

Laparoscopic Transperitoneal Adrenalectomy Results: In a Single-Center Experience

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ABSTRACT

Objective: Laparoscopic adrenalectomy is the gold standard for the resection of adrenal tumors. There are some technical difficulties due to the rarity in general surgical practice and the long learning curve. The present study aims to evaluate perioperative and postoperative results of laparoscopic transperitoneal adrenalectomy in a single center.

Methods: Between December 2008 and June 2018, 65 patients underwent laparoscopic transperitoneal adrenalectomy. Patients' demographic data, perioperative and postoperative results were retrospectively analyzed from hospital medical records.

Results: Sixty-five patients underwent laparoscopic transperitoneal adrenalectomy. In this study, there were 44 female and 21 male patients. According to the tumor types, there were forty-seven functional adrenal tumors, thirteen incidental adrenal tumors and three isolated adrenal metastasis from lung cancer. Thirty-one patients had right-sided and thirty-four patients had left-sided adrenal tumors. Conversion to open surgery was seen in five patients.

Conclusion: Laparoscopic transperitoneal adrenalectomy is a feasible and safe operative technique in adrenal tumors. Patients should be mobilized early and enforced to respiratory exercise to decrease postoperative complications. In addition to them, the surgeon should be experienced in laparoscopy to decrease the rate of conversion.

INTRODUCTION

The diagnosis of incidental adrenal masses has been increased with the development of diagnostic modalities in the last few decades.^[1] Incidentaloma is a term used for adrenal masses detected in abdominal computed tomography, magnetic resonance imaging or ultrasonography.^[2] Since the first laparoscopic adrenalectomy (LA) was carried out by Gagner et al.^[3] in 1992, laparoscopic removal of the adrenal lesion has become the gold standard for the small, benign and even large lesions of the adrenal gland. Laparoscopic adrenalectomy has more popularity as time passes due to favorable operative field, fewer complications, decreased morbidity, better cosmetic result, less postoperative pain, faster recovery, shorter hospital stay and earlier return to daily activities.^[4] Several techniques have been described. The most popular are laparoscopic lateral transabdominal approach, posterior retroperitoneoscopic adrenalectomy and robotic adrenalectomy.^[3,5,6] Adrenalectomies are not common operations in general practice. Thus, adrenalectomies should be performed in centers with endocrine surgery experience.

The present study aims to evaluate perioperative and postoperative results of laparoscopic transperitoneal adrenalectomy in a single center.

MATERIALS AND METHODS

In this study, we reviewed the retrospective analysis of the patients who underwent laparoscopic transperitoneal adrenalectomy between December 2008 and June 2018. All patients' indications for surgery were according to the American Endocrine Surgeons and Endocrinology guidelines; adrenal incidentalomas larger than 4 cm in diameter, functional tumors which were any size (Cushing's syndrome, pheochromocytoma, Conn's syndrome or sex hormone producing tumor), and solitary adrenal metastases. Cushing's syndrome was diagnosed: increased urinary free cortisol level, low adrenocorticotropic hormone level, and cannot be suppressed after 1 mg overnight dexamethasone test. The diagnosis of Conn's syndrome (aldosteronoma) was diagnosed based on elevated plasma aldosterone to plasma renin activity ratio more than 20 and non-suppressibility of aldosterone after the saline infusion test. Pheochromocytoma was diagnosed by the clinical evidence of the elevated level of catecholamines and metabolites (metanephrines) in urine or fractionated metanephrines in plasma. All patients with pheochromocytoma were used alpha-receptor blocker (phenoxybenzamine or doxazosin) at least two weeks before surgery. For patients with tachycardia,

a beta receptor blocker was added in addition to alpha-adrenergic blocker.

A lateral transabdominal technique was used for all laparoscopic adrenalectomies. The patients were placed in a lateral decubitus position with the tumor side up and the table flexed between the 12th rib and iliac crest. Four trocars were used for right-sided adrenalectomies. Three trocars were used almost all patients for left-sided adrenalectomies (only one patient needed four trocars). A thirty-degree laparoscope was inserted all cases and pneumoperitoneum was maintained at 12–14 mm Hg by insufflation of carbon dioxide (CO₂). On the right side, the right lobe of the liver was mobilized to expose the inferior vena cava, and the triangular ligament was divided before the placement of a liver retraction. Sharp and blunt dissection starts at the medial to the lateral edge of the liver. Care is necessary to the vena cava inferior due to the short course of adrenal vein. For the left-sided adrenal gland tumor, the spleen, splenocolic ligament, splenorenal ligament were dissected, and the tail of the pancreas was mobilized to the medial on the left side. Care is necessary not to misinterpret adrenal from the tail of the pancreas because of similar tissue appearance, especially in obese patients. All the specimen was placed into the endobag to take out the abdomen.

