

## The applicability of laparoscopic adrenalectomy and our experience at a secondary health institution

İkinci basamak devlet hastanesinde laparoskopik adrenalectomi uygulanabilirliği ve deneyimlerimiz

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### Özet

**Amaç:** Laparoskopi eğitiminin yaygınlaşması, ileri düzey laparoskopik girişimlerin ikinci basamak sağlık kuruluşlarında da yapılabilmesine olanak tanımıştır. Biz laparoskopiyeye yeni başlayan kliniğimizde transperitoneal laparoskopik adrenalectomi deneyimlerimizi paylaşmayı amaçladık.

**Gereç ve Yöntemler:** Ekim 2012 ve Nisan 2019 arası laparoskopik transperitoneal adrenalectomi yapılan otuz hasta çalışmaya dahil edildi. Retrospektif olarak yapılan değerlendirmede; cinsiyet, yaş, beden kitle endeksi, adrenal kitle karakteristikleri, hormonal aktivitesi, operasyon süresi, kanama durumu, transfüzyon ihtiyacı, final patoloji ve komplikasyon oranları incelendi.

**Bulgular:** Ortalama kitle boyutu 48.5±23 milimetre ve ortalama operasyon süresi 70.2±21.6 dakika olarak bulundu. Peroperatif ortalama kanama miktarı 41±48.8 cc olarak bulunurken sadece 2 hastada transfüzyon ihtiyacı görüldü. Ortalama hastanede yatış süresi ise 1.3±0.88 gün olarak bulundu. Vakaların hiçbirinde açık tekniğe dönüş gerekmedi ve 2 hastada transfüzyon ihtiyacı dışında major komplikasyon yaşanmadı.

**Sonuç:** Transperitoneal laparoskopik adrenalectomi cerrahisi, yeterli eğitim sonrasında uygun hastalarda ikinci basamak hastanelerde de düşük komorbite ve mortalite oranları ile güvenle uygulanabilir.

**Anahtar Kelimeler:** laparoskopi, transperitoneal, adrenalectomi, deneyim, açık cerrahi

### Abstract

**Objective:** Since the laparoscopy education had become widespread, the advance laparoscopic procedures can be performed even at secondary public hospitals. In this study, we aimed to present our experience of the first seven years of laparoscopic transperitoneal adrenalectomy.

**Material And Methods:** the study included 30 patients with laparoscopic transperitoneal adrenalectomy (LA) performed from October 2012 to April 2019. The retrospective assessment investigated age, sex, body mass index, adrenal mass characteristics, hormonal activity, operation duration, hemorrhage status, transfusion requirements, final pathology and complication rates.

**Results:** Mean age was 54.3±11.5 years and mean body mass index was 25.6±2.7 kg/m<sup>2</sup>. Mean mass size was 48.5±23 mm and mean operation duration was 70.2±21.6 minutes. Mean peroperative hemorrhage amount was 41±48.8 cc, while only 2 patients required transfusion. Mean hospitalization duration was 1.3±0.88 days. None of the laparoscopic cases was converted to open surgery, and no major complications such as death recorded.

**Conclusion:** Transperitoneal laparoscopic adrenalectomy (LA) surgery may be performed safely after adequate training for appropriate patients with low morbidity and mortality.

**Keywords:** laparoscopy, adrenalectomy, experience, open surgery, transperitoneal

The study was approved by Memorial Bahçelievler Hospital Ethical Committee, (Decision No: 2022-63, Date: 2022/07/27).

All research was performed in accordance with relevant guidelines/regulations, and informed consent was obtained from all participants.

## INTRODUCTION

Open adrenalectomy has been the most popular surgical technique for adrenal pathologies, and is performed for nearly a century, starting in the late 19<sup>th</sup> century to 20<sup>th</sup>. In this technique adrenal glands are totally resected transabdominally or retroperitoneally, which may cause complications due to its invasive nature, effecting surgical results (1,2).

