ABSTRACT
In order to prevent patients from adrenal insufficiency, partial adrenalectomy (PA) (cortex sparing adrenalectomy) has come in consideration. PA seems to be safe and feasible in the hands of appropriately trained surgeons. For patients requiring bilateral adrenalectomy, laparoscopic PA is accepted as a gold standard procedure. For one side functional or non-functional benign adrenal adenoma, no exact consensus exists for PA. No difference has been detected between total and partial adrenalectomy of benign adrenal tumor for dealing perioperative complication. Additional evidence is needed before a recommendation can be provided for PA of benign adenoma in a single gland. In this manuscript and video, a laparoscopic PA of right adrenal adenoma is presented.

Key Words: Partial adrenalectomy, Cortex sparing adrenalectomy, Adrenalectomy, Laparoscopic surgery

INTRODUCTION
Lifelong steroid dependence after bilateral total adrenalectomy is not acceptable procedure. In order to prevent patients from lifelong steroid dependence and the complications of adrenal insufficiency, partial adrenalectomy (PA) (cortex sparing adrenalectomy) come in consideration [1]. The first modern clinical use of open PA was described by Van Heerden for the treatment of bilateral hereditary pheochromocytomas in 1985 [2]. Since the first description of a laparoscopic adrenalectomy by Michel Gagner in 1992, laparoscopic adrenalectomy has quickly become the standard of care for removing the majority of adrenal masses (3). Recently, laparoscopic PA has replaced bilateral adrenalectomies for hereditary pheochromocytomas and PA has also been reported for unilateral functional benign tumors [4,5].

In this manuscript and video, a laparoscopic PA of right adrenal adenoma is presented.

CASE PRESENTATION
A 38-year-old male presented with fatigue, headache and high blood pressure. She had hypokalemia (K+ = 2.1 – 2.8 mmol/dL). In the Endocrinology Department, the recumbent and ambulant saline infusion tests showed elevated aldosterone levels. The abdominal MRI (Figures 1,2) showed regular bordered nodular right adrenal adenoma. Adenoma was located inferiorly to the right adrenal gland, showing slight contrast enhancement following injection of IV Gadolinium, with slight signal suppression in opposite phase images (Figures 3,4). She was also being followed up, under valsartan 320 mg, amlodipin 10 mg, spironolactone 50 mg, metoprolol 25 mg, and oral potassium replacement.
therapies. In the preoperative period, complete blood count, electrolytes and biochemistry and coagulation values were all within normal limits. A right cortex sparing adrenalectomy was decided to be performed.

**Patient Positioning and Trocar Placement**

Left lateral decubitus position with general anesthesia was applied. The space between the lower costal margin and the iliac crest is then increased by flexing the bed. The monitors are placed at the patients head and the surgeon and first assistant stand facing the abdominal wall of the patient. The initial trocar is placed at the anterior axillary line by open Hasson technique, 2 cm below the costal margin. The next two ports are placed on either side of the first port with at least 8 cm of distance between them to allow freedom of movement of the instruments. Two 11 mm and two 5 mm ports were used. The pneumoperitoneum was achieved with CO₂ insufflation. Intra-abdominal pressure was set to 12-14 mmHg.

**Figure 1**: Regular bordered adrenal adenoma with 2x3 cm diameter was seen at the apex level of kidney and under the liver in MRI image.

**Figure 2**: Adrenal adenoma was seen as a contrast enhancement at the upper pool level of right kidney.

**Figure 3**: Adrenal adenoma was seen as a contrast enhancement at the upper pool level of right kidney in sagittal section of abdominal MRI.

**Figure 4**: Adrenal adenoma was seen as a contrast enhancement under the liver lateral to the portal vein in vertical section of abdominal MRI.
Adrenalectomy Procedure

Initially, the right lobe of the liver is elevated by dividing the right triangular ligament up to the level of the diaphragm (Figure 5). Then, dissection of the medial border of the adrenal was begun and a dissection plane was developed between the lateral aspects of the IVC and the medial border of the adrenal gland (Figure 6). Adrenal mass is identified and exposed. The dissection proceeds towards to the mass side with the ultrasonic dissector. The specimen is mobilized posteriorly off the psoas muscle and the lateral attachment is divided. Then, by using vessel sealing device (Ligasure®) the adenoma is excised with some surrounding healthy adrenal tissue without destroying capsule of adenoma (Figure 7). During this excision, approximately more than 1/3 of the adrenal cortex is left behind (Figure 8). During this process, special attention is paid not to dissect the remaining adrenal gland from the surrounding tissues. The specimen is placed in an endo-bag to avoid spillage and removed from the abdomen. Hemostasis is performed by the help of electro cautery and using Surgicell® and the fascia is closed with absorbable suture. The skin is closed with prolpon suture. Pathological analysis of the removed specimen revealed a 2.1x2x1.5 cm adrenal adenoma.

Follow Up

Oral intake was started on post-operative day-1 and discharged from the hospital on post-operative day-3, with stable vital signs and electrolyte values, after consulting to endocrinology.

Figure 5: Liver was retracted by finger liver retractor.

Figure 6: After resecting triangular ligament of liver inferior vena cava and adrenal gland were seen.

Figure 7: During enucleation of adrenal adenoma preservation of remaining adrenal tissue was seen.

Figure 8: Blood supply of remaining part of adrenal tissue was preserved only adenoma was enucleated.
department patient was discharged. At 1-year follow up, all the medications were discontinued, vital parameters are stable.

**DISCUSSION**

Studies reporting long-term outcomes after partial adrenalectomy have showed steroid-free outcomes in up to 91% of patients for bilateral pheochromocytomas [5,6].

The location of the tumor within the gland is the main determinant of the ease and ability to perform a PA. Anteriorly and marginally located adrenal masses are generally more amenable for PA. Adrenal cortical tissue needed to preserve adrenal function is 1/3 of one gland or 15% of total adrenal cortical tissue [7]. When preparing the remnant, it is suggested that the portion of adrenal cortex that is to be preserved should not be mobilized out of the retroperitoneum to preserve the blood supply [8]. Preservation of the adrenal vein is a debating subject [9]. In our case, adrenal vein was not divided or preserved but the remaining adrenal tissue was not dissected from posterior and superior in order not to destroy blood supply of gland.

There is no difference between total and partial adrenalectomy of benign adrenal tumor for dealing perioperative complication and operation time (6).

**TAKE HOME MESSAGES**

1. PA is safe and feasible in the hands of appropriately trained surgeons.

2. For patients requiring bilateral adrenalectomy, laparoscopic PA seems to be the procedure of choice.

3. Additional evidence is needed before a recommendation can be provided for PA of benign adenoma in a single gland.

**REFERENCES**


