Are there differences between the right and left laparoscopic adrenalectomy?
Our experience

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Are there differences between the right and left laparoscopic adrenalectomy? Our experience

AIM: *The purpose of this study was to determine if there are different outcomes between the right and left laparoscopic adrenalectomy according to our experience.*
MATERIAL OF STUDY: *From September 2010 to September 2015 forty-two LA were performed. Variables compared include age, body mass index (BMI), ASA score, operative time, estimated blood loss, conversions, gland size, tumor size, post-operative ambulation, postoperative hospitalization, perioperative and postoperative complications.*
RESULTS: *Substantially there are no difference in postoperative results between right and left LA.*
DISCUSSION: *We report difference in the operative time because left procedure is more complex. The difference in the blood loss due to two intraoperative bleeding in right side, can be considered a given accidental.*
CONCLUSIONS: *It's important an adequate learning curve to improve intraoperative and therefore postoperative Outcomes.*

KEY WORDS: Functioning neoplasms, Laparoscopic adrenalectomy, Laparoscopic transperitoneal adrenalectomy, Minimally invasive surgery, Non-Functioning neoplasm

Introduction

From the first laparoscopic adrenalectomy (LA) proposed by Gagner in 1992 [1], many studies have been published and that have shown the benefits of this minimally invasive approach over conventional open adrenalectomy (OA) [2-7]. The decreased requirements for analgesics, shorter hospital stay and lower morbidity have come the standard of care for a benign adrenal mass [8-12]. With evolution of laparoscopic technique and increased experience, even large lesion and adrenal malignancy can be managed laparoscopically [13].
Transperitoneal and retroperitoneal approach are the most common, especially the first one that mimics the open surgical approach [14]. The differences between the left and right adrenal glands are essentially anatomical: neighboring organs and venous drainage. Right gland has relationships with the inferior vena cava, the liver, the kidney, the second portion of the duodenum and drains into a short vein that flows directly into the inferior vena cava posterolaterally and is partially retrocaval. The left gland has relationships with the spleen, the pancreas, the kidney, the aorta and drains in a long vein into the left renal vein. Furthermore, variations of these venous drainages patterns occur in 5-6% of cases and can pre-

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dispose to intraoperative bleeding [15]. Historically right LA can be more challenging for anatomical reasons mentioned above. The purpose of this study was to determine if there are different outcomes between the right and left LA according to our experience.

Material and Method

From September 2010 to September 2015 we treated 64 patients with adrenal disease. Twenty-four OA and forty-two LA were performed. In the laparoscopic group, there were twenty-one right and twenty-one left adrenalectomies, only one was bilateral. There were twenty-three women and eighteen men with a mean age of 50.87 years (range: 17-73). Preoperative evaluation included biochemical testing as clinically indicated and all patients had tumor imaging studies by either computed tomography (CT) scan or magnetic resonance imaging (MRI) scan. Metaiodobenzylguanidine (MIBG) scanning was utilized selectively. Indications to LA were: functioning neoplasms in 19 patients (Conn's syndrome, Cushing's syndrome, pheocromocytoma), and non-functioning neoplasms in 22 patients (cortical adenomas, myelolipomas, oncocytomas, incidentalomas) (Table I). All operations were carried out with the lateral transperitoneal approach, except in three cases converted to open surgery. We used the precocious binding of the adrenal vein, greatest care in hemostasis and in dissection with a normal electric scalpel, preserving the anatomical integrity of the gland and the positioning of a tubular drainage at the end of the operation. In this retrospective study we compared the results between the right and left LA with lateral transperitoneal approach, and if there are any difference. Variables compared include age, body mass index (BMI), ASA score, operative time, estimated blood loss, conversions, gland size, tumor size, postoperative ambulation, postoperative hospitalization, perioperative complications and postoperative complications. The data was analyzed employing Mann-Whitney U-test and Fisher exact test from the computer programs (Statistica 8.0 by StatSoft inc.1984-2007). Differences were considered statistically significant when $p < 0.05$.

