SURGICAL TECHNIQUE

Transperitoneal laparoscopic adrenalectomy


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Abstract

Objectives: To present our results with transperitoneal laparoscopic adrenalectomy after completion of 70 procedures.

Materials and methods: Between July 2002 and December 2010, transperitoneal laparoscopic adrenalectomy was performed in 70 patients with the following diagnoses: Conn syndrome (22 cases), nonfunctioning adenomas (18), Cushing syndrome (10), pheochromocytomas (7), myelolipomas (4), metastasis after treatment of primary nonadrenal tumors (6), ganglioneuroma (1), adrenal gland hematoma (1) and adrenal carcinoma (1). We describe the size, surgical and hospitalization times, blood loss, need for transfusion, surgical complications and rate of conversion to open surgery.

Results: Of 70 patients, 35 were men and 35 women (1:1) with a mean age of 58.2 years (range, 82.2–29.1). The most common site was left (58%) compared to right (42%). The mean size of the surgical specimen was 5.1 cm, mean surgical time was 119.2 min (50–240) and mean operative bleeding was 140.6 (30–800) cm³. Only 3 patients required blood transfusion. The mean time until oral feeding was 17 h, and the mean hospital stay was 4.3 (2–15) days. Complications were 2 cases of surgical infections, 1 of prolonged paralytic ileus, and 1 of splenic laceration and 1 of intestinal perforation, which both required reconversion to open surgery (4.28%).

Conclusions: Laparoscopic adrenalectomy is a safe procedure, with a low percentage of complications and a short hospital stay. The choice of this approach will depend on the surgeon’s experience with the lesion etiology and size in each case.

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Keywords

Adrenal; Laparoscopy; Transperitoneal

Palabras clave

Suprarrenal; Laparoscopia; Transperitoneal

Resumen

Objetivos: Presentar nuestros resultados en suprarrenalectomía laparoscópica transperitoneal tras haber realizado 70 procedimientos.

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Material y métodos: Entre julio de 2002 y diciembre de 2010, 70 pacientes fueron sometidos a suprarrenalecctomía laparoscópica transperitoneal con los siguientes diagnósticos: 22 de síndrome de Conn, 18 adenomas no funcionantes, 10 casos de síndrome de Cushing, 7 feocromocitomas, 4 mielolipomas, 6 casos de metástasis tras tratamiento de neoplasia primaria no adrenal, un ganglioneuroma, un hematoma de glándula suprarrenal y un carcinoma suprarrenal. Describimos el tamaño, el tiempo quirúrgico y de hospitalización, la pérdida sanguínea y la necesidad de transfusión, las complicaciones quirúrgicas y la tasa de conversión a cirugía abierta.

Resultados: De los 70 pacientes 35 fueron hombres y otras 35 mujeres (1:1) con una edad media de 58,2 años (82,2 - 29,1). La localización predominante fue la izquierda (58%) frente a la derecha (42%). Con un tamaño medio de la pieza quirúrgica de 5,11 cm, el tiempo quirúrgico promedio fue de 119,2 minutos (50 - 240) y el sangrado operatorio medio de 140,6 cc (30 - 800), precisando tan sólo en tres pacientes transfusión sanguínea. El período promedio para alimentación oral fue de 17 horas y la estancia media hospitalaria fue de 4,3 días (15 - 2). Como complicaciones observamos dos casos de infecciones quirúrgicas, un ileo paralítico prolongado, un caso de laceración espelénica y otro de perforación intestinal; ambos precisaron reconversión a cirugía abierta (4,28%).

Conclusiones: La suprarrenalectomía por vía laparoscópica es una técnica quirúrgica segura, con un bajo porcentaje de complicaciones y que precisa breve estancia hospitalaria. La elección de esta vía de acceso dependerá de la experiencia individual del cirujano, teniendo en cuenta tanto la etiología como el tamaño de la lesión en cada caso.

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Introduction

Urology has always been a pioneer, along with other surgical disciplines, in the application of minimally invasive approaches to surgery. There is no organ in the genitourinary system on which minimally invasive surgery has had no impact.

The approach of the adrenal gland laparoscopically was implanted quickly after Gagner, in 1992, communicated the first laparoscopic experience in the removal of the adrenal gland. Since then, multiple centers have reported their initial experience demonstrating both the advantages of this surgical access and its safety and efficacy.

We present the results of the first 70 laparoscopic adrenalectomies that have been performed by the same surgical team at the Department of Urology, University Hospital of Albacete, and in a private center in the city.

Materials and methods

Retrospective observational study was done of the first 70 transperitoneal laparoscopic adrenalectomies that have been performed at our center, by the Department of Urology, between July 2002 and December 2010. The patients were referred to the Department of Urology after having been previously studied in the Nephrology, Endocrinology and Internal Medicine 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.

