Laparoscopic Adrenalectomy: 6 Years Experience in Srinagarind Hospital

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Background and Objective: *Laparoscopic adrenalectomy has become the procedure of choice to treat benign functioning and non-functioning adrenal tumors. This study aims to present our single unit experience of laparoscopic adrenalectomy.*
Material and Method: *Review of all recorded clinical data was performed in patients who underwent laparoscopic adrenalectomy for adrenal neoplasm, between January 2008 and December 2013 in Srinagarind Hospital. Patients' demographic data, lesion size, operation time, blood loss, conversion rate, length of postoperative stay, morbidity and mortality were collected and analyzed.*
Results: *Forty-six adrenalectomy were done. 11 men and 35 women, with a mean age of 44 years (range 20-69) were enrolled. A right adrenal gland tumor in 14 cases (30.43%) and left adrenal gland tumor in 32 cases (69.57%). Overall mean operative time was 97 minutes and mean blood loss was 61.73 ml. Conversion to open surgery was necessary in 6 of 46 patients (13.04%). Mean length of post operative hospital stay of conversion to open surgery group (9.83 days) was longer than laparoscopic group (4.67 days) significantly $p<0.05$ (95% CI: -7.28 to -3.03). Tumor mean size was of 2.6 cm and most was cortical adenoma. Morbidity rate was 2.17% and no mortality.*
Conclusion: *Laparoscopic adrenalectomy is the procedure of choice for benign adrenal gland tumor. Current review confirms that it has been a safe and feasible procedure associated with minimal morbidity. Surgical skill and laparoscopic experience are important factors to achieve consistently good outcomes.*

Keywords: *Adrenalectomy, Laparoscopy*

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Laparoscopic surgery is now the gold standard treatment of benign surgical adrenal disease: aldosteroma, pheochromocytoma, Cushing's disease, and the incidental adrenal mass[1]. Open procedures have increased operative times, transfusion requirements, reoperations, length of stay and 30-day morbidity rates. Open procedures resulted in more pneumonia, unplanned intubation, unsuccessful ventilator wean, systemic sepsis, cardiac arrest, renal insufficiency, and wound infections[2]. Although feasible in many cases and tempting, laparoscopic resection should not be attempted in patients with tumors suspicious for or known to be adrenocortical carcinoma[3].

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The contemporary approach is to perform an open transabdominal adrenalectomy in the following clinical settings to avoid rupture and spillage of malignant or large tumors[4].

1) Primary adrenal malignancy of any size (e.g., adrenal cortical carcinoma, malignant pheochromocytoma).

2) Adrenal mass invading surrounding structures (e.g., liver, kidney, inferior vena cava).

3) Adrenal mass suspicious but not confirmed as a primary adrenal malignancy (e.g., >6 cm, irregular margins, hemorrhage or central necrosis, hypervascular).

4) Bilateral benign adrenal masses not accessible to the laparoscopic approach.

5) Extensive prior upper abdominal or retroperitoneal procedures that preclude a MIS approach.

6) Concomitant procedures (e.g., hepatic resection) not amenable to laparoscopic approach.

Although some retrospective studies show laparoscopic adrenalectomy for large solid cortical tumors without pre- or intra-operative evidence of malignancy it is not contraindicated and unlikely to have a deleterious effect on long-term outcome. Each case should be considered individually[5]. Pheochromocytomas can be safely resected laparoscopically[6].

The authors report the results of a retrospective audit of 46 patients with adrenal lesions who had undergone laparoscopic adrenaletomy in the last six-year Srinagarind Hospital.

Material and Method

Study design

A review of all recorded clinical data was performed for patients who underwent laparoscopic adrenalectomy (LA) for adrenal neoplasm, between January 2008 and December 2013. Most of the patients were diagnosed with primary hyperaldoteronism. Suspected primary malignant adrenal tumor was considered as a contraindication to LA. Outcomes measured for our analysis were pathological report, size of tumor, estimated blood loss, operative times, length of hospital stay, morbidity and mortality rate.

In most cases, patients were referred to surgery by regional endocrinology units, following a comprehensive endocrinological assessment. Data about patients, adrenal pathology, operative times, size of tumor, side of tumor, estimated blood loss, length of hospital stay, morbidity and mortality rate were retrospectively collected. Diagnostic imaging consisted of ultrasonography, computed tomography (CT), as well as magnetic resonance imaging being performed. The anesthesia chart and pathology report of each patient were obtained. Forty-six patients who underwent adrenalectomy were included in the study (Table 1).

Routine pre-operative evaluation was performed including blood pressure control, EKG, chest radiography. In Conn's disease patients, with low serum levels of potassium, pre-operative therapy with potassium and spironolactone was indicated. Postoperatively, patients were not routinely admitted to the Intensive Care Unit. Patients were discharged if they had no cardiovascular complaints or pain, and had begun oral feeding.

