

OUR EXPERIENCE IN LAPAROSCOPIC ADRENALECTOMY

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ABSTRACT

BACKGROUND: 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.

MATERIALS AND METHODS: Thirty-eight laparoscopic adrenalectomies was performed for adrenal lesions during the period 2006 to 2012 were reviewed.

RESULTS: A total of 35 laparoscopic adrenalectomies were done in 32 patients. The mean tumour size was 5.03 cm (2-11 cm). The lesions were localised on the right side in 17 patients and on the left side in 15 patients, with bilateral tumours in 3 patients. Functioning tumours were present in 32 of the 46 patients. The average blood loss was 112 ml (20–400 ml) with the mean operating time being 144 min (45 to 270 min). Three patients underwent conversion to open procedure. Three of the 32 patients (9.52%) on final histology had malignant tumours.

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, good preoperative assessment, team work and adherence to anatomical and surgical principles are the key to success.

Key words: Laparoscopic adrenalectomy, adrenal tumour, large adrenal lesions, pheochromocytomas, aldosteronoma.

INTRODUCTION

The first tumor operations on the adrenal glands were done to remove "large abdominal swellings". Knowsly Thornton of London is credited with the first known successful operation to remove an adrenal cancer in 1899 [11]. 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.[1] The common indications include aldosteronoma, Cushing's syndrome, pheochromocytoma, virilising and feminising tumours, and benign non-functioning tumours. [2] The widespread adoption of LA has been partly due to the improvement in laparoscopic instrumentation and technical expertise and partly 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. [3–6] As experience with the technique has increased, so have the indications, with reports of large tumours (more than 5 cm in diameter) being successfully removed using the laparoscopic approach.[7, 8] However as the size of the adrenal gland increases so does the technical difficulty and increased risk of dealing with an malignant pathology of the gland. 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.[9]

At our institute, we followed the policy of graded approach by tackling smaller tumours in the initial part of our series before embarking onto more vascular and larger tumours.

MATERIAL AND METGHODS

Thirty eight adrenalectomies were performed by in the Department of General and Operative surgery in Medical university of Varna, between 2006 and 2012. Of these 38 cases involving adrenal lesions, 35 were finished as LA, and 3 were converted to open adrenalectomy.

The department of endocrinology primarily evaluated all of the patients. Depending on the suspected pathology,

appropriate hormonal workup was done including serum epinephrine / nor epinephrine, serum cortisol, serum ACTH levels, serum aldosterone and urinary VMA levels. Iodine 131 meta-iodobenzylguanidine (MIBG) scan was done in patients with pheochromocytoma to rule out multiple and ectopic sites of overproduction. Contrast-enhanced computerised tomography (CECT) was relied upon in all cases to look for the size of the gland, relation to 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 patients were operated using the lateral transperitoneal approach. The technique is described in detail elsewhere.[10] All patients were operated under general anaesthesia. Carboperitoneum was maintained at 12 mm Hg.

For the right side, four to five working ports were placed. The liver was mobilised and retracted via the epigastric port. The thin layer of fascia covering the 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 the 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 spleno-renal 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 identification of the renal vein. 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 use of lateral ports for retraction. Increased vascularity and desmoplastic reaction, seen in large tumours especially pheochromocytoma was countered with the use of ultrasonic dissector. To avoid breach 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

A total of 38 adrenalectomies were done in 32 patients. The average age was 33.6 years (range 16 - 62 years) with the male to female ratio of 1.6:1. Functioning tumours were present in 22 of the 32 patients.

The mean tumour size was 7.03 cm with range of 5 to 15 cm. 14 patients had tumour size more than 8 cm. The lesions were localised on the right side in 17 patients and on the left side in 21 patients with bilateral tumours in 4 patients.

The average blood loss was 112 ml (range 20 - 400 ml). The mean operating time was 144 min (range 45 to 270 min) with the average operating time for the right side being 134 min and the left side being 138 min. The average operating time for bilateral tumours was 165 min.

Three patients required conversion to open procedure. Bleeding was the cause of conversion in three patients of large pheochromocytomas (size 5 cm and above). Technical difficulty in one patient of paraganglioma situated in the aorto-caval window and local invasion in a patient with adrenocortical sarcoma were the cause of conversion in the other two patients. The mean in-hospital stay was 4 days (2-8 days) with no major post-operative complications.

The final histological examinations revealed pheochromocytoma ($n=26$), paraganglioma ($n=4$), adenomyolipoma ($n=7$), Cushing's disease ($n=4$), schwannoma ($n=1$), tuberculosis ($n=1$), carcinoma ($n=2$) and adrenocortical sarcoma ($n=1$). Three of the 32 patients (9.52%) had malignant tumours. One patient (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 is 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.[3 - 6]

Three issues are of utmost importance while dealing with large adrenal tumour. First is the intra-operative technical difficulty due to distorted anatomy and overhanging on surrounding important vascular pedicles, the second being the risk of dealing with a malignant neoplasm. The third issue is retrieval of these large tumours without intra peritoneal spillage.

As the size of the adrenal tumour increases, the surrounding anatomy is disturbed – inferior vena cava (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 a near bloodless field. It is important to always first clip the adrenal vein on the specimen side before clipping on the patient side; else the vein dilates and 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 publications in recent times have demonstrated safety of the laparoscopic approach for large adrenal tumours greater than 5 cm. [8, 12-16] There is no real consensus on the definition of large adrenal tumour. While most publications support the size of 5 cm as "large", [17-20] there are a few recent reports suggesting a size of 6 to 8 cm that should be treated as large. [21, 22]

Malignancies of the adrenal gland may arise from the cortex or medulla or may be metastatic. The relationship of size of the adrenal gland with malignancy is a grey zone with varied opinions. The risk of adrenocortical carcinoma (ACC) in an incidentally discovered 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.[24] However, most large tumours are still benign. Numerous predictors for malignancy other than size like family history, presence of virilising features, mixed hormonal secretion, solid areas on imaging and rapid enhancement and rapid washout on MRI contrast imaging have been suggested.[15] Unfortunately only local invasion and presence of metastases are the only two reliable signs which accurately predict malignancy. In our series, only 3 of the 46 tumours turned out to be malignant (6%) which suggests that most large tumours without evidence of invasion or metastasis on radiology preoperatively turn out to be benign. Similar results have been reported by other series.[12, 14-16] 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 and deprive them of the benefits of LA.

In the absence of unequivocally preoperative or intra-operative local invasion, the appropriate procedure for an adrenocortical carcinoma (ACC) is simple adrenalectomy. The laparoscopic view 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 ACCs treated laparoscopically compare favorably 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 initial resection.[16] In our small experience of three malignant cases, we noticed uncomfortable thick adherence between other neighboring organs as a criteria for malignancy that was difficult to dissect. Possibly, conversion to open 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 Shen *et al*, wherein the handport aids in retraction of the overhanging tumour and the same incision is then utilised for specimen extraction.[25] 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 like colectomy, splenectomy and even bariatric procedures. In open surgery, surgeon's eyes, mind and the hands work in tandem to perform a particular task. In laparoscopic surgery, the tip of the telescope 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 work together performing a given procedure repetitively, the team automatically enhances in performance. Ramirez-Plaza CP *et al* echoes this sentiment and has proposed outpatient LA in selected group of patients.[26] Therefore, the concept of team work as suggested by us assumes importance in performance of LA for large adrenal tumours.

CONCLUSION

Our results show that mere size should not be considered as a contraindication to laparoscopic approach in large adrenal masses. Preoperative assessment and planning, team work, experience and adherence to anatomical and surgical principles are the key to success.

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