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Laparoscopic Adrenalectomy: A Report of the First Experiment in Iran

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ABSTRACT

Purpose: To report the first experiment in laparoscopic adrenalectomy and study its success and immunity in treating different adrenal diseases.

Materials and Methods: From March 1997 to July 2001, 11 patients underwent laparoscopic adrenalectomy through transperitoneal approach. Five of whom were males and 6 were females. Their mean age was 35.5 (range 28 to 52) years. Lesion was located at left in 6 patients and at right in 5. All necessary steps were preoperatively taken including CT scan, MRI, MIBG scan, and endocrine tests such as ACTH, cortisol, mineralocorticoid, 17-hydroxyprogesterone, and VMA. Three (5, 10, and 12 mm) trocars were used in left laparoscopic adrenalectomy and three or four (12, 10, 5, and 5 mm) trocars were applied in right laparoscopic adrenalectomy. All patients have been followed up for three months by physical examination and paraclinical tests.

Results: Mean operation time (including anesthesia and surgery) was 205 ± 65.95 (range 130 to 310) minutes. No significant difference was seen between the operation time in the left and the right adrenalectomy ($p=0.5$). Mean hospitalization was 5.54 ± 3.4 (range 3 to 15) days. Mean size of mass was 5.45 ± 1.7 (range 2 to 8) cm. Blood transfusion was performed in 2 patients and open surgery was conducted for one because of high adhesion. No mortality was reported. During a 3-month follow-up, hormonal tests and blood pressure were normal for all patients, with no medical treatment.

Conclusion: This experiment showed that transperitoneal laparoscopic adrenalectomy is an effective and safe approach in the treatment of adrenal masses with the least morbidity.

KEY WORDS: adrenal neoplasm, laparoscopic, adrenalectomy

Introduction

First laparoscopic adrenalectomy was performed in 1992 by Qagner.⁽¹⁻³⁾ This approach was quickly developed because of less hemorrhage during operation, shorter hospitalization, and faster postoperative improvement.⁽⁴⁻⁶⁾ Laparoscopic adrenalectomy may be conducted either transperitoneally or retroperitoneally.^(4, 5, 7, 8) Transperitoneal approach

was the preferable method in this study which is the first report of laparoscopic adrenalectomy in Iran and to our knowledge the first one in a renal transplanted patient worldwide.

Materials And Methods

From March 1997 to July 2001, 11 patients underwent laparoscopic adrenalectomy through

transperitoneal method. Five of whom were males and 6 were females. Their mean age was 35.5 (range 28 to 52) years. Table 1 indicates clinical and pathological details.

TABLE 1. *Patients' clinical and pathological characteristics*

No.	Age	Gender	Adrenal Pathology	Side of Operation
1	43	Male	Conn's syndrome	Right
2	40	Female	Conn's syndrome	Left
3	52	Male	Pheochromocytoma	Right
4	32	Male	Pheochromocytoma	Right
5	35	Male	Pheochromocytoma	Left
6	34	Female	Pheochromocytoma	Left
7	39	Female	Adrenal Medolary Hyperplasia	Left
8	28	Male	Pheochromocytoma	Left
9	29	Female	Pheochromocytoma	Left
10	31	Female	Conn's syndrome	Right
11	28	Female	Myelolipoma	Right

Ultrasonography and abdominal CT scan was preoperatively performed for all patients. MRI was conducted if CT scan was unclear. MIBG scan was performed if pheochromocytoma was suspected and MRI or CT Scan were not helpful. Routine biochemical tests such as K, Na, FBS, and endocrine analyses like ACTH, cortisol, minralocorticoid, 17-hydroxyprogesterone in blood, and VMA in 24-hour urine were conducted too. Details of the procedure, its complications, and subsequent open surgery, if needed, were introduced to all patients. Intestinal preparation was performed 24 hours before the procedure. NG tube and urethral catheter were applied under general anesthesia. Then patients were secured in flank position with an angle of approximately 60 degrees. The bed was flexed 30 degrees and was reversed Trendelenburg 10 degrees to retract intestine from the field of surgery. After the preparation of patient Veress needle was used through an umbilical incision and pneumoperitoneum was induced by CO₂. Trocars were placed when the pressure reached 19-20 mmHg, then it was reduced to 14-15 mmHg.

