Invited Paper

LAPAROSCOPIC ADRENAL SURGERY

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The laparoscopic approach for excision of the adrenal gland was first described by Gagner *et al*. in 1992.[1] Over the years, several series have established laparoscopic adrenalectomy (LA) as the gold standard for the removal of adrenal lesions of almost any pathology in adults.[2–4] Utilization of laparoscopy for adrenalectomy in the pediatric and adolescent age groups is much lower, due to the relative infrequency of adrenal masses in this patient population associated with a relatively higher incidence of malignancy;[5] other factors like small body size and inexperience with smaller laparoscopic instrumentation may also limit the enthusiasm among surgeons for this approach.[6]

This study reviews our experience with LA in children, at a single referral centre.

MATERIALS AND METHODS

This is a retrospective study of all laparoscopic adrenal surgeries performed on pediatric patients at our institute from January 2003 to May 2010. Patient medical records were reviewed for demographic data, preoperative evaluation and diagnosis, as also preoperative details, postoperative hospital stay, complications, histopathological features and follow-up data.

All patients underwent preoperative biochemical evaluation to rule out functional tumours. Radiological imaging with contrast-enhanced computed tomography (CT) or magnetic resonance imaging (MRI) scans was done in all patients to assess the size, side, local extent and distant metastasis. Additionally, metaiodobenzylguanidine scans were carried out during evaluation of functioning adrenal medullary lesions.

As in adults, the blood pressures of children with biochemical or clinical evidence of phaeochromocytoma were controlled prior to surgery with alpha blockade, using doxazocin and beta blockade when necessary.

SURGICAL TECHNIQUE

All cases were performed by the standard lateral transperitoneal approach, which has been extensively described. The patients were positioned in the 45° lateral decubitus position and a sub-umbilical 5 mm or 10 mm port was used for a 30° telescope. Two 3 mm or 5 mm working ports were used — one in the iliac region and the other subcotric port was ustal port in the midclavicular line [Figure 1]; an additional 3 mm epigassed for liver retraction in right-sided procedures. Carbon dioxide was used for insufflation maintaining pneumoperitoneum at a pressure of 8 – 10 mm Hg. When bilateral LA was performed in a single stage, the patients were re-positioned and re-draped after completion on one side. For the left-sided procedures, early control of the adrenal vein was attained at its origin from the renal vein. This was accomplished after colonic and splenopancreatic mobilisation, without direct handling of the adrenal gland itself. For right-sided procedures, the right lobe of the liver was mobilised and retracted upwards after dividing the right coronary ligament. The sub-hepatic inferior vena cava was exposed to approach the adrenal vein at the superomedial corner of the adrenal gland. After division of the adrenal veins, the gland was dissected free. The specimens were routinely placed in indigenously prepared plastic bags and retrieved through the umbilical port, extending it judiciously when necessary.

Figure 1
Port positions for left laparoscopic adrenalectomy in a child

RESULTS

Ten adrenalectomies were performed in seven children during the seven-year period of study. The four boys and three girls had a mean age of 9.6 years and a mean body-weight of 28 kgs. All the patients were symptomatic on presentation [Table 1] and none had antenatally detected masses or incidentalomas. Preoperative diagnosis were phaeochromocytoma (n = 4), Cushing's disease refractory to pituitary surgery (n = 2) and ganglioneuroma (n = 1). Three children underwent bilateral single-stage adrenalectomy, while four underwent unilateral adrenalectomy — three on the left side and one on the right side.

Table 1
Demographics, perioperative data and final histopathology of seven patients

Sex / Age (Years)	Body Weight (kgs)	Presentation	Side / Size (cm)	Operative time (min)	Postoperative Stay (days)	Pathology
M /16	39	Hypertension	L / 5	75	4	Normal Adrenal
F / 12	55	Cushing's syndrome	R / 5 L / 5	270	5	Cushing's disease [Adrenal Hyperplasia]
F / 14	34	Hypertension	R / 5	130	4	Pheochromocytoma
F / 1	8	WDHA	L / 3.7	120	3	Ganglioneuroma
M / 14	25	Hypertension	R / 7	250	6	Pheochromocytoma
M / 10	32	Cushing's syndrome	L / 5 R / 5	270	5	Cushing's disease [Adrenal Hyperplasia]
M / 0.5	3	Hypertension	L / 5 L / 2.3	120	10	Neuroblastoma

WDHA – Watery Diarrhoea-Hypokalaemia-Alkalosis Syndrome

On radiological imaging, the sizes of the adrenal masses ranged from 2 to 7 cm (mean 4.8 cm) in the longest dimension. The mean operative time was 111 minutes for unilateral and 263 minutes for bilateral cases. Estimated blood loss was negligible (< 50 ml) in all cases. The same surgical technique was followed in all patients and early adrenal vein ligation was successfully accomplished in all 10 procedures. Two patients with phaeochromocytoma developed intraoperative hemodynamic fluctuations in spite of adequate preoperative preparation with alpha blockade and intravenous hydration. There were no open conversions, but terminal hand assistance was employed in one child to dissect and retrieve a 7cm right phaeochromocytoma with retrocaval extension.

Postoperative hospital stay averaged 5.3 days. One infant developed postoperative septic arthritis of the hip joint that required prolonged hospital stay and parenteral antibiotics. Those with Cushing's disease were transferred to the endocrinology unit for further management. There was no mortality in this series of seven patients.

The final histopathology [Table 1] revealed a normal adrenal gland in a teenage boy with uncontrolled hypertension, which required three anti-hypertensive drugs. His urinary vanillylmandelic acid levels were elevated and the preoperative CT scan was initially interpreted as a left adrenal mass; in retrospect, it was probably just a very prominent splenic notch. The histology of the female infant who presented with features of the watery diarrhoea-hypokalaemia-alkalosis syndrome