ANAESTHESIA FOR ADRENALECTOMY

BY

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CADE (1954) indicated that the adrenal gland is composed of an outer cortex, essential to life, which produces hormones controlling carbohydrate, protein and electrolyte metabolism, and the medulla, which secretes adrenaline and noradrenaline. Surgery of the adrenals consists of partial or total removal of one or both glands or tumour, performed at one operation, or in two stages with about three weeks between each adrenalectomy, and involves replacement of the hormones with desoxycorticosterone acetate, cortisone and short-term administration of noradrenaline. Successful bilateral adrenalectomy was first performed in 1945 (Huggins and Scott) following the discovery and synthesis of cortisone, who with Bergenstal (1951, 1952) reported further successes.

Total Adrenalectomy.

Bilateral adrenalectomy is performed in conjunction with removal of the gonads to remove all known sources of sex hormones in patients with hormone dependent carcinoma. Some regression of the neoplasm and clinical improvement of the patient with multiple secondaries has been noted (Taylor, 1954) in patients with advanced carcinoma of the prostate and the breast. Patients selected for adrenalectomy are usually in an advanced stage of disease which may involve hepatic, pleural or pulmonary metastases with resultant diminution in air entry. Low haemoglobin and red cell count are common and should be corrected by blood transfusion. It is essential that cortisone is given pre-operatively in single stage bilateral adrenalectomy, and before the operation for removal of the second adrenal in the two-stage type. It is also advisable to give cortisone before the removal of the first adrenal, in case there is only one gland, or that the second may be replaced by carcinomatous tissue. Intramuscular injection of cortisone in 100-mg doses is given 48 hours, 24 hours, and 1 hour before the scheduled start of operation. Premedication should be atropine or scopolamine with a hypnotic. Before operation, intravenous transfusion is essential; using a three-chambered set, one bottle of dextrose, one plainly labelled bottle of 5 per cent dextrose with 4 ml noradrenaline added and firmly turned off, and one chamber reserved for blood transfusion if necessary.

The operation is usually performed in two stages. The first, oophorectomy and removal of the right adrenal is carried out about three weeks before removal of the left. For the first stage, the anaesthetized patient is placed supine on the table and oophorectomy performed through an
abdominal incision. The patient is then turned on to the left side for removal of the right adrenal, the bridge of the table being raised, or a sandbag inserted under the left loin. For the second stage, the removal of the left adrenal, the patient is placed on her right side on the table, and the left loin used for the surgical approach. A loin incision is used for removal of both adrenals, and the 12th and sometimes the 11th rib removed. Incision of the pleura, accidental or designed, may occur.

General anaesthesia is indicated for the operation. Induction is with thiopentone and with the aid of a short-acting relaxant, a cuffed tube is inserted into the trachea. Frequent involvement of the pleura with secondary carcinomatous deposits, presence of pleural fluids, the limitation of respiratory movement by the operative position and the possible opening of the pleural cavity during operation necessitates control of respiration. Therefore, cuff tube, closed circuit anaesthesia and use of the relaxants with gas and oxygen is advisable. Pethidine and further doses of thiopentone may be given when indicated.

It is essential that the blood pressure be recorded throughout the operation; minor falls occur with the hypotensive effect of thiopentone during the induction of anaesthesia and with blood loss. The estimated blood loss from observation of the swabs, packs and sucker contents should be replaced. Occlusion of the veins of the second gland usually causes an abrupt fall in blood pressure. This should be corrected immediately with the noradrenaline solution which is run intravenously as fast as is necessary to restore and maintain pressure. Postoperatively, this transfusion of noradrenaline is maintained until the blood pressure remains level when the drip is discontinued. In some cases, the pressure has not fallen on occlusion of the veins. This may be due to the presence of other adrenal tissue in the body, to handling of the gland and output of hormones before ligating the veins (which maintains pressure), or in the cases of complete replacement of the gland by tumour, to the prior secretory function of noradrenaline by other tissues being established.

Partial Adrenalectomy and Tumour Removal.

Tumour or cortical hypertrophy is found in Cushing's syndrome and treatment consists of excision of the tumour or subtotal adrenalectomy. Anaesthesia is as outlined above. Pre-operative preparation includes administration of 200 mg of cortisone given intramuscularly each day for two days prior to operation. A mild diabetes, which is resistant to insulin, may be present clinically and therefore pre-operative administration of glucose is advisable.

The adrenogenital syndrome of virilism and disordered nitrogen metabolism is also caused by a tumour or hypertrophy of the cortex and the treatment is to excise the tumour or perform a subtotal resection.

The adrenal medulla possesses sympathetic nervous tissue from which a phaeochromocytoma may arise. The treatment is surgical removal, and anaesthesia follows that indicated by Paper and Cahill (1952) and Ward, Riches and Johnson (1952). The clinical picture is typified by...
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Acute attacks of hypertension, and severe hypertension may occur during the anaesthesia, due to the excretion of sympathetic amines from the tumour. This is most likely to occur early in anaesthesia, especially during the positioning of the patient and in the handling of the tumour. Phentolamine is adrendylic and lowers blood pressure if elevation is due to circulating adrenaline and is given with the premedication in a 20-mg dose intramuscularly, and in 10-mg doses before the induction of anaesthesia, before the positioning on the table, and before the tumour is handled.

Some 10 per cent of the tumours are bilateral and a laparotomy through abdominal incision is usually performed unless the diagnosis is certain.

Premedication consists of scopolamine and a sedative. The anaesthetic advocated is thiopentone induction, with phentolamine 10 mg given intravenously; intubation with a cuff tube using a short-acting relaxant; maintenance with gas, oxygen, pethidine, with intermittent thiopentone injections; and the use of continuous suxamethonium in drip form, if respiratory control is made necessary as by pleural puncture.

Drugs which affect myocardial irritability or rate, and produce ventricular arrhythmias in the presence of circulating adrenaline are contra-indicated; thus chloroform, ether, cyclopropane, trilene, flaxidil, and curare are all debarred. Gross irregularity of the pulse may occur during the tumour dissection due to excessive secretion of noradrenaline. If this occurs, procaine amide in 200-mg doses should be administered intravenously. Following ligation of the vascular pedicle of the tumour, some hypotension rapidly occurs and must be immediately corrected by noradrenaline transfusion. When pressure is restored, the slow infusion is continued postoperatively for about twenty-four hours, and until the danger of hypotensive episodes is past.

It will be thus apparent that anaesthesia for adrenalectomy, although not technically difficult, requires careful pre-operative preparation and assessment, unremitting observations of the condition, and especially of the blood pressure, of the patient. Patients on cortisone therapy are sensitive to anaesthetic drugs and added caution in their administration is indicated. Blood loss is badly tolerated and death may occur immediately post-operatively from shock in spite of normally adequate care and attention.

REFERENCES