

Chapter 5

Open Adrenalectomy

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Abstract Though laparoscopic adrenalectomy has become the gold standard for management of benign adrenal tumours, open adrenalectomy remains the standard of care for large tumours or tumours suspicious for malignancy. In this chapter we will detail the indications for open adrenalectomy. Preoperative considerations, particularly indicators of malignancy, will be discussed. A thorough description of open right and left adrenalectomy will be separately described, along with important post-operative considerations for patients undergoing open resection.

Keywords Open adrenalectomy • Adrenocortical cancer • Transperitoneal adrenalectomy

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Indications

Laparoscopic adrenalectomy has become the standard of care for the surgical management of functional and non-functional adrenal tumours [1, 2]; open adrenalectomy is utilized in the following situations:

1. Large adrenal tumours, usually over 10 cm in diameter [2].
2. Known, or high suspicion of adrenocortical carcinoma pre-operatively [3].
3. Conversion after laparoscopic inspection of an adrenal tumour and suspicion of malignancy intraoperatively. Such features include abnormally large tumour blood vessels, local invasion and tumour thrombus inside the adrenal vein [4].

Suspicion of adrenocortical carcinoma is raised with a number of clinical, biochemical, and radiographic findings summarized below.

Clinical	Pain, palpable mass, rapid growth, IVC compression or obstruction.
Biochemical	Mixed hormone secretion, virilizing hormone secretion, elevated levels of hormone precursors (i.e., DHEA).
Radiographic	Size >4–6 cm, > 10 Hounsfield units on non-contrast CT, < 50 % washout on contrast CT, irregular borders, lymphadenopathy, presence of calcification or necrosis, evidence of invasion, >3.4 SUV on PET-CT.

There are a number of approaches for open adrenalectomy including the retroperitoneal, thoracoabdominal and the anterior or lateral transperitoneal approach. In our unit, we favour the lateral transperitoneal approach (Fig. 5.1).

Preoperative Preparation

Pre-operative workup is essential to diagnose a functional adrenal tumor. The common syndromes that require evaluation are Conn's syndrome, pheochromocytoma, Cushing's



FIGURE 5.1 The patient is placed in the lateral position. The operating table is then broken to maximize the space between the costal margin and the iliac crest. The bean bag is then aspirated to firmness to secure the patient in place

syndrome, and functional adrenocortical carcinoma, which usually has Cushing-virilizing features. Open adrenalectomy is usually reserved for large pheochromocytomas or functional and non-functional adrenocortical carcinomas [5, 6].

A full preoperative workup for hyperaldosteronism, Cushing's syndrome and pheochromocytoma is reviewed in detail by Young [5] and Sidhu et al. [7].

At induction, patients should have DVT prophylaxis with subcutaneous fractioned heparin or equivalent, pneumatic calf compressors as well as an indwelling bladder catheter and a nasogastric tube.

Positioning

The patient is placed in the lateral position with the operating table placed in maximal flexion to accentuate the space between the costal margin and the iliac crest. A bean bag is

useful to secure the patient in position and appropriate strapping is provided (Fig. 5.1).

Description of Procedure

Right Sided Adrenalectomy

The costal margin is palpated and a subcostal incision two fingerbreadths below the costal margin is performed from the mid-clavicular line medially to the mid-axillary line posteriorly. This incision can be extended down to the midline anteriorly if required. The skin and underlying fat along this line are incised. The external oblique, internal oblique and transverse abdominal muscles are divided using cautery. The peritoneum is then entered sharply exposing the peritoneal cavity. At this point, full palpation of the peritoneal cavity is required to exclude metastatic disease.

