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Laparoscopic adrenalectomy. Five-year experience

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Objective: Adrenal conditions requiring surgery are uncommon and are usually seen in several surgical departments. Our experience in laparoscopic management of adrenal pathology after almost five years of use of laparoscopy for retroperitoneal conditions at our center is reported.

Materials and methods: A total of 37 laparoscopic adrenalectomies were performed over 53 months for benign and malignant conditions. The transperitoneal approach was used in most cases (97%) because of the greater surgeon experience with this route. Pregnancy and suspected periadrenal infiltration were considered as absolute contraindications.

Results: Mean operating time was 90 minutes, mean intraoperative bleeding 80 ml, and mean hospital stay was 2 days. The main complication was one death. A malignancy was found in 4 patients (10%), while all other patients (90%) had a benign condition, including 8 pheochromocytomas.

Conclusions: Laparoscopy is considered to be the gold standard for benign adrenal conditions. When the malignant mass is a single metastasis from a primary tumor, the laparoscopic approach appears to be reliable. When the malignant lesion is a primary adrenal tumor, laparoscopic management is more controversial, although the results reported by experienced surgeons in their series appear to be adequate.

Suprarrenalectomía laparoscópica. Experiencia de 5 años

Palabras clave:
Suprarrenal
Adrenalectomía
Laparoscopia
Feocromocitoma

R E S U M E N

Objetivo: la patología adrenal susceptible de indicación quirúrgica es poco frecuente y normalmente se encuentra dividida entre varios servicios quirúrgicos. Presentamos nuestra experiencia en el manejo laparoscópico tras casi 5 años de implantación de la laparoscopia en la patología retroperitoneal en nuestro centro.

Material y métodos: en 53 meses se han realizado un total de 37 suprarrenalectomías por patología benigna y maligna. El abordaje más frecuentemente empleado es el transperi-

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toneal (97%) debido a la mayor experiencia del cirujano con esta vía. La paciente embarazada y la sospecha de infiltración periadrenal se han tomado como contraindicaciones absolutas.

Resultados: el tiempo quirúrgico medio es de 90 minutos, sangrado intraoperatorio de 80 cc, estancia media postoperatoria de dos días y la principal complicación ha sido un exitus. En 4 ocasiones la patología es maligna (10%), el resto (90%) benigna, con 8 feocromocitomas.

Conclusiones: la laparoscopia se considera el patrón oro para la patología benigna adrenal. Cuando la lesión es de naturaleza maligna, en caso de ser una metástasis única procedente de otro tumor primario, parece que el abordaje laparoscópico es fiable. Cuando la lesión maligna es primaria adrenal existe más controversia en este tipo de abordaje, si bien es cierto que en series de cirujanos experimentados los resultados parecen adecuados.

Introduction

Laparoscopic surgery of the adrenal gland was first described in 1992 by Gagner, who used the transabdominal approach to access the gland in a patient with Cushing syndrome[1].

Since then, laparoscopy has become widely consolidated in Urology. Indeed, laparoscopic surgery is experiencing an exceptional expansion in its indications and in technological development (robotics, working with a single port, the use of natural orifices, etc.). However, as a concrete area, adrenal gland pathology appears to continue to be treated by other specialities such as General Surgery – though this probably varies greatly from one hospital center to another.

After publishing our initial experience in 2006 comparing the first two years of laparoscopic surgery with 10 years of open surgery[2], the present study reviews our 5 years of experience with laparoscopic adrenalectomy.

Material and methods

An analysis is made of our series of laparoscopic adrenalectomies from its start in November 2004 to the present time, representing a total of 53 months.

The transperitoneal approach was the most commonly used option. We agree with most authors that this approach is more convenient, thanks to its more generous working space and the anatomical orientation[3,4]. In reference to the latter, a contributing factor is undoubtedly the fact that the rest of retroperitoneal laparoscopic procedures are also carried out in this way (radical, simple and partial nephrectomy, live donor, pyeloplasty, etc.). After decollation following the line of Toldt, on the left side we find the principal adrenal vein at its entry point to the renal vein. In some cases we can find the branch corresponding to the inferior diaphragmatic vein over the anterior surface of the gland. On the right side, the anatomical reference is again the principal renal vein and the laterocaval plane. At the apex of the gland we find the principal adrenal vein, usually in a retrocaval position, and of short length. Firm traction upon the gland is to be avoided, since the tissue is fragile and tears easily – causing bleeding that is difficult to control and greatly contaminates the dissection layers.

In the mentioned period of time we have performed a total of 37 adrenalectomies, with an important increase in the number of cases in the last year (Fig. 1). The Services from which the patients have been referred are reported in Table 1.

