

Transperitoneal laparoscopic adrenalectomy

Our experience



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Transperitoneal laparoscopic adrenalectomy. Our experience

AIM: Laparoscopic adrenalectomy is considered the standard technique for the surgical removal of the adrenal gland. This report is about a 4-year single experience in our Endocrine and General Surgery Unit with laparoscopic adrenalectomy.

METHODS: A total of 24 lateral transperitoneal laparoscopic adrenalectomies were performed. The indications for laparoscopic surgery were: aldosteronoma in 3 patients, pheochromocytoma in 6 patients, nonfunctioning adenoma in 6 patients, adenoma causing Cushing's syndrome in 3 patients, 1 lymphangioma-like adenomatoid tumor, 1 myelolipoma, 1 complicated adrenal cyst, 2 adrenocortical carcinomas, 1 lung metastasis.

RESULTS: All except two had successful laparoscopic adrenalectomy. Complication occurred in one patient. 3 patients underwent other associated laparoscopic procedures. Operative time ranged from 100 to 240 minutes for laparoscopic adrenalectomy, from 180 to 210 minutes in the cases with two associated laparoscopic procedures, 5 hours for bilateral adrenalectomy; the postoperative hospital stay for laparoscopic adrenalectomy ranged from 4 to 8 days (6,79 days) and from 7 to 13 days (9,12 days) for patients undergoing the open or converted procedure.

CONCLUSIONS: Laparoscopic adrenalectomy is technically feasible and reproducible. We evaluate the effectiveness of laparoscopic adrenalectomy for a variety of endocrine disorders except in the case of invasive carcinoma or large masses. "Antonio Cardarelli" Endocrine and General Surgery Unit in Naples is known as a specialized center for thyroid and parathyroid surgery; in future, we could also become a high-volume laparoscopic referral center for adrenal gland pathologies.

KEY WORDS: Adrenal adenoma, Adrenalectomy, Laparoscopy.

Introduction

Adrenal gland originates by the adreno-genital primordium¹. Adrenocortical tumors are common and most are benign adrenocortical adenomas. Malignant adreno-

cortical carcinoma is a rare tumor type and is observed at the rate of one or two cases per million annually. These tumors may be sporadic or part of any of several genetic diseases: familial pheochromocytoma-paraganglioma syndromes, multiple endocrine neoplasia type 2, neurofibromatosis 1 and von Hippel-Lindau disease²⁻⁵. Surgery is the primary therapy for adrenal gland diseases. Non-surgical treatment is still under debate^{6,7}. The approach of the adrenal gland laparoscopically was implanted quickly after Gagner⁸, in 1992, communicated the first laparoscopic experience in the removal of the adrenal gland. Since then, multiple centers have reported their experience demonstrating both the advantages of this surgical access and its safety and efficacy⁹⁻¹³. We report our experience of about 4 years, from April

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2008 to July 2012, and the results of 30, 24 laparoscopic and 6 laparotomic, adrenalectomies that have been performed by the same surgical team at the Endocrine and General Surgery Unit, "Antonio Cardarelli" Hospital in Naples, Italy.

Materials and methods

Retrospective observational study was done of 24 lateral transperitoneal laparoscopic and 6 laparotomic adrenalectomies that have been performed at our Unit, from April 2008 to July 2012. The patients were referred to the Endocrine and General Surgery Unit after having been previously studied in the Endocrinology, Internal Medicine and Nephrology consultations. By reviewing medical records, we have established: age, sex, personal history, reason for consultation, additional tests (ultrasound, CT or MRI), surgery-related variables (date of the intervention, tumor size and location, and duration of surgery), preoperative preparation, surgical and postoperative complications, need for transfusion, and rate of conversion to open surgery.

