

## AN OPERATIVE TECHNIQUE FOR ADRENALECTOMY\*

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**I**N recent years rapid strides have been made in delineating the normal physiology of the adrenal gland as well as the syndromes produced by its abnormal function. The advances in knowledge of the adrenals have effected an increase in the indications for adrenalectomy. In addition to Cushing's syndrome, adrenogenital syndrome, pheochromocytoma and adrenal neoplasms, extirpation of the adrenals has been performed for essential hypertension, carcinoma of the prostate, carcinoma of the breast, Kimmelstiel-Wilson's disease, primary aldosteronism and some types of secondary aldosteronism such as hepatic cirrhosis<sup>1,2</sup> and idiopathic edema<sup>3</sup>. Many of the individuals with these diseases are extremely poor operative risks because of impaired kidney, liver and cardiovascular functions.

In order for a precarious patient to survive an adrenalectomy, great pains must be taken in preoperative preparation and postoperative care. The operative procedure should be brief, relatively bloodless and potentially free of complications. In this paper a technique which apparently fulfills these criteria, is described. The method, except for a recent slight modification, has been employed by the Urology Section at the University of Michigan Medical Center for a number of years with excellent results.

### PROCEDURE

*Anesthesia.* No routine anesthetic is employed. The agent, or agents, used in anesthetizing the patient is selected by the anesthesiologist in accord with the particular profile of the individual. All patients, how-

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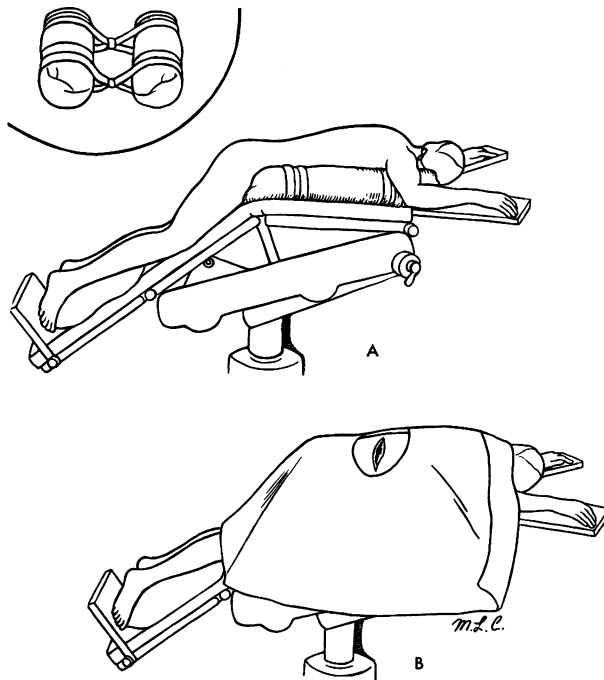


Figure 1. Position of patient on operating table during adrenalectomy. (A) Adequate pulmonary ventilation obtained by placing rolls along lateral aspect of thorax from shoulders to pelvis. Inset illustrates method of preventing displacement of supports during operation by lashing them together with figure of eight gauze strips. (B) After flexing the body by angulating the table, the thorax is made parallel with the floor.

ever, are intubated since the pleura is adjacent to the operative site and the pleural cavity may be entered during the procedure.

*Posture of the Patient.* After endotracheal intubation the patient is turned from the supine to the prone or face-down position. Adequate pulmonary ventilation is obtained by placing the individual on two rolls as illustrated in Figures 1A and 1B. Improvised supports can be made by rolling a pillow along its longitudinal axis and taping it circumferentially. The rolls are placed under the shoulders and along the lateral aspects of the thorax down to the pelvis. Displacement of the rolls during operation is prevented by lashing them together with several figure of eight gauze strips (inset, Figure 1).

After the patient is turned to the prone position and the symphysis aligned with the break in the table, the table is angulated so as to flex the