Recently, with the developments in laparoscopic techniques, minimally invasive adrenalectomy mostly replaced open surgery due to having fewer complications, thus open technique was preserved only for tumors bigger than 8 cm such as feochromositoma, and for cortical adrenal cancers with higher risk of local invasion (1-3).

Laparoscopic adrenalectomy (LA) was first performed in 1992 (4). Many approaches like transperitoneal, lateral retroperitoneal and posterior retroperitoneal approach have been defined for laparoscopic adrenalectomy.

Laparoscopy is an advanced surgical procedure yielding satisfactory outcomes with better cosmesis and acceptable mortality and morbidity rates including decreased hemorrhage, shorter hospitalization duration, lower complication rates (5-7). However it is not a 'zero complication' technique, that is, it requires high skill and experience level and the limited excess to the equipments limits its widespread usage (2,8-10). Although, open surgery may be used for advanced-stage malignancies and large tumors, the most common complications of open surgery are wound and pulmonary infections, hematoma, sepsis, and thrombosis (11,12).

Laparoscopic surgery as being an advanced surgery requiring high skill level and experience, has a learning curve that is reported in the literature to be stabilized between 20 and 40 surgical cases. (13-15).

In this study, we aimed to present our experience of the first seven years of laparoscopic transperitoneal adrenalectomy, which we performed after having an experience of laparoscopic nephrectomy cases of more than 55. Final outcome, peroperative data and complication rates were assessed.

## MATERIAL AND METHODS

The study included 30 patients with laparoscopic transperitoneal LA performed from October 2012 to April 2019. The data retrospectively assessed are, age, sex, body mass index, adrenal mass dimensions, hormonal activity, operation duration, mean blood loss, and transfusion requirement, rates of conversion to open technique, histopathological results and intraoperative and postoperative complications, mortality rate. Hormonally active tumors or tumors bigger than 4 cm, increasing of dimensions during follow up, any suspicion of malignancy in radiological imaging were the main surgical indications.

Diagnosis of adrenal tumors is established by computerized tomography and magnetic resonance imaging. During diagnosis and treatment of hormone-active adrenal tumors, consultation was requested with the endocrinology department and care was coordinated with the endocrinology department before and after the operation.

All procedures were performed under general anesthesia. A semi-flank positioning (on the left or right side) of the patient is facilitated. By bending the operating table 20-30 degrees at 4-5 cm superior to the iliac crest, the highest level of distance was maintained between the iliac crest and the lower ribs (Figure 1). Usually three or four ports (Two 10-mm ports for the camera and right hand and one or two 5-mm ports for other instruments) were used during the procedure (Figure 2). Nasogastric tube and Foley catheter should also be applied. After dissection of the adrenal gland, the adrenal vein was identified (Figure 3) and sealed using Liga-Sure or with a Harmonic Scalpel or by clipping (Figure 4). The adrenal mass was dissected carefully again using the Liga-Sure or a Harmonic Scalpel (Figure 5). The specimen was retrieved totally in an specien retrieval bag (Figure 6).

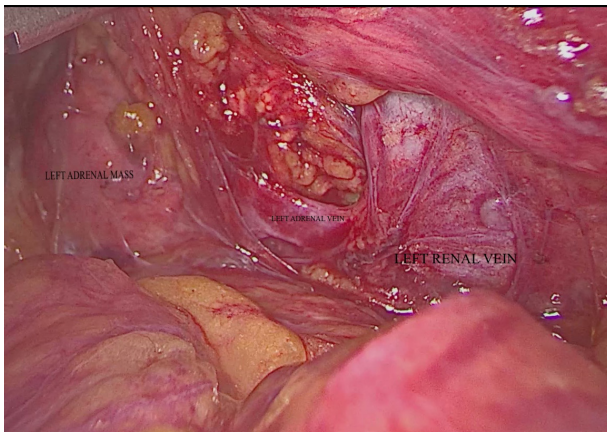
The blood loss was assessed as the blood level in the suction machine. The surgery time starting from the first incision for the camera port to its closure.



