

# Laparoscopic vs open adrenalectomy for benign adrenal neoplasm

## A comparative study

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### Abstract

**Background:** The aim of this study was to compare the outcome of laparoscopic adrenalectomy (LA) performed for benign adrenal neoplasm to the open procedure in a similar group of patients.

**Methods:** All consecutive patients who underwent LA between June 1996 and February 1999 were evaluated. Data analysis included patient's age and gender, indication for surgery, histological diagnosis, size of specimen, comorbid conditions, length of stay and ileus, postoperative narcotic consumption, and time to return to normal activity. The results were compared retrospectively to a well-matched group of patients who underwent an open adrenalectomy (OA).

**Results:** Twenty-eight LA were performed in 24 patients for the following disorders: adrenocortical adenoma, 16 (four Cushing's syndrome, 12 Conn's syndrome); pheochromocytoma, 10; and nonfunctioning tumor, two. These cases were compared with a well-matched group of 28 patients who underwent OA in the same department. There were two conversions to open surgery (7%) in the laparoscopic group and no deaths in either group. Of all the evaluated parameters, the following statistically significant differences between the two groups were noted: The mean operative time was longer in the LA group (188 vs 139 min,  $p < 0.001$ .); however, this became insignificant in the last 10 cases of LA, when the mean length of surgery was reduced to 130 min. The overall morbidity was lower in the LA group (16% vs 39%,  $p = 0.05$ ), as was the mean time to tolerate a regular diet (2 vs 3.9 days), mean meperidine consumption (mg) (109 vs 209), mean length of stay (4 vs 7.5 days), and mean time to return to normal activity (2.2 vs 5.2 weeks), ( $p < 0.001$  for all).

**Conclusion:** LA for benign adrenal disorders is a safe procedure that is associated with significantly lower morbidity, shorter ileus and hospitalization, reduced postoperative pain, and a faster return to normal activity than the open procedure.

**Key words:** Adrenalectomy — Benign adrenal neoplasm — Laparoscopy

Laparoscopic resection is increasingly replacing open surgery as the preferred procedure in most patients with benign adrenal tumors [6, 10, 11]. Laparoscopic adrenalectomy (LA) was first reported in 1992 by Gagner et al. [5, 6]; since then, several institutions, mostly university hospitals, have used this technique successfully.

The purpose of this study was to compare the effectiveness and outcome of LA to open adrenalectomy (OA) in the management of benign adrenal disorders.

### Patients and methods

All consecutive patients who underwent LA (which was limited to benign disorders) between June 1996 and February 1999 were evaluated and compared retrospectively with a well-matched group of patients who underwent OA at our institution during the same and a previous period of time.

Patients with a lesion  $>8$  cm and patients with suspected metastatic lesions were excluded. The following data were recorded and analyzed: age, gender, comorbidity, previous surgery, indication for surgery, histological diagnosis, size of specimen, length of procedure, morbidity, blood loss, conversion rate, length of ileus and stay, postoperative narcotic consumption, and time to return to normal activity. Return to normal activity was recorded by using a telephone questionnaire and defined subjectively by each patient according to several guidelines, such as return to full work and home, social, and sport activities.

LA was performed transperitoneally with the patient in the lateral decubitus position. Four 10–12-mm ports were used for the right-sided tumors and three 10–12-mm ports for the left-sided ones. The specimen was always retrieved in one piece using one of the commercially available bags; for larger specimens, one of the lateral port sites was enlarged as necessary.

**Table 1.** Patient data

Patient data	LA	OA
No. of patients	24	28
Male	10	13
Female	14	15
No. of procedures	28	28
Mean age (yr; range)	46.3 (20–72)	45.4 (22–67)
Mean tumor size (cm) (range)	3.6 (0.5–8)	2.9 (0.5–7)
Diagnosis		
Pheochromocytoma	10	11
Cushing's syndrome	4	5
Conn's syndrome	12	11
Nonfunctioning tumor	2	1

LA, laparoscopic adrenalectomy; OA, open adrenalectomy

Statistical analysis was performed using Student's *t*-test, and a *p* value of <0.05 was considered significant.

## Results

Twenty-eight LA were performed in 24 patients. There were 10 men and, 14 women; their mean age was 46 years (range, 20–72) (Table 1). The indications for surgery included 16 cortical adenomas (four Cushing's syndrome and 12 Conn's syndrome), 10 pheochromocytomas, and two nonfunctioning tumors. Four patients underwent bilateral laparoscopic adrenalectomy in the same session, eight right and 12 left. Four patients (16%) in the LA group had previously undergone abdominal surgery. This group of LA was compared to a well-matched group of 28 patients comprised of 13 men and 15 women with a mean age of 45 years (range, 22–67) who underwent open adrenalectomy (OA). Mean tumor size (cm) was similar for the two groups (3.6 vs 2.9). Pathological analysis confirmed benign disease in all patients. Interestingly, in two patients who had a preoperative diagnosis of Conn's syndrome with a suspected cortical adenoma based on CT and nuclear scanning, the final histological diagnosis was adrenocortical hyperplasia. Both patients, however, recovered from the disease.