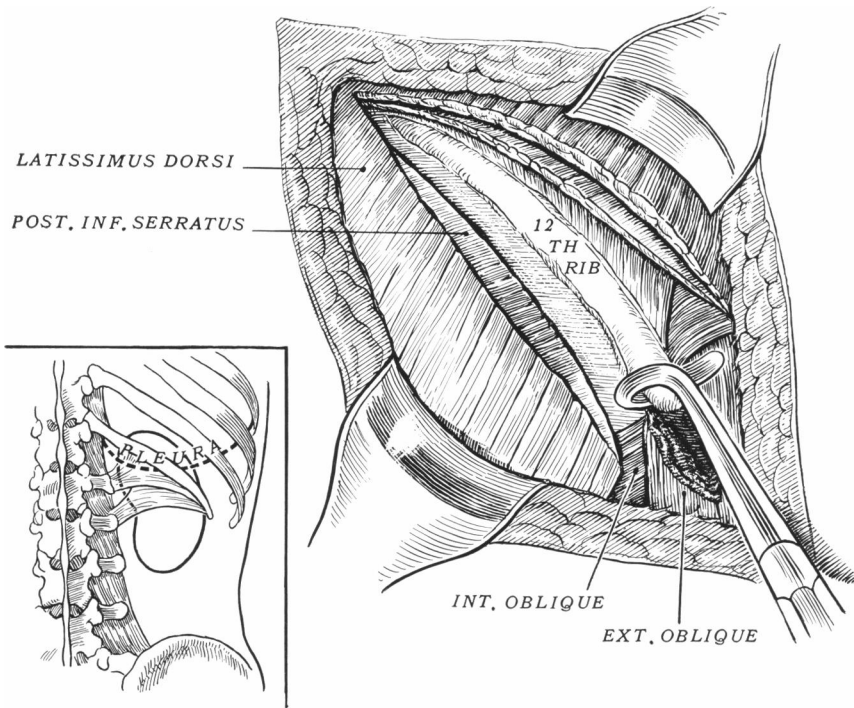


Figure 2. Surgical approach to the right adrenal gland. The Doyen rib elevator is being placed between the periosteum and bone at the very tip of the right 12th rib. Inset indicates position of the pleura in respect to the 12th rib.

patient's body. This maneuver serves to widen the intercostal spaces and increase the distance between the inferior costal margin and the iliac crest. The whole table is then adjusted to place the patient's back and thorax parallel with the floor.

*Operative Technique:* 1) *Surgical approach:* The adrenals are approached retroperitoneally through the region of the twelfth ribs. Two surgical teams of two members each make a simultaneous bilateral approach. In the group of four it is necessary to have only one experienced surgeon, a resident capable of removing a rib and two interns or medical students.

The skin incision is made over the twelfth rib extending medially from the outer border of the sacrospinalis muscles to several centimeters beyond the tip of the twelfth rib. The incision is carried rapidly down through subcutaneous tissue, latissimus dorsi, and posterior inferior ser-

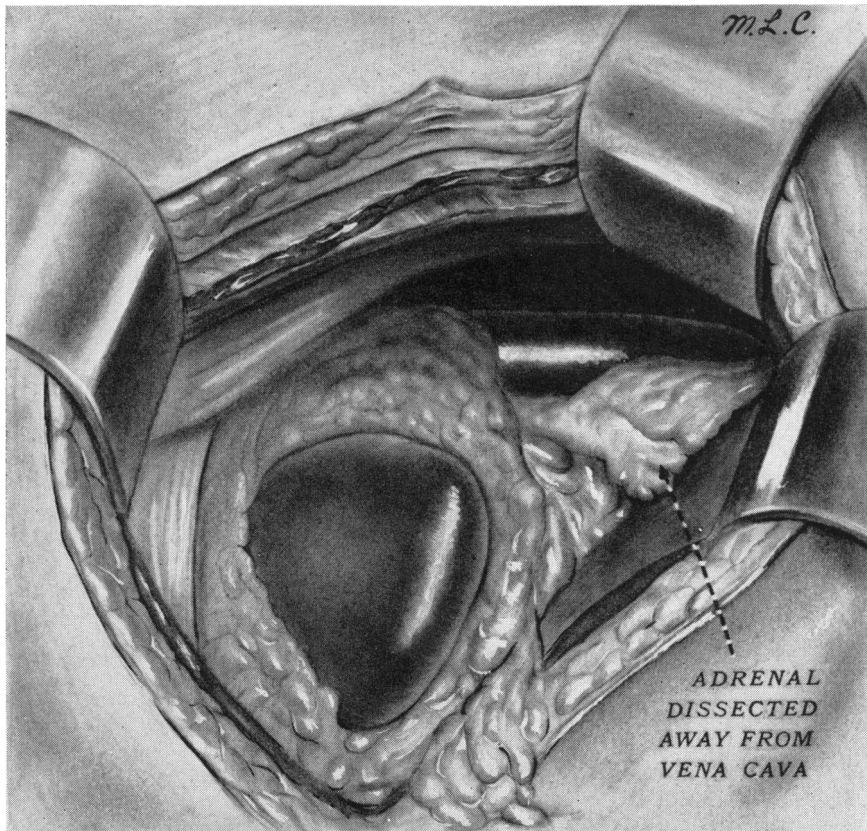


Figure 3. Relationship of the right adrenal gland to surrounding structures. Note that the adrenal is not in close relationship to the upper pole of the right kidney. A portion of the medial aspect of the adrenal overlies the inferior vena cava.

