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, oöphorectomy 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 oöphorectomy 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 ap-
proach. A loin incision is used for re-
moval 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 re-
 laxant, 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 open-
ing of the pleural cavity during operation
necessitates control of respiration. There-
fore, cuff tube, closed circuit anaesthesia
and use of the relaxants with gas and
oxygen is advisable. Pethidine and fur-
ther 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 intra-
 venously as fast as is necessary to restore
and maintain pressure. Postoperatively,
this transfusion of noradrenaline is
maintained until the blood pressure re-
mains 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 treat-
ment consists of excision of the tumour or
subtotal adrenalectomy. Anaesthesia is
as outlined above. Pre-operative prepar-
ation 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 resec-
tion.

The adrenal medulla possesses symp-
pathetic nervous tissue from which a
phaeochromocytoma may arise. The treat-
ment 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
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 adrenolytic 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 preoperative 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 postoperatively from shock in spite of normally adequate care and attention.

REFERENCES