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Mini review

# Section 3. Adrenal Overview

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**Abstract**

Adrenalectomy is ideally suited to minimally invasive surgery. The adrenal glands can be approached endoscopically using either transperitoneal or retroperitoneal access. The transabdominal lateral approach is more direct, allows the gravity-facilitated exposure of the adrenals and results in less dissection than does the anterior approach. The transabdominal lateral approach is currently the most widely practiced approach since it provides a wide operative field and direct access to the blood vessels. 

*Keywords:* Adrenalectomy; Transperitoneal access; Retroperitoneal access; Laparoscopic adrenalectomy

## 1. Introduction

Since the 1980s, minimally invasive surgical techniques have attracted interest in all surgical specialties. During the last 10 years, laparoscopic surgery has begun to replace conventional open surgical techniques for abdominal and thoracic surgery. The adrenal gland appears to be ideally suited for a laparoscopic approach because of its small size, low incidence of malignant tumors, and the associated morbidity from conventional operative approach. Therefore, a laparoscopic approach can rapidly become the gold standard for adrenalectomy. The future of endocrine surgery is obviously implicated in the historical evolution toward minimal access and is dependent on the association of laparoscopic and endocrine surgeons. While endocrine surgery remains in the field of specialized surgeons, endocrine surgeons may not obtain basic endoscopic skills. As surgeons and actors of progress in the medical field, endocrine surgeons must develop their imagination and combine special skills for endoscopy with specialized endocrine procedures.

## 2. Laparoscopic adrenalectomy

Conventional methods for removing adrenal glands have included the transabdominal approach, the posterior approach through the bed of the 12th rib, and the lateral or transthoracic approach. Each procedure has distinct advantages and disadvantages. The transabdominal approach enables a thorough exploration of the abdomen, and allows the surgeon to remove both adrenal glands, but it also has the associated morbidity of a major laparotomy. The posterior approach is less traumatic, but the limited exposure is inadequate for a first approach to the adrenal veins and for removing large tumors. The transthoracic approach provides the most direct and widest exposure to the adrenal gland, but its morbidity is high, related to the thoracic approach. All of these disadvantages of conventional open surgery explain the rising popularity of laparoscopy.

Since the first laparoscopic adrenalectomy was performed in 1992 [1], this approach has been adopted world

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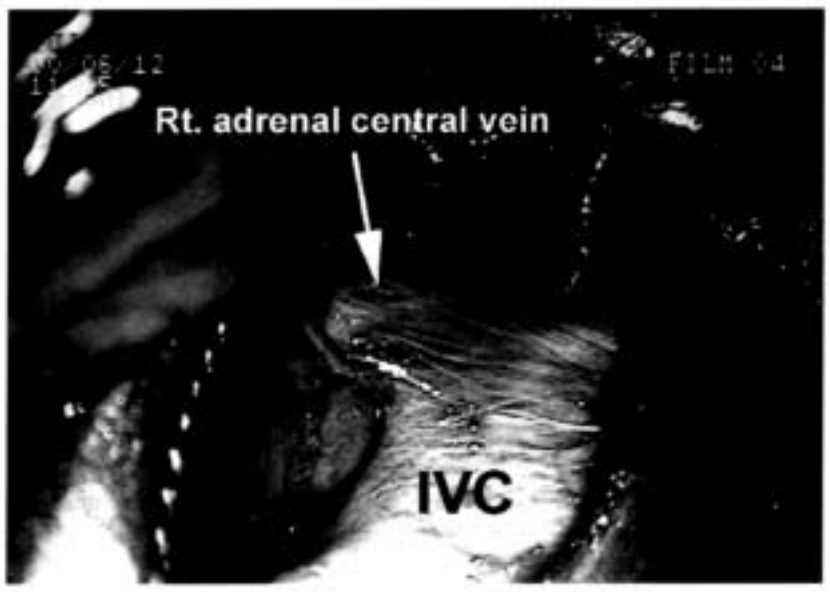


Fig. 1. The right adrenal central vein can be identified.