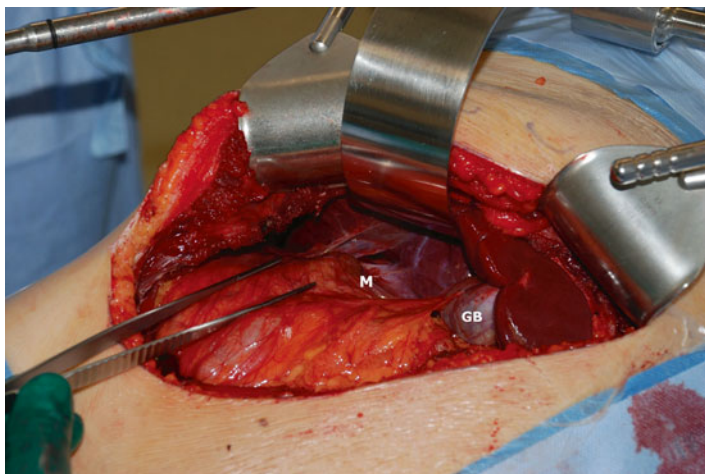


FIGURE 5.2 A subcostal incision is made, the muscle layer is divided and the peritoneal cavity entered. The triangular ligament is divided, the liver retracted superiorly and the peritoneum of the hepatorenal pouch is divided to gain access to the upper border of the adrenal tumor (*M*). *GB* gallbladder

The hepatic flexure of the colon is mobilized and retracted inferiorly. The duodenum can then be Kocherized to allow better access to the IVC. The liver is mobilized medially and superiorly by dividing the right triangular ligament (Fig. 5.2). Morrison's pouch is then entered by incising the peritoneum below the liver and overlying the adrenal gland. The superior margin of the adrenal tumor is identified. The lower margin of the tumor and the renal vein are identified inferiorly (Fig. 5.3). Medial to the tumor, the IVC can then be identified by a combination of sharp and blunt dissection after incising the overlying peritoneum. We aim to triangulate the dissection onto the adrenal vein from below and above (Fig. 5.4). With the patient in the lateral position, the adrenal vein is encountered as the IVC is passing under the liver. Once the adrenal vein is secured, the tumor is lifted off from the retroperitoneum and the feeding arteries, which

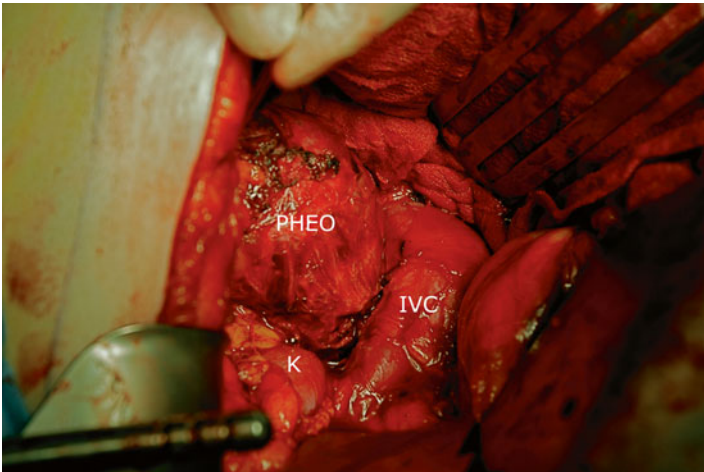


FIGURE. 5.3 Open adrenalectomy for a right sided adrenal pheochromocytoma. Dissection is carried out along the lateral margin of the IVC, triangulating from above and below to encounter the adrenal vein (not shown). *PHEO* pheochromocytoma, *K* kidney, *IVC* inferior vena cava