ratus muscles. The periosteum is incised along the midline of the rib and the attached muscles and periosteum are dissected free from the posterior surface of the rib with the Haight periosteal elevator. The anterior surface of the rib is separated from the periosteum with the use of the Doyen rib elevator which should be inserted initially under the tip of the rib anteriorly in order to avoid tearing the pleura (Figure 2). The pleura dips below the twelfth rib in the region of the costovertebral angle and may be perforated readily if one is slightly careless in placing the elevator under the rib near the vertebral column.

The rib is transected medial to the outer margin of the sacrospinalis and removed from the body after dissecting free the very tip of the rib.

In the process of cutting the tip of the twelfth rib free from its muscle and fascial attachments, a small opening is usually made through the lumbodorsal fascia into the retroperitoneal space. The small opening is enlarged to the margin of the sacrospinalis muscle by inserting the thumbs or index fingers and bluntly separating the lumbodorsal fascia posteriorly. By using the blunt method for enlarging the wound, injury to the peritoneum and pleura is avoided.

On entering the retroperitoneal space the posterior surface of the kidney with accompanying perinephric fascia and fat is observed.

2. *Exposure of the Adrenals:* The left adrenal gland is usually held in proximity to the superomedial surface of the left kidney by the perinephric fascia. Thus to expose the left adrenal, the left kidney is retracted downward and the fat lying superior and medial to the kidney is carefully cleaned away with long Russian tissue forceps until the yellowish orange color of the adrenal becomes apparent. The entire posterior surface of the adrenal is exposed as well as its peripheral outline.

In many instances the position of the right adrenal gland is not in accord with existing anatomical descriptions. Unlike the left adrenal the right adrenal gland may not be associated closely with the superomedial surface of the right kidney. Often the right adrenal gland lies higher than the upper pole of the kidney and its medial aspect partially covers the posterior surface of the inferior vena cava (Figure 3). It is also quite fixed in this position so that frequently it does not move down when the right kidney is pushed inferiorly. Occasionally the right adrenal will be adherent to the surface of the liver. Exposure of the right adrenal is accomplished in the same manner as described for the left gland. The important point to remember is that the right adrenal is usually much higher than the upper margin of the corresponding kidney and overlies the vena cava.

3. *Adrenalectomy:* Arterial vessels supplying the adrenal gland consist of a superior branch from the inferior phrenic, a middle branch from the aorta and an inferior branch from the renal artery; these arteries break up into a dozen or more fine branches before reaching the organ. Thus there are no large arteries entering the parenchyma of the gland<sup>4</sup>. The venous plexus of the left adrenal gland empties into a large vein which communicates with the left renal vein; the venous blood from the right suprarenal gland passes into a vein which drains directly