Operative time was considered as the period from skin incision to wound dressing. An antibiotic prophylactic therapy was administered in all cases. Most of the 46 adrenalalectomies were performed using a standard transperitoneal lateral laparoscopic approach, with 4 trocars if the tumor was in the right adrenal gland, and usually 3 trocars if it was in the left one. The patients were placed in the left or right lateral decubitus position (on the side opposite to the tumor), of about 30° for right LA and of about 90° for left LA. In each case pneumoperitoneum was induced by Hasson trocar, according to an "open" technique, or vision entry technique. Pressure was maintained at 12-14 mmHg with carbon dioxide (CO_2). Harmonic scalpel™ (Ethicon Endo Surgery INC-Johnson & Johnson) was routinely employed for adrenal glands dissection. In the surgical intervention, the first step in most cases was the vascular control of the main adrenal vein by metallic-clips or Hem-o-lock. The lateral and posterior connections of the right hepatic lobe were incised and the liver was superiorly and medially retracted. During a left LA, a wide left colon mobilization is routinely carried out. The surgical specimens were extracted in plastic bags through a mini-laparotomy at the site of 12 mms trocars. An off-suction drain was not routinely placed and removed after about 1-2 days. Full mobilization and free eating were recommended on the first postoperative day.

The data were reported as a mean $\pm$ standard deviation (range). Continuous variables were compared using the student t-test with $p<0.05$ considered statistically significant. This study was approved by the Khon Kaen University Ethic Committee (number HE571021).

Results

Demographics

Eleven men and 35 women, with a mean age of 44 years (range 20-69) were enrolled manifesting a right adrenal gland tumor in 14 cases (30.43%) and left adrenal gland tumor in 32 cases (69.57%). Co-morbidity disease included hypertension and hypokalemia in 33 patients (71.74%), diabetes in 1 patient (2.17%) and both hypertention and diabetes in seven patients (15.22%). four patients (8.70%) had no co-morbidity disease. One patient (2.17%) had thalassemia (Table 1).

Outcome of surgery

Two patients (4.34%) had undergone previous abdominal surgery, laparotomic approach. Simultaneous laparoscopic procedure was performed in two patients. First was simultaneous laparoscopic cholecystectomy and second was laparoscopic splenectomy due to inadvertent injury of splenic hilum. Overall mean operative time was 97 minutes (range 35-240) mean blood loss was 61.73 ml (range 0-1,500) (Table

2). One patient required intra-operative blood transfusion. Harmonic scalpel™ (Ethicon Endo Surgery INC-Johnson & Johnson, NJ, USA) was used in tissue dissection and hemostasis control.

Conversion to open surgery was necessary in 6 of 46 patients (13.04%), due to uncontrolled hemorrhage in four patients, due to severe adhesion right subphrenic in one patient and due to instrument failure in one patient. Pack red cell transfusion was used in one patient because of inadvertent injury of left renal vein and converted in open surgery. Mean postoperative hospital stay was 5.3 days (range 2-22). There was no mortality (Table 3).

Mean length of postoperative hospital stay of conversion to surgery group (9.83 days) was longer than laparoscopic group (4.67 days) significantly $p<0.05$ (95% CI: -7.284948 to -3.031719).

Tumor mean size was of 2.6 cm (range 0.4-10). Pathological reports were reviewed and shown in Table 4. Thirty-five patients (76.09%) had cortical adenoma. The smallest was adrenal medullary hyperplasia 0.4 cm in size and largest was simple cyst 10 cm in size.

Table 1. Demographic data

	Number
Sex (%)	
Male	11 (23.91)
Female	35 (76.09)
Site of tumor (%)	
Left	32 (69.57)
Right	14 (30.43)
Mean age: year (range)	44.36 (20-69)
Body weight: kg (range)	61.95 (41.5-86.5)
Height: cm (range)	159 (140-176)
Comorbidity disease (%)	
None	4 (8.7)
Diabetic mellitus	1 (2.17)
Hypertension	33 (71.74)
Both diabetic mellitus and hypertension	7 (15.22)
Thalassemia	1 (2.17)

Table 2. Operative data

	Mean	Range
EBL*	61.73 cc	0-1,500 cc*
Operative time	97.82	35-240
Length of post operative stay	5.34	2-22

* EBL = estimate blood loss, 0 refer to minimal blood loss

Morbidity

One patient had occurrence of postoperative complication. 30-day morbidity rate was 2.17% (1 of 46 patients). A case of right subphrenic collection had severe adhesion after being accessed by laparoscopy so a surgeon decided to covert to open surgery. Right subcostal incision was performed on the tumor, which was 5.5x3.2x3.2 cm in size and attached to the wall of second part duodenum. The tumor was dissected by Harmonic scalpel and inadvertent injury of duodenal wall was found and interrupted suture was performed. Estimate blood loss was 150 cc and no transfusion was required. Jackson-Pratt drain was placed. 5 days post-op ultrasound showed a large subphrenic collection and percutaneous drainage was placed to the collection. Post-op stay was 22 days.