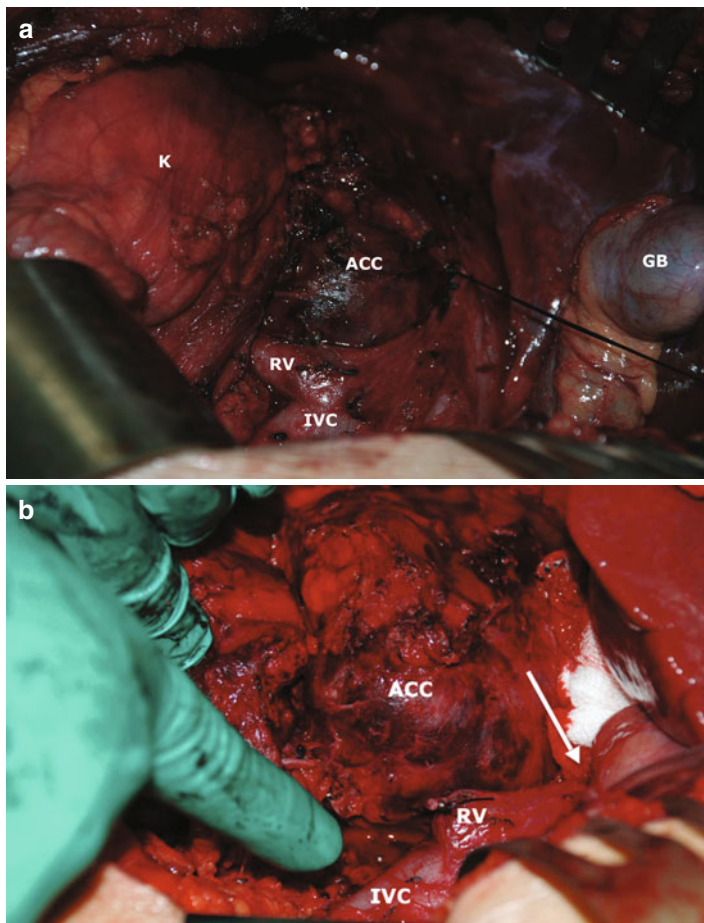


FIGURE 5.4 Open adrenalectomy for a large ACC invading the right kidney. (a) Right renal vein is identified below the inferior margin of the tumor. (b) The renal vein has been divided. The *arrow* shows the putative position of the right adrenal vein. ACC adrenal tumor, RV renal vein, IVC inferior vena cava, K kidney, GB gallbladder

arise from the inferior phrenic, the aorta and the renal arteries are ligated and divided with a thermal sealing device.

Left Sided Adrenalectomy

Open adrenalectomy on the left side is completely different to surgery of the right side. A subcostal incision is performed in a similar way with the patient in the right lateral position. The peritoneal cavity is entered and explored. Attention is directed to the splenic flexure of the colon, which should be mobilized along the line of Toldt (Fig. 5.5). The lienorenal ligament is then divided and the spleen and tail of the pancreas are rotated medially (Fig. 5.6). The adrenal tumor can then be inspected and the renal vein is identified on its inferomedial aspect. The adrenal vein is then identified as it

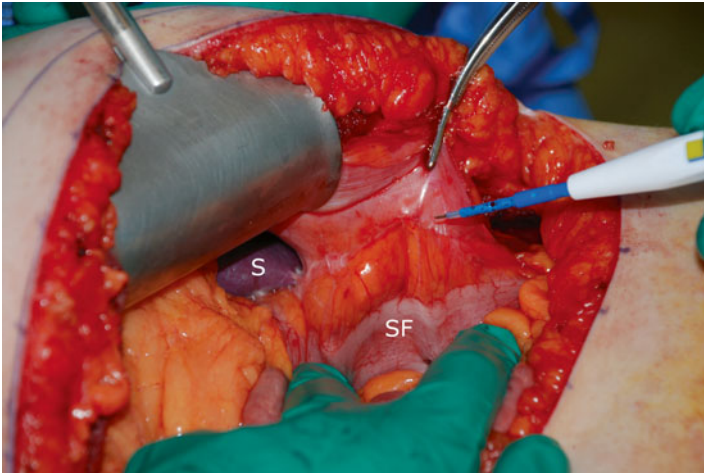


FIGURE 5.5 Open adrenalectomy for a left 4 cm ACC. The splenic flexure of the colon is mobilized to expose the spleen, which is then medialized by dividing the lienorenal ligament. *S* spleen, *SF* splenic flexure

