

# Laparoscopic adrenalectomy: 10 years experience

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## Abstract

**Purpose:** Laparoscopic adrenalectomy is considered the standard technique for the surgical removal of the adrenal gland. Shorter length of stay, decrease in postoperative pain and reduced complication are all the advantages of the laparoscopic approach. This report is about a 10-year single experience with laparoscopic adrenalectomy.

**Materials and Methods:** A total of 34 lateral transperitoneal laparoscopic adrenalectomies were performed. 24 right-sided lesions and 10 left-sided lesions were removed. The indications for surgery were aldosteronoma in 20 patients and nonfunctioning adenoma in 10 patients, and 1 child underwent bilateral adrenalectomy for bilateral adrenal hyperplasia.

**Results:** All except one had successful laparoscopic adrenalectomy. Complication occurred in one patient who required open conversion because of bleeding. In addition, one patient suffered a pancreatic injury where the patient was managed conservatively. The average operative time was 2 hours and 30 minutes and the hospital stay was 2.5 days.

**Conclusion:** Laparoscopic adrenalectomy is technically feasible and reproducible. Lateral transperitoneal approach offers advantages including better visibility and easy access to other organ systems. There is always a learning curve for the urological laparoscopy.

**Key Words:** Adrenal adenoma, adrenalectomy, laparoscopy

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## INTRODUCTION

Laparoscopic adrenalectomy has become the standard technique for the surgical removal of the adrenal gland at many centers worldwide.<sup>[1]</sup> The surgical approach to the adrenal gland requires a large flank incision, causing morbidity particularly in patients with morbid obesity.

Advanced laparoscopy has played a significant role in the urologic practice in the 21<sup>st</sup> century.

Many reports followed confirming the advantages of laparoscopic adrenalectomy over open adrenalectomy: Laparoscopy offers a shorter length of stay (LOS), a decrease in postoperative pain, faster return to preoperative activity level, improved cosmesis, and reduced morbidity.<sup>[2,3]</sup>

A wide range of potential indications for laparoscopic removal of adrenal gland have been identified. Functional adrenal tumors, including aldosteronoma, glucocorticoid- and androgen/estrogen-producing adenoma, and small to moderate size solitary pheochromocytomas are amenable to laparoscopic adrenalectomy [Figures 1 and 2].

Several laparoscopic approaches have been described. Amongst these are the lateral transabdominal, anterior transabdominal, and lateral retroperitoneal and posterior retroperitoneal approaches. Each approach has specific advantages and disadvantages.<sup>[4]</sup> The surgeon chooses the approach that

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**Figure 1:** CT scan showing 6 cm lobulated right adrenal mass

would enable him/her to perform laparoscopic adrenalectomy successfully with minimal morbidity.

We present our series of patients undergoing laparoscopic adrenalectomy via a transperitoneal approach. Operative parameters, including operative time, estimated blood loss, LOS, open conversion and complication, were analyzed.

## MATERIALS AND METHODS

Between 1999 and 2010, 34 lateral transperitoneal laparoscopic adrenalectomies were performed by a single laparoscopic endourologist. A total of 24 right-sided lesions and 10 left-sided lesions were removed. The indications for surgery were aldosteronoma in 20 patients, nonfunctioning adenoma in 10, and 1 child underwent bilateral adrenalectomy for bilateral adrenal hyperplasia.

Intraoperative parameters analyzed included operative time, estimated blood loss, complications, and conversion rate.

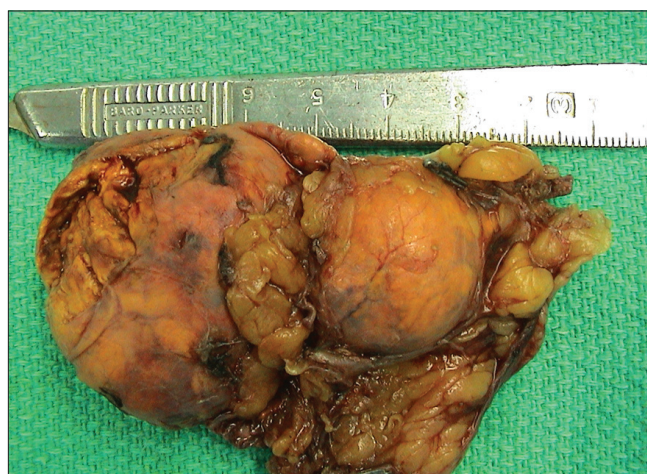
The postoperative parameters analyzed were LOS, time to oral intake, postoperative convalescence, return to work, and complications.