Results

Of 30 patients, 9 were men and 21 women with a mean age of 51.5 years (52.11 men; 51.24 women). The following diagnoses in 24 patients treated by laparoscopy (80%) were established: 3 Conn's syndrome (12.5%), 6 pheochromocytomas (25%), one of which bilateral, 6 nonfunctioning adenomas (25%), 3 cases of Cushing's syndrome (12.5%), 1 lymphangioma-like adenomatoid tumor (4.17%), 1 myelolipoma (4.17%), 1 complicated adrenal cyst (4.17%), 2 poorly differentiated G3 adrenocortical carcinoma (8.32%), 1 case of suspected lung metastasis discovered during histologic evaluation (4.17%). The predominant location was left in 13 cases (54.17%), compared to right in 10 cases (41.66%); one patient showed bilateral involvement (4.17%). 3 patients underwent other associated laparoscopic procedures at the same time as the adrenalectomy: cholecystectomy in 2 patients with diagnosis of right nonfunctioning adenoma, the first, and right pheochromocytoma, the second, associated with lithiasic cholecystitis; myomectomy in the third patient with right adenoma causing Cushing's syndrome.

Other 6 cases (20%), 5 large adrenal tumors, with an average size of the surgical piece removed of 16 cm, ranging from 12 to 20 cm, and 1 pheochromocytoma with comorbid conditions, diffuse angiomatosis of the spleen and jejunal gastrointestinal stromal tumor, treated surgically at the same time as the adrenalectomy by splenectomy and small bowel resection and anastomosis, were approached traditionally via laparotomy from the start. Transperitoneal laparoscopic adrenalectomy was

performed in all cases in lateral decubitus position. The average size of the surgical piece removed by laparoscopy was 5.79 cm, ranging from 3,5 to 10 cm. Operative time ranged from 100 to 240 minutes for laparoscopic adrenalectomy, from 180 to 210 minutes in the cases with two associated laparoscopic procedures, 5 hours for bilateral adrenalectomy. The mean hematic loss was 103.12 ml (range 25-800 ml), requiring the transfusion of 2 packed red blood cells in only one patient, reoperated by laparotomy for bleeding. The postoperative hospital stay for laparoscopic adrenalectomy ranged from 4 to 8 days (6,79 days) and from 7 to 13 days (9,12 days) for patients undergoing the open or converted procedure. All except two (8.33%) had successful laparoscopic adrenalectomy because of adhesions from previous surgery in one case and bleeding from an accessory right adrenal vein entering the inferior vena cava in the other. In these two cases conversion to open surgery was necessary. Complications presented were: bleeding, originated from retroperitoneal vessels with an associated minimal diaphragmatic injury occurred in one patient who required reintervention with conventional right subcostal minilaparotomy, and one case of hypokalemia, in the early postoperative period; a prolonged paralytic ileus for 5 days with a good evolution after conservative treatment and management with a nasogastric tube. After reviewing our records, 11 of 30 patients (36.67%) are lost to follow-up, 4 patients had died, none as a result of surgery: 2 adrenal cancer patients, with metastases to liver in the first patient and to lung and spinal column in the second, a lung cancer one, and 1 acute myocardial infarction patient.

Discussion

Despite starting the program of laparoscopic adrenalectomy in our center in 2005, it was from 2008 when we began to perform a greater number of interventions and considered the laparoscopic approach as a usual technique. The surgical approach to the adrenal glands has changed dramatically because of the development of laparoscopic techniques for performing adrenalectomy.¹⁴ Laparoscopic adrenalectomy is considered to be a minimally invasive surgery that once the learning curve is overcome can be performed in just over an hour,¹⁵ with a shorter hospital stay and recovery time, decrease in blood loss and in postoperative pain, and better patient satisfaction¹⁶⁻²¹. The trans- or retroperitoneal approach seems to depend primarily on the surgeon, each having advantages over the other, but without demonstrating that a way is different from the other regarding the final result and complications²²⁻²⁴.

We prefer lateral decubitus transperitoneal flank approach because it provides the surgeon with a large working space and allows excellent access to the superior retroperitoneum; furthermore, retraction of adjacent viscera is

