

State-of-the-Art Review

Does Tumor Size Influence the Outcome of Laparoscopic Adrenalectomy?

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ABSTRACT

Background: Laparoscopic adrenalectomy is safe and effective for small adrenal tumors, but its role for large adrenal tumors and the influence of tumor size on the outcome of laparoscopic adrenalectomy have been questioned.

Patients and Methods: Thirty-one patients with unilateral adrenal tumors operated on between January 1997 and April 2000 were selected for this study. The indications for surgery were Conn's adenoma in 16 patients, pheochromocytoma in 7 patients, Cushing's adenoma in 4 patients, and incidental lesions in 4 patients. The patients were divided in two groups: 19 patients with tumors <3.5 cm (Group I) and 12 patients with tumors ≥ 3.5 cm (Group II). The outcomes of the two groups were compared.

Results: None of the laparoscopic procedures was converted to open surgery. The tumor size correlated with operative time ($r = 0.434$; $P = 0.015$) and blood loss ($r = 0.513$; $P = 0.003$), with both being significantly greater for larger tumors. No patient required a blood transfusion during or after surgery. One preoperative complication occurred in Group I. There was no perioperative complication in Group II. The median postoperative hospital stay and opioid requirement did not differ significantly between the groups. One patient in Group I developed pneumonia, while no postoperative complications were recorded in Group II.

Conclusion: Surgery for large adrenal tumors can safely be performed laparoscopically with outcomes comparable to those of surgery for small tumors.

INTRODUCTION

SINCE THE INTRODUCTION of laparoscopic cholecystectomy in the late 1980s, minimally invasive surgical techniques have improved tremendously. Advances in instrumentation and improved skills allow laparoscopic treatment for a wide range of indications. Laparoscopic adrenalectomy was first reported in 1992 by Gagner and associates.¹ Since then, several series

have been published, and laparoscopic adrenalectomy has been shown to be safe and effective.² Currently, it is considered the treatment of choice for small adrenal tumors.³ However, laparoscopic adrenalectomy for large tumors and the influence of tumor size on the outcome of laparoscopic adrenalectomy has not been specifically addressed. The aim of this study was to evaluate and compare the results and complications of laparoscopic adrenalectomies for small and large tumors

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and define any influence of tumor size on the outcome of laparoscopic adrenalectomy.

PATIENTS AND METHODS

From January 1997 to April 2000, 31 patients with unilateral tumors underwent laparoscopic adrenalectomy at the National Hospital (Rikshospitalet) at the University of Oslo. The indications for surgery were Conn's adenoma in 16 patients, pheochromocytoma in 7, Cushing's adenoma in 4, and "incidentaloma" in 4. The distribution of the tumor sizes is presented in Figure 1.

The patients were divided into two groups. Group I consisted of 19 patients with tumors <3.5 cm, and Group II consisted of 12 patients with tumors ≥ 3.5 cm. There was no statistical difference between the groups regarding age, sex, ASA classification, or tumor location (Table 1). The groups also were similar in regard to the learning curve of the surgeon.

During surgery, the patients were placed in a lateral position. Three trocars were used for operations on the left side and four for tumors on the right side. The trocars were inserted 3 to 5 cm below the costal margin from the pararectus line in the dorsal direction. On the right side, a fourth trocar was inserted just below the costal margin in the pararectus or median lines. An open technique was used for placing the first, 12-mm, trocar with 30° laparoscope into the abdominal cavity, 4 to 5 cm lateral to the pararectus line and 3 to 5 cm below the costal margin. Carbon dioxide was insufflated until the intra-abdominal pressure reached 8 to 9 mm Hg. For the other

ports, 11-mm trocars were used. The adrenal vein was located, and the tumor was mobilized after the vein had been identified and divided. The dissection was done with the Harmonic Scalpel (Ethicon, Cincinnati, OH) or AutoSonic (AutoSuture, Norwalk, CT). The surgical specimen was removed using the Endo-Catch (AutoSuture).

The following peroperative factors were compared in the two groups: operative time, blood loss, number of blood transfusions, need for open conversion, and complications. Postoperatively, the following were recorded and compared: opioid administration, hospital stay, and postoperative complications. The opioid administration was recorded from the first postoperative day.

The data are presented as median and range. For comparison of frequencies, Fisher's exact test was performed. For analysis of the continuous variables, the Mann-Whitney rank sum test was used. Pearson's r was used to examine the association between tumor size and operative time and between tumor size and blood loss. A P value <0.05 was regarded as significant.

RESULTS

All tumors were removed, and there were no conversions to open surgery. The median operative time was significantly longer and the blood loss significantly greater in Group II than in Group I (Table 2). The tumor size correlated with operative time ($r = 0.434$; $P = 0.015$) and blood loss ($r = 0.513$; $P = 0.003$). Blood transfusions were not required in any of the patients during or after the operation. One peroperative complication

