

Factors Predicting Success of Laparoscopic Adrenalectomy: Our Experience

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ABSTRACT

Introduction: Adrenal is one of the most feared organs owing to its anatomical position. However, adrenalectomy by laparoscopic means has now been adopted as the procedure of choice to treat benign and malignant functioning and nonfunctioning adrenal tumors. We describe our experience with laparoscopic adrenalectomy (LA) in 37 patients at a tertiary institute and try to predict factors for open conversion.

Materials and methods: Thirty-seven patients who underwent LA from August 2013 to February 2018 were retrospectively analyzed and factors leading to conversion to open adrenalectomy assessed.

Results: Among 37 patients, 31 had pheochromocytoma on histopathology and 1 patient had adrenal hyperplasia leading to Cushing's syndrome. Five out of 37 patients had to be converted to open technique—multiple adhesions with the bowel, retrocaval tumor extensions, difficult dissection, and prolonged operative time due to large tumor size (in two patients) and severe hepatomegaly were the reasons for conversion to open.

Conclusion: Laparoscopic adrenalectomy is safe and feasible for large adrenal lesions.

Keywords: Adrenalectomy, Laparoscopic, Success.

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INTRODUCTION

Adrenalectomy is often performed by surgeons with an interest or training in endocrine surgery. Adrenal is one of the most feared organs because of its deep retroperitoneal location and close relation to vital structures. Adrenalectomy by laparoscopic means is one of the successful applications of minimally invasive surgical techniques. It has now been adopted as the procedure of choice to treat benign and malignant functioning and nonfunctioning adrenal tumors.¹ Adrenalectomy was initially done by open surgery when Sargent performed the first planned adrenalectomy in 1914.² However, laparoscopic adrenalectomy (LA) is now being done also for hypervascular tumors and large benign and malignant adrenal tumors.³

We report our experience in 37 patients who underwent LA and the factors which affected their conversion to open in 5 cases.

MATERIALS AND METHODS

Thirty-seven patients who underwent LA from August 2013 to February 2018 were retrospectively analyzed based on age, sex, and detailed history which would suggest a syndromic association or past history of abdominal surgery. The weight and height of patients were taken to calculate the body mass index (BMI).

The department of endocrinology at our institute primarily evaluated these patients. Depending on the suspected pathology, an appropriate hormonal workup was done and patients with functional as well as nonfunctional tumors were referred to us for surgical management. The ones with functional tumors like pheochromocytoma and Cushing's syndrome were stabilized preoperatively.

All patients underwent contrast-enhanced computerized tomography (CECT) and/or magnetic resonance imaging (MRI) for delineating the size of the gland, relation with inferior vena

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cava (IVC) on the right side, the renal vein on the left side, and the presence or absence of lymph nodes.

The success of laparoscopic surgery was defined as completion of the entire surgery by laparoscopic means. If, at any point during the surgery, there occurred a difficulty or a complication that was not manageable laparoscopically, the patient was converted to open surgery.

Patients with suspicion of malignancy, tumor invasion of adjacent organs, and patients who were high risk due to cardiopulmonary disease were excluded from the study.

All specimens, after extraction, were sent for a histopathology examination.

Technique

All patients were operated on under general anesthesia and a lateral transabdominal flank approach was used with an intra-abdominal pressure of 12 mm Hg. Wherever necessary hemostasis was achieved using bipolar coagulation, Harmonic scalpel, Ligaclips, Hem-o-lok clips.

Right Adrenalectomy

(Fig. 1) Four ports were used normally. Three ports of 10 mm (1 for 30 degree scope and 2 as working ports) each were placed along the right costal margin and one 5 mm port at the xiphisternum for liver retraction. An additional 5 mm fifth port would be inserted for liver retraction if required, in the right anterior axillary line.

The triangular ligament was first cut and the peritoneum was incised along with the liver as far as the diaphragm so that the right lobe of the liver falls away medially. The plane was created between liver and adrenal and dissection proceeded medially reaching the adrenal vein.

After complete dissection of the vein, it was cut between clips. The gland was then dissected free using a hook with monopolar coagulating current and delivered after placement in endobag. The specimen was extracted via a 10 mm port, by enlarging the incision. The port sites were closed using the standard technique.

Left Adrenalectomy

Port placement on the left side was similar to the right. Four ports were used.

The peritoneum was incised along the White Line of Toldt in a "T" shaped manner.

The two horizontal limbs of T extended from colon caudally to splenocolic ligament in the cephalad direction till the greater curvature of the stomach was visible.

This allowed complete retraction of the spleen and the colon by positional gravity and exposed the kidney enveloped in the Gerota's fascia. The vertical limb of "T" was the line of dissection between the tumor and spleen. Dissection was done at the site of the renal hilum, for identification of the adrenal vein, which was clipped and divided. The adrenal gland was then dissected free from the surrounding structures and delivered in a retrieval bag.

RESULTS

The demographic details and patient characteristics have been summed up in Table 1. Out of 37 patients, 32 were evaluated and found to have functional tumors. Eventually, 31 of them had pheochromocytoma on histopathology and 1 patient had adrenal hyperplasia leading to Cushing's syndrome. One patient had sudden cardiovascular collapse at the time of induction but was resuscitated on time and the patient went on with the surgery successfully. Most

of the patients had intraoperative fluctuations of blood pressure which was managed successfully by an anesthetist. These patients eventually had pheochromocytomas on histology. The patient who was pregnant had intraoperative accelerated hypertension with a maximum recording of 230/110 mm Hg, managed by inj. nitroprusside and nitroglycerine (NTG) drip.