Of the 70 patients, 35 were men and 35 women (1:1) with a mean age of 58.2 years (82.2–29.1). The following diagnoses were established: 22 Conn’s syndrome (31.42%), 18 nonfunctioning adenomas (25.71%), 10 cases of Cushing’s syndrome (14.28%), 7 pheochromocytomas (10%), 4 myelolipomas (5.71%), 6 cases of metastasis after treatment of primary nonadrenal neoplasia (8.57%), a ganglioneuroma (1.42%), an adrenal gland hematoma (1.42%) (Fig. 1). The predominant location was left in 41 cases (58%), compared to right in 29 cases (42%). No patient showed bilateral involvement.

Transperitoneal laparoscopic adrenalectomy was performed in all cases in lateral decubitus position at 90° with respect to the operating table without pellet (Fig. 2). This position facilitates (on the left side) the gravity displacement of the spleen and the pancreatic tail medially, making direct access to the adrenal glands possible. We used 0° 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 used 4 trocars, a 12-mm Hasson trocar (located 2 cm above the navel at the level of the outer side of the anterior rectus abdominis, through which we introduce the laparoscope), a 10-mm trocar (near the costal margin, in the midclavicular line, right hand of the surgeon), and two 5-mm trocars, a subcostal one in the internal axillary line (for the surgeon’s left hand), and the other one near the left iliac fossa, similar to the one used in the radical nephrectomy (Fig. 3). On the right side, we used 4 more: Hasson trocar for the optics, and 10-mm trocar in a similar position to the left approach (in the costal margin at the level of the midclavicular line for the right hand of the surgeon), 5-mm trocar (subcostal, at the level of the
Figure 1  (A) Cushing’s syndrome, (B) Conn’s syndrome, (C) pheochromocytoma, and (D) adrenal hematoma.

Figure 2  Placement of the patient at 90° without pellet.

Figure 3  Placement of trocars for left adrenalectomy.

Figure 4  Placement of trocars for right adrenalectomy.

axillary line for the left hand of the surgeon), and another 5-mm trocar in the inner costal margin, below the xiphoid appendix, allowing the assistant to separate the liver during the surgery (Fig. 4).

We always start the adrenalectomy with the approach and section of the adrenal vein and subsequent dissection of the adrenal gland. On the left side, we perform decollation 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 reference point for the approach of the left adrenal gland. On the right side, it is essential, and prior to any move, to explore hepatic mobility; and 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 careful 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 (Fig. 5). 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 removal.

The average size of the surgical piece was 5.11 cm (14–1.5) with a surgical time of 119.2 min (240–50). The average size of the tumors of incidental finding was 5.72 cm (4.2–8). The mean hematonic loss was 147.6 cm$^3$ (800–30), requiring the transfusion of packed red blood cells in only three patients (4.2%).

The patients started to develop oral tolerance to liquid 17 h after surgery (5 days–8 h), establishing intravenous analgesic treatment scheduled every 8 h in the first 24 h of the surgery, and orally on demand from the second postoperative day. The mean duration of hospital stay was 4.3 days (15–2).

We have divided our sample into two groups: the first 35 patients operated against the latter, in order to check the evolution of our learning curve, and we have observed how in the first 35 patients the mean surgical time was 141.2 min for a medium-sized piece of 4.3 cm, while in the second group the time spent was significantly lower (100.5 min) for a larger surgical piece (5.4 cm). Moreover, the average period of hospital stay for the first group was 5.2 days, compared to 3.9 days in the second one.

Among the complications presented, two surgical wound infections, a prolonged paralytic ileus for 5 days with a good evolution after conservative treatment and management with a nasogastric tube, a case of splenic laceration, and one of bowel perforation stand out. In these two cases, along with a patient with metastatic lung cancer of 14 cm, conversion to open surgery (4.28%) was necessary. After reviewing medical records, 5 patients had died since July 2002, but none as a result of surgery: 3 lung cancer patients, a chronic myeloid leukemia one, and 1 acute myocardial infarction patient.

**Discussion**

Despite starting the program of laparoscopic adrenalectomy in our center in 2002, it was from 2006 when we began to perform a greater number of interventions and considered the laparoscopic approach as a usual technique, operating on increasingly larger masses (Fig. 6).

The laparoscopic approach of the adrenal gland is currently one of the clearest indications of laparoscopic surgery in our specialty, leaving behind those large lumbotomic incisions to treat small adrenal lesions, which were the cause of a morbidity and mortality that could reach up to 40%. 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, with a short hospital stay, and a rapid recovery of the patient, allowing for an early incorporation to the daily activities.

