

TRANSPERITONEAL LAPAROSCOPIC ADRENALECTOMY FOR ADRENAL TUMOURS: EXPERIENCE WITH 54 PATIENTS

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ABSTRACT

Objective: To present our laparoscopic surgery experience in the treatment of adrenal masses.

Methods: Between January 2008 and March 2015, a total of 58 adrenal glands in 54 patients (39 females, 15 males) underwent transperitoneal laparoscopic adrenalectomy (TLA) to remove an adrenal mass. The patients underwent hormonal evaluation, triphasic magnetic resonance imaging, and/or abdominal computed tomography. Thirty-one patients (57.4%) had a hormonally active adrenal mass.

Results: Twenty-nine right, 21 left, and 4 bilateral TLA were performed. The mean age and body mass index of the patients were 49.5 ± 11.2 years and 27.2 ± 4.3 kg/m², respectively. The mean adrenal mass size, operation time, estimated blood loss, and hospitalisation duration were 35.9 ± 15.0 mm, 92.7 ± 29.6 minutes, 50.8 ± 33.1 ml, and 3.7 ± 2.5 days, respectively. No minor or major complications were observed postoperatively. In pathological examinations, 38 (70.3%) patients had adenoma or adrenal hyperplasia, 8 (14.7%) had pheochromocytoma, 2 (3.7%) had periadrenal paraganglioma, 2 (3.7%) had adrenal cysts, 1 (1.9%) had schwannoma, 1 (1.9%) had myelolipoma, 1 (1.9%) had myeloid metaplasia, and 1 (1.9%) had adrenal cortical carcinoma.

Conclusion: TLA is a safe and efficient minimally invasive treatment option with a low morbidity rate in the surgical treatment of adrenal masses.

Keywords: Laparoscopy, adrenalectomy, transperitoneal.

INTRODUCTION

Since the introduction of the laparoscopic approach to adrenalectomy by Gagner et al.¹ in 1992, this minimally invasive technique has gained worldwide acceptance and has become the gold standard for the removal of most small, benign lesions of the adrenal gland. The advantages of less perioperative blood loss, less pain after operation, shortened hospital stay, earlier return to everyday life, and better cosmetic results make laparoscopy preferable for patients, and laparoscopy also provides a larger point of view for the surgeon.² Several techniques have been described, the most popular being the lateral transperitoneal adrenalectomy (LTA) approach and

posterior retroperitoneoscopic adrenalectomy.³ Each of these techniques is highly successful in experienced hands, and it is recommended that surgeons choose the approach that is most familiar to them. However, adrenalectomies are not common operations in general practice and it can be difficult to overcome the learning curve of approximately 30 cases.⁴

We have performed LTA routinely for adrenal tumours, including relatively large tumours. The purpose of this study was to evaluate our single-centre experience with LTA performed for a variety of adrenal tumours.

METHODS

Fifty-four patients who received LTA for adrenal masses between January 2008 and March 2015 were included in the study. LTA was performed for masses that were hormonally active, hormonally non-active but larger than 4 cm, and smaller than 4 cm but with enlargement in consecutive topographical investigations. Detailed patient histories were recorded and examinations were performed before surgery. Routine biochemical investigations, total blood count, serum cortisol, aldosterone, dehydroepiandrosterone sulphate levels, free cortisol, vanillylmandelic acid, and metanephrine in 24-hour urine analyses were performed. The masses were diagnosed in 39 patients by abdominal magnetic resonance imaging, while 15 patients were diagnosed by abdominal dynamic computed tomography. The Endocrinology and Metabolism Clinic made the preparations, including assessment of the hormonal activity of the mass and preoperative management for hormonally active masses. The masses from 31 patients (57.4%) were hormonally active. Eight (14.8%) of these 31 patient masses were pheochromocytoma and alpha blockers and beta blockers were given to these patients before surgery (addition of metoprolol 50 mg/day on the third day of a 15-day treatment with doxazosin 2 mg/day). The Cushing's protocol was used in patients with Cushing's disease and was continued for 3 days after surgery. The Addison's protocol was used in patients for whom bilateral LTA was planned, and this protocol also continued for 3 days after surgery. For preventing malign hypertension, phentolamine mesylate (a non-selective alpha blocker) was available for the duration of the whole operation. All of the pathological examination results were recorded after surgery.

