Endocrine Consequences of Hypophysectomy

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Total hypophysectomy in man has become a practical therapeutic procedure for the management of certain endocrine disorders,1 metastatic cancer,2 and vascular changes associated with diabetes mellitus.3 The successful accomplishment of this ablative procedure was dependent upon the availability of target organ hormones for replacement, namely cortisone, thyroid and gonadal steroids. Surgical removal of the pituitary by way of a transfrontal craniotomy has proved to be a satisfactory means of accomplishing total hypophysectomy with minimal morbidity and mortality.2 Other surgical approaches, namely, transantral-transphenoidal, transnasal-transplanumoidal, and transethmoid-transphenoidal have also been successfully employed. Yttrium-90 implantation of the pituitary with the use of trocars provides a much simpler approach which can apparently accomplish a nearly complete destruction of the gland with minimal risk of side effects.4 It is the purpose of this paper to review the endocrine consequences of hypophysectomy and to discuss the management of these patients during and after the procedure.

Adrenal Function

Following hypophysectomy, hydrocortisone, androgen and estrogen production by the adrenal cortex are profoundly suppressed, whereas aldosterone secretion is relatively less affected. The hypophysectomized patient requires cortisone replacement therapy in an average maintenance dose of 37.5 mg. of cortisone acetate by mouth daily (25 mg. at breakfast and 12.5 mg. at supper). During periods of stress, extra cortisone must be supplied to prevent the development of adrenal insufficiency or crisis. For minor stresses, doubling the dosage of cortisone during the period of stress is usually adequate. For severe stresses, such as severe infection or further surgery, the cortisone dosage should be increased to 200 or 300 mg. per day in divided increments. When the patient is unable to retain cortisone orally, it must be administered parenterally, preferably with a continuous intravenous drip of hydrocortisone hemisuccinate.

If replacement cortisone is withdrawn from the hypophysectomized patient, signs and symptoms of adrenal insufficiency usually develop promptly; in two or three days the patient experiences anorexia, progressing to nausea and vomiting, weakness, lethargy and prostration. Fever, postural hypotension and subsequently recumbent hypotension develop. This course may occasionally be compressed into 36 hours, or rarely may take three or four weeks. Small doses of cortisone quickly restore normalcy. During cortisone withdrawal, the urinary 17-ketosteroids fall precipitously, and the blood and urine 17-hydroxycorticosteroids reach extremely low values. Metabolic studies have failed to reveal any significant changes in water and electrolyte balance to account for the profound collapse, and it would seem likely that some alteration in intermediary metabolism, perhaps involving energy exchange, is responsible for the syndrome associated with cortisone deficiency.

The hypophysectomized patient given replacement doses of cortisone can withstand severe dietary sodium restrictions for indefinite periods without developing sodium depletion. When dietary sodium is restricted, urinary sodium excretion decreases greatly within three to four days, as it does in normal subjects, and sodium balance and serum sodium levels are maintained. Aldosterone is present in the urine of hypophysectomized patients and rises to above normal levels when dietary sodium is restricted. It is apparent that aldosterone secretion by the adrenal cortex continues to be physiologically adequate in the absence of the pituitary gland, and that re-