CLINICAL CASE

Laparoscopic right adrenalectomy for pheochromocytoma


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Abstract Various concerns and controversies have emerged worldwide with respect to laparoscopic adrenalectomy performed on malignancies that have called into question the efficacy and effectiveness of the procedure. Nevertheless, laparoscopic adrenalectomy is considered the gold standard of treatment when performed on benign adrenal masses. A 39-year-old woman had a past history of recently diagnosed and difficult-to-control high blood pressure and was referred by the endocrinology service with the diagnosis of a right adrenal gland tumor. Total metanephrines in 24-h urine were 5844 µg/24h (range: 36-203 µg/24h) and total catecholamines in 24-h urine were 289 µg/24h. A computed axial tomography scan showed an 8 cm occupying mass on the right adrenal gland with a tumoral aspect that was solid, oval-shaped, and hypodense; it had no calcifications, slight contrast enhancement, and less attenuated areas in its interior suggesting necrosis. A laparoscopic right adrenalectomy was performed. Surgery duration was 195 min, intraoperative blood loss was 450 ml, the surgical specimen was extracted through an approximately 7 cm-long wound in the right iliac fossa, and hospital stay was 3 days. The histopathologic study reported pheochromocytoma. The surgical result was comparable to that of open surgery, with the added benefits of minimally invasive surgery.

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Adrenal gland tumors are better known as incidentalomas because 3-5% of them are found in tomography studies carried out for a different reason. The large majority of adrenal masses, 80%, are benign and non-functioning; however, they must be distinguished from metastatic tumors arising from other organs, mainly breast, lung, or kidney cancers or lymphoma; and 5% are primary malignant tumors. These tumors have the same frequency in men and women and incidence increases with age, as is true for the majority of cancers; few cases present in patients younger than the third decade of life. Its pathogenesis appears to be related to diabetes, obesity, and a family history of adrenal tumors.

The diagnosis of any adrenal gland lesion requires clinical suspicion, the measuring of mineralocorticoids, glucocorticoids, estrogens, androgens, and catecholamines in blood or in urine. Despite the fact that 95% of the adrenal gland lesions are benign and non-functioning, complete hormone studies should be performed to rule out a malignant process or a functioning tumor that produces different clinical manifestations, such as Cushing’s syndrome, feminizing tumor, virilizing tumor, aldosteronoma, and pheochromocytoma.

Radiologically, a benign tumor corresponds to one that in an ultrasound, tomography scan, or magnetic resonance scan is smaller than 4 cm, is well defined, and homogeneous, whereas tumors with contrary characteristics are considered malignant or metastatic.

From the first description of laparoscopic adrenalectomy performed by Gargner in 1992, the advantages in comparison with open surgery were apparent. Seven years later, in 1999, it was regarded as the gold standard for treating benign adrenal lesions. Nevertheless, with the advances made in improving laparoscopic techniques, this procedure is being performed on patients with malignant and metastatic lesions of the adrenal gland.

Laparoscopic adrenalectomy is performed on primary adrenal gland tumors (benign or malignant), as well as on metastatic lesions. If the lesions are frankly malignant, the procedure can be carried out if the tumor is organ-confined with no evidence of local invasion or neoplasia involving the adrenal vein. If the tumors are larger than 6-7 cm, radical surgery is difficult, but it can be performed depending on the characteristics of the patient and the skill of the surgeon. Adrenalectomy is indicated in metastatic lesions for curative reasons in the case of a solitary metastatic adrenal lesion and for diagnostic reasons when adrenal metastasis is suspected without locating the primary focus.

Contraindications for laparoscopic adrenalectomy are cardiovascular or severe bronchopulmonary disease, a previous surgical procedure in the upper abdomen in the region of the affected adrenal gland, and disease characteristics such as malignant lesions larger than 6 cm with a compromised adrenal vascular pedicle and surrounding tissues.

Case presentation

A 39-year-old woman had a past history of recently diagnosed high blood pressure that was poorly controlled with oral antihypertensive drugs, essential thrombocytosis, menarche at 12 years of age, and 4 pregnancies and births. Her past surgical history included surgery for bilateral tubal occlusion 15 years earlier with recanalization 5 months prior. She was referred by the endocrinology service with the diagnosis of a right adrenal gland tumor. The patient...
was conscious, alert, cooperative, well hydrated, and had adequate skin and tegument coloration. There were no findings related to her head, her chest was normal with adequate breathing and clean pulmonary fields, well ventilated with no aggregates, there was an increased frequency of rhythmic heart sounds, good intensity, a flat abdomen with no scars, peristalsis was present, and palpation revealed no abdominal masses or pain. Her extremities were unremarkable.

