

Original Research Article

SINGLE CENTRE EXPERIENCE WITH LAPAROSCOPIC ADRENALECTOMY FOR ADRENAL TUMORS

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Received : 05/01/2025
Received in revised form : 21/02/2025
Accepted : 07/03/2025

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DOI: 10.70034/ijmedph.2025.1.259

Source of Support: Nil,

Conflict of Interest: None declared

Int J Med Pub Health

2025; 15 (1); 1384-1387

ABSTRACT

Background: In the last three decades, laparoscopic adrenalectomy has become the gold standard for surgery for adrenal gland diseases. Majority of adrenalectomies are currently performed using robotic & laparoscopic approaches. Surgery for adrenal gland truly reaps the benefits of minimally invasive techniques because of location & anatomy. This study aims to demonstrate single centre experience with laparoscopic transperitoneal adrenalectomies.

Materials and Methods: Pre-operative, intra-operative, post-operative data of 10 patients who underwent laparoscopic adrenalectomies from March 2023 to December 2024 were collected & analyzed retrospectively.

Results: A total of 10 patients underwent laparoscopic adrenalectomy during this period. Statistical analysis was performed using SPSS version 26. Mean age of patients was 41.7 years, surgical approach was laparoscopic transperitoneal, one case required conversion to open, mean tumor size was 6.15cm, most common histology was adrenocortical adenoma, mean duration of hospital stay was 4.1 days. There were no intra operative & post-operative complications.

Conclusion: Safe outcomes are achievable with laparoscopic adrenalectomy in low volume centre with trained and dedicated surgeons, anesthesiologists and endocrinologists.

Keywords: Laparoscopic adrenalectomy(LA), conversion to open, post-operative complications.

INTRODUCTION

Increased use of abdominal imaging such as ultrasonography, computed tomography (CT) has led to increased diagnosis of incidental adrenal masses. Adrenalectomy is indicated in functional adrenal masses or suspected adrenal malignancy, either primary adrenal cortical carcinoma or solitary metastasis from non adrenal sources.^[1] Laparoscopic adrenalectomy is the current standard of care for adrenal lesions with exception of invasive adrenal cortical carcinoma (ACC) or ACC with caval thrombus.^[1]

Late 20th and early 21st centuries ushered the entrance of minimally invasive techniques for

surgery of adrenal gland. Evolution of adrenal surgery continues to greater heights with virtual reality, computer simulation and their incorporation into existing robotic platforms. Quicker recovery, shorter hospital stay, fewer complications, less blood loss are well known advantages of laparoscopic adrenalectomy.^[2]

The aim of this study is to demonstrate single institution, single surgeon experience of laparoscopic adrenalectomy (LA) performed via lateral transperitoneal approach.

MATERIALS AND METHODS

This was a retrospective study of all laparoscopic adrenalectomies for benign & malignant adrenal tumors performed at NRI General Hospital, Mangalagiri from March 2023 to December 2024. A total of 10 patients underwent LA during this period. Data was collected on patients age, gender, American Society of Anesthesiologists (ASA) class, laterality, size, histopathology type, hormonal activity, operative time, intra operative complications, conversion to open, length of hospital stay, post operative complications, operative morbidity & mortality within 30 days after surgery. Data is expressed as mean and statistical analysis was performed using SPSS version 26.

All patients were evaluated with Contrast enhanced Computed tomography (CECT) abdomen. Additional diagnostic work up was performed only in lesions at least 1cm in size unless clinical signs & symptoms suggestive of adrenal hormone excess were present. Before surgery all patients underwent biochemical testing to determine if lesion was hormonally active. Testing was performed for subclinical hypercortisolism (1mg overnight Dexamethasone Suppression test [DST]), pheochromocytoma (Plasma metanephrines and normetanephrines) and primary aldosteronism (only if patient was hypertensive or hypokalemic-plasma aldosterone concentration, plasma renin activity[PRA])

Pre-operative management- Before surgery, all patients underwent laboratory tests, chest x-ray, electrocardiography (ECG) and 2D echocardiography for surgical fitness. A scheduled pharmacological treatment was administered in case of pheochromocytomas by endocrinologist. Alpha adrenergic blocker doxazosin was given atleast seven days prior to normalise blood pressure and expand the contracted intravascular space. After adequate alpha blockade has been achieved beta

adrenergic blockage was initiated, typically 2-3 days preoperatively.

Surgical procedure- All patients received general anaesthesia with orotracheal intubation & antibiotic prophylaxis (ceftriaxone 1gm) was given as per institution protocol. All operations were performed by a single surgeon & his team via lateral transperitoneal approach. Patient is placed in lateral decubitus position with operating table slightly flexed at level of umbilicus. 10mm camera port is placed in anterior axillary line, 3cm below costal margin, two 5mm working ports are placed in posterior axillary line & mid clavicular line. For right side additional 5mm port is placed in epigastrium for liver retraction. For left sided lesions, splenic flexure is mobilized, spleen is rotated medially by dividing lateral attachments of spleen. Renal vein is identified and dissected to identify left adrenal vein, which is clipped & divided. Superiorly adrenal is released from pancreas dividing phrenic vessels and from surrounding periadrenal adipose tissue. Medially adrenal is mobilized off the aorta by clipping or cauterising small vessels and specimen is extracted. On right side, triangular ligament is divided which helps in liver retraction, white line of Toldt is incised and colon is mobilized medially to expose right kidney, adrenal and Inferior vena cava (IVC). Right adrenal vein is identified, clipped & divided. Rest of the dissection is done as described for left adrenalectomy.

