OUR EXPERIENCE IN LAPAROSCOPIC ADRENALECTOMY

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ABSTRACT

PURPOSE: Laparoscopic adrenalectomy (LA) has become the procedure of choice to treat functioning and non-functioning adrenal tumours. With improving experience, large adrenal tumours (> 5 cm) are being successfully tackled by laparoscopy.

MATERIAL AND METHODS: Thirty-five laparoscopic adrenalectomies performed in 32 patients for adrenal lesions during the period from 2006 to 2012 were analyzed.

RESULTS: Mean tumour size was 5,03 cm (range, 2-11 cm). Tumour size was larger than 8 cm in four patients. The lesions were localized on the right side in 17 patients and on the left one in 15 patients while bilateral tumours were established in three patients. Functioning tumours were present in 22 out of 32 patients. Average blood loss was 112 mL (range, 20-400 mL) with the mean operating time being 144 min (range, 45-270 min). Three patients underwent conversion to open procedure. Final histology revealed malignant tumours in three of 32 patients (9,52%).

CONCLUSION: LA is safe and feasible for large adrenal lesions. Mere size should not be considered as a contraindication to laparoscopic approach in large adrenal masses. Graded approach, perfect preoperative assessment and planning, team work and adherence to anatomical and surgical principles are the key to success.

Key words: *adrenal tumours, laparoscopic adrenalectomy, surgical technique, pheochromocytoma, postoperative results*

INTRODUCTION

Laparoscopic adrenalectomy (LA) is one of the successful applications of minimally invasive surgical techniques. Since its first description, LA has been adopted quickly as the procedure of choice to treat benign functioning and non-functioning adrenal tumours (5). Common indications include aldosteronoma, Cushing's syndrome, pheochromocytoma, virilising and feminising tumours, as well as benign non-functioning tumours (22). LA widespread adoption is partly due to the improvement in laparoscopic instrumentation and technical expertise as well as to the several trials demonstrating the superiority of the laparoscopic approach over traditional open surgery in the form of shorter hospital stay, early return to activity, less postoperative pain and fewer complications related to blood loss and surgical scar (2,8,16,23). As experience with the technique increase, so do indications, with reports of large tumours (more than 5 cm in diameter) being successfully removed using the laparoscopic approach (6,11). However, as adrenal gland size increases, so does the technical difficulty and increased risk of dealing with a malignant pathology of the gland (24). The principal concerns surrounding the laparoscopic approach to large adrenal tumours are the risk of an inadequate resection and the potential for port-site or peritoneal metastases, which would adversely affect the clinical outcome (1).

In our Clinic of Surgery, we adhere to the policy of graded approach by tackling smaller tumours in the initial part of our series before embarking onto more vascular and larger tumours.

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MATERIAL AND METHODS

Thirty-five adrenalectomies for adrenal lesions in 32 patients were performed by in the First Clinic of Surgery, St. Marina University Hospital of Varna, between 2006 and 2012. Of them, 32 were completed as LA, and three were converted to open adrenalectomy.

All of the patients were primarily evaluated in the Clinic of Endocrinology, St. Marina University Hospital of Varna. Depending on the suspected pathology, appropriate hormonal workup was done including serum epinephrine/norepinephrine, serum cortisol, serum ACTH levels, serum aldosterone and urinary VMA levels. ^{131}Iodine meta-iodobenzylguanidine (MIBG) scan was done in patients with pheochromocytoma to rule out multiple and ectopic sites of overproduction. Contrast-enhanced computerized tomography (CECT) was relied upon in all cases to look for the size of the gland, relation to inferior vena cava (IVC) on right side, renal vein on left side, and presence or absence of lymph nodes. Tumours with obvious invasion of adjacent organs or distant metastasis were excluded.

Surgical technique

All the patients were operated under general anaesthesia using the lateral transperitoneal approach. The technique was described in detail elsewhere (3). Carboperitoneum was maintained at 12 mm Hg.

