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Nature of Complications of the Adrenal Tumor in Laparoscopic Adrenalectomy

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Abstract **Original Research Article**

Introduction: Small adrenal tumors are treated by laparoscopic adrenalectomy. Due to technical complexity and carcinogenic potential, laparoscopic adrenalectomy (LA) is debatable for big tumors. This study examined the relationship between adrenal tumor size and safe laparoscopic adrenalectomy at a tertiary institution. ***Objective:*** To observe the Nature of complications of the adrenal tumor in laparoscopic adrenalectomy. ***Methods:*** After convenience sampling, 24 adrenal tumor patients who had unilateral transperitoneal LA at Bangabandhu Sheikh Mujib Medical University from January 2020 to December 2021 were divided by tumor size. In group I (n = 11), tumors were ≤5 cm and in group II (n = 13) size > 5 cm. Comparing group's demographic, perioperative and pathologic data. Data were examined using SPSS version 23 and Chi-square (2) and unpaired t tests to determine the impact of adrenal tumor size on laparoscopic adrenalectomy safety and efficacy. ***Result:*** Group I tumours averaged 3.21±1.17 cm (1.5-4.9 cm) and group II tumours averaged 5.58±0.69 cm (5-7 cm). Group I operative time was 61.82±12.3 minutes (50 to 80 minutes), and group II was 68.08±9.69 minutes (55 to 90 minutes). Mean blood loss was 47.27±18.62 mL (range 30 to 80 mL) and 71.92± 26.26(40-120ml) for groups I and II, respectively. I and II had no difficulties. Groups I and II had average hospital stays of 5.2±1.8 (3-9 days) and 5.4±2.1 (4-12 days). Group II's operative time and mean hospital stay didn't differ from group I's. ***Conclusion:*** Blood loss was the only major intraoperative risks associated with laparoscopic transperitoneal adrenalectomy for big adrenal tumors > 5 cm. The most important component in laparoscopically removing a large adrenal tumor is carefully selecting patients to undergo the procedure with a skilled surgeon in adrenal surgery.

Keywords: Adrenal Tumor, Laparoscopic Adrenalectomy, Complications.

INTRODUCTION

The adrenal cortex is the site of origin for adrenal tumors such as adenomas and carcinomas, whereas the adrenal medulla is the site of origin for neuroblastomas, pheochromocytomas, ganglioneuroblastomas, and ganglioneuromas. Adrenal adenomas and carcinomas originate in the adrenal cortex. Lipoma, myelolipoma, adenomatoid tumor, benign mesenchymal tumor, sarcoma, malignant lymphoma, and melanoma are extremely uncommon cancers. In clinical practice, patients can present with either a functional or a nonfunctional primary adrenal tumor. Because of the widespread availability of cutting-edge imaging techniques like as computed tomography (CT) scans and magnetic resonance imaging (MRI), there has been an increase in the number of cases in which asymptomatic adrenal masses were discovered by accident (referred to as incidentalomas) (MRI). Using these approaches, it is

today possible to diagnose adrenal masses as tiny as 0.5 cm and their occurrence has been reported to be as high as 4% in abdominal investigations [1].

Despite the fact that multi-modal therapy can improve patient survival, surgery is widely regarded to be the only treatment approach that can permanently remove an adrenal tumor. This is despite the fact that surgery is the only treatment option that can completely remove an adrenal tumor. Despite advancements in surgical technique and perioperative care, adrenalectomy for the treatment of adrenal tumors is associated with an increased risk of morbidity and mortality. Because of the large incision that is required in order to expose the relatively tiny working region, the open approach to the adrenal gland is linked with a significant amount of postoperative morbidity [2].

In recent years, laparoscopic adrenalectomy (LA) has overtaken open surgery as the form of adrenalectomy that is most commonly preferred. In most cases, laparoscopic adrenalectomy (LA) came out on top when compared to open adrenalectomy (either anterior or posterior approach), which was one of the several types of adrenalectomy that have been studied in the past. Pain relief after surgery, shortened hospital stays, reduced post-operative disability, and a reduced risk of problems However, there have only been a small number of prospective randomized trials comparing small (*size ≤ 5cm)* versus large (*size > 5 cm) laparoscopic* adrenalectomy [3-15].

OBJECTIVE

- To see the nature of complications of the adrenal tumor in laparoscopic adrenalectomy.

MATERIALS AND METHODS

This study is a cross sectional study and this study was carried out in the Department of General Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka, conducted from January 2020 to December 2021. Fulfilling the inclusion and exclusion criteria patients with adrenal tumor whom were operated in the Department of General Surgery, Bangabandhu Sheikh Mujib Medical University, were included in this study. Patients were classified by tumor size into 2 groups. Patients in group I had tumor size ≤ 5 cm (n = 11) and patient in group II had tumor size > 5 cm (n = 13). Convenience sampling was used for the sampling technique and the total number of population was 24.