All LA were performed by the same surgeon (P.R), whereas the OA were performed by several surgeons who all work in the same department. The mean operative time for LA was 180 min vs 139 min in the OA group ( $p < 0.001$ ). However, there was a progressive decrease in operative time for LA, a reflection of the learning curve; for the last 10 cases, the mean operating time was only 130 min.

Only two patients in the LA group required conversion to open surgery (7%). There were insurmountable technical difficulties in one patient with bilateral pheochromocytoma who had already had one side removed laparoscopically in the same session. In the second patient, the reason for conversion was bleeding (not requiring transfusion).

Two patients in the laparoscopic group required blood transfusions. The first one needed 1 U intraoperatively due to bleeding (controlled laparoscopically) from the adrenal surface. The second one required 1 U postoperatively. In the open group, one patient required 2 U of blood postoperatively.

Postoperative morbidity is shown in Table 2. The overall morbidity in the LA group was lower than that of the OA

**Table 2.** Postoperative morbidity of laparoscopic vs open adrenalectomy

OA complications	<i>n</i>	LA complications	<i>n</i>
Rt lower lobe atelectasis	8	Postoperative angina	1
Rt lower lobe pneumonia	1	Rt lower lobe atelectasis	1
Wound infection	2	Wound infection	1
		Pneumothorax	1
Total	11 (39%)		4 (16%)

OA, open adrenalectomy; LA, laparoscopic adrenalectomy

**Table 3.** Outcome of laparoscopic vs open adrenalectomy

	LA	OA	<i>p</i> value
Operating time (min)	188	139	<0.001
Operating time in the last 10 cases (min)	130		NS
Morbidity (%)	16	39	0.05
Total blood transfusions (U)	2	2	
Mean narcotic requirement (meperidine IM; mg)	109 ± 44	209 ± 49	<0.001
Time to tolerate regular diet (days)	2	3.9	<0.001
Length of hospital stay (days)	4	7.5	<0.001
Conversion to open surgery	2 (7%)		
Time to return to normal activity (wk)	2.2	5.2	<0.001

LA, laparoscopic adrenalectomy; OA, open adrenalectomy; NS, not significant

group—16% vs 39% ( $p = 0.05$ ). The mean postoperative length of stay in the LA group was 4 days, which was significantly less than 7.5 days for the OA group ( $p < 0.0001$ ). The mean meperidine (mg) requirement was significantly less in the LA group (109 ± 44) than in the OA group (209 ± 49) ( $p < 0.001$ ).

Table 3 summarizes the outcome of the two groups. The mean time to return to normal activity was significantly shorter in the LA group—2.2 vs 5.2 weeks in the OA group ( $p < 0.001$ ).

## Discussion

Since its introduction in 1992, the laparoscopic approach for adrenalectomy has gradually become the operative procedure of choice for a variety of functioning and nonfunctioning benign adrenal neoplasm [5, 6, 10, 11]. Its application in primary and secondary adrenal malignancies is still debated [9, 12]. Until this issue is resolved, we have limited this approach to benign disorders.

The world literature now contains >200 reports that provide insight and analysis for the selection and refinement of the operative technique, as well as describing the application of this procedure to a growing range of patients [1, 3, 8]. Of the several suggested techniques for the performance of laparoscopic adrenalectomy, we chose the lateral transperitoneal approach. We believe that this approach provides the best exposure and makes anatomical orientation easier. In addition, it allows exploration of the abdominal cavity, performance of additional procedures if needed (we performed one cholecystectomy in this series), and better vascular control in case of major bleeding. Our initial experience indicates that this approach is highly satisfactory.

In discussions about limiting the size of tumors amenable for laparoscopic resection, most authors have suggested 6 cm as an arbitrary upper limit, citing the increased incidence of malignant neoplasms in larger tumors as well as the technical difficulties encountered when removing large lesions [2, 7]. However, Gagner et al. have proposed 15 cm as the upper limit size for resectability [7]. A prospective multicenter evaluation of LA in Belgium supported the assertion that LA can be performed safely by well-trained laparoscopic surgeons in tumors  $\leq 12$  cm [4]. In our series, although we have not set a size limit as a criterion for LA, the largest tumor size was 8 cm in two patients who both had a successful laparoscopic procedure.

Similar to several other studies [7, 8, 9, 12], our retrospective comparative study of the laparoscopic vs the open approach found significant benefits in terms of outcome for patients undergoing LA. Length of stay and convalescence were significantly shortened, as were analgesic requirements and postoperative ileus. At 4 days, the mean length of stay in the LA group in this series may look relatively long; however, as can be seen, the majority of the patients had either Conn's syndrome or pheochromocytoma and therefore needed close hemodynamic and electrolyte monitoring, as well as a slow tapering off of their medications. Another factor that increased the mean length of stay in the LA group is the two conversions. As would be expected, the respiratory complications in the open group were markedly higher than in the laparoscopic group; and although we have used the transabdominal approach, we have not had any inadvertent injuries to adjacent organs.

Our series also reflects the learning curve associated with advanced laparoscopic surgery, since the mean length of the procedure decreased markedly in the last cases as compared to the time for the earlier cases. As the time of

operation becomes shorter, morbidity may be expected to show the same trend.

In summary, based on this comparative clinical study, laparoscopic adrenalectomy for benign adrenal neoplasm is a safe and effective procedure that has significant advantages over the open procedure.

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