Hemodynamic effects of adrenal medullectomy in the dog

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Received for publication 31 June 1965.

1 This work was supported, in part, by Public Health Service General Research Support Grant 1 SO1 FR 05417-01 awarded to Temple University School of Medicine, Public Health Service Grants H 3875 and 5-T1HE 5362, and the American Medical Association Education and Research Foundation Grants-in-Aid for Research Project.

2 An abstract of this work has been published in Federation Proc. 24: 525, 1965.

Methods

Six trained, unanesthetized dogs were subjected to cardiac output and blood pressure measurements by previously reported methods (3). Mean control values were established on the basis of three to five duplicate sets of determinations at intervals of approximately 2 weeks. After these studies were completed, plasma cortisol concentration was measured by the method of Peterson (2). The left adrenal medulla was then removed by sterile surgical techniques during pentobarbital anesthesia. The procedure was to incise the adrenal cortex and curet out the adrenal medulla under direct vision through a left subcostal incision. Two weeks later a complete right adrenalectomy was performed. Duplicate hemodynamic measurements were made 2-4 weeks after the right adrenalectomy and the mean of these was used for the experimental value for each dog. We have previously shown that these measurements do not change significantly with time in previously trained control dogs (3). In four of the dogs plasma cortisol was measured preoperatively and on the day of the postoperative hemodynamic studies by the method of Peterson (2). Plasma samples for cortisol determination were drawn prior to any hemodynamic measurements or other stress.

After all postoperative hemodynamic and endocrine...
results

When microscopic examination was done on multiple sections of each demedullated gland, no chromaffin cells were seen in the glands from any of the animals included in our series. The cortical cells from these glands had a normal and healthy appearance.

Mean plasma cortisol was 1.18 μg/100 ml preoperatively and 11.0 μg/100 ml at the time of postoperative hemodynamic study (Table 1). Hemodynamic values are summarized in Table 2. In five of the six dogs cardiac output was decreased following adrenal medullectomy; in the remaining dog cardiac output was unchanged. The mean control cardiac output was 2.7 liters/min, whereas following operation it was 2.1 liters/min. Mean blood pressure averaged 10 mm Hg higher following medullectomy; it was elevated in four dogs and essentially unchanged in two. Calculated total peripheral resistance was elevated in every dog. Average heart rate and stroke volume were both decreased following medullectomy but not to a level of statistical significance.

As a further control, three animals had only unilateral adrenalectomy as the experimental procedure. There was no consistent or significant change in hemodynamic measurements in these animals. The mean plasma cortisol concentration at the time of postoperative measurements was 6.4 μg/100 ml.

discussion

The operative procedure described was effective in producing adrenal medullectomy without producing adrenal cortical insufficiency. In three out of four dogs plasma cortisol was higher following operation than before.

The hemodynamic pattern following adrenal medullectomy differs from that following total adrenalectomy in that the blood pressure is maintained and possibly increased following medullectomy, whereas it is markedly reduced following total adrenalectomy (3). On the other hand, the effects of medullectomy on cardiac output and total peripheral resistance are qualitatively similar to the effects of total adrenalectomy, but quantitatively these changes are much less after medullectomy.

The adrenal medulla does play a role in the maintenance of normal cardiovascular function in the resting, unanesthetized dog.

The authors are indebted to Dr. Elizabeth Lautsch for the microscopic evaluation of the adrenal glands, to Dr. Daniel O'Leary for the cortisol determinations, and to Margaret Oppenheimer, Robert Faust, and Remus Berretta for their expert technical assistance in carrying out this study.

REFERENCES