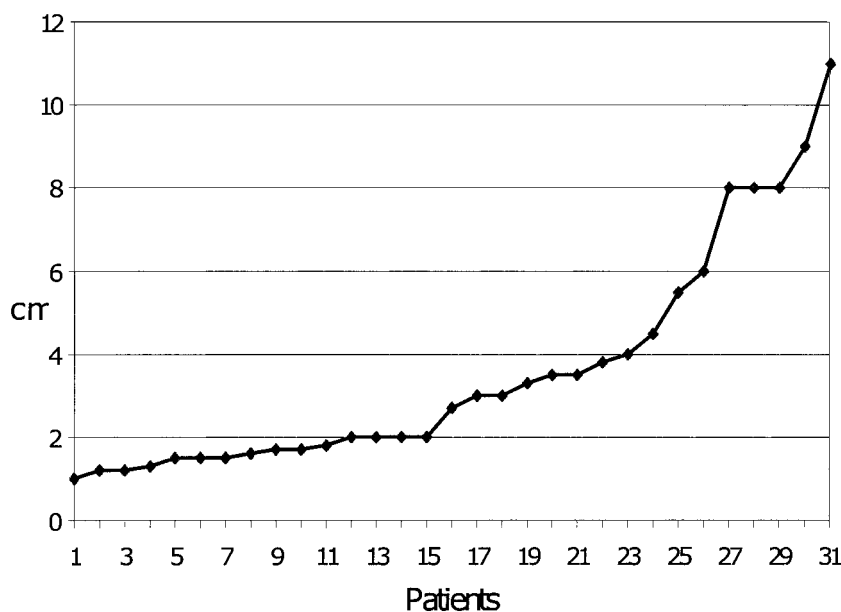


FIG. 1. Distribution of adrenal tumor sizes.

TABLE 1. PATIENT CHARACTERISTICS IN GROUP I (TUMOR <3.5 CM) AND GROUP II (TUMOR ≥3.5 CM)

	Group I (N = 19)	Group 2 (N = 12)	P value
Median age (years)	50 (34–76)	52 (31–65)	NS
Sex (male/female)	13/6	7/5	NS
Tumor location (left/right)	8/11	8/4	NS
ASA classification ^a	2 (2–3)	2 (1–3)	NS
Median tumor size (cm)	1.7 (1–3)	5.75 (3.5–11)	<0.001

^aASA-American Society of Anesthesiologists.

occurred in Group I: a small hole was created in the diaphragm, which was sutured. No perioperative complications occurred in Group II.

The postoperative hospital stay did not differ significantly in the two groups. In both groups, two patients required opioid administration for pain control (Table 2). In Group I, one patient developed postoperative pneumonia. No other postoperative complications were recorded.

DISCUSSION

Since the initial report of laparoscopic adrenalectomy by Gagner and associates in 1992,¹ the laparoscopic approach has become the preferred surgical treatment for benign adrenal tumors.^{2,3} Principally, there are two laparoscopic approaches: transabdominal and retroperitoneal.^{3–6} In our experience, the transabdominal approach is preferable because it facilitates intra-abdominal orientation, and access to the adrenal glands is easier. This approach also enables removal of larger tumors.

There are contraindications to laparoscopic adrenalectomy,^{3,6} some of which are not specific to adrenal surgery (uncorrectable coagulopathy, severe cardiopulmonary insufficiency). Invasive adrenal carcinoma is an absolute contraindication. Tumors >6 cm are considered probably malignant.^{7,8} However, many adrenal adenomas are

>6 cm, and some cortical carcinomas are small. Hence, this conception is contraindicated by some authors.⁹ In our experience, one of the five tumors >6 cm (considered preoperatively to be an incidentaloma) turned out to be a metastasis from a renal carcinoma. The operation was completed without any difficulties, consuming 170 minutes with 150 mL of blood loss. There has been no recurrence of the tumor at the follow-up of 24 months. However, this case accents the importance of comprehensive preoperative CT or MR investigations or both in the planning of laparoscopic surgery for adrenal glands. Previous surgery in the adrenal region may also be considered a contraindication to the laparoscopic approach.²

Large adrenal tumors have been said to be more difficult to dissect laparoscopically, and the operation is often associated with more complications.^{10,11} In this report, the outcomes of laparoscopic adrenalectomy were similar for large and small tumors. The only differences found between the groups were slightly greater blood loss and longer operative times in Group II. These differences were without consequences for the patients, however, as no blood transfusions were given and no perioperative complications were recorded in Group II. The postoperative hospital stay, pain medication needs, and complications were also the same in the two groups. In one report, tumors >8 cm were considered a contraindication to a laparoscopic approach.¹² In our investigation, the four patients having tumors ≥8 cm showed no differ-

TABLE 2. OUTCOMES OF LAPAROSCOPIC ADRENALECTOMY IN GROUP I AND GROUP II

	Group I (N = 19)	Group 2 (N = 12)	P value
Operative time (min)	85 (50–160)	165 (75–325)	0.005
Blood loss (mL) ^a	50 (20–100)	125 (50–400)	0.001
Perioperative complications	1	0	NS
Conversion	0	0	–
Postoperative stay (days)	2 (2–5)	3 (2–5)	NS
Patients requiring opioids	2	2	NS
Postoperative complications	1	0	NS

^aNo transfusions were required.

ences in peroperative or postoperative outcomes except greater blood loss and operative time. The greater blood loss and longer operative time in Group II is explained by the need for more extensive dissection because of the greater tumor volume. The predominance of pheochromocytomas in Group II is possibly an additional factor in the increased blood loss in patients with large tumors because of the more vascular structure of these lesions.

Cosmetically, there was no major difference between the groups. In the patients with large tumors, however, the trocar incision had to be lengthened to enable removal of the tumor. The incision was made at the lower trocar position. In most of the cases, the incision did not exceed 5 cm. The exception was in a patient with an 11-cm tumor, who required a 6-cm incision.

Conversion from the laparoscopic to the open approach was not necessary in any of the patients. Nevertheless, one must be prepared to convert in cases of uncontrolled bleeding, absence of operative progress in a reasonable time, or discovery of invasive growth.

CONCLUSION

Our experience shows that surgery for adrenal tumors as large as 11 cm performed laparoscopically with safety and outcomes similar to those of small tumors if there is no doubt about the benign nature of the lesion.

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