Statistical analysis

Continuous variables were presented as mean±SD for normally distributed data or as the median for data with non-normal distribution. Categorical variables were presented as frequencies (%).

RESULTS

Between December 2008 and June 2018, 65 patients (44 female and 21 male) underwent laparoscopic transperitoneal adrenalectomy. Forty-seven (72.3%) functional adrenal tumors, thirteen (20%) incidental adrenal tumors and three (6.7%) isolated adrenal metastasis from lung cancer were included in this study. Thirty-one patients (47.7%) had right-sided and thirty-four (52.3%) patients had left-sided adrenal tumors. The mean age of patients was 50.54 (±14.1) years and the mean tumor size was 4.7 (±2.3) cm. Most of the patients' preoperative diagnoses were Conn's and Cushing's syndrome (41 out of 65, 63%). There were 57 comorbidities; most of these comorbidities were hypertension and diabetes mellitus. There was not any relevance to the outcome of surgery (Table 1).

Four trocars were used for right-sided tumors, three trocars for left-sided tumors (four trocars only used in one patient) and five trocars were used for a patient who had a right-sided tumor with symptomatic cholelithiasis. Mean operative time was 95.5±21.4 minutes. In this study, nine perioperative complications (two major bleeding from the surgical field) occurred, and in one obese patient, conversion to laparotomy was needed due to bleeding from the right median adrenal vein and inferior vena cava insertion. The rate of conversion to laparotomy was encountered

in five (7.7%). The causes of conversion to laparotomy were dense adhesions in two patients, laparoscopically in-

Table 1. Patients characteristics

	(n=65)
Age, mean±SD	50.54±14.1
Gender, n (%)	
Female	44 (67.6)
Male	21 (32.4)
ASA, n (%)	
ASA 2	37 (56.9)
ASA 3	28 (43.1)
Tumor location, n (%)	
Right	31 (47.6)
Left	34 (52.4)
Tumor size, mean±SD	4.7±2.3
Conn	17
Cushing	22
Cushing + hyperandrogenism	1
Cushing + cholelithiasis	1
Pheochromocytoma	6
Pheochromocytoma + myolipoma	1
Hyperandrogenism	1
Incidentaloma	13
Metastasis	3
Comorbidity, n (%)	
No	8 (12.3)
Yes	57 (87.7)

ASA: American Society of Anesthesiologist; SD: Standard deviation.

Table 2. Perioperative and postoperative results

	(n=65)
Operation time, mean±SD	95.5±21.4
Perioperative complication, n (%)	
No	56 (86.1)
Yes	9 (13.9)
Bleeding	8
Vena Cava Inferior injury	1
Conversion to open surgery, n (%)	5 (7.7)
Right	4
Left	1
Postoperative complication, n (%)	
No	56 (86.1)
Yes	9 (13.9)
Clavien-Dindo Class 2	8
Blood Transfusion	4
Pleural Effusion	2
Upper extremity microembolism	1
Deep vein thrombosis	1
Clavien-Dindo Class 5	1
Length of hospital stay, mean±SD (days)	2.8±1.3

SD: Standard deviation.

Table 3. Postoperative histopathology

	(n=65)	
	n	%
Cortical adenoma	45	69.2
Cortical adenoma + myolipoma	1	1.5
Metastasis	3	4.7
Ganglioneuroma	2	3
Pheochromocytoma	6	9.6
Pheochromocytoma + Ganglioneuroma	1	1.5
Cyst	2	3
Cystic lymphangioma	1	1.5
Myolipoma	1	1.5
Cortex carcinoma	2	3
Nodular hyperplasia	1	1.5

tractable bleeding in two patients (one in non-obese and the other in the obese group) and inferior vena cava injury in one obese patient. In patients who converted to laparotomy, there was no surgical intraoperative mortality. In eight patients, pleural effusion (two patients), deep vein thrombosis, upper extremity microembolism and major postoperative bleeding with the need of blood transfusion (4 patients) were seen as postoperative Clavien-Dindo class 2 complications. Although all patients underwent deep vein thrombosis prophylaxis and anti-embolic socks, an obese patient died due to cardiopulmonary arrest (Table 2). Mean length of hospital stay was 2.8 ± 1.3 .

Postoperative histopathological diagnoses are listed in Table 3. Cortex adenoma was reported that most of the patients [45 patients (69.2%)] and two patients had cortex carcinoma. Three patients who underwent previously pneumonectomy due to lung cancer had isolated adrenal metastasis, which was confirmed radiologically. These three patients' adrenal metastasis was resected laparoscopically without any complication.