Three 12, 10, and 5 mm trocars were applied in left adrenalectomy (for 6 patients). The 12 mm trocar was applied through umbilical incision and used for telescope. The 10 mm trocar was applied on brest line parallel to umbilicus and the 5 mm trocar was applied on midline between xiphoid and umbilicus. Then peritoneum was opened from the colonial spleen curve to sigmoid on Toldt line and colon was pushed inside. Then Jerota fascia was opened on renal vein, so that adrenal gland

and vein were seen. Adrenal vein was cut after clipping bilaterally. Then fat tissue and the rest of the vessels were cut by mets or electrocutter after clipping bilaterally, so that adrenal gland was totally freed. Three to four (12, 10, 5, and 5 mm) trocars were used in right adrenalectomy (for 5 patients). Similar trocars were applied at left. The second 5 mm trocar was inserted on the brest line at the rib margin to retract the liver if needed. Adrenal gland was seen at right side behind peritoneum after retracting the liver upward. Hepatocolic and peritoneum ligaments were cut, thus, anterior surface of adrenal gland was shown. After freeing the gland at inferior, lateral, posterior, and finally medial surfaces and cutting adrenal vein, following bilateral clipping, adrenal gland was removed through an umbilical incision made for 12 mm trocar, after enlarging it (depending on the size of gland). As a drain, Nelaton 18 F has been applied through 10 mm trocar for 2-3 days for all patients. Patients were followed up by paraclinical tests and physical examination for three months. Student's t test was used to compare the size of mass and time of procedure.

Results

The mean time of the procedure (including anesthesia and surgery) was 205±64.95 (range 130 to 310) minutes. Mean time at left side was 227.5±53.1 (range 145 to 305) minutes. There was no significant difference in the time of procedure between left and right sides ($p=0.5$). Mean hospitalization was 5.54±3.4 (range 3 to 15) days.

The mean size of mass was 5.45±1.7 (range 2 to 8) cm. No significant difference was seen between left and right sides in the size of the mass ($p=0.6$).

A 28-year female with a history of a 15-year renal transplantation was among the patients. She underwent laparoscopic adrenalectomy because of an adrenal mass, pathologic report of which was myelolipoma.

Blood transfusion was performed for 2 patients. Normal diet was started for 9 patients at the first postoperative day.

Open surgery due to severe adhesion was conducted for one patient (9%) who underwent laparoscopic adrenalectomy because of pheochromocytoma. Hypertension crisis was occurred during the procedure in one pheochromocytoma patient, which was properly managed without problem by an anesthesiologist. Postoperative complications were reported in just one patient with left adrenalectomy. This patient underwent open surgery due

to postoperative hemorrhage. No hernia or infection was seen at the site of trocars and no mortality was reported. Blood pressure and hormonal tests were normal with no medical treatment during eight months follow-up.

Discussion

Surgical intervention is regarded essential in several adrenal disorders. The familiarity with adrenal surgery anatomy and its pathophysiology is also considered important for a successful procedure. Open surgery incision for adrenal mass removal is toracoabdominal, flank, anterior, and posterior (lumbar). The selection of method is dependent on adrenal pathology, patient's physical structure, history of surgical operation, and the surgeon experience.⁽⁹⁾

Laparoscopic adrenalectomy is an effective and safe method to treat various endocrine and neoplastic adrenal diseases,^(4,6,10,12) as it is shown in this study. Several studies reported that the morbidity of laparoscopic adrenalectomy is less than open surgery.^(4,5,7,13,14,15) Previously, laparoscopic surgery needed a longer time than open surgery; however, the progress of technology and laparoscopic experiment leads to similar time durations.⁽¹⁴⁾ Patients in laparoscopic surgeries would be hospitalized shorter and would return to their normal activities sooner. Younger patients could return to their sport activities sooner with no limitation. Regarding the cosmetics, short incisions at trocar places instead of long incisions would be more considerable particularly for females.⁽¹⁴⁾ Magnification by laparoscope would lead to easier detection of small vessels around adrenal mass which causes a distinguishable decrease of hemorrhage comparing to open adrenalectomy.⁽¹⁶⁾ It also brings a more accurate view of surgical anatomy of adrenal gland and helps differential diagnosis between adenoma and normal tissue of gland. Elective removal of adrenal lesion without total removal of the gland, which is problematic in open surgery, is more practical in laparoscopic surgery. Guazzoni et al reported successful removal of 2 adrenal cysts without adrenal removal after which adrenal function was normal.⁽¹⁴⁾ Most authors agree on the effectiveness of laparoscopic therapy for Conn's syndrome and Cushing's syndrome.⁽⁴⁾ Because of hypertension crisis during surgery, pheochromocytoma surgery differs from other adrenal tumoral surgeries.^(4,5,17) It was believed that laparoscopic methods are contraindicated with pheochromocytoma, for the produced