Discussion

The presented series includes patients mostly referred to our observation by endocrine units Department of Medicine, some of the patients were incidentaloma; no pheochromocytoma cases were referred to our unit; most patients often needed pre-operative medical treatment.

Compared with previous studies[7,8] which had many cases of malignant tumor and pheochromo-

Table 3. Convert to open surgery

Case No.	Cause	EBL (ml)	LOS
7*	Left renal vein injury	1,500	8
12	Severe adhesion	150	22
21	Uncontrol hemorrhage	100	7
27	Uncontrol hemorrhage	350	8
32	Uncontrol hemorrhage	250	6
33	Instrument failure	250	8

* Only 1 morbidity case (2.17%)

Table 4. Pathological report

Mean tumor size	2.6 (0.4-10) cm
Cortical adenoma, n (%)	35 (76.9)
Hyperplasia, n (%)	5 (10.85)
Calcification, n (%)	2 (4.34)
Extramedullary hematopoiesis, n (%)	1 (2.17)
Medullary hyperplasia, n (%)	2 (4.34)
Simple cyst, n (%)	1 (2.17)

cytoma, our study had neither malignant tumor nor pheochromocytoma. Mean tumor size of this study was 2.6 cm and lower than previous study. Conversion was 6/46 cases compared with 5/46 cases[8] and bleeding being the cause of conversion was the same.

In cases, which converted to open surgery, post-op hospital stay was longer than laparoscopic surgery significantly and had associated hemorrhage more than 50%. According to our experience, severe adhesion and hemorrhage resulted in a higher risk of complications and conversion. Nevertheless, in conversion to open surgery patients there was only one morbidity.

Conclusion

Laparoscopic adrenalectomy is the procedure of choice for benign adrenal gland tumor; the current review confirms that it has been a safe and feasible procedure associated with minimal morbidity. Surgical skill and laparoscopic experience are important factors for consistently good outcomes.

What is already known on this topic ?

Laparoscopic surgery is now the gold standard treatment of benign surgical adrenal disease.

What this study adds ?

Laparoscopic adrenalectomy in Srinagarind Hospital is a safe and feasible procedure.

Acknowledgement

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Potential conflicts of interest

None.

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ผลการผ่าตัดต่อมหมวกไตผ่านกล้องประสบการณ์ 6 ปี ที่โรงพยาบาลศรีนครินทร์

จักรพันธ์ วิทยาไพโรจน์, เกรียงศักดิ์ เจนวิถีสุข, สุริยะ พันธุ์ชัย, ไชยยุทธ ธนไพศาล, โอวตือ แซ่เซียว, กฤษฎา เปานาเรียง

ภูมิหลังและวัตถุประสงค์: เพื่อรายงานผลการผ่าตัดรักษาเนื้องอกต่อมหมวกไตผ่านกล้อง ซึ่งในปัจจุบันเป็นวิธีการผ่าตัดสำหรับเนื้องอกต่อมหมวกไตทั้งแบบผลิตฮอร์โมนและไม่ผลิตฮอร์โมน

วัสดุและวิธีการ: โดยศึกษาข้อมูลบันทึกการผ่าตัด ขนาดเนื้องอก ผลทางพยาธิวิทยาและเวชระเบียนของผู้ป่วยที่ได้รับการผ่าตัดต่อมหมวกไตผ่านกล้องในช่วงวันที่ 1 มกราคม พ.ศ. 2551 ถึง 31 ธันวาคม พ.ศ. 2556

ผลการศึกษา: มีผู้ป่วยทั้งหมด 46 ราย ผู้ชาย 11 ราย ผู้หญิง 35 ราย อายุเฉลี่ย 44 (20-69) ปี เนื้องอกอยู่ด้านขวา 14 ราย (34.43%) เนื้องอกด้านซ้าย 32 ราย (69.57%) ระยะเวลาการผ่าตัดเฉลี่ย 97 นาที ประเมินการเสียเลือดเฉลี่ย 61.73 มิลลิลิตร เปลี่ยนเป็นการผ่าตัดแบบเปิด 6 ราย (13.04%) ระยะเวลาการนอนโรงพยาบาลเฉลี่ยในกลุ่มที่ผ่าตัดแบบผ่านกล้อง 4.67 วัน น้อยกว่ากลุ่มที่ผ่าตัดแบบเปิดที่มีค่าเฉลี่ย 9.83 วัน อย่างมีนัยสำคัญทางสถิติ $p<0.05$ (95% CI: -7.28 to -3.03) ขนาดเนื้องอกเฉลี่ย 2.6 เซนติเมตร ผลพยาธิวิทยาส่วนใหญ่เป็น cortical adenoma มีภาวะแทรกซ้อน 2.17% ไม่มีผู้ป่วยเสียชีวิตระหว่างการรักษา

สรุป: การผ่าตัดต่อมหมวกไตผ่านกล้องเป็นการรักษาเนื้องอกต่อมหมวกไตซึ่งปลอดภัยและภาวะแทรกซ้อนน้อย