Table I - *Preoperative neoplasms characteristics.*

	Left side (N=21)		Right side (N=21)
Functioning neoplasms	11/21(52.38%)	(1 bilateral)	9/21(42.86%)
Non-functioning neoplasms	10/21(47.62%)		12/21(57.14%)

Table II - *Clinical patient characteristics.*

	Left Side (N=21)	Right Side (N=21)	*P Value
AGE			
Mean (SD)	52.05 (14.16)	49.70 (14.65)	0.295
Median	51.5	49	
Range	17-73	23-73	
BMI			
Mean (SD)	24.62 (4.06)	27.70 (3.63)	0.393
Median	24	27	
Range	19-30	20.5-36	
ASA score			
Mean (SD)	1.60 (0.75)	1.40 (0.60)	0.245
Median	1	1	
Range	I-III	I-III	

**P Value* obtained from Mann-Whitney U-test.

Results

The comparison of the selected data, above listed, showed the following results. The patients had a mean age of 50.87 (range: 17-73) at the time of surgery and this findings was not statistically significant (p=0.295). Mean BMI was 26.58 Kg/m² (range: 19-36) and did not differ between sides (p=0.393). The mean ASA score on the left side was 1.60 (range: I-III) and on the right it was 1.40 (range: I-III) with p-value 0.245. Table 2 shows the clinical characteristics of the patients in all groups. Other non-significant results were: tumor size (mean 3.05, p=0.113), gland size (mean 5.81, p=0.168), postoperative ambulation (mean 31.25, p=0.142) and postoperative hospitalization (mean 4.05, p=0.452). The conversion occurred only on the right side in 14% of cases (p=0.116). Reasons of conversion were in one case dense adhesions for previous episodes of acalculous cholecystitis in diabetic patient and in two cases bleeding, respectively from the adrenal capsule and from a small accessory vein. Perioperative complications occurred in one case (5%) on the left side and in 0% on the right (p=0.5), it was an hemoperitoneum in the first postoperative day, promptly resolved surgically. Finally between non-significant results there were postoperative complications at 30 days with 9% on both sides (p=0.697), and among them there were wound infection and atrial fibrillation for the left side, pulmonary embolism and port-site hematoma for the right side. Mean overall operative time was 146 minutes with 159 minutes on the left (range: 120-220) and 133 minutes on the right side (range: 90-200). P Value was statistically significant (p=0.012). We also observed a difference in blood loss (mean 87.22, p=0.006). No mortality occurred. All data are summarized in Table III.

TABLE III. *Intraoperative and postoperative results of LA.*

	Left Side (N=21)	Right Side (N=21)	*P Value
OPERATIVE TIME (min)			
Mean (SD)	159 (36.49)	133 (32.05)	0.012
Median	150	127.5	
Range	120-220	90-200	
BLOOD LOSS (ml)			
Mean (SD)	74.20 (14.06)	100.25 (52.95)	0.006
Median	71.5	92.5	
Range	50-96	50-280	
CONVERSION RATE (%)	0/21 (0%)	3/21 (14%)	0.116
GLAND SIZE (cm)			
Mean (SD)	5.99 (1.37)	5.63 (1.38)	0.168
Median	5.5	5.5	
Range	4-9	3.3-9	
TUMOR SIZE (cm)			
Mean (SD)	2.73 (1.53)	3.37 (1.46)	0.113
Median	2.5	3.1	
Range	0.7-7	1.6-6	
POSTOPERATIVE ambulation (hours)			
Mean (SD)	29.60 (7.51)	32.90 (10.38)	0.142
Median	26.5	29	
Range	22-45	22-50	
POSTOPERATIVE hospitalization (days)			
Mean (SD)	4.05 (1.05)	4.05 (1.14)	0.452
Median	4	4	
Range	3-6	3-6	
PERIOPERATIVE complication rate (%)	1/21 (5%)	0/21 (0%)	0.5
POSTOPERATIVE complication rate (%)	2/21 (9%)	2/21 (9%)	0.697

**P Value*: obtained from Mann-Whitney U-test (operative time, blood loss, gland size, tumor size, postoperative ambulation and postoperative hospitalization) and Fisher exact test (conversion, perioperative complication and postoperative complication).