Inclusion Criteria

- All diagnosed cases of adrenal tumor.
- Age more than 18 years.

Exclusion Criteria

Patients having the following criteria were excluded from the study-

- Suspected/Proven malignancy.
- Contraindication for laparoscopic surgery.

Data Collection and Analysis

An interest-variable-containing questionnaire was used to collect data. Questionnaires, clinical exams, and organized follow-up documents/records were used to collect patient data. The study ran from January 2020 to December 2021 at BSMMU's Department of General Surgery. The study comprised 24 adrenal tumor cases that met the selection criteria. A checklist established by the researcher was used to collect data on age, sex, clinical symptoms, laboratory investigation (24-hour urine VMA, Metanephrine), ultrasonogram of the whole abdomen, CT scan of the whole abdomen (non-contrast and contrast enhanced), or MRI scan. Patients were divided by tumor size. In group I (n = 11), tumors were 5 cm and in group II (n = 13).

After preoperative preparation, including nutritional status improvement, anemia (if present), dehydration, electrolytes imbalance correction, and anesthetic fitness assessment, all cases are sent for surgery. After telescope introduction, surgical operation was done. Documented surgical and histopathological details. Peroperative drain tube collection, weight differential between blood-soaked and wet gauze, visual impression were used to estimate blood loss. Post-operative follow-up and complications were properly managed. All patients were followed from the first post-operative day to one month or hospital stay. During hospitalization, post-operative adverse events are recorded in a data sheet. Later, the patient's condition and treatment outcome are determined at a follow-up clinic or by phone. After collecting, master sheet data was reviewed and modified. Then, the study's variables were processed and analyzed using SPSS-23 (Statistical Package for Social Sciences). Following are tables and figures with the results. This study includes mean, percentages, and standard deviations. Chi-square (X2) and Unpaired-t tests were used for statistics. 95% confidence interval was used with a significance level of 0.05.

RESULTS

Table 1 shows the study subjects' demographics. In group-I, 81.8% of patients were below 50 years and in group-II, 69.2%. In group-I, the mean age was 37.55±10.26 and in group-II, 37±13.69. In group-I (81.8%) and group-II (69.2%), most patients were female. Age and sex variations across groups weren't significant (p>0.05). All (100%) patients in group-I had a BMI below 30 kg/m2 and 11 (84.6%) in group-II. Group-mean I's BMI was 25.97±2.03 kg/m2 and group-was II's 25.94±3.29 kg/m2. BMI differences across groups were non-significant (p>0.05). In group-I, 63.6% of patients had HTN, and in group-II, 61.5%. 36.4% of group-I patients and 46.2% of group-II patients had DM. One (9.1%) patient in group-I had

CKD, hypothyroid, and medullary thyroid cancer. 7.7% of group-II patients had dyslipidaemia and hepatitis B. Co-morbidities didn't differ between groups (p>0.05).

Table 1: Demographic profile and the Co-morbities of the patients

Demographic characteristics	**Group-I (n=11)**		**Group –II (n=13)**		P value
Age in years	N	%	N	%	
<50	9	81.8	9	69.2	
≥50	2	18.2	4	30.8	[a]0.913[ns]
Mean±SD	37.55±10.26		37±13.69		
Sex					
Male	2	18.2	4	30.8	
Female	9	81.8	9	69.2	[b]0.478[ns]
BMI (kg/m^2)					
<30	11	100.0	11	84.6	
≥30	0	0.0	2	15.4	
Mean ± SD	25.97±2.03		25.94±3.29		**0.979[ns]**
Range (min-max)	**21.3-28.4**		20.9-31.5		
Co-morbidity					
HTN	7	63.6	8	61.5	**0.915[ns]**
DM	4	36.4	6	46.2	**0.627[ns]**
CKD	1	9.1	0	0.0	**0.266[ns]**
Hypothyroid	1	9.1	0	0.0	**0.266[ns]**
Medullary Ca of thyroid	1	9.1	0	0.0	**0.266[ns]**
Dyslipidaemia	0	0.0	1	7.7	**0.347[ns]**
Hepatis B carrier	0	0.0	1	7.7	**0.347[ns]**

Table 2 shows the distribution of the study subjects according to tumour status. It was observed that almost two third 7(63.6%) of patients had left site tumour in group-I and 7(53.8%) in group-II. The mean tumour size was 3.21±1.17 cm in group-I and 5.58±0.69 cm in group-II. Almost half 5(45.5%) of patients had functioning tumor in group-I and 4(30.8%) in group-II. The differences of tumor size was statistically significant (p<0.05) between two groups.