Statistical Analysis

The definitive data were calculated using Statistical Package for Social Sciences (SPSS Inc., Chicago, Illinois, USA) for Windows version 18.0. All numerical values were given as mean \pm standard deviation.

RESULTS

The mean age of the patients was 49.5 \pm 11.2 years (range: 16-72). Thirty-nine patients (72.2%) were female while 15 patients (27.8%) were male. Right adrenalectomy, left adrenalectomy, and bilateral adrenalectomy was performed in 29, 21, and 4 patients, respectively. Twenty patients (37%) had clinical Cushing's disease. Patients' demographic features and perioperative findings are listed in [Table 1](#). Blood transfusion was not necessary in any patients. None of the patients had perioperative or postoperative minor or major complications. The laparoscopic modality was changed to open surgery in two patients for whom rightadrenalectomies were performed without complications. One of these patients displayed bradycardia based on severe chronic obstructive pulmonary disease (COPD), while bleeding was the reason for the other patient's open procedure. In pathological examinations, 38 (70.3%) patients had adenoma or adrenal hyperplasia, 8 (14.7%) had pheochromocytoma, 2 (3.7%) had periadrenal paraganglioma, 2 (3.7%) had adrenal cysts, 1 (1.9%) had schwannoma, 1 (1.9%) had myelolipoma, 1 (1.9%) had myeloid metaplasia, and 1 (1.9%) had adrenal cortical carcinoma (ACC). All patients with hormonally active adrenal masses had normal hormone levels after their operation.

Table 1: Patient characteristics and perioperative findings.

Parameter	Value (mean \pm standard deviation)
Age, years	49.5 \pm 11.2
Body mass index, kg/m ²	27.2 \pm 4.3
Mass size, mm	35.9 \pm 15
Duration of operation, min	92.7 \pm 29.6
Estimated blood loss, ml	50.8 \pm 33.1
Duration of hospital stay, days	3.7 \pm 2.5
Size of specimen, cm	42.1 \pm 15.1

DISCUSSION

Adrenal surgery rates have been increasing in conjunction with the increased prevalence of incidental adrenal masses found during routine cross-sectional imaging. Adrenal glands can be seen more clearly in laparoscopic surgery and therefore vascular structures and parenchyma are more easily controlled. Therefore, the need for open surgery has decreased over time. Primary hyperaldosteronism, pheochromocytoma, glucocorticoid-secreting adrenal masses, hormonally non-active masses larger than 4 cm in size, and masses smaller than 4 cm but showing malignant potential by growth in consecutive computed tomography scans are indications for adrenalectomy.⁵ In the literature there are many studies comparing laparoscopic adrenalectomy (LA) with open adrenalectomy (OA) with regard to oncological efficacy, perioperative and postoperative parameters, and complication rates.⁶⁻⁸ Imai et al.⁸ compared results of LTA (n=40) and OA (n=40) in hormonally active benign adrenal masses smaller than 6 cm. In this study, estimated blood loss was lower in the LTA group (40 ml versus 172 ml). Postoperative analgesic consumption was 2.5-times lower in the laparoscopy group and duration of hospital stay was also shorter in the laparoscopy group (12 versus 18 days). The authors concluded that LTA is a safe technique that results in less patient discomfort, lower estimated blood loss, and earlier discharge than OA, with no increase in financial cost. LTA should be adopted as the technique of choice for the removal of functioning adenomas and for adrenal masses less than 6 cm in diameter. Size criteria are, currently, the main subject considered when deciding on the laparoscopic approach to an adrenal lesion. In fact, size is an important variable in predicting malignancy. Tumours larger than 6 cm are likely to be malignant, but many adrenal adenomas are larger than 6 cm. On the basis of the National Institutes of Health consensus statement, the incidence of ACC is 2% for lesions <4 cm, 6% for tumours 41-60 mm in size, and 25% for tumours >6 cm. Therefore, if size is the only criterion used to choose the optimal surgical approach then many patients with benign adrenal masses will have an unnecessary OA.⁹ Furthermore, some authors suggest that patients with benign adrenal lesions larger than 5-6 cm should not be treated with LA because of the longer operation time and the elevated risk of bleeding. On the other hand, recent

records demonstrate that LA for large adrenal tumours is safe and technically feasible.^{10,11} In practice, these limitations of the laparoscopic approach to large adrenal masses depend on the surgeon's experience and skill, and the size of the mass cannot be considered as an absolute contraindication for laparoscopy. In our study, six adrenal masses were larger than 6 cm and there were no differences in the operation time, complication rate, and bleeding compared with the other masses.

