Brief Report

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Laparoscopic resection of ectopic pheochromocytoma

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Summary **Ectopic pheochromocytoma (EP) is considered as pheochromocytoma located at extra-adrenal site. Surgical removal is believed to be the best choice for treatment of pheochromocytoma. We present a series EP resected by laparoscopic approach (LEP) and confirm its feasibility. We retrospectively reviewed clinical data of 4 patients underwent laparoscopic resection of LEP (periaortocaval EP, *n* = 1; retroperitoneal EP, *n* = 2; bladder EP, *n* = 1), which was collected and analyzed retrospectively in Zhejiang Provincial People's Hospital. The tumors were all successfully resected by laparoscopic approach, and there was no one conversed to open surgery or needing blood transfusion. Laparoscopic resection is a feasible and safe choice for EP.**

Keywords: Ectopic pheochromocytoma, laparoscopic, minimal invasive, hypertension

1. Introduction

Pheochromocytoma is a chromaffin cell tumor commonly located at adrenal medulla. Ectopic pheochromocytoma (EP) is considered as pheochromocytoma located at extra-adrenal site, which usually lies at para-aortic region. EP originated from chromaffin cells is a really rare tumor, which is from nerve crest. It has been reported the annual incidence is 0.4/1 million ~ 9.5/1 million (*1*). The age of onset varies from 30 to 50 years old, commonly sporadic cases. The distribution of EP is very changeable, it could occur from skull base to pelvic cavity where chromaffin cells are. The most common place of EP is paraortic, followed by bladder, mediastinum and head (*2*).

The clinical presentations of EP include hypertension, palpitations, dizziness and headache, but there are about 24~75% of asymptomatic patients (*3*). The level of norepinephrine is not high, so the tumor is usually called non-functioning ectopic pheochromocytoma. Clinically, EP could be diagnosed according to clinical presentation and catecholamines in blood. As for iconography, we can find strengthened vascular shadow on CT scanning due to rich arteries in the neighbor of tumor. Retroperitoneal EP should be differentiated with schwannoma, liposarcoma and hyperplastic lymph gland. EP also should be differentiated with bladder cancer when it locates in bladder.

EP is not sensitive to radiotherapy or chemotherapy, so surgical remove is believed to be the best choice for treatment of pheochromocytoma (*4*). Laparoscopic approach is widely accepted because of its minimal invasive advantage. However, because of the reality of the EP, only a few publications reported single case reports of laparoscopic resection of EP (*5-7*). Here we present a series of EP resected by laparoscopic approach to prove the feasibility of the method.

2. Patients and Methods

The research admitted by ethics committee is not involved medical ethic. The surgery is rational in our hospital. From 2014 to 2017, the clinical data of 4 consecutive cases underwent laparoscopic resection of LEP (periaortocaval EP, *n* = 1; retroperitoneal EP, *n* = 2; bladder EP, *n* = 3) was collected and analyzed retrospectively in Zhejiang Provincial People's Hospital (Table 1). These are three women and one man. Three patients had hypertension in varying degrees that

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Table 1. Patients' characteristics

Case	Sex	Age	Tumor size (cm)	Preoperative SBP (mmHg)	Preoperative DBP (mmHg)	Preoperative heart rate (bpm)
1	F	27	3.1	136	87	96
2	F	22	5	149	99	130
3	F	46	3.8	130	93	88
4	M	71	1.6	128	74	80

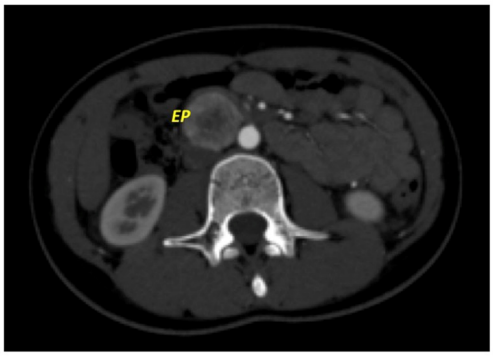

Figure 1. CT scan shows an enhanced tumor (EP) at periaortocaval area. EP, Ectopic pheochromocytoma.