Table 2: Distribution of the study subjects according to tumour status (n=24)

Tumour status	**Group-I (n=11)**		**Group –II (n=13)**		***p* value**
	n	**%**	**n**	**%**	
Site of tumour					
Right	4	36.4	6	46.2	[a]0.627[ns]
Left	7	63.6	7	53.8	
Size of the tumour (cm)					
Mean±SD	3.21±1.17		5.58±0.69		[b]0.001[s]
Range (min-max)	1.5-4.9		5-7		
Funtional state					
Funtioning	5	45.5	4	30.8	[a]0.459[ns]
Non funtioning	6	54.5	9	69.2	

Table 3 shows the distribution of the study subjects according to dissection & haemostasis. It was observed that no patient had found difficulty dissection in group-I and 1(7.7%) in group-II. One (9.1%) patient had found difficulty haemostasis in group-I and 3(23.1%) in group-II. The differences of dissection and haemostasis were statistically not significant (p>0.05) between two groups.

Table 3: Distribution of the study subjects according to dissection & haemostasis (n=24)

	Group-I (n=11)		**Group –II (n=13)**		***p* value**
	n	**%**	**n**	**%**	
Dissection					
Difficulty	0	0.0	1	7.7	0.347[ns]
No difficulty	11	100.0	12	92.3	
Haemostasis					
Difficulty	1	9.1	3	23.1	0.359[ns]
No difficulty	10	90.9	10	76.9	

Table 4 shows the distribution of the study subjects according to operation note. The mean duration of operation was 61.82±12.3 approx. min in group-I and 68.08±9.69 approx. min in group-II. The mean estimated blood loss was 47.27±18.62 approx. ml in group-I and 71.92±26.26 approx. ml in group-II. No patient had need conversion into open in group-I and 1(7.7%) in group-II due to encountering difficulty in dissection caused by adhesions and risk of capsular tear. The differences of estimated blood loss was statistically significant ($p<0.05$) between two groups.

Table 4: Distribution of the study subjects according to operation note (n=24)

Operation Note	**Group-I (n=11)**		**Group –II (n=13)**		***p* value**
	n	**%**	**n**	**%**	
Duration of operation (Approx. min)					
Mean±SD	61.82±12.3		68.08±9.69		[a]0.176[ns]
Range (min-max)	50-80		55-90		
Estimated blood loss (Approx. ml)					
Mean±SD	47.27±18.62		71.92±26.26		[a]0.016[s]
Range (min-max)	30-80		40-120		
Conversion into open					
Yes	0	0	1	7.7	[a]0.347[ns]
No	11	100	12	92.3	

Table 5 shows the distribution of the study subjects according to drain collection. The mean 1st POD was 48.18±38.1 ml in group-I and 81.82±80.23 ml in group-II. The mean 2nd POD was 18.18±10.31 ml in group-I and 31.36±25.7 ml in group-II. The mean 3rd POD was 22.5±3.54 ml in group-I and 29.17±21.08 ml in group-II. The mean 4th POD was 32.5±10.61 ml in group-I and 35±21.21 ml in group-II. The mean 5th POD was 12.5±10.61 ml in group-I and not found in group-II.

Table 5: Distribution of the study subjects according to amount of drain fluid collection

Amount of drain fluid Collection	**Group-I (n=11)**	**Group –II (n=13)**	***p* value**
	Mean±SD	**Mean±SD**	
1st POD(ml)	48.18±38.1	81.82±80.23	0.216ns
2nd POD(ml)	18.18±10.31	31.36±25.7	0.125ns
4th POD(ml)	32.5±10.61	35±21.21	0.726ns
5th POD(ml)	12.5±10.61	-	-

ns= not significant

p value reached from Unpaired-t test

Table 6 shows the distribution of the study subjects according to drain removal. It was observed that majority 9(81.8%) patients had drain tube removal on 3rd POD in group-I and 9(69.2%) in group-II. The differences of drain removal was not statistically significant ($p>0.05$) between two groups.

Table 6: Distribution of the study subjects according to drain tube removal (n=24)

Drain tube removal	**Group-I (n=11)**		**Group –II (n=13)**		***p* value**
	n	**%**	**n**	**%**	
3rd	9	81.8	9	69.2	
4th	0	0.0	2	15.4	0.397[ns]
5th	2	18.2	2	15.4	

Table 7 shows the distribution of the study subjects according to complications. It was observed that, no complication was found in both groups.