The initially contemplated absolute contraindications to the laparoscopic approach have been maintained: pregnant women and radiologically suspected periadrenal infiltration. Pheochromocytoma is presently not regarded as a contraindication. We maintain the initial indications of functional masses of any size, and non-functional masses measuring over 5 cm in size.

Results

From November 2004 to March 2009, we performed a total of 37 laparoscopic adrenalectomies: 36 via the transperitoneal approach, and a single lumboscopic procedure, due to the surgical antecedents of the patient. In 16 cases the patients were men (43%), while 21 corresponded to women (57%). In 18 cases the left-side gland was involved (48%), while in 19 cases the right-side gland was removed (52%). The mean patient age was 49 years (range 28-79). The mean body mass index (BMI) was 26 kg/m^2 (range 18-36). In 14 cases there were antecedents of major abdominal surgery (37%). The mean surgery time was 90 minutes (range 50-180), the mean intraoperative bleeding volume was 80 ml (range 50-200), and the mean hospital stay was two days (range 2-7). No patients required transfusion. We recorded one postoperative death, corresponding to case number 9 (cerebrovascular accident). This was a 79-year-old woman with ASA 3 status and a history of transient ischemic attack, referred by the Service of Endocrinology due to a functional right adrenal adenoma that produced Cushing syndrome. The operation lasted 70 minutes, and was without incidents. However, the patient suffered massive thromboembolic brain damage 12 hours after the operation. In case number 15 conversion to open surgery was decided due to the presence of periadrenal infiltration on the part of an undifferentiated right adrenal gland malignancy, requiring radical nephrectomy due to kidney infiltration.

As regards the histopathological findings of the resected pieces, there were 8 pheochromocytomas (two bilateral), 4 tumor metastases (2 from lung and two from rectum-

sigmoid), one undifferentiated carcinoma, a ganglioneuroma, 10 functional adenomas causing Cushing syndrome, 9 hyperaldosteronism-generating lesions, a myelolipoma, a mesothelial cyst, and two large, non-functional adenomas.

Discussion

Due to its location in the retroperitoneal space, at the junction of the renal hilum, the adrenal gland is familiar to urologists. On the other hand, the visibility generally offered by laparoscopy, particularly in a region as deeply located as the adrenal gland, makes the management of such cases via laparoscopic surgery particularly attractive. In our Service the transperitoneal approach is the most commonly used option (Fig. 2). Lumboscopy in turn offers the advantage of not having to mobilize abdominal structures (spleen, liver, intestine, etc.), and avoids adherences in the case of previous surgical interventions. However, the working space is clearly inferior, and the main series contraindicate this approach in obese patients (BMI > 45 kg/m^2) and in masses over 7 cm in size[5,6]. On the other hand, we are of the opinion that the approach should be decided considering surgeon convenience and experience.

The first difficulty in planning a study such as ours is undoubtedly the documentation of sufficient patients who are diagnosed with an infrequent disease, have been referred from a range of Services (Endocrinology, Nephrology, Internal Medicine, Oncology, etc.), and who are already normally assigned to another surgical area (usually General Surgery) for treatment. In this context, close contact with the Service of origin, and permanent information on the process, can help redirect the flow of patients in part. Our experience in this sense has been very positive, with very important implication on the part of services such as Endocrinology and Anesthesia in patient preparation and follow-up. On comparing with the 10 years of open surgical experience, during which Endocrinology referred three cases, we see that after the introduction of laparoscopic surgery in our Service, a total of 15 cases were referred by Endocrinology for treatment in only four years.

As regards the indications of the technique, few authors question the usefulness and safety of laparoscopy in application to benign functional adrenal masses causing Cushing syndrome or hyperaldosteronism. Laparoscopy is presently considered the gold standard for such pathology, since it offers all the advantages of minimally invasive surgery (shorter hospital stay, fewer complications and increased patient satisfaction), with the same efficacy and safety of open surgery[7]. Indeed, a number of articles have examined the question as to what point the introduction of laparoscopy has served to change the indications of adrenal gland surgery. In an analysis of 1816 adrenalectomies performed in Florida (USA)[8], after examining the important increase in the number of cases registered during the period 1998-2005 (practically two-fold), the authors concluded that the indications of such surgery probably should be revised, particularly in reference to incidentally detected non-functional lesions.