Five out of 37 patients had to be converted to the open technique. One of them had multiple adhesions with the bowel because of past abdominal surgery for duodenal perforation which made the separation of bowel difficult. One patient had retrocaval tumor extensions and was densely adherent to IVC and liver with a size of 8.5 × 7 cm. It eventually turned out to be adrenocortical carcinoma. Two patients were converted to open because of the difficulty in dissection and prolonged operative time due to large tumor size. One of the patients had severe hepatomegaly. Despite adding a fifth retraction port, separation of tumor from the liver bed was difficult, so the decision was taken to proceed with open surgery. The characteristics of patients converted to open along with reasons for the same have been summed up in Table 2.

DISCUSSION

Studies have suggested that large tumors are not a contraindication for LA, but some authors do not approve laparoscopic approach for large tumors because of increased risk of malignancy, especially in tumors with infiltration to surrounding structures on computerized tomography (CT), which may even lead to peritoneal dissemination

Table 1: Patients' characteristics

Total patients	37
Mean age in years (range)	46 (27–65)
Sex	Male—15 (40.54%) Females—22 (59.45%)
Average BMI in kg/m ² (range)	
Side	Right—16 (43.24%) Left—20 (54.05%) B/L—1 (2.7%)
Any significant history	1 female—5 months pregnant 1 male—past history of abdominal surgery for duodenal perforation
Mean size in cm (range)	6.05 cm (2.5–9.6 cm)
Functional tumors	32 (31 pheochromocytomas and 1 patient of Cushing's disease)
Final histopathology	Nonfunctioning adenomas—4 Pheochromocytoma—31 Adrenocortical carcinoma—1 Adrenal hyperplasia—1

Table 2: Reasons for conversion to open adrenalectomy

No. of patients converted to open	Reason for conversion
1	Hepatomegaly in a right-sided tumor
1	Adherent to kidney, liver, and retrocaval extension—eventually malignant
2	Large tumor size
1	Past abdominal surgery leads to adhesions with bowel

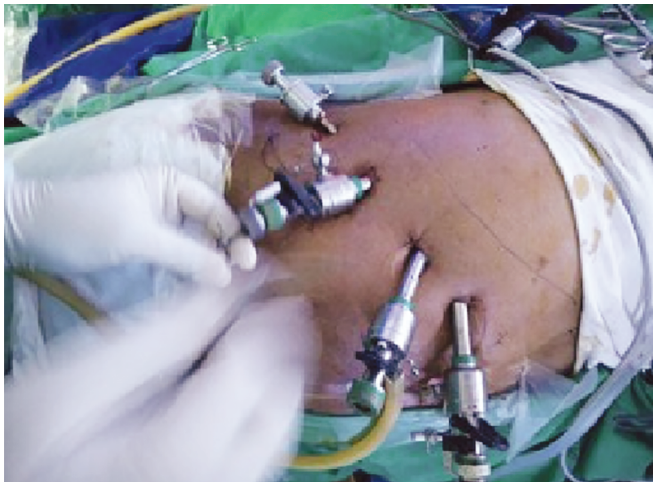


Fig. 1: Port placement for right adrenalectomy

or port site recurrence.⁴⁻⁷ In the present study, the laparoscopic approach was adopted in all patients with adrenal tumors regardless of tumor size. Two patients were converted to open adrenalectomy because of large tumor size.

However, the size of the tumor can be regarded as the most important factor for conversion.⁸

In recent literature, contraindications for LA are invasive adrenocortical carcinoma, large tumor >10–12 cm in diameter, and malignant adrenocorticotrophic hormone (ACTH) secreting pheochromocytoma with lymphadenopathy and adrenocortical carcinoma with caval thrombus.⁹ Patients with malignancy or suspicion of malignancy were not included in the study.

One patient in our study underwent bilateral LA for adrenal hyperplasia because of ectopic ACTH secreting adenoma in the lung. Here, the laparoscopic approach is much preferred when compared with the open approach, as bilateral laparoscopic adrenal surgery leads to much less tissue injury in immunocompromised patients with a risk of delayed wound healing. It also enables better visibility of the surgical field because of an additional advantage of magnification, thus decreasing the risk for retained remnants and adrenal rest tissue.¹⁰

Right adrenal gland—more retrocaval and a shorter adrenal vein than left adrenal gland, so right side is a more challenging and time-consuming procedure than left-sided adrenalectomy.¹¹ However, Po-Hui Chiang et al. did not find any difference in conversion rates based on the laterality of tumors.¹²

Prior abdominal surgery¹³ leads to prolonged operating times, increased technical difficulty, increased risk in initial entry into the abdominal cavity, and increased chances of causing injury to the surrounding organs. Morris et al. showed a trend for longer operative times in patients with previous surgery; however, the difference was not significant.¹⁴

Pheochromocytomas, being larger and more vascular when compared with other adrenal neoplasms, are a challenge to resect and lead to more complications, longer operative times, and more conversions to open procedure.¹⁵

Zografos et al., in their study, have linked obesity with a higher incidence of conversions because of difficult cannula placement, excessive intraperitoneal fat obscuring the anatomy, excessively thick abdominal wall causing difficulties in the manipulation of instruments, thereby leading to longer operating times.¹⁶

CONCLUSION

Laparoscopic adrenalectomy can be adopted even for large adrenal lesions and is safe and feasible. The laparoscopic attempt should be given even for large and malignant adrenal tumors; however, conversion to open surgery should not be delayed to avoid an adverse outcome.

There is an increased risk of conversion to open surgery in patients with:

- Large tumors (≥ 5 cm), (size—most important).
- Malignancy.

- Right-sided tumors.
- History of past abdominal surgery.

This information can help in appropriate counseling and taking of preoperative consent of candidates for LA.

Laparoscopic adrenalectomy can also be carried out safely in a pregnant woman without harm to the fetus.

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