as mesotheliomas, as well as one cortical adenoma in these animals, were reported by Slye, Holmes, and Wells (4).

The experimental production of blastomatoid and blastomatous conditions in these glands was accomplished in recent years by various methods. Staemmler (6) noted the occurrence of adenomatoid proliferations in the adrenal medulla of rats subjected over prolonged periods to subcutaneous injections of nicotine, a substance which activates the release of adrenaline. Spiegel (5) observed the appearance of cortical tumors in old male guinea pigs which had been castrated at an early age. Similar neoplastic reactions were found by Woolley, Fekete, and Little (7, 8) in female mice ovariectomized immediately after birth. Gardner (1) observed the occurrence of tumorous conditions in ovariectomized mice receiving intravaginal instillation of benzpyrene dissolved in oil, in untreated ovariectomized mice, or in mice receiving estrogens for prolonged periods. The untreated ovariectomized mice were castrated from 5 to 9 weeks after birth.

The following communication deals with an adrenal tumor found at autopsy in a male rat castrated at the age of 1 month and maintained on a vitamin E-deficient diet for a subsequent period of 12 months. This animal was one of a series of 30 similar rats which were killed when 13 months old. While the adrenals of these rats were in general grossly and microscopically normal, the left adrenal gland of this particular animal was found at autopsy to be a round, white-yellow node surrounded by a smooth capsule and measuring 1 cm. in diameter. The cut surface was yellowish-white and homogeneous. The other internal organs were normal.

The histological examination of the tumor showed that it consisted mainly of densely packed, ill-defined, round or irregularly shaped cells having a round, moderately chromatic nucleus. Mitotic figures were rare. In some portions there were areas of larger, polygonal cells with a loose, pink-stained cytoplasm. Interspersed in this cellular matrix were strands of elongated, large cells arranged in loose bundles. The oval-shaped and irregular-sized nuclei were often hyperchromatic, while the cytoplasm was relatively abundant and deeply pink-stained (Fig. 1). The stroma was scanty and consisted mainly of thin-walled capillaries. The neoplasm grew expansively compressing the atrophic and vacuolated cellular cortical tissue, which covered the tumor like a cap. The demarcation between the two tissues was indistinct. There was no

Fig. 1.—Photomicrograph of section of tumor of adrenal medulla showing ill-defined and irregular groups of larger lightly stained cells and of smaller more intensely stained cells of indistinct outlines and oval or round shape with transitions into elongated spindle-shaped cells, which are often arranged in bundles. Hematoxylin and eosin stain. Mag. X 200 (approx.).
invasion of the surrounding tissue. Sections stained for chromaffinic material by the method of Schmorl (Giemsa staining) were free from any green-colored, chromaffinic cellular granulation.

The examination of the other internal organs revealed moderate arteriosclerotic lesions in the myocardial, pulmonary, and renal tissues. The walls of the cerebral vessels were often thickened and hyaline, and occasionally surrounded by small hemorrhages. Small degenerative and fibroblastic foci were present in the myocardium.

**SUMMARY AND CONCLUSIONS**

The adrenal tumor described was found in one of 30 castrated male rats kept on a vitamin E-deficient diet and was apparently of medullary origin. The location of the tumor in the gland, the presence of nervous tissue elements in the neoplastic parenchyma, and also, to a certain extent, the occurrence of arteriosclerotic lesions in various internal organs support this diagnosis. In view of the absence of chromaffinic matter in the cells of the neoplasm, the diagnosis of ganglioneuroma of the adrenal seems to be justified.

It is uncertain whether or not the development of this blastoma is causally related to the endocrine and vitamin disturbances experimentally produced in this rat. Investigations now under way may clarify this question, which is important, as Gardner concluded that the adrenal tumors observed in ovariectomized mice are of cortical derivation and originate from the zona glomerulosa; *i.e.*, remote from the androgenic zone.

**REFERENCES**

A Tumor of the Adrenal Medulla in a Castrated Male Rat

W. C. Hueper and Gustav J. Martin


Access the most recent version of this article at:
http://cancerres.aacrjournals.org/content/2/4/294.citation

Sign up to receive free email-alerts related to this article or journal.

To order reprints of this article or to subscribe to the journal, contact the AACR Publications Department at pubs@aacr.org.

To request permission to re-use all or part of this article, use this link http://cancerres.aacrjournals.org/content/2/4/294.citation. Click on “Request Permissions” which will take you to the Copyright Clearance Center's (CCC) Rightslink site.