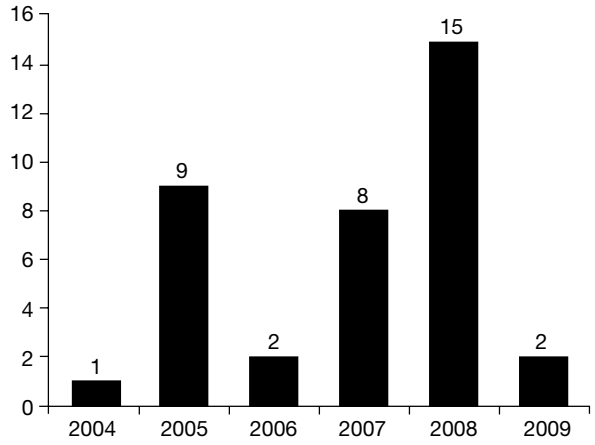

Figure 1 – Distribution by years.

Table 1 – Services referring the patients

	No. cases
Endocrinology	15
Nephrology	8
Cardiology	3
Urology	3
General Surgery	2
Chest Surgery	2
Oncology	2
Internal Medicine	1
Digestive Medicine	1

Figure 2 – Incisions in bilateral pheochromocytoma.

In the case of pheochromocytoma, the initial reluctance towards laparoscopic treatment, on the grounds that catecholaminergic discharge could be produced by the pneumoperitoneum, does not seem sufficiently important to discard this technique as a first choice – though the operation must be carried out by an experienced surgeon, in order to lessen gland manipulation and shorten the surgical time[9-11]. In any case, we consider that the laparoscopic management

Figure 3 – Bilateral pheochromocytoma.

Figure 4 – Pheochromocytoma measuring 8 cm in size.

of such cases is totally dependent upon the preoperative preparation and intraoperative anesthesia. Undoubtedly, and more than in any other indication, the experience of the anesthetic team with patients of this kind will define the limit with conversion to open surgery (Figs. 3 and 4).

As regards the indication of laparoscopic surgery in malignant adrenal gland disease, we feel that a distinction must be made between primary lesions of the adrenal gland (adrenocortical carcinoma) and lesions originating from other primary tumors (lung, colorectal, melanoma, kidney and breast). Primary adrenal carcinoma is infrequent, with an incidence of two cases per one million inhabitants/year. It is aggressive, with a 5-year survival rate of 11-38%, and the treatment consists of total surgical resection. Initial laparoscopic management of this tumor was a total failure, with 5 cases of local recurrence in ports and peritoneal carcinomatosis in the period 1997-1999[12-16]. This led to the suspicion that laparoscopy – probably as a result of the pneumoperitoneum – facilitated tumor cell spread. Posterior studies, though still involving small series of patients because of the rarity of the disease, yielded better oncological results than those initially reported[17-19]. In a metaanalysis published in 2005[20] and involving 420 open adrenalectomies due to malignant disease, the observed local and peritoneal relapse rates were very similar to those reported in laparoscopic series (local relapse 30%, distant relapse 67%, and peritoneal recurrences 14%).

Less controversy is found in relation to laparoscopic surgery when treating adrenal gland malignancies corresponding to metastases of lesions located elsewhere. In these cases it seems clear that surgical treatment of single adrenal metastatic lesions improves patient survival. The literature contains series in which laparoscopy afforded the same oncological control as open surgery, with the added advantages of this type of surgical approach[21]. The basic rules of oncological laparoscopic surgery of course must be observed: the use of bags to extract the pieces, avoidance of tumor fragmentation, and complete tumor resection leaving a safety margin. Patient selection is also important. In this context it seems reasonable to avoid tumors of large size with radiologically suspected infiltration of adjacent structures. In these cases the possible need for conversion to open surgery and the risk of local disease relapse, peritoneal spread or port metastases are greater[22].

Conclusion

Laparoscopic adrenalectomy in application to malignant disease was initially questioned due to the poor oncological control reported. However, laparoscopy has now again been contemplated as an alternative to open surgery, thanks to the good results obtained with growing experience in patient selection and in application of the technique.

In application to benign adrenal gland disease, laparoscopic surgery appears to be superior to classical open surgery, since the associated morbidity is clearly lower, while the same results are obtained in correcting the pathology.

As always in such cases, the technique chosen (transperitoneal versus lumboscopic), the surgery time, transfusion rate, complications, etc., are strongly dependent upon surgeon experience and on correct patient selection.

Conflicts of interest

The authors declare no conflicts of interest.

REFERENCES

1. Gagner M, Lacroix A, Bolte E. Laparoscopic adrenalectomy in Cushing's syndrome and pheochromocytoma. N Engl J Med. 1992;327:1033.