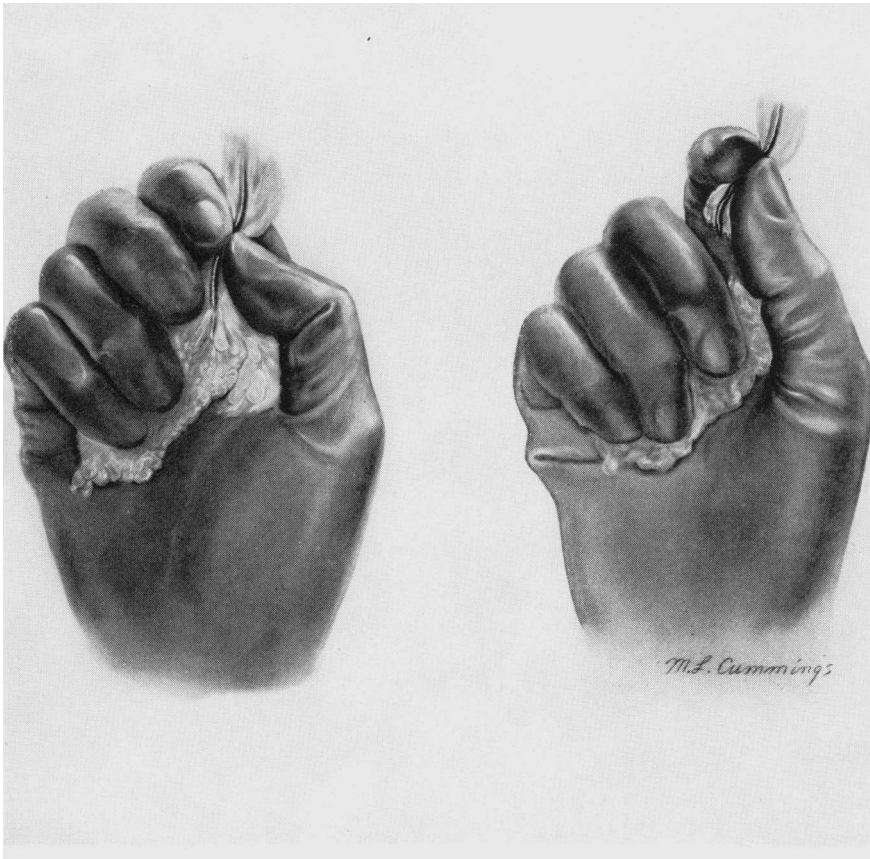


Figure 4. Technique of manipulative removal of adrenal gland. Note that the organ is held in the palm of the hand while the thumb and index finger are used to extract the vessel from the parenchyma.

into the inferior vena cava. Occasionally there are variations in the venous drainage of the right adrenal<sup>2</sup>.

Until recently our technique in removing the adrenal gland involved ligating the vessels with either thread or metal clips. At the present time the author removes the adrenal by simply manipulating the vessels free from the organ (after the gland has been exposed and the surrounding fat dissected away). Figure 4 demonstrates the technique. Note that the gland is held in the palm of the hand while the index finger and thumb are used in extracting the vessels from the parenchyma of the gland. Never pull the gland away from its vessels for this may result in a tear

in the vena cava. The maneuver is usually accomplished in several minutes after which a pack is placed in the wound for four minutes. During the period of packing the surgeon can step over to the other side and remove the opposite adrenal in the same fashion. On removing the packs the wounds will usually be found to be dry. Penrose drains are inserted into the suprarenal areas and the wounds closed in an appropriate fashion. The drains are usually left in situ for a period of seven days in order to avoid abscesses in patients prone to infection.

#### DISCUSSION

Fifteen patients have been subjected to adrenalectomy by the manipulative technique for such conditions as Cushing's syndrome, pheochromocytoma, primary aldosteronism, secondary aldosteronism, hypertension, mammary neoplasm and Kimmelstiel-Wilson's disease. Average operating time was one hour. Operative and immediate postoperative mortality was zero. The youngest patient was an infant three and one-half months old with primary aldosteronism<sup>6</sup>. In only one patient, our most recent, was it necessary to ligate the adrenal veins because of persistent hemorrhage; this individual with massive ascites had secondary aldosteronism associated with cirrhosis of the liver. It should be noted that the manipulative technique would not be used if abnormally large veins were encountered.

Although retroperitoneal pneumography has been made safe with the use of carbon dioxide as the gaseous medium, we have found this diagnostic procedure to be of little value in localizing most tumors of the adrenal. In the majority of cases it is necessary to expose both adrenals surgically and examine them. The simultaneous bilateral retroperitoneal approach permits exploration in a rapid safe manner—much safer than pneumography with gases other than CO<sub>2</sub>. Postoperative paralytic ileus is minimized since manipulation of the intestines is avoided by staying out of the peritoneal cavity. Thus the care of the patient is simplified because oral food and fluids can be started within 24-48 hours after operation.

The most common objection to the employment of the retroperitoneal approach is usually voiced in relation to aberrant pheochromocytoma. The advocates of the transperitoneal route state that they can explore both adrenal areas and the bifurcation of the aorta without changing the patient's position and making another incision. Actually it

is quite simple when using the retroperitoneal approach, to extend one of the incisions anteriorly in the form of a hockeystick and explore the entire retroperitoneal area. Of course, it will be necessary first to close the patient's incision over the opposite rib and turn him to the lateral decubitus position; but this requires little time and effort.

#### SUMMARY

A rapid, safe technique for unilateral or bilateral adrenalectomy is described. The technique employs a simultaneous bilateral retroperitoneal approach and a manipulative procedure for removing the adrenal glands.

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