The criteria on which we rely to indicate surgery are: functioning adrenal mass, incidentaloma > 5 cm or incidentalomas between 4 and 5 cm in patients younger than 60 years. The aggressiveness of the tumor is also a determining factor for the indication of surgery. The most common indication in our center is Cushing's disease (22.5%).
patients especially experienced surgeons near the retroperitoneal area, it has been reported that incidental adrenal masses in the range of 5.6–2.3 cm, according to different criteria that exceed the interest of this article.8

We perform transperitoneal approach to feel more familiar with this route and provide greater comfort for the wide surgical field against the retroperitoneal route. 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 complications.9,10 We place the patient in the unchanged 90° position, since we use a 0° optic, and that allows us to better visualize the vascular pedicle. We systematically use 4 trocars, as described above, on the right and left side, since on the one hand it facilitates dissection and reduces surgical time and, on the other hand, it allows for the active participation of the assistant at surgery, without increasing morbidity this being a 5-mm accessory trocar. We performed the first access to the abdominal cavity through a minilaparotomy, placing a Hasson trocar, as it gives us more security to avoid bowel injuries. Another particular modification we made usually on the left side is the placement of the fourth trocar (5 mm) near the left iliac fossa, the same as in radical nephrectomy, more inferior than most authors, using the assistant to separate the spleen, to breathe in, etc. This position provides greater comfort for the surgeon and the assistant and it has a lower risk of injury to surrounding structures, especially the spleen, in our experience. On the right side, we have also slightly modified, according to our experience, the position of the fourth trocar (5 mm) placing it in the inner costal margin, below the xiphoid appendix, allowing the assistant to separate the liver and help the surgeon in the dissection during the progression of the surgery.

Currently, the size is not so much a relative contraindication as the preoperative diagnosis, since, in our experience, myelolipomas of a significant size will be less difficult to remove than smaller malignant lesions. Henry et al.11 performed laparoscopic adrenalectomies in 19 patients with potentially malignant tumors, all of them over 6 cm, requiring conversion in two cases and concluding that laparoscopic adrenalectomy is feasible in selected patients and experienced hands, needing open adrenalectomy in the event of local invasion during surgery. In our work, we provide 6 adrenalectomies for adrenal metastases, three secondary to lung cancer, two for renal cancer, and one for colon cancer, in the case of lesions smaller than 5 cm, except one of 14 cm that required conversion to open surgery. Therefore, laparoscopy must be considered as a reference in the treatment of functioning and nonfunctioning benign lesions of the adrenal gland under 12 cm.12 Open surgery is recommended only for lesions larger than 10–12 cm or tumors with clearly malignant features on preoperative imaging.13,14

Regarding the conversion rate to open surgery, the largest series published, such as the Japanese series with 4900 patients15 or that by Shen et al.,16 present a conversion rate of 3–18%. In our case, conversion was required in 4.28% of the cases (three patients). The first case involved a 14 cm adrenal mass of metastatic origin, secondary to a lung cancer, widely attached to the psoas muscle and of difficult resection that required early conversion after splenic laceration and subsequent active bleeding. The case of intestinal perforation occurred when performing minilaparotomy for Hasson trocar insertion, as a consequence of intestinal adhesions secondary to previous abdominal surgery. In the third patient, conversion due to splenic bleeding was required.

The learning curve is necessary in all surgical fields, but especially in laparoscopy. The 70 cases in our center have been intervened by three surgeons. We observe the difference in the reduction of the surgical time and hospital stay in the group of the second 35 adrenalectomies, although larger surgical pieces were intercepted. We cannot set a cut-off point at the time of establishing how many laparoscopic adrenalectomies are needed to overcome the learning curve, this being a surgeon-dependent situation, especially if we have previous experience in laparoscopic kidney surgery, but we can say observing our results and those of other recent series8 that progressive experience and the acquired security makes it possible to assume adrenal lesions of increasing size and complexity.

The results presented by numerous works regarding early oral tolerance, postoperative pain with good oral control, and the rapid incorporation to work have allowed for adrenalectomy to become a technique that, in selected cases, may be performed under a major ambulatory surgery regime.17

In summary, laparoscopic adrenalectomy is a safe surgical technique, with a low complication rate, and that requires a shorter hospital stay. The choice of this access route will depend on the individual surgeon’s experience, taking into account both the etiology and the size of the lesion in each case. It should therefore be considered the gold standard in the treatment of benign functioning and nonfunctioning lesions of the adrenal gland under 12 cm and some selected malignant lesions. In these, the surgeon’s experience, the adhesions of the lesion and the size of the same are the main restrictive factors for its use. Compared with open surgery, laparoscopic adrenalectomy achieves superior results in terms of morbidity, recovery, satisfaction, and better cosmetic results of the patient.

In fact, since the incorporation of laparoscopy to surgery, in most urology departments, laparoscopic adrenalectomy performed by urologists with experience in laparoscopic nephrectomy does not imply an additional difficulty, which is why, the number of urology departments that publish their recent experience is increasing. Currently, it is likely that the learning curve for an adrenalectomy is shorter for an urologist with experience in laparoscopic renal surgery than for a general surgeon with laparoscopic experience; hence, we should claim this surgery in those centers where its care location has not been defined, within what we would call a retroperitoneal and adrenal gland urological unit.

Conflict of interest

The authors declare that they have no conflict of interest.
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References