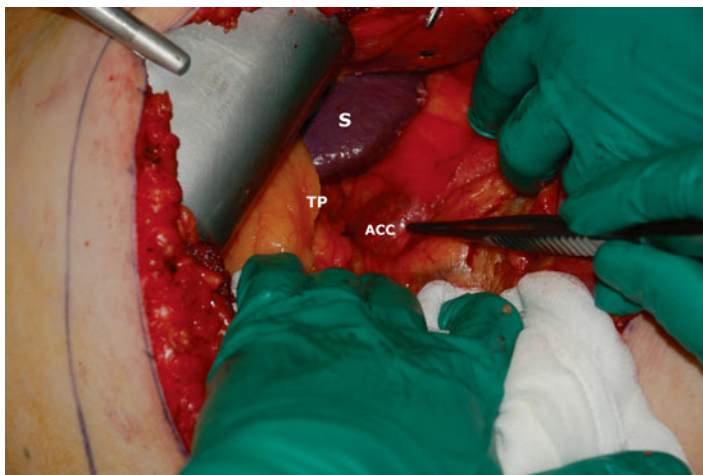


FIGURE 5.6 The spleen and the tail of the pancreas have been medialized to expose the adrenal gland. *S* spleen, *ACC* adrenal tumor, *TP* tail of pancreas

enters the left renal vein; it is often joined by the inferior phrenic vein prior to this point (Fig. 5.7). The adrenal vein is ligated and divided. The tumor is then lifted off from the retroperitoneum and any feeding vessels are ligated and divided.

The use of drains is optional. The muscle layer is closed using a running non-absorbable suture. Skin is then sutured using an absorbable subcuticular stitch.

Postoperative Care

Patients should be observed closely for signs of bleeding and blood pressure should be monitored frequently. Signs of adrenal insufficiency should be addressed immediately especially in patients with Cushing's syndrome. Electrolyte values are checked daily. Patients with Cushing's syndrome should be placed on IV steroids until able to take them orally. The urinary catheter can usually be removed on the first postop-

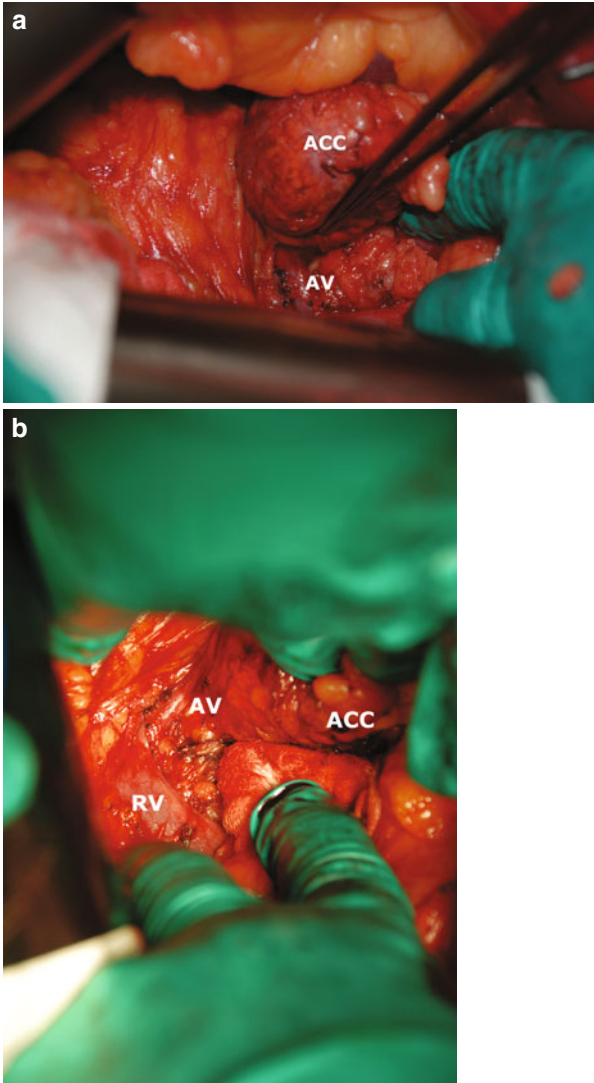


FIGURE 5.7 (a) The left adrenal vein is encountered on the inferomedial aspect of the gland. (b) The left renal vein is identified; the adrenal vein is shown here draining into the left renal vein. AV adrenal vein, ACC adrenal tumor, RV renal vein

erative day as well as the nasogastric tube. Diet is recommenced once peristalsis is re-established. Patients are usually able to leave the hospital after the fifth postoperative day.

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