Discussion and Comments

Since its introduction in 1992 [1], LA has rapidly become the procedure of choice for the surgical management of most adrenal tumors. Comparing to OA, LA offers better clinical outcomes, lower less perioperative morbidity, shorter hospitalization and better cosmetic results [11,16-20]. Transperitoneal and retroperitoneal approach are the most common [10]. The majority of surgeons performs the lateral transperitoneal access that favors excellent exposure and allows gravity to aid in the retraction of adjacent organs. The posterior retroperitoneal approach is an alternative that avoids the peritoneal cavity and may be helpful for patients with abdominal adhesions or patients requiring bilateral adrenalectomies; however, exposure and working space are limited, and anatomical relationship may not be as familiar. The third and less common access is an anterior transperitoneal approach, which affords the traditional view of anatomy but requires considerable effort to retract adjacent organs and maintain exposure [21]. We prefer the first way that requires less dissection, better retraction of the adjacent organs and easy removal of the surgical specimen. In our experience there are difference statistically significant only for operative time and blood loss about the comparison between right and left side. The operative time is longer for surgery of the left adrenal gland. The reasons of these findings are several. It is important to remember that left adrenal gland is nearby to the tail of the pancreas, the splenic vasculature and there are a lot of anatomical variations of the spleen itself. Varkarakis [22] observed during LA an 8% rate of pancreatic injury. Sometimes for a better exposure of the left gland is required the mobilization of the splenic flexure of the colon while on the right

side the retraction of the liver is more simple. Another important consideration is the dissection of the left renal hilum for vascular control of the adrenal vein. All these reasons suggest that on the left side the procedure is more complex than the right. Lezoche [23] reported differences in operative time between the right and left LA (respectively 80 and 100 minutes), but this results was not statistically significant. About blood loss in our results, the explication of difference statistically significant the explanation is that on three total conversions (7.1%) occurred only on the right side, two cases (4.8%) were due to intraoperative bleeding, respectively from the adrenal capsule and a small accessory vein. In the literature bleeding caused by injury to the inferior vena cava, adrenal vein or accessory vein may occur in 5-10% of cases as a result of inadequate exposure or visualization of these structures [24-27]. Another important feature is gland and tumor size. All our patients were affected to benign adrenal masses with diameter from 3.3 cm to 9 cm and neoplasm size from 0.7cm to 7cm. Like Assalia and Gagner [11] also our experience shows LA to be the procedure of choice for lesion under 8 cm without evidence of malignancy. Indeed LA for large adrenal masses (8 cm or greater) is associated with significantly longer operative time, increased blood loss and longer hospital stay [28]. In the overall perspective there are no difference in postoperative results between right and left LA.

Conclusions

We report difference in the operative time because left procedure is more complex. The difference in the blood loss due to two intraoperative bleeding in right side, can be considered a given accidental. It's important an adequate learning curve to improve intraoperative and therefore postoperative outcomes.

Riassunto

OBIETTIVO: Lo scopo di questo studio è determinare se ci sono differenze tra la surrenectomia laparoscopica destra e sinistra, secondo la nostra esperienza.
MATERIALE DI STUDIO: Dal settembre 2010 al settembre 2015 quarantadue surrenectomie laparoscopiche sono state eseguite. Le variabili prese in considerazione includono l'età, l'indice di massa corporea (BMI), il score ASA, il tempo operatorio, la perdita di sangue stimata, le conversioni, le dimensioni della ghiandola, le dimensioni del tumore, la deambulazione postoperatoria, la degenza postoperatoria, le complicanze perioperatorie e postoperatorie.
RISULTATI: Sostanzialmente non ci sono differenze nei risultati postoperatori tra la surrenectomia laparoscopica destra e di sinistra.
DISCUSSIONE: Noi abbiamo osservato differenze nel tempo operatorio perché la procedura di sinistra può risultare più complessa, ulteriore differenza è stata notata nella perdita di sangue a causa di due sanguinamenti intraoperatori a destra, ma questo può essere considerato un evento accidentale.
CONCLUSIONI: è importante una curva di apprendimento adeguata per migliorare i risultati intraoperatori e quindi l'outcome postoperatorio.

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