### Operative technique

#### *Right transperitoneal adrenalectomy*

The lateral transperitoneal approach has been adapted to the adrenal gland. All patients have a complete preoperative endocrine evaluation, including adrenal vein sampling when appropriate and imaging studies of the adrenal glands. A clear liquid diet and a mechanical bowel preparation are administered the day before surgery.

Patients are placed in the semilateral decubitus position [Figure 3]. The umbilical region is placed over the break in the operating table; the table is flexed. An axillary roll protects the dependent brachial plexus. The arms are secured using a neuro



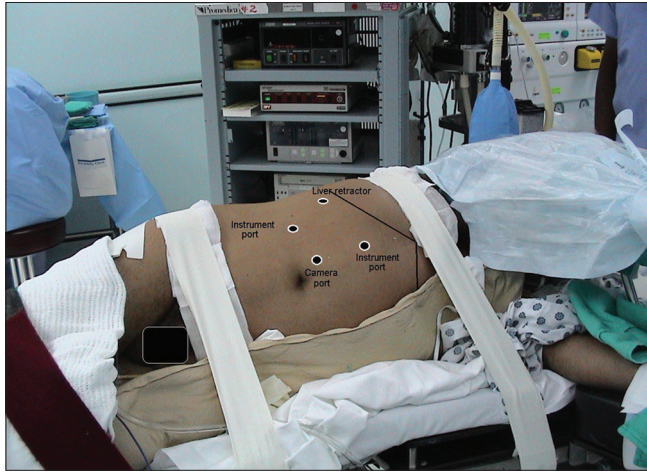
**Figure 2:** Gross specimen of the 6 cm adrenal mass removed laparoscopically

arm board. Patients are secured to the table using a 3-inch cloth tape across the shoulders and hip. The table is rolled to achieve a near-supine position for entry into the abdomen. An open technique with Hassan Trocar is employed. The peritoneal space is insufflated to 15 mm Hg using CO<sub>2</sub>, 5-mm trocar is then placed at the lateral border of the rectus, just cephalad to the umbilicus. The patient is rolled to a full flank position. A total of four trocars are needed with the right-sided intraperitoneal approach in order to facilitate liver retraction after mobilization; a 10-mm trocar is placed in the midclavicular line just caudad to the umbilicus and a 10-mm trocar is placed just under the xiphoid process in the midline [Figures 3 and 4].

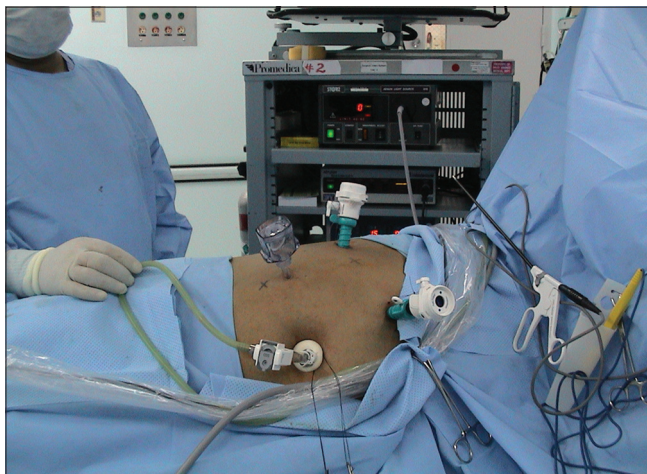
The liver is retracted anteriorly, and the posterior peritoneum is incised high along the undersurface of the liver. The remainder of the triangular ligament and the anterior and posterior coronary ligaments are incised to release the right lobe of the liver from the diaphragm, exposing the bare area of the liver. Mobilization of the liver proceeds in a lateral to medial direction until the vena cava is identified. The second portion of the duodenum is mobilized medially to expose the renal hilum. Dissection along the anterior wall of the vena cava in a cephalad direction will release the right lobe of the liver. The accessory hepatic veins are identified and preserved. Meticulous dissection along the lateral vena cava will allow identification of the right adrenal vein. Once the vein is isolated, two or three hemoclips are applied on the caval side and one or two hemoclips on the adrenal side of the vein. The adrenal vein is sharply divided between the clips, releasing the medial aspect of the adrenal gland away from the vena cava. The dissection is continued along the medial aspect of the gland; this facilitates identification and control of the inferior vascular pedicle arising from the right renal hilum. The lateral attachment is the last to be released. These attachments will serve to support the gland in a lateral and cephalic position.