Laparoscopic surgery could also be performed for ACC. Brix et al.¹² reported no difference in survival, disease-free recurrence, tumour capsule violation, or peritoneal carcinomatosis between 117 patients undergoing OA and 35 patients undergoing LA for Stage 1-3 ACCs of less than 10 cm in size. In 12/35 patients, LA was converted to OA because of bleeding (n=4), adhesions (n=4), bowel perforation (n=1), or other technical problems (n=2), and intraoperative evidence of malignancy (n=1). The authors suggest that LA performed by an experienced surgeon is justified for potentially malignant adrenal incidentalomas and for selected cases of Stage 1 and 2 ACC.¹² Porpiglia F et al.¹³ showed no significant difference in recurrence-free survival between patients with Stage 1 and Stage 2 ACC in 18 patients who underwent LA compared with 25 patients who underwent OA. In our study, one patient's pathological examination result was ACC. This patient had a preoperative enhancing mass of 4.5 cm on the right adrenal gland. No perioperative or postoperative complications were seen and there was no recurrence during this patient's 6 years of follow-up.

Although LA is a minimally invasive procedure, complications can occur with this procedure. Early or late complications take place especially before the surgeon's completion of the learning curve. Early complication rates of 0-15% have been reported in LA.¹⁴ General complications associated with LA include wound haematomas and infection, and deep vein thrombosis; patients with Cushing's syndrome are more prone to infectious and thrombotic complications. Specific complications include injury to the surrounding organs such as the liver, pancreas, spleen, inferior vena cava, renal vessel, diaphragm, and pleura. The most commonly reported complication is vascular injury, which is seen more in right LA. The incidence of this complication varies between 0.7% and 5.4%.¹⁵⁻¹⁸ In our study, no major or minor complications were

seen, the mean operation time was 92.7±29.6 minutes, the mean estimated blood loss was 50.8±33.1 ml, and the mean duration of hospital stay was 3.7±2.5 days. Our results are similar to data from national and international literature. Conzo et al.¹⁹ reported that the risk factors for changing to an open procedure are masses larger than 8 cm and comorbidities. Shen et al.²⁰ reported the factors that might cause a change to open surgery as being a tumour size larger than 5 cm, body mass index (BMI) ≥24 kg/m², and the presence of pheochromocytoma. In our study, the laparoscopic procedure was changed to an open procedure in two (3.7%) patients. In these two patients, tumour sizes were <5 cm and BMI was >24 kg/m²; the two reasons for changing in these two patients were bradycardia based on COPD and bleeding.

In the national literature, the most common result of histopathological examinations is benign adrenal mass, with an incidence of 60-65%.²¹⁻²³ Yavaşcaoğlu et al.²⁴ performed LA in 33 patients

(right LA: 15, left: 17, bilateral: 1) with a mean age of 49 years. The mean mass size, duration of operation, estimated blood loss, and duration of hospital stay were 35.9 mm, 150 minutes, 47 ml, and 3.2 days, respectively. One patient had pancreatic injury during the operation and this injury was managed conservatively without problems. The masses' pathological examination results were: adrenocortical adenoma (69.7%), pheochromocytoma (15%), adrenocortical hyperplasia (6%), ACC (3.1%), metastatic adenocarcinoma (3.1%), and oncocytoma (3.1%). In our study, adrenocortical hyperplasia was found in 70.3% and pheochromocytoma was found in 8 (14.7%) patients.

In conclusion, the incidence of adrenal masses has increased with the usage of radiological diagnostic methods. In the surgical treatment of these masses, LTA is a generally safe, efficient, and minimally invasive method with low complication rates.

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