



Original Research

Perioperative Surgical Morbidity of Laparoscopic Transperitoneal Adrenalectomy in the Treatment of Adrenal Masses

Tarik Yahiaoui^{1,2} | Mustapha Lounici³

1. Department of Urological Surgery - University Hospital Center of Tizi-Ouzou – Algeria.

2. Faculty of Medicine - Mouloud Mammeri University - Tizi-Ouzou – Algeria.

3. Central Hospital of the Army – Algiers – Algeria



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Abstract:

Background: Laparoscopic adrenalectomy has become the gold standard for the treatment of benign lesions of the adrenal glands ^[1,2]. The aim of this study is to evaluate the perioperative surgical morbidity of laparoscopic transperitoneal adrenalectomy for the treatment of adrenal masses less than 6 cm in size.

Material and methods: This is a prospective descriptive single-centre study of perioperative morbidity of transperitoneal laparoscopic adrenalectomy of 36 adrenal masses less than 6 cm in size, performed over a two-year period.

Results: The average age of the patients was 44.2 ± 10.1 years, with a sex ratio of 0.4; the average BMI was 26.5 ± 4.5 kg/m²; the abdominal-pelvic surgery background was found in 19.4% of the cases. The average size of the lesions was 25.86 mm. The indication for surgery was the secreting nature of the adrenal masses in 32 patients and the suspicion of malignancy on imaging in 4 patients. The average operating duration was 115.56 ± 37.5 min and the average blood loss was 36.8 ± 50.1 ml. The average hospital stay was 2.3 ± 1.1 days (1-3 days). Postoperative complications occurred in 8.4% of the patients; they were all Clavien-Dindo grade 2 and were generally benign.

Conclusion: Adequate patient preparation, with meticulous surgical technique, is the key to a good patient outcome. Treatment outcomes do not depend on the experience of a one surgeon, but on the experience of the whole team involved in perioperative care.

Keywords: Adrenal/ Adrenal masses/ Incidentaloma/ Laparoscopy/ Laparoscopic adrenalectomy/ Perioperative morbidity.

Background

Over the past thirty years, endocrine surgery has known a surprising number of diagnostic and

therapeutic innovations. Laparoscopic adrenalectomy reported by Gagner in 1992 is one of these innovations ^[1-3].

Initially, laparoscopy was only used for the removal of small adrenal adenomas, but the indications have gradually expanded to larger lesions, including non-functioning tumors, pheochromocytoma and Cushing's disease [4,5]. Despite almost negligible mortality, the morbidity rate of laparoscopic adrenalectomy is 3-20% [6]. Considering the need for a classification of surgical complications, in 1992 Clavien et al. proposed a classification of surgical complications based on five different levels of complications stratified according to the invasiveness of the procedure and the clinical impact of the complication. In the field of urology, its use has increased from 21% in 2010 to 50% in 2012. However, this classification includes only the postoperative complications. In 2005, Satava proposed a simple classification to assess surgical errors during minimally invasive surgery [7].

The objective of our study is to evaluate the perioperative surgical morbidity of laparoscopic transperitoneal adrenalectomy for the treatment of adrenal masses inferior to 6 cm.

Material and methods

We performed a prospective descriptive monocentric study of the perioperative morbidity of transperitoneal laparoscopic adrenalectomy on 36 adrenal masses less than 6 cm in size; performed between 2019 and 2021 at the level of the Department of Urological Surgery of the University Hospital Center of Tizi-Ouzou.

Data were collected by one surgeon by indirect administration on pre-established data sheets and completed from the patients' medical files. All the data collected were entered (computerized) and analyzed on the SPSS.21 statistical software.

Results:

In this study, 36 laparoscopic transperitoneal adrenalectomies were performed for different adrenal masses. The average age of the patients was 44.2 ± 10.1 years (25-74 years); there was a female predominance of 69.4% with a sex ratio of 0.4; the average BMI was 26.5 ± 4.5 kg/m²; the abdominal-pelvic surgery background was found

in 19.4 % of the patients; 72.2 % of the patients presented with clinical symptomatology related to a functional adrenal tumor; one patient as part of the exploration of MEN1 and more than 25 % of the adrenal masses were discovered incidentally. A CT scan was performed in 86.1% of our patients; the adrenal masses were located on the left side in 63.9% of cases; the average size was 25.86 mm (08 to 56 mm); it should be noted that in 22.2% of cases, the size of the adrenal masses was between 40 and 60 mm. Suspicious character was mentioned in 38.7% of the patients who had a non-contrast computed tomography (NCCT) >20 HU. After calculation of the washout, only 4 patients, or 12.9% of the cases, had presented suspicious character (washout <60/40).