facilitated by gravity as a result of the patient's position and it's also possible to examine other intraabdominal organs and perform concomitant procedures¹⁴, such as cholecystectomy in two our patients. The disadvantages of this approach are that some retractions of adjacent viscera is required and, on the left side, the colon must be partially mobilized, which can result in a transient period of postoperative ileus; there is no possibility of a simultaneous approach to the contralateral adrenal gland because of the lateral decubitus position and therefore, for bilateral adrenalectomy, the patient must be repositioned between sides¹⁴. We used 30° optic. Before the start of the surgery, a nasogastric and a bladder catheter were placed in all the patients. We performed the position of the trocars in a systematic way. On the left side, we generally used 3 trocars: an opening technique with a Hasson trocar, located 2 cm above the umbilicus at the level of the outer edge of the anterior rectus abdominis, through which we introduce the laparoscope; one 10-to 12-mm trocar near the costal margin, in the mid-clavicular line, for right hand of the surgeon and for insertion of the 10-mm clip applicator and for specimen extraction; another generally 5 mm, but it depends on individual case and the patient's body habitus, subcostal trocar in the internal axillary line, for the surgeon's left hand; finally, if necessary, a fourth trocar near the left iliac fossa for an assistant to help and retract during maneuvering. On the right side, we used 4 trocars: a Hasson trocar for the optics; two trocars in a similar position to the left approach, one 10-to 12-mm in the costal margin at the level of the midclavicular line for the right hand of the surgeon and one 5 mm, or 10-to 12-mm less frequently, subcostal at the level of the axillary line for the left hand; another 5-mm trocar in the inner costal margin, below the xiphoid appendix, allowing the assistant to separate the liver during the surgery. We always start the adrenalectomy with the approach and section of the adrenal vein and subsequent dissection of the adrenal gland.¹⁵ On the left side, we perform mobilization of the splenic flexure of the descending colon in the first place, so the spleen and the tail of the pancreas are medially displaced, which provides access to the adrenal gland. We proceed to the identification of the left renal vein and the left adrenal vein, crucial landmark for the approach of the left adrenal gland. On the right side, it is essential, and prior to any move, to explore hepatic mobility; the partial section of the triangular ligament of the liver is performed in order to facilitate it. This allows for the sufficient hepatic mobility to expose the adrenal area and the anterior side of the vena cava through the peritoneum. Then, we proceed to perform the Kocher maneuver with exposure of the anterior side of the vena cava and then accurate dissection of the right adrenal vein, as its lesion produces a bleeding difficult to control due to its direct drainage into the vena cava. In both cases, the adrenal veins were clipped with conventional clips, two or three

proximal, and one distal. However, we are aware that the right adrenal vein could be large and will require an Endogia vascular load. In both approaches, the adrenal vein ligation is essential as a first step, but sometimes it will also depend on the nature of the lesion, size, and technical difficulties in its removal¹⁵. Although advances in laparoscopic techniques have provided a new approach, its use should be applied appropriately. The criteria on which we rely to indicate surgery are referred to literature. Adrenalectomy is indicated for any patient with a hormonally active or functional tumor, incidentaloma > 5 cm or incidentalomas between 4 and 5 cm in patients younger than 50 years, nonfunctioning adrenal lesion with progressive growth or solitary adrenal metastasis^{15,25}. Most hormonally active tumors are benign lesions less than 6 cm in size and are, therefore, appropriate for laparoscopic excision¹⁴. Laparoscopic is also a valid approach for removal of hyperplastic glands in patients with ACTH-dependent Cushing's syndrome who have failed treatment of the pituitary or ectopic ACTH source and for Cushing's syndrome due to nodular adrenal hyperplasia. Laparoscopic adrenalectomy has also been used for the treatment of congenital adrenal hyperplasia^{14,26}. The precise cutoff for which laparoscopic adrenalectomy is appropriate in nonmalignant-appearing adrenal masses cannot be so precisely defined. Several groups reported that it's technically possible laparoscopic resection of adrenal masses up to 13-15 cm^{9,11,27}. In our experience we removed adrenal cortical tumors up 6-7 cm (6 cm in 3 patients, 6,5 cm in 1 and 7 cm in 2), a complicated adrenal cyst of 8 cm and 1 myelolipoma of 10 cm. We noted an increased technical difficulty associated with laparoscopic removal of larger tumors, so we agree with authors affirming an appropriate size cutoff might be 8 to 10 cm for non-cortical tumors such as pheochromocytomas or myelolipomas and 6 cm for adrenal tumors^{14,28}. Also, the role of laparoscopic adrenalectomy in the management of patients with primary adrenal malignancies has not yet been established. Large tumors are more difficult to manipulate laparoscopically, which could increase the risk of tumor spillage. The lack of wide exposure and tactile sensation leaves this method prone to incomplete removal of malignant tumors. Adrenal malignancies may invade contiguous organs, soft tissue, or lymph nodes that require resection. Because of these limitations, we agree with the vast majority of authors who suggest that this method of adrenalectomy be reserved for lesions with a small probability of malignancy; this would typically mean that patients with lesions larger than 8 to 10 cm are not good candidates for a laparoscopic approach^{29,30}. Similarly, masses that have radiographic signs of malignancy such as irregular borders may be better approached through one of the more conventional methods^{29,31-33}. Regarding the conversion rate to open surgery, the largest series published, present a conversion rate of 3-18%^{34,35}. The most common reasons that the