DISCUSSION

Lesser postoperative pain, early mobilization, better cosmetic results, shorten hospitalization, early return to daily activities and lesser morbidity and mortality are advantages of LA when comparing to conventional open.^[7]

Size of adrenal tumors is an important criterion agreed for the LA. The larger the size of adrenal masses is, the higher the likelihood malignancy is. Adrenocortical carcinoma is 2% for <4 cm masses, 6% for lesions 4 to 6 cm in size and 25% for lesions >6 cm.^[8] Because of this, if the size is only criteria to decide surgical technique, more than half of patients with benign adrenal tumors will have unnecessary open surgery.^[9] Recent studies showed that LA for the large adrenal lesions is safe and feasible.^[10-12] In this study, when comparing group 1 and 2, there was not statistically significant differences concerning perioperative and postoperative results.

It is obscure why complication incidences vary in LA. This difference may be due to specific organs that are manipulated in the course of operation. Particularly, on the left-sided adrenal tumors, splenic flexure mobilization is required, which may lead to spleen injury.

For the treatment of adrenal tumors, there are many techniques of minimal invasive surgery; transperitoneal and retroperitoneal laparoscopic adrenalectomy.^[13] In our study, we performed a lateral transabdominal technique. The most important advantages of this surgical approach are providing extended surgical field visualization and allowing for the resection of larger adrenal tumors. In our study, we performed transabdominal LA successfully in 27 patients who had large adrenal tumors > 5 cm. On the other hand, there are some disadvantages of transabdominal laparoscopic adrenalectomy. There may be a risk of adhesion in patients who underwent previous abdominal surgery. In this study, we encountered three dense adhesions and two of these patients were converted to open surgery. In addition to this, transabdominal LA requires mobilizing intra-abdominal organs and structures that may cause a risk of vascular or organ injury. We encountered vascular injury in eight patients (two out of seven patients were major bleeding) and two of these patients were converted to open surgery to control bleeding. In one obese patient, we did not differentiate the pancreas tail from a left-sided adrenal tumor, which was 2.1 cm in size. Surgeons should be carefully evaluated patients before surgery concerning previous laparotomies and adrenal mass size. Surgeons may not differentiate and visualize small size adrenal mass from adipose tissue in obese patients; in addition to this, the surgeon may misinterpret adrenal from the tail of the pancreas because of similar tissue appearance.

CONCLUSION

Laparoscopic transperitoneal adrenalectomy should be the first choice for the treatment of adrenal tumors. We think that surgeons should keep in mind that because of increased fatty tissue in obese patients, especially left-sided tumors, surgeon may encounter technical difficulties. Patients should be mobilized early and enforced to respiratory exercise to decrease postoperative complications. In addition to these, the surgeon should be experienced in laparoscopy to decrease the rate of conversion.

Ethics Committee Approval

Approved by the local ethics committee.

Informed Consent

Retrospective study.

Peer-review

Internally peer-reviewed.

Authorship Contributions

Concept: O.A.; Design: O.A., S.K.; Supervision: O.A.; Fundings: O.A.; Materials: O.A., S.K.; Data: O.A., S.K.;

Analysis: O.A., S.K.; **Literature search:** O.A., S.K.; **Writing:** O.A.; **Critical revision:** O.A., S.K.

Conflict of Interest

None declared.

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Laparoskopik Transperitoneal Adrenalektomi Sonuçları: Tek Merkez Deneyimi

Amaç: Laparoskopik adrenalektomi adrenal tümörlerin rezeksiyonunda altın standarttır. Genel cerrahi pratiğinde nadir karşılaşılmaması ve öğrenme eğrisinin yüksek olmasından dolayı bazı teknik zorlukları vardır. Bu çalışmanın amacı tek merkezde yapılan laparoskopik transperitonealinin adrenalektominin perioperatif ve postoperatif sonuçlarının değerlendirilmesidir.

Gereç ve Yöntem: Aralık 2008 ile haziran 2018 tarihleri arasında 65 hastaya laparoskopik transperitoneal adrenalektomi yapıldı. Hastaların verileri, perioperatif ve postoperatif sonuçlar hastanenin medikal kayıtlarından geriye dönük olarak analiz edildi.

Bulgular: Altmış beş hastaya laparoskopik transperitoneal adrenalektomi yapıldı. Bu çalışmada 44 kadın hasta ve 21 erkek hasta vardı. Tümör tipine göre; 47 fonksiyonel adrenal tümör, 13 insidental tümör ve üç hastada akciğer kanserine bağlı izole adrenal metastaz mevcuttu. Otuz bir hastanın sağ adrenal bezinde ve 34 hastanın ise sol adrenal bezinde tümör vardı. Beş hastada açık cerrahiye dönüldü.

Sonuç: Laparoskopik transperitoneal adrenalektomi adrenal tümörlerde güvenli ve uygulanabilir bir tekniktir. Postoperatif komplikasyonları azaltmak için hastalar erken mobilize edilmeli ve solunum egzersizi yaptırılmalıdır. Buna ek olarak, açığa dönüş oranını azaltmak için cerrah laparoskopik konusunda tecrübeli olmalıdır.

Anahtar Sözcükler: Adrenalektomi; laparoskopik; transperitoneal.