The operative indication of a laparoscopic adrenalectomy was decided after a multidisciplinary consultation following the recommended morphological and biological balance sheet. 32 of our patients were operated on for secreting adrenal tumors (20 primary hyperaldosteronism (CONN adenoma), 9 Cushing's syndromes, 3 of which were subclinical, and 3 pheochromocytomas), 4 patients have presented non-secreting adrenal tumors, suspected of malignancy on imaging.

We operated on all our patients via a lateral transperitoneal approach. No incidents were recorded during the introduction of the first trocar by open laparoscopy and the creation of the pneumoperitoneum; 4 trocars were used for the right adrenalectomies in 15 cases and 3 trocars for the left adrenalectomies. The procedures were performed with the use of the hook and bipolar forceps, using the monopolar energy and the thermofusion/diffusion as well (LigaSure); the control of adrenal vein was ensured using clips in all our patients. The drainage of the peritoneal cavity after adrenalectomy was performed in 31 of our patients. The surgical procedures were carried out in good conditions; conversion to open surgery was not necessary. The average duration of the operation was 115.56 ± 37.5 min (40 to 180 min); the average blood loss noted in 94.4% (34

patients) was 36.8 ± 50.1 ml, only one patient operated on for pheochromocytoma required a blood transfusion. The average postoperative hospital stay of the patients was 2.3 ± 1.1 days (1-3 days).

The perioperative morbidity of transperitoneal laparoscopic adrenalectomy is represented by intraoperative events and postoperative complications.

Intraoperative undesirable events have been reported in 11.1% of cases. The occurrence of intraoperative events was significantly associated with the abdominal surgery background ($p=0.01$) and adrenal tumor size ($p=0.03$) in our study.

In our series, postoperative complications are noted in 8.4% of the patients operated on by transperitoneal laparoscopy, occurring within 30 days of the surgery: Two patients presented an acute adrenal insufficiency; one patient presented a surgical site infection. All postoperative complications were Clavien-Dindo grade 2 and were generally benign. They did not affect long-term outcomes.

Several preoperative risk factors that could affect the incidence of morbidity were evaluated, age was not associated with postoperative complications ($p=0.93$), nor was gender ($p=0.38$), the BMI ($p=0.38$), the ASA score ($p=0.39$), the adrenal tumor size ($p=0.57$), whether the adrenal tumor was secreting or not ($p=0.99$), the operative duration ($p=0.93$) and the occurrence of intraoperative incidents ($p=0.99$).

Pathologically, benignity was the rule in our series. It was dominated by adrenal adenomas in 75% of cases, 4 pheochromocytomas whose PASS histopronostic score was inferior to 4 in favor of benignity, two oncocytic secreting tumors, one ganglioneuroma, one micro nodular adrenal hyperplasia and one adrenal medulla hyperplasia.

Discussion:

Laparoscopic adrenalectomy is often performed by general surgeons. However, we present our experience in the care of adrenal tumors. We

performed 36 laparoscopic transperitoneal adrenalectomies for adrenal tumors between December 2019 and December 2021. This is a heterogeneous group of lesions that originate from either the cortex or the adrenal medulla. Nearly 3/4 of the patients were over 40 years, with a female predominance (sex ratio of 0.4); the reasons for this gender disparity are not well clarified. However, complex hormonal interactions with adrenal, endocrine and neurocrine functions as well as variations in hormone receptor sensitivity have been supposed to play an important role^[8]. Adrenal masses inferior to 40 mm represented 77.8% of cases. They were all functional. Different threshold values ranging from 40 to 60 mm have been proposed for surgical resection of adrenal masses^[9-11]. The risk of malignancy increases significantly with a tumor size superior to 40 mm. The indication for adrenalectomy can only be decided after multidisciplinary consultation. Perioperative care was standardized for all patients. Medical preparation was necessary for secretory adrenal tumors with the objectives of: better control of adrenal disease and comorbidities related to hormonal hypersecretion and the prevention of perioperative complications as well. The first procedures were performed using a bipolar hook and clamp as well as the monopolar energy. The introduction of thermofusion (Ligasure®) for laparoscopic adrenalectomies has allowed us to achieve a better dissection and a good haemostasis. It has also allowed us to reduce the need for transfusions reducing thus the postoperative morbidity. The Ligasure®, a vessel sealing device, provides easier vascular control compared to endoclip application. It has proved that a sealed vessel could resist to pressures three times higher than normal systolic blood pressure^[12-13]. When dissecting the adrenal gland from all sides, any traction on the friable adrenal parenchyma exposes the capsular fractures, which can have serious consequences in case of malignancy. The placement of drains after laparoscopic lateral transperitoneal adrenalectomy remains controversial^[14-15]. However, no drain