For the right side, four to five working ports were placed. The liver was mobilized and retracted via the epigastric port. The thin layer of fascia covering IVC was incised along the right lateral border and the same incision was extended along the peritoneum on the inferior aspect of the liver, laterally up to the right triangular ligament. The latter maneuver aided in additional retraction of the liver and exposure of the gland and the vein. A plane was created between the adrenal gland and IVC at the lower aspect of the tumour to reach the retroperitoneal muscle and the dissection proceeded cephalad reaching the adrenal vein. The specimen side of the vein was clipped first and with two clips on patient side, the vein was divided. The gland was then dissected free from the surrounding structures.

For the left side, three to four subcostal ports were used. The peritoneum on the lateral aspect of the descending colon was serially incised and the incision extended superiorly to incise the splenorenal ligament till greater curvature of stomach was seen. This allowed complete retraction of the spleen-pancreas complex and the colon by positional gravity exposing the adrenal tumour and the kidney enveloped in the Gerota's fascia. Dissection was done at the site of the renal hilum for renal vein identification. The adrenal vein was identified along the superior border of the renal vein. This was clipped (specimen side first) and divided. The adrenal gland was then dissected free from the surrounding structures and additional adrenal branches of inferior phrenic vessels were clipped or coagulated.

The difficulties due to the overhanging nature of these large adrenal tumours were overcome by using of lateral ports for retraction. Increased vascularity and desmoplastic reaction seen in large tumours, especially, in pheochromocytoma was countered with the use of ultrasonic dissector. To avoid breech of oncologic principles of rupture and spillage, two lateral ports were joined that enabled an intact removal of the gland in a retrieval bag. The ports were closed using monofilament nylon and skin with clips. No drains were used.

RESULTS

Average patients' age was 33,6 years (range, 16-62 years) with male to female ratio of 1,6:1. Functioning tumours were present in 22 of these 32 patients. Mean tumour size was 5,03 cm (range, 2-11 cm). Tumour size was larger than 8 cm in four patients. The lesions were localized on the right side in 17 patients on the left side in 15 patients, with bilateral tumours in three patients.

Average blood loss was 112 mL (range, 20-400 mL) with the mean operating time being 144 min (range, 45-270 min), 134 min for the right side, 138 min for the left one and 165 min for bilateral tumours.

Three patients required conversion to open procedure. Bleeding was the cause of conversion in three patients of large pheochromocytoma (size 5 cm and above). Technical difficulty in one patient of paraganglioma situated in the aortocaval window and local invasion in a patient with adrenocortical sarcoma were the causes of conversion in the other two patients. The mean hospital stay was four days

(range, 2-8 days) without any major postoperative complications.

The final histological examinations revealed pheochromocytoma (n=18), paraganglioma (n=3), adenomyolipoma (n=5), Cushing's disease (n=4), carcinoma (n=2) as well as schwannoma, tuberculosis, and adrenocortical sarcoma (one patient each). Final histology revealed malignant tumours in three of 32 patients (9,52%). One patient with adrenocortical sarcoma died of metastasis three months after surgery. One patient developed incisional hernia through the specimen retrieval site two years postoperatively that was corrected surgically. The mean follow up was 26 months.

DISCUSSION

Shorter hospital stay, early return to activity, less postoperative pain and fewer complications related to blood loss and surgical scar are the proven benefits of the laparoscopic approach (2,8,16,23).

Three issues are of utmost importance while dealing with a large adrenal tumour. First comes the intraoperative technical difficulty due to distorted anatomy and overhanging on surrounding important vascular pedicles, second does the risk of dealing with a malignant neoplasm, and third relates to retrieval of these large tumours without intraperitoneal spillage. As the size of the adrenal tumour increases, the surrounding anatomy is disturbed such as IVC, liver and kidney on the right and spleno-pancreas complex and kidney on the left. This is especially true for pheochromocytoma or malignant tumours. Pheochromocytomas also elicit an intense desmoplastic reaction which leads to numerous dilated vessels in the vicinity of the tumour. However, in non-functional benign large adrenal tumours, the planes are well-maintained. Use of ultrasonic dissector helps in maintaining the near bloodless field. It is important always first to clip the adrenal vein on the specimen side before clipping on the patient side; otherwise the vein dilates and this can lead to hemorrhage. Our results show that large tumours can be safely tackled using the laparoscopic approach with reasonable operative times, blood loss and conversion rates.