Table 7: Distribution of the study subjects according to complications (n=24)

Complications	**Group-I (n=11)**		**Group-II (n=13)**	
	n	**%**	**n**	**%**
Wound infection				
Yes	0.0	0.0	0	0.0
No	11	100.0	13	100.0
Respiratory complication				
Yes	0.0	0.0	0	0.0

No	11	100.0	13	100.0
Cardiac complication				
Yes	0.0	0.0	0	0.0
No	11	100.0	13	100.0
Urinary complication				
Yes	0.0	0.0	0	0.0
No	11	100.0	13	100.0

Table 8 shows the distribution of the study subjects according to histopathology. It was observed that almost Three-quarters 8(72.7%) of patients had adrenocortical adenoma in group I and 6(46.2%) patients in group II. In group 1, 2 patients (18.2%) had adrenal myelolipoma, and in group 2, 3 patients (23.1%). Two (15.4%) patients had a pheochromocytoma in group-II, which was not found in group-I. One patient (7.7%) had a ganglioneuroblastoma in group II and was not found in group I.

Table 8: Distribution of the study subjects according to histopathology (n=24)

Histopathology	**Group-I (n=11)**		**Group –II (n=13)**	
	n	**%**	**n**	**%**
Adrenocortical adenoma	8	72.7	6	46.2
Adrenal myelolipoma	2	18.2	3	23.1
Pheochromocytoma	0	0	2	15.4
Ganglioneuroblastoma	0	0	1	7.7
Not available	1	9.1	1	7.7

DISCUSSION

The typical procedure for adrenal tumor removal is laparoscopic adrenalectomy [4]. When compared to open surgery, this method had less complication, less postoperative pain, a shorter LOS, and reduced morbidity [7, 14-16]. Consequently, the expense of laparoscopic adrenalectomy is minimal. Recently, an adrenalectomy rates rise as a result of standard medical techniques. Malignant tumors or benign diseases are responsible for a large portion of the growth [17]. As technology has advanced, the laparoscopic procedure has progressed from transabdominal to posterior endoscopic and robotic-assisted surgery. According to recent research, malignant or big tumors should be treated with open surgery. (more than 100 mm), yet there have been some recent studies that demonstrate comparable results mortality and morbidity rates after laparoscopic surgery, as long as oncological guidelines are followed [18-22]. In open surgery is advised for exceptionally large or locally invasive tumors to allow for en bloc excision [23]. Therefore, it has been suggested that these people go to specialized centers for treatment effect positive change [24, 25].

The majority of patients (81.8%) were under 50, and 9 (69.2%) in group I were in group II. Group 1's mean age was 37.55±10.26 while group II's was 37±13.69. In group I (81.8%) and group II (69.2%), most patients were female. Age and sex differences weren't significant (p>0.05).

In our analysis, 63.6% of group-I patients and 53% of group-II patients had left-sided malignancies. Group-I tumors averaged 3.21±1.17 cm and group-II 5.58±0.69 cm. 45.5% of patients had group I function, 30% group II. The two groups' tumor sizes differed significantly (p<0.05).

2/3 7(63.6%) group-I patients and 8(61.5%) group-II patients experienced HTN. Group 1 had 36.4% DM and group 2 had 46.2%. One (9.1%) patient in group I had CKD, hypothyroidism and medullary thyroid Ca. 7.7% of group II patients had dyslipidemia and were hepatitis B carriers. Comorbidity didn't differ between groups (p>0.05).

Group I had no dissection difficulties, while group II had one (7.7%). One (9.1%) patient in group-I developed hemostasis problems and 3 (23.1%) in group-II. Dissection and hemostasis didn't differ across groups (p>0.05).

Mean operation time was 61.82±12.3 min in group-I and 68.08±9.69 min in group-II. In group-I, the mean blood loss was 47.27±18.62 ml and in group-II, 71.92±26.26 ml. No patient in group-I needed open surgery due to adhesions and capsular tear, while 1 (7.7%) in group-II did. Estimated blood loss differed between groups (p<0.05). Neither group had complications.

The majority of patients in group I (81.8%) and group II (69.2%) were hospitalized within 5 days. In group 1, the average hospital stay was 5.2±1.8 days and in group 2, 5.4±2.1 days. Hospitalization length was not different across groups (p>0.05).

Three-quarters Group I had 8 (72.7%) and group II had 6 (46.2%) adrenocortical adenomas. 2 patients (18.2%) in group 1 and 3 patients (23.1%) in group II developed adrenal myelolipoma. Two (15.4%) individuals had group-II pheochromocytomas, not group-I. One patient (7.7%) had a group II ganglioneuroblastoma but not group I.

CONCLUSION

Blood loss was only major intraoperative risks associated with laparoscopic transperitoneal adrenalectomy for big adrenal tumors > 5 cm. The most important component in laparoscopically removing a large adrenal tumor is carefully selecting patients to undergo the procedure with a skilled surgeon in adrenal surgery.

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