makes laparoscopic adrenalectomy ambulatory [16].

The average operating duration was 115.56 ± 37.5 min, which was significantly influenced by the use of Ligasure®. In some studies, longer operating durations were apparently associated with higher complication rates. However, in complicated and difficult cases, naturally longer operating durations must be taken for granted [10]. According to UKRETS (UK Registry of Endocrine and Thyroid Surgery), the median postoperative length of stay is 3 days (2-5 days) is largely dictated by the underlying pathology [13].

For the evaluation of intraoperative surgical errors during laparoscopic transperitoneal adrenalectomy, we used the modified Satava classification. One patient operated for pheochromocytoma has presented an intraoperative haemorrhage caused by capsular rupture following operational difficulties; at another patient, loss of control of the left middle adrenal vein occurred during its dissection and its coagulation causing bleeding; and in two cases of right adrenalectomy, during liver retraction, laceration of the liver parenchyma occurred as reported by Ozgor [17] in his study. These incidents were successfully managed without changing the operative approach in a conservative manner. The use of monopolar coagulation may be the cause of the occurrence of intraoperative incidents. Thus, the development of advanced devices such as the LigaSure, vascular control and dissection manoeuvres, among others, play a key role in reducing operative bleeding and intra- and postoperative complications [12,13]. When intraoperative undesirable events confer a postoperative burden to patients, these events reach the status of complication. However, the direct cause-and-effect relationship between a specific intraoperative event and the subsequent postoperative complication can often be difficult to evaluate.

The surgical community defines postoperative complications as: "any deviation from the ideal postoperative course that is not inherent to the

procedure and does not involve failure to heal" as stated by Dindo and Clavien [18-20]. The morbidity rate of laparoscopic adrenalectomy in our series is 8.4% compared to the literature data which are of 3-20% [6].

Acute adrenal insufficiency is a serious complication, involving the patient's vital prognosis and requiring urgent care. Its incidence after adrenalectomy for Cushing's syndrome is unknown. According to the data, it is estimated at 7 per 100 patients/year with a significant risk in the early postoperative period, despite treatment with steroid replacement, sometimes even at high dose [21,22]. In our series, two cases of acute adrenal insufficiency were recorded in the postoperative period: One patient who had been put under mitotane preoperatively the effect of which may persist for several days after stopping it and therefore the need for high dose hydrocortisone in the postoperative period [23]. The other patient presented an acute adrenal insufficiency after the omission of hydrocortisone treatment; this patient required hospitalization; NaCl and steroid replacement was necessary until improvement of the general health condition and correction of ionic disorders.

Only one patient, operated on for left Conn's adenoma, presented a surgical site infection which was treated with local care.

Considering the complication rate after laparoscopic transperitoneal adrenalectomy, several preoperative risk factors analyzed didn't affect the incidence of morbidity. On the other hand, postoperative complications, whether directly associated with a previous unfavorable intraoperative incident or not, always have a negative impact on patient well-being.

Conclusion:

The transperitoneal laparoscopic approach to adrenal surgery has proven to be a reproducible and safe procedure with good perioperative results. The results of the treatment do not depend on the experience of a one surgeon, but on that of the whole team involved in the perioperative care.

Transperitoneal laparoscopic adrenalectomy for adrenal masses inferior to 6 cm can be performed successfully by any urological surgeon after a relatively short learning curve, with a low perioperative morbidity.

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