Numerous recent publications demonstrate the safety of the laparoscopic approach for large adrenal tumours greater than 5 cm (6,10,12,13,15,17,19). There is, however, no real consensus on the definition of a large adrenal tumour. While most authors consider the size of 5 cm as 'large' (4,7,14,20), there are a few recent reports suggesting a size of 6 to 8 cm that should be treated as large (9,26).

Adrenal gland malignancies may arise from the cortex or medulla, or may be metastatic. The relationship between adrenal gland size and malignancy is a grey zone with various opinions. The risk of adrenocortical carcinoma (ACC) in an incidentally diagnosed adrenal tumour is 2% for tumours less than 4 cm, 6% for tumours between 4 and 6 cm, and greater than 25% for tumours larger than 6 cm. Between 5 and 26% of pheochromocytomas are malignant (25). However, most large tumours are still benign. Numerous predictors for malignancy other than size like family history, presence of virilizing features, mixed hormonal secretion, solid areas on imaging and rapid enhancement and rapid washout on MRI contrast imaging have been suggested (13). Unfortunately, only local invasion and presence of metastases are the only two reliable signs which accurately predict malignancy.

In our series, only three of the 46 tumours (6%) turned out to be malignant which suggests that most large tumours without evidence of invasion or metastasis on radiology preoperatively turn out to be benign. Similar results are already reported by other authors (13,15,17,19). Thus if size is the sole criterion on which the choice of operative approach is based, many patients with benign large adrenal lesions would have an unnecessary open adrenalectomy that might increase their morbidity rate and deprive them of the benefits of LA.

In the absence of unequivocally preoperative or intraoperative local invasion, simple adrenalectomy is the appropriate procedure for an ACC. Laparoscopy offers an excellent magnified view and makes the dissection of the adrenal gland possible. The laparoscopic approach offers as good if not better a chance of complete resection of the adrenal gland as the open approach. Long-term results of ACC treated laparoscopically compare favourably well with those achieved with the open approach and recurrence of malignant disease has more to do with the biology of disease processes than surgical approach adopted at

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initial resection (19). In our small experience of three malignant cases, we note a uncomfortably thick adherence between other neighbouring organs as a criteria for malignancy that was difficult to dissect. Possibly, conversion to open surgery is required in these patients.

Retrieval of these large tumours can be a technical problem. It is important to avoid tumour rupture and spillage. Literature seems markedly silent on retrieval of larger tumours. Hand-assisted laparoscopic dissection is recommended by some authors (21) wherein the handport aids in retraction of the overhanging tumour and the same incision is then utilized for specimen extraction. This approach would be useful for non-functioning tumours. In our experience, size is not a cause of conversion but the obscured anatomy and possible infiltration into surrounding structures is definitely a cause. In functioning tumours like a pheochromocytoma, handling can lead to fluctuations of blood pressure and disaster.

LA is a procedure that is performed infrequently when compared to other advanced procedures such as colectomy, splenectomy and even bariatric procedures. In open surgery, surgeon's eyes, mind and hands work in tandem to perform a particular task. In laparoscopic surgery, telescope tip is the eye of the surgeon that is controlled by the camera person. Therefore, the camera person has to read the surgeons' mind allowing the surgeon to make maneuvers of his choice. If a group of individuals working together when performing the given procedure repetitively, the team automatically enhances in performance. This sentiment is echoed and outpatient LA is proposed in selected group of patients (18). Therefore, the concept of team work as suggested by us assumes importance in performance of LA for large adrenal tumours.

CONCLUSION

Our results and our brief review of the literature show that LA is safe and feasible for bigger adrenal lesions. Mere size should not be considered as a contraindication to laparoscopic approach in bigger than average adrenal masses. Graded approach, perfect preoperative assessment and planning, team work, experience and adherence to anatomical and surgical principles are the key to success.

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