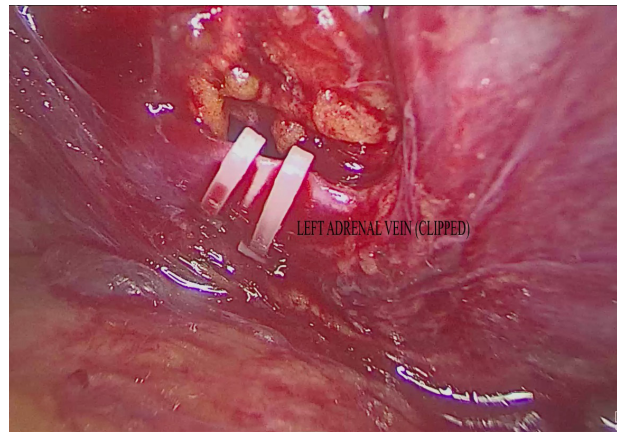
**Figure 1.** Surgical position during right adrenalectomy



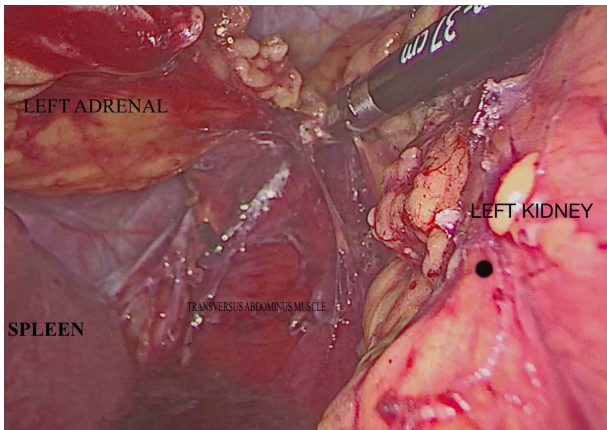
**Figure 2.** Port placement for right adrenalectomy



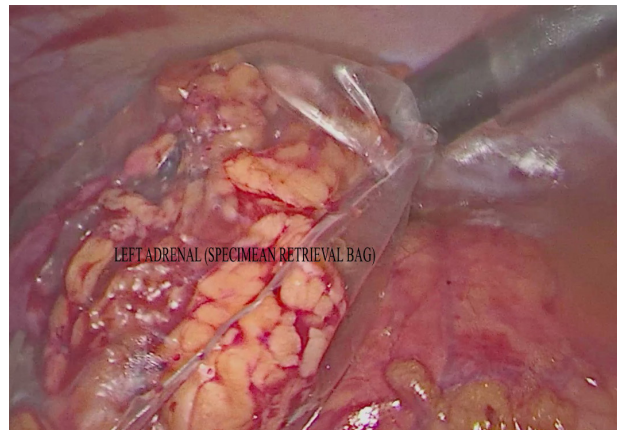
**Figure 3.** The identification of the left adrenal vein and renal vein



**Figure 4.** Clipping the left adrenal vein



**Figure 5.** Dissection of the left adrenal gland



**Figure 6.** Retrieval of the adrenal gland within the bag

## RESULTS

The study included a total of 30 patients comprising 6 men (20%) and 24 women (80%). Mean age was  $54.3 \pm 11.5$  (30-72) years and mean body mass index was  $25.6 \pm 2.7$  kg/m<sup>2</sup> (22-33). Mean mass size was  $48.5 \pm 23$  (28-100) mm and mean operation duration was  $70.2 \pm 21.6$  (40-130) minutes.

Half of patients had adrenal mass on the right (n:15), while the other half had adrenal mass on the left (n:15). Only one of the operated patients had hormonal activity and final pathology was pheochromocytoma. Histopathological evaluation revealed that; 17 patients had cortical adenoma, 4 patients have myelolipoma, 4 patients have adrenal cyst, 2 patients have 1 patient had ganglioneuroma, 1 patient had granulomatous infection, and 1 patient had pheochromocytoma (Graphic 1).