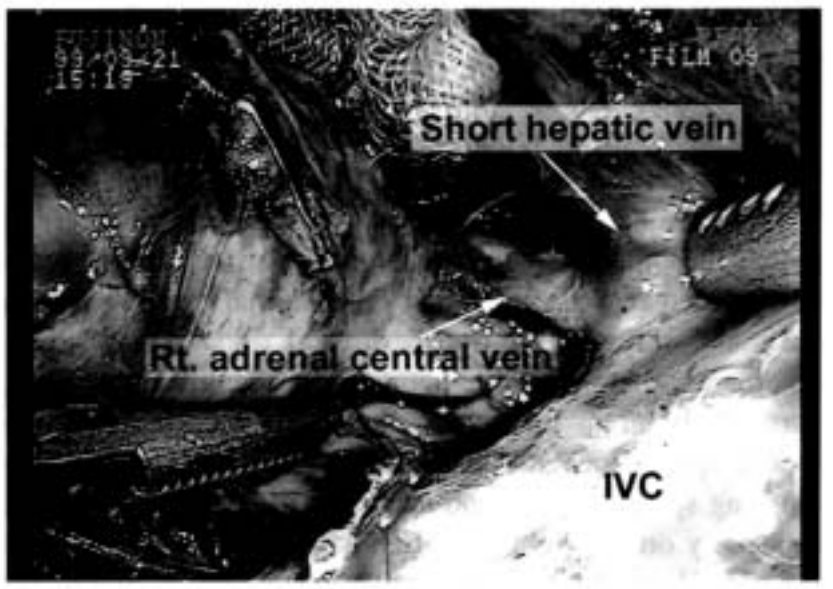


Fig. 2. The right adrenal central vein is sometimes branched from the short hepatic vein.

wide, and the benefits of minimally invasive surgery are allowing laparoscopic adrenalectomy to rapidly replace open adrenalectomy as the standard of care for adrenal tumors.

### 2.1. Transabdominal approach

Under general anesthesia, patients are placed in the lateral decubitus position with the affected side. When the tumor is in the right adrenal gland, four trocars are placed to perform right adrenalectomy with 10–12 mmHg carbon dioxide insufflation. The vena cava was used as a major landmark to begin the dissection, and it leads to the gland easily. The gland itself does not have to be dissected but only its vascular landmarks showing the limits of the dissection field. Immediate control of the adrenal central vein allows safe dissection of the gland (Fig. 1). The right adrenal central vein is sometimes branched from the short hepatic vein (Fig. 2). When the tumor is located in the left adrenal gland, three trocars are inserted to perform left adrenalectomy. The key to success is to start the procedure by dissecting the splenoparietal ligament with coagulating scissors close to the diaphragm, far enough to visualize the greater curvature of the stomach and the left crus. Then the left adrenal gland and the left adrenal central vein can be identified (Fig. 3).

### 2.2. Retroperitoneal approach

Under general anesthesia, the patient is mainly in a lateral position. The initial dissection to the retropneumoperitoneal space is carried out under direct control with a finger or using a dilated balloon. It creates a cavity that can be progressively enlarged by smooth dissection after insertion of the operative ports. The operative pressure of the pneumoperitoneum ranges between 12 and 20 mmHg. The main suggested advantage of this approach is that it allows adrenal removal in a patient with potential major intra-abdominal adhesions related to previous surgery. However, orientation during retroperitoneal surgery is difficult because there are few anatomical landmarks. To aid operation, gerota's fasia can be opened to identify the position of the kidney. Dissection is then performed up to the upper pole of the kidney, when the adrenal gland comes into view. During this procedure, care should be taken to avoid rupture of the peritoneum. When the tumor is in the right adrenal gland, the dissection is initiated along the avascular anterior surface and lateral rim of the gland to the upper pole. The gland is dissected from the upper pole of the kidney, dissection being continued medially and superiorly until the inferior vena cava and right adrenal vein are identified. The adrenal vein is clipped and transected. When the tumor is in the left adrenal gland, the main difference is the dissection of the adrenal vein, which lies inferiorly and medial to the upper pole of the kidney.


Fig. 3. The left adrenal gland and the left adrenal central vein can be identified.

## 3. Transperitoneal approach or retroperitoneal endoscopic approach

The lateral transabdominal approach is currently the most widely practiced route since it provides the best overall view of the adrenal gland and surrounding structures, and allows the appropriate movement of the instruments. Access to the blood vessels, particularly the adrenal central veins, is easy and direct. The transperitoneal approach provides landmarks that help the surgeon to localize the gland, particularly on the left side in obese patients. The retroperitoneal space does not provide the same landmarks, the working space is small and access to the vein is not direct, especially on the right side. Endoscopic maneuvers can be limited. However, the retroperitoneal approach minimizes the amount of dissection and allows more direct access without interference from the intra-abdominal organs [2-5].

## 4. Indication for laparoscopic adrenalectomy

The best laparoscopic indications are for Conn's adenomas [6,7], benign Cushing's tumor [8], and virilizing tumors. These tumors are usually small and easy to dissect. Although several studies have shown that laparoscopic resection of pheochromocytomas can be undertaken safely without specific complications, their potential intraoperative problems are greater. Moreover, few studies have examined the hemodynamic consequences of pneumoperitoneum. Pneumoperitoneum causes an elevation in intra-abdominal pressure and induces hemodynamic changes, which might be aggravated in patients with a pheochromocytoma. Carbon dioxide insufflation may cause respiratory acidosis and hypercapnia, acute hypercapnia increasing the plasma catecholamine level in experimental animals [9]. Then, more experience is required to make clear when this should be the preferred approach.

## 5. Conclusion

Endoscopic adrenalectomy has now become the gold standard, numerous retrospective studies having compared endoscopic with open adrenalectomy. These have shown that endoscopic procedures are associated with less postoperative discomfort, a decreased hospital stay, less postoperative disability and a lower rate of complications.

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