laparoscopic procedure cannot be carried out to completion are the presence of intra-abdominal adhesions, bleeding and a difficult dissection, whereby the surgeon feels an open procedure will provide a safer and more complete resection. The latter is more common in morbidly obese patients. It has also been shown that a more experienced surgical team decreases the amount of complications^{36,37}. Critical analysis of our data shows results fully comparable to those found in the scientific literature for each considered variable, except one, that is, the average hospital stay of our patients longer than data reported by others. It lies not in patients' clinical conditions, but it was due, especially at beginning, to the need to change old habits when introducing a new technique. Now we have more experience and knowledge from the analysis of our records in patients undergoing laparoscopic adrenalectomy, so we will reduce the hospital stay in the future.

Conclusions

Laparoscopic adrenalectomy is technically feasible and reproducible. We prefer lateral decubitus transperitoneal flank approach. We evaluate the effectiveness of laparoscopic adrenalectomy for a variety of endocrine disorders except in the case of invasive carcinoma or large masses. We agree with authors^{14,29,30} affirming an appropriate size cutoff might be 8 to 10 cm for noncortical tumors and 6 cm, probably also 7 cm, for adrenal tumors, although it's technically possible to remove adrenal masses greater than 8 cm in diameter and up to 13-15 cm^{9,11,27}. "Antonio Cardarelli" Endocrine and General Surgery Unit in Naples is known as a specialized center for thyroid and parathyroid surgery; in future, we could also become a high-volume laparoscopic referral center for adrenal gland pathologies.

Riassunto

OBIETTIVO: La surrenectomia laparoscopica è considerata la tecnica "gold standard" per l'asportazione chirurgica del surrene. Noi riportiamo l'esperienza di circa 4 anni di chirurgia laparoscopica del surrene presso la nostra Unità di Chirurgia Generale ed Endocrina.

METODI: Abbiamo eseguito 24 surrenectomie per via laparoscopica con approccio transperitoneale in decubito laterale. Le indicazioni all'intervento laparoscopico sono state le seguenti: 3 pazienti con diagnosi di aldosteronoma, 6 di feocromocitoma, 6 di adenoma non funzionante, 3 di adenoma causa di Sindrome di Cushing, 1 di tumore adenomatoide simil-linfangiomatoso, 1 di mielolipoma, 1 di cisti surrenalica complicata, 2 di carcinoma adrenocorticale, 1 di metastasi polmonare.

RISULTATI: In tutti i pazienti tranne due abbiamo ultimato con successo la surrenectomia laparoscopica.

Abbiamo avuto una complicanza in un paziente. In 3 pazienti abbiamo eseguito contemporaneamente un'altra procedura laparoscopica. Il tempo dell'intervento è stato di 100-240 minuti per la surrenectomia laparoscopica, di 180-210 minuti nei casi con due procedure laparoscopiche associate, di 5 ore per la surrenectomia bilaterale; la degenza ospedaliera postoperatoria è stata da 4 a 8 giorni (6,79 in media) e da 7 a 13 giorni (9,12 in media) per pazienti sottoposti in prima istanza a procedura laparotomica o convertiti successivamente.

CONCLUSIONI: La surrenectomia laparoscopica è tecnicamente fattibile e riproducibile. Abbiamo valutato la sua efficacia in una varietà di disordini endocrini del surrene, tranne nei casi di carcinoma invasivo o masse surrenaliche molto grandi. L'Unità di Chirurgia Generale ed Endocrina dell'Ospedale "Antonio Cardarelli" di Napoli è conosciuta come centro specializzato per la chirurgia della tiroide e della paratiroide; in futuro, speriamo di essere considerati anche un centro di riferimento per la chirurgia laparoscopica del surrene.

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