Mean perioperative hemorrhage amount was  $41 \pm 48.8$  (10-250) cc and only 2 patients required transfusion. Mean hospitalization duration was  $1.3 \pm 0.88$  (1-5) days. None of the cases is converted to open surgery (Table 1).

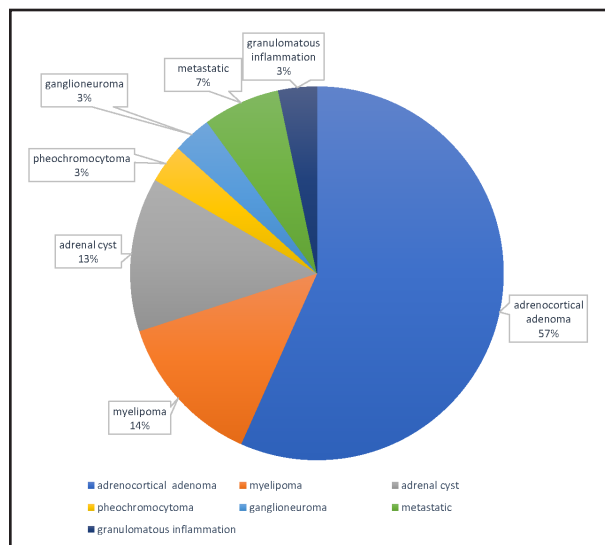
**Table 1.** Demographic features and parameters

Patient (n=30)	
Gender( M/F)	6/24
Site (R/L)	15/15
Hormonal activity	1 patient (3,3%)
Mean age	$54.3 \pm 11.5$ years
Mean body mass index	$25.6 \pm 2.7$ kg/m <sup>2</sup>
Mean size of the mass	$48.5 \pm 23$ mm
Mean operation duration	$70.2 \pm 21.6$ minutes
Need of transfusion	2 patients (6.66%)

## DISCUSSION

This study summarizes the seven-year LA results of a single surgeon after experience of laparoscopic nephrectomy of 55 cases (Y.İ.Ç.).

All patients included are either referred from an endocrinologist or primarily diagnosed in our clinic and referred to endocrinology for hormonal evaluation. Adrenal benign tumors with hormone secretion and tumors with malignancy suspicion are main indications for open adrenalectomy.



**Graphic 1.** Histopathological diagnosis

In the classical open surgical technique, a large incision in the flank area up to 25 cm is performed. Commonly 12<sup>th</sup> costa is removed for better visualization (16,17).

Laparoscopic adrenalectomy (LA) technique is first reported in 1992 and has become the popular surgical approach for adrenal tumors (4). Laparoscopy is an advanced surgical procedure yielding satisfactory outcomes with better cosmesis and acceptable mortality and morbidity rates including decreased hemorrhage, shorter hospitalization duration, lower complication rate.

Open adrenalectomy requires large incision with increased risk of wound and pulmonary infection, sepsis, longer recovery time, higher intra and postoperative complications (2,10,18-20).

Postoperative retroperitoneal hemorrhage may result in hypovolemic shock requiring re-surgery for exploration of the hemorrhage localization. intraoperative hemostasis is an important step in open adrenalectomy (21).

The surgeon may decide planned open adrenalectomy preoperatively or may convert to open technique during the laparoscopic surgery.

The indications for conversion to open surgery during laparoscopy are, perioperative visualization of the invasion to vascular structures, to adjacent tissues or lymphadenopathy that can't be detected in radiological imaging. An other indication is that,

larger or adherent tumor that can't be removed en-bloc causing risk of tumor seeding. Al-Jalabneh et al, compared open surgery with LA and reported that there was a significant blood loss, operative time and hospital stay difference in favor of LA in their study (22).

In our series, transperitoneal laparoscopic adrenalectomy is preferred due to familiarity of the surgeon to transperitoneal approach which was performed with low complication rates and no mortality.