Presurgical laboratory results: Hb 9.5 g/dl; Hct 31.9%; platelets 605,000; and leukocytes 9.6.

Blood chemistry reported central glucose of 106 mg/dl; urea of 33 mg/dl; creatinine 0.79 mg/dl; PT 12.3 sec; and PTT 23.7 sec with an INR of 0.91.

Total metanephrines in 24-h urine were 5,844 µg/24h (range: 36-203 µg/24h); total catecholamines in 24-h urine were 289 µg/24h.

The tomographic study reported an 8 cm occupying mass with a tumoral aspect that was solid, oval-shaped, with lobulated contours, and hypodense; it had no calcifications, slight contrast enhancement, and less attenuated areas in its interior suggesting necrosis. It was situated in the projection of the right adrenal gland, invading the inferior vena cava, which persisted with a late phase filling defect (figs. 1-3). The remaining structures had normal tomographic characteristics and there was no evidence of lymph nodes or other retroperitoneal masses. Probable adrenocortical carcinoma was suggested.

The presence of an adrenal mass with slight contrast enhancement, central necrosis, and high blood pressure, in addition to elevated metanephrines in urine, led us to diagnose pheochromocytoma.

The decision was made to perform a laparoscopic right adrenalectomy. The patient was hospitalized 5 days prior to the procedure for adequate preoperative preparation in relation to blood pressure figures and preload. Preoperative blood pressure figures were maintained at 160/95 mmHg despite management with prazosin 1 mg/8 h and atenolol 50 mg/12 h. The patient was put in the adequate left lateral

**Figure 1** Contrast-enhanced abdominal CAT. High view, hepatic lesions.

**Figure 2** Contrast-enhanced abdominal CAT showing the adrenal lesion.

**Figure 3** Contrast-enhanced CAT with the highest view clearly showing the adrenal lesion.

**Figure 4** Position of the patient for the operation.
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once the adrenal vein was sectioned, the space between the lateral wall of the vena cava and the peri-adrenal fat was opened to look for the psoas muscle. An avascular plane between the adrenal gland and the psoas muscle was easily created, surrounding the gland with fibro-fatty tissue, encountering the division of the gland from the upper kidney pole (fig. 7). The dissection of all the edges with LigaSure can control the small arterial vessels and the secondary adrenal veins. With the right adrenalectomy properly performed, the surgical specimen was deposited into an extraction bag and extracted through an approximately 7 cm-long incision made in the right iliac fossa region at the level of the trocar placed at that zone. The trocars were then removed under direct vision, the procedure was ended, closing the incision by layers and if possible, closing the opening of the 10 mm trocars.

Results

Surgery duration was 195 min and intraoperative blood loss was 450 ml. A transfusion of one unit of packed red blood cells was administered.

The first postoperative day the patient had normal vital signs: HR 78 bpm, RR 18 bpm, BP 97/60 mmHg (for which the antihypertensive drug doses were suspended), body temperature 36°C. Diuresis was 85.2 ml/h, abdominal trocar wounds were clean, peristalsis was present, serosanguineous Blake drain output was 65 ml, and the control hemogram reported leukocytes 14.3, neutrophils 85.7%, Hb 9.9 g/dl, Hct 31.4 %, and platelets 562,000.

Blood chemistry: glucose 69 mg/dl, urea 16 mg/dl, BUN 7 mg/dl, creatinine 0.69 mg/dl, and normal serum electrolytes. Oral intake of food and walking were started.

The second postoperative day showed blood pressure of 110/70, with no antihypertensive drug intake, diuresis of 83.3 ml/h, serosanguineous Blake drain output of 30 ml, and clean wounds. Eating by mouth was tolerated, there was adequate pain control, and the patient was walking. Due to satisfactory progression the asymptomatic patient was released from the hospital with the drain intact. It was
removed 7 days later with a mildly serous output. Her BP was 110/70 mmHg.

Discussion

Laparoscopic adrenalectomy has clear advantages over open surgery and thus has been the gold standard for 15 years in the treatment of adrenal gland tumors. Furthermore, with the advances that have been made in relation to the laparoscopic instruments and the refinement of the surgical technique, as well as the skill of the surgeon, the indications have been on the rise for this procedure in treating any adrenal mass, regardless of its etiology and often of its size.

Tumor size is no longer a limitation for performing laparoscopic adrenalectomy, but this consideration is directly related to the skill and experience of the surgeon. The surgical result is on a par with that of open surgery, with the added benefits that minimally invasive surgery provides.

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Conflict of interest

The authors declare that there is no conflict of interest.

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Annex. Additional material

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References