2. Aguilera Bazán A, Pérez Utrilla M, Alonso y Gregorio S, Cansino Alcaide R, Cisneros Ledo J, De la Peña Barthel J. Suprarrenalectomía abierta y laparoscópica. Revisión de 10 años. Actas Urol Esp. 2006;30(10):120-5.
3. Desai M, Strzempkowski B, Matin SF, Steinberg AP, Meraney AM, Gill IS. Prospective randomized comparison of transperitoneal versus retroperitoneal laparoscopic radical nephretctomy. J Urol. 2005;173:38-41.
4. Abdelmaksoud A, Biyani CS, Bagheri F, Janetschek G. Laparoscopic approaches in urology. BJU Int. 2005;95:244-9.
5. Walz MK, Peitgen K, Diesing D, Petersenn S, Janssen OE, Philipp T, et al. Partial versus total adrenalectomy by the posterior retroperitoneoscopic approach: early and long-term results of 325 consecutive procedures in primary adrenal neoplasia. World J Surg. 2004;28:1323-9.
6. Walz MK, Alesina PF, Wenger FA, Deligiannis A, Szuczik E, Petersenn S, et al. Posterior retroperitoneoscopic adrenalectomy results of 560 procedures in 520 patients. Surgery. 2006;140:943-50.
7. Smith CD, Weber CJ, Amerson JR. Laparoscopic adrenalectomy: new gold standard. World J Surg. 1999;23:389-96.
8. Joris JL, Hamoir EE, Hartstein GM, Meurisse MR, Hubert BM, Charlier CJ, et al. Hemodynamic changes and catecholamine release during laparoscopic adrenalectomy for pheochromocytoma. Anesth Analg. 1999;88(1):16-21.
9. Gallagher S, Wahi M, Haines K. Trends in adrenalectomy rates, indications, and physician volume: A statewide analysis of 1,816 adrenalectomies. Surgery. 2007;142:1011-21.
10. Tauzin-Fin P, Sesay M, Gosse P, Ballanger P. Effects of perioperative alpha 1 block on haemodynamic control during laparoscopic surgery for phaeocromocytoma. Br J Anaest. 2004;92(4):512-7.
11. Lodin M, Privitera A, Giannone G. Laparoscopic adrenalectomy (LA): Keys to success correct surgical indications, adequate preoperative preparation, Surgical Team Experience. Surg Laparosc Endosc Percutan Tech. 2007;17:392-5.
12. Ushiyama T, Suzuki K, Kageyama S, Fujita K, Oki Y, Yoshimi T. A case of Cushing's syndrome due to adrenocortical carcinoma with recurrence 19 months after laparoscopic adrenalectomy. J Urol. 1997;157:2239.
13. Hofle G, Gasser RW, Lhotta K, Janetschek G, Kreczy A, Finkenstedt G. Adrenocortical carcinoma evolving after diagnosis of preclinical Cushing's syndrome in an adrenal incidentaloma. A case report. Horm Res. 1998;50:237-42.
14. Hamoir E, Meurisse M, Defechereux T. Is laparoscopic resection of a malignant corticoadrenaloma feasible? Case report of early, diffuse and massive peritoneal recurrence after attempted laparoscopic resection. Ann Chir. 1998;52:364-8.
15. Deckers S, Derdelinckx L, Col V, Hamels J, Maiter D. Peritoneal carcinomatosis following laparoscopic resection of an adrenocortical tumor causing primary hyperaldosteronism. Horm Res. 1999;52:97-100.
16. Foxius A, Ramboux A, Lefebvre Y, Broze B, Hamels J, Squifflet J. Hazards of laparoscopic adrenalectomy for Conn's adenoma. When enthusiasm turns to tragedy. Surg Endosc. 1999;13:715-7.
17. Lombardi CP, Raffaelli M, De Crea C, Bellantone R. Role of laparoscopy in the management of adrenal malignancies. J Surg Oncol. 2006;94:128-31.
18. Schlamp A, Hallfeldt K, Mueller-Lisse U, Pfluger T, Reincke M. Recurrent adrenocortical carcinoma after laparoscopic resection. Nat Clin Pract Endocrinol Metab. 2007;3:191-5.
19. Liao CH, Chueh SC, Lai MK, Hsiao PJ, Chen J. Laparoscopic adrenalectomy for potentially malignant adrenal tumors greater than 5 centimeters. J Clin Endocrinol Metab. 2006;91:3080-3.
20. González RJ, Shapiro S, Sarlis N, Vassilopoulou-Sellin R, Perrier ND, Evans DB, et al. Laparoscopic resection of adrenal cortical carcinoma: a cautionary note. Surgery. 2005;138: 1078-85.
21. Strong VE, D'Angelica M, Tang L, Prete F, Gönen M, Coit D, et al. Laparoscopic adrenalectomy for isolated adrenal metastasis. Ann Surg Oncol. 2007;14:3392-400.
22. Saunders B, Doherty G. Laparoscopic adrenalectomy for malignant disease. Lancet Oncol. 2004;5:718-26.