*Left transperitoneal adrenalectomy*

Laparoscopic dissection of the left adrenal gland requires two 5-mm trocars and one 10-mm trocar [Figure 5]. One 10-mm



**Figure 3:** Position and trocar placement for laparoscopic right adrenalectomy



**Figure 4:** Trocars' placement for laparoscopic right adrenalectomy (2)



**Figure 5:** Position and trocar placement for laparoscopic left adrenalectomy

trocar for the camera is placed at the lateral border of the rectus just cephalad to the umbilicus. An additional 5-mm trocar port is placed in the midline just below the xiphoid process. A 10-mm trocar is then placed in the midclavicular line just cephalad to the umbilicus.

The spleen, splenic flexure, descending colon, and tail of the pancreas require extensive mobilization to view the left adrenal gland. The splenic flexure and spleen are mobilized as a single unit. All splenic attachment to Gerota's fascia, the abdominal sidewall and the diaphragm are released using the Harmonic Scalpel. The lateral splenic attachment is incised up to the level of the gastric fundus. The plane between the tail of the pancreas and Gerota's fascia should be developed for the pancreas to fall away with the spleen.

As on the right side, dissecting and releasing the avascular lateral attachment of the adrenal gland should be saved for the last. Preserving the lateral adrenal attachment will facilitate dissection of the medial aspect of the gland. Working from the top of the adrenal gland, the dissection is carried along its medial border, controlling the small arterial branches coming from the aorta with either the Harmonic Scalpel or clips. After release of all medial attachments, the adrenal vein can usually be identified as it joins the left renal vein. Right-angle or large straight clips are used to assure hemostasis before the left adrenal vein is divided. The Harmonic Scalpel can then be used to facilitate the dissection and hemostatic division of numerous arterial and venous vessels found along the perimeter of the adrenal gland.

**RESULTS**

Laparoscopic adrenalectomy was completed in 33 of 34 adrenal specimens. One patient required conversion to open surgery; the adrenal vein was torn at its junction with the inferior vena cava, necessitating laparotomy.

Complication in the laparoscopic series occurred in the one patient who required open conversion; in two cases, partial avulsion of the adrenal vein occurred and these patients were managed laparoscopically. In addition, one patient suffered pancreatic injury.

The median operative time was 2 hours and 30 minutes, blood loss ranged from 100 to 250 ml and none of the patients required blood transfusion. The hospital stay and convalescence period were also significantly shorter; hospital stay ranged from 1 to 5 days with a median of 2.5 days. The morphine equivalent requirement, as expected, was significantly less in the laparoscopic adrenalectomy patients.

**DISCUSSION**

Introduction of laparoscopic adrenalectomy has radically

changed the surgical approach to the adrenal gland. As has been reported, exposure of the adrenal gland and control of its friable parenchyma and abundant vascularity is what has made laparoscopy so advantageous in our approach to adrenal gland. The literature review and data analysis provided objective evidence that minimally invasive techniques compare favorably with traditional open surgery in terms of safety, efficacy, patient outcome, reproducibility, and complications.<sup>[5-9]</sup>

A variety of laparoscopic approaches to the adrenal gland have been described. The lateral transperitoneal technique offers distinct advantages to the laparoscopist, including improved visibility of familiar anatomic landmarks, easy access to other organ systems, the use of gravity to retract the spleen and liver, a wide exposure, and a position that permits the natural application of innovations such as the hand-assisted technique.

Retroperitoneal laparoscopy confers several advantages for the experienced retroperitoneoscopic surgeon, including reduced risk of visceral injury, fewer postoperative intestinal complications, and optimal exposure in patients with intra-abdominal adhesions secondary to previous surgery.<sup>[10]</sup>

Several reports reveal significant advantages for the laparoscopic approach with regard to patient's satisfaction and comfort, hospital stay, and return to normal daily activities.<sup>[11-14]</sup>

The laparoscopic adrenalectomy can be employed in most patients with adrenal pathology, including cortisol-producing adenomas, aldosterone-producing adenomas, and pheochromocytomas.

## CONCLUSION

The benefits of laparoscopic surgery in the preoperative and postoperative periods are well established and have been widely reported. Laparoscopic adrenalectomy, in particular, represents a true success of the application of minimally invasive techniques in extirpative surgery. Compared with the established standard treatment option of surgery for adrenal

pathology, this relatively novel alternative is now viewed at many centers as at least equivalent in terms of efficacy and patient safety. At centers such as ours where our experience continues to grow, laparoscopic adrenalectomy is considered superior to open adrenalectomy for the most extirpative adrenal surgery.

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