peritoneum with CO₂ and the increase of abdominal pressure would lead to hemodynamic changes and the release of catecholamines as well, which are more severe in pheochromocytoma.⁽¹⁸⁾ Furthermore, CO₂ could cause hypercapnia and respiratory acidosis which are mostly led to hypertension during laparoscopy for pheochromocytoma.^(17,19) Sprung et al have recently shown that laparoscopic hemodynamic changes are comparable with those of open surgery methods. The number of hypertension episodes and the highest level of hypertension during surgery were equal in both methods, while hypotension severity was lower in laparoscopic methods than open surgery.⁽²⁰⁾ Consequently, pheochromocytoma could be treated by laparoscopic surgery, although large lesions could increase the chance of hemorrhage, hypertension and postoperative complications due to increased number of vessels.⁽²¹⁾ In this study hypertension was just occurred in one patient (out of 6) with pheochromocytoma which was controlled with no complication. Since Ganger has indicated that lesions larger than 13 cm could be treated by laparoscopic adrenalectomy, the size of adrenal mass was no more considered as a limited factor in laparoscopic surgery.^(4,12) Thus, larger masses which could mostly be malignant, would be removed by laparoscopic surgery, though, enlarging the incision of umbilicus would be essential.⁽¹⁴⁾ Dissection would be more difficult and the surgery would last in a way that could be beyond patient's tolerance.⁽²¹⁾ Moreover, large masses have many abnormal vessels which could increase hemorrhage.⁽²²⁾ Bilateral adrenalectomy for Cushing's syndrome after unsuccessful treatment of hypophysis adenoma (surgery or radiotherapy) or for secondary Cushing's syndrome could lead to improper discharge of ACTH.^(23,24) In our study, the decrease of wound infection risk, better postoperative respiratory capacity and shorter hospitalization would be main advantages of laparoscopy.⁽²¹⁾ Laparoscopy is applied in the treatment of non-functional adrenal masses too, especially when their malignancy is proved.⁽²⁵⁾ This is a common case as 20-22% of laparoscopic adrenalectomies are because of incidentaloma removal.^(4,6) Porpiglia et al reported that the incidence of incidentaloma was 30% of the whole laparoscopic adrenalectomies.⁽²¹⁾ Several factors such as a mass larger than 6 cm (in CT Scan or sonography), non-homogenized mass in CT scan and an increase of DHEA or estradiol are used to distinguish malignant adrenal masses from benign.⁽²⁶⁾

In spite of these factors, adrenalectomy may be performed for an incidentaloma then cortical carcinoma may be detected by the analysis of pathologic sample. Porpiglia et al reported such a carcinoma after laparoscopic removal of the mass. No sign of recurrence was reported after 40 months follow-up.⁽²¹⁾ It is commonly believed that this treatment would be sufficient for proved malignant adrenal masses provided that the neoplasma is limited to the gland and a perfect and accurate laparoscopy is performed.^(4,5)

Laparoscopic transperitoneal removal of adrenal glands includes anterior and lateral transperitoneal methods. In anterior transperitoneal method, adrenal anterior margin is usually freed at the end which occasionally leads to upward movement of adrenal by which its pulling downward becomes difficult.⁽¹⁶⁾ However, in this study adrenal anterior margin was easily freed at the beginning after the retraction of the liver or spleen toward medial line through lateral transperitoneal approach. Thus, it seems that lateral transperitoneal approach would be better than anterior transperitoneal, particularly for large tumors.

Conclusion

This study indicated that transperitoneal laparoscopic adrenalectomy is an effective and safe approach, which should be performed by a skilled laparoscopic surgeon to minimize potential intraoperative and postoperative complications such as infection and to prevent open incision.

Clinical outcomes of laparoscopic surgery in such circumstances would be much better than open surgery and its morbidity would be much lesser.

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