Post-operative management- Adequate post-operative analgesics were given. Patients were mobilized within 12 hours, urinary catheters were removed early, drains are removed on postoperative day 1 or 2. Chest physiotherapy was started immediately once patient was fully awake. They were started on oral liquids early and progressed as tolerated and discharged if deemed fit from post-operative day 2.

RESULTS

From March 2023 to December 2024, 10 patients underwent LA. Demographic details are shown in table 1.

Table 1: Demographics

		Percentage
Mean age (years)	41.7	
Male patients (n)	6	60%
Female patients (n)	4	40%
ASA class 1&2 (n)	9	90%
ASA class 3 (n)	1	10%

Functioning tumors were diagnosed in 3 cases and all were pheochromocytomas. In 4 cases diagnosis was incidental adenoma. Other histologies were

ACC, adrenal pseudocyst, myelolipoma one each. Characteristics of tumors are shown in table 2.

Table 2: Adrenal Neoplasm characteristics

		Percentage
Right Side (n)	5	50%
Left Side (n)	5	50%

Mean size (cm)	6.15	-
Functional (n)	3	30%
Non functional (n)	7	70%
Phaeochromocytoma (n)	3	30%
ACC (n)	1	10%
Adrenal pseudocyst(n)	1	10%
Myelolipoma (n)	1	10%
Adenoma (n)	4	40%

Regarding surgery, mean operative time was 93 mins, mean blood loss was 91 ml. No patient required intra or postoperative blood transfusion. There were no intraoperative complications. One case was converted to open in a case of suspected

adrenocortical carcinoma to prevent tumor spillage during handling. No major post-operative complication occurred. There was no 30 day mortality. Perioperative data is summarized in table 3.

Table 3: Perioperative data

		Percentage
Mean operating time (min)	93	
Mean blood loss (ml)	91	
Conversion to open (n)	1	10%
Mean hospital stay (days)	4.1 days	
30 day morbidity (n)	0	0%
30 day mortality (n)	0	0%

DISCUSSION

During the study period, of the 10 patients, 9 had tumors successfully removed by LA with 1 switched to open surgery. Mean tumor size was 6.15 cm. Size criteria are at the moment main subject discussed for laparoscopic approach for adrenal tumors. Large tumor size is considered a relative contraindication to LA. Larger size increases the chance that the tumor is malignant & distorts the regional anatomy, making laparoscopic resection more difficult. Studies by MacGillivray et al,^[3] Zografos et al,^[4] showed no difference in short term morbidity in patients with larger tumor sizes (>6 to 8cm) compared with those with smaller tumors, but requiring longer operative time.^[5] Bittner et al,^[6] found that tumor size more than 8cm, increases the risk of open conversion significantly (by 14 times). The maximum tumor size in our experience was 13 cm myelolipoma which is dissected into two without difficulty. These limitations for laparoscopic approach to large adrenal masses depend on surgeon experience and skill and size alone cannot be considered as an absolute contraindication to laparoscopy.

LA in ACC is currently controversial. Strict adherence to the oncologic principles for resection of ACC (Preservation of intact peritoneum on anterior surface of gland, en bloc resection, intact tumor capsule, minimizing bleeding & fluid spillage into peritoneal cavity, extraction of specimen in bag,^[7] is difficult during LA and thus open approach seems to be technique of choice. A recent review by European society of Endocrinology (ESE) concluded that there were no differences in perioperative mortality or morbidity, completeness of resection and recurrence free and overall survival rates between open & minimally invasive adrenalectomy.^[8] A recent joint guideline (2023)

Europe society of Endocrinology (ESE), European society of Endocrine Surgeons (ESES), and European Network for the Study of Adrenal Tumor (ENSAT) suggested that the laparoscopic approach for a suspected malignant adrenal mass with a diameter of less than 6cm without evidence of local invasion or suspected metastatic lymph nodes as an option, should be restricted to high volume centers.^[9] So, what is most important is the ability of the surgeon to perform safe and complete resection. In our study we had to switch to open surgery in case of suspected adrenal cortical carcinoma to prevent tumor spillage during handling as the size of lesion was larger. Shen et al demonstrated that significant independent predictive factors for conversion to open surgery were tumor size >5cm, Body mass index (BMI) >24kg/m², phaeochromocytoma based on multivariate analysis.^[10]

Mean operating time was 93 minutes (80-120min) excluding the case which required conversion to open and it decreased with increasing surgeon experience. Conzo et al reported mean operative time of 96.5min (75-110min) with experience after learning curve.^[11] Argues et al,^[5] reported mean operative time of 120 minutes for adrenal masses smaller than 6cm. In literature mean operating time is reported to be between 83-240 minutes.^[12] Brunt et al, analysed 50 studies of LA and reported complication rate of 10.9%.^[13] Coste et al also reported post operative complication rate of 10%.^[14] There were no intra operative or post operative complications in our series of 10 cases, but this could be due to small sample size.

The overall mean length of hospital stay was 4.1 days. In literature mean length of hospital stays range between 1 - 12 days.^[15,16] Mortality rate in our series was 0%. Other centers quote mortality ranging from 0-0.8% emphasizing the overall safety of LA.^[14,17,18]

CONCLUSION

Our experience provides preliminary evidence that LA can be successfully implemented in low volume centers with acceptable outcomes, with experienced & dedicated laparoscopic surgeons, anesthesiologists and endocrinologists. However, more evidence is needed to confirm these findings and to optimize patient care in such settings.

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