In the literature LA is suggested for tumors smaller than 8 cm (23-25). However, Boylu et al., reported successful results of LA for tumors to 12 cm (26). A case of 18 cm tumor is reported to be successfully removed by LA (27). In the present study, tumors with sizes 10 cm or less were operated laparoscopically.

Although some guidelines recommending laparoscopic surgery for tumors smaller than 6 cm, (15), Oneil et al., suggested open technique in cases with tumor invasion, thrombus, and lesions bigger than 10 cm (28).

However, in a recent study in 2020, Fiori et al., have proposed that laparoscopy yields excellent results for large lesions (up to 12–14cm) without radiological signs of malignancy, in experienced hands (29).

Although this study subjectifies laparoscopic surgery, it should be noted that open adrenalectomy has a current role and should be used in cases of bigger adrenal tumors, in tumors with radiologically suspicion of malignancy or evidence of local invasion in computerized tomography, that is expected to be adrenocortical cancer (ENSAT III) staging system (European Network for the Study of Adrenal Tumors)(30).

Lack of equipment, high expenses in more technological approaches and limited sources of trained and skilled mentors limits the surgeons to start to laparoscopic approach especially in developing countries.

It is reported that the learning curve for LA stabilizes between the 20th and 40th surgery (13-15). The training should include theoretical knowledge in anatomy and instrumentation followed by practice. The previous experience with other procedures of the learning surgeon and the experience and shoulder to shoulder mentoring of the mentor is important

If the surgeon has experience in laparoscopic techniques such as nephrectomy, prostatectomy, LA becomes easier to apply. A surgeon in a center with more cases for minimally invasive techniques earns the ability and performs better. Guebbels et al., described that learning to operate faster is possible where a more experienced is learning from the experienced (31).

In the literature the importance of training starting from theoretical, simulator assistance, and higher volume of assistance with the mentor, utilizes the key to a successful LA performance. In the literature it is reported that there was no difference in surgery time of residents when compared to attending surgeons, which is discussed as selecting basic cases for residents and switching of the operator when face with an obstacle. This shows the importance of patient selection.

This study shows that the training and education in laparoscopy leads surgeons and patients to better and less invasive surgeries with lower morbidity, which will improve results, decrease complications.

According to a comparison of transperitoneal and retroperitoneal laparoscopic adrenalectomy published in the 2018 Cochrane database, the mean operation duration for transperitoneal laparoscopic adrenalectomy was between  $59.7 \pm 18.6$  to  $271.6 \pm 46.9$  minutes. When investigated in terms of mortality rates, mortality developed in 1 patient out of a total of 75 in three studies included in the meta-analysis. Mean hemorrhage amount displayed variability from  $16.3 \pm 25.4$  to  $406.6 \pm 138$  cc. In 4 studies included in the meta-analysis and out of a total of 110 patients, 1 patient converted to open surgery (32). When these results are investigated, it appears our data are consistent with the literature.

The greatest limitations of our study can be listed as the retrospective design, lack of follow-up results, lack of duration until oral intake, lack of duration to mobilization, and not determining comorbidities.

## CONCLUSION

This study provides important conclusions for the surgeons beginning to LA which may be performed safely with low morbidity and mortality rates, especially in second step hospitals where laparoscopic techniques are less frequently used.

### Conflict of Interest

The author declare to have no conflicts of interest.

### Financial Disclosure

The author declared that this study has received no financial support.

### Informed Consent

Informed consent was obtained from all individual participants included in the study.

### Ethical Approval

The study was approved by Memorial Bahçelievler Hospital Ethical Committee (Decision No: 2022-63, Date:2022/07/27) and written informed consent was received from all participants. The study protocol conformed to the ethical guidelines of the Helsinki Declaration.

### Author Contributions

Conception and design; Data acquisition; Data analysis and interpretation; Drafting the manuscript; Critical revision of the manuscript for scientific and factual content; Statistical analysis; Supervision; Çömez Yİ.

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