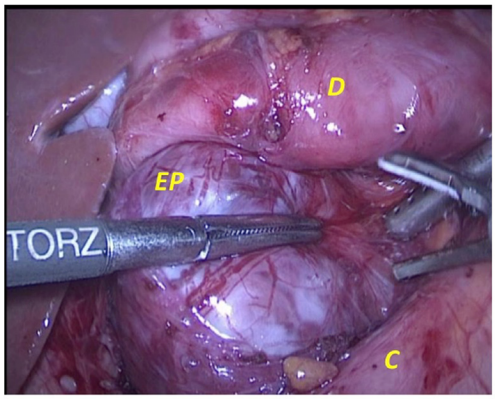

Figure 2. Intraoperative figure shows an EP at periaortocaval area after Kocher's maneuver was performed. EP, Ectopic pheochromocytoma; C, colon; D, duodenum.

could be controlled by medicines. Other symptoms include palpitations, dizziness and headache. Besides clinical presentation, patients who underwent LEP were evaluated by biochemical and image test before surgery. Computer tomograply (CT) is necessary for preoperative diagnosis and assessment (Figure 1). The tumor size examined before surgery ranged from 1.6 to 5 cm. Preoperative treatments: the patient 3 had Terazosin 2 mg qn; the patient 4 had Nifedipine 30 mg qd.

Surgical approach Laparoscopic resection of EP: Under general anesthesia, the patient 1 was placed in supine position. Pneumoperitoneum was established (12 mmHg). Four laparoscopic ports were placed (2 × 10 mm, 2 × 5 mm). Firstly, the Kocher's maneuver was performed to expose tumor (Figure 2). During operation, the blood pressure raised up to 300/110 mmHg when we touched the tumor. Then we stopped all operation during the surgery and used sodium nitroprusside 15 mg by micro pump lasting for 5 min, the blood pressure dropped to previous level. The tumor was carefully dissociated with surrounding tissue and taken out with an endobag from enlarged umbilical incision. Then the blood pressure dropped to normal range and the surgery was finished. The surgical approach of patient 2 and 3 is similar to the approach mentioned above.

The position of ectopic pheochromocytoma in patient 4 was in bladder. The patient was placed in supine position in the condition of general anesthesia and pneumoperitoneum established at 15 mmHg. Three trocars were placed at left axillary line under navel 3cm, right axillary line under navel 3cm and navel. Firstly, 300 mL water was injected to bladder by catheter, and then the bladder was opened by electrocautery. The tumor was located at the posterior wall of bladder. The SBP went up to 245 mmHg when we touched the tumor. After removing the tumor with electrocautery, we closed the bladder with 2-0 prolene.

3. Results and Discussion

The perioperative data of the 4 patients are shown in Table 2. All EPs were resected using transperitoneal laparoscopy, and there was no one conversed to open surgery. The operative time ranged from 40 to 95 min. The estimated blood loss ranged from 10 to 100 mL. The HSBP during operation of the 4 patients were higher than normal, and the highest blood pressure even reached to 310 mmHg. When we stopped all operation during the surgery and used sodium nitroprusside or ebrantil, the blood pressure dropped to normal range in a few minutes. Mean LSBP was 109.5, which was higher than normal range. Meanwhile, there was no need of blood transfusion in the 4 patients. All patients started liquid diet after 24 hours and soft diet after 36 hours. There was no complication occurred in the period of hospitalization. The length of postoperative hospital stay ranged from 5 to 10 days. The outcomes of pathology in our study are all benign.

At present, the best treatment approach is surgical removal (*4*). The incidence of intraoperative bleeding is high due to rich arteries around tumor and the position of tumor, like para-aortic and pare-cava. So the advantages of laparoscopic approach are totally appeared because of

Table 2. Perioperative results of patients

Case	Operative time (min)	EBL (mL)	HSBP (mmHg)	LSBP (mmHg)	POHS (day)
1	85	50	310	124	6
2	95	50	168	104	10
3	40	100	180	115	5
4	60	10	170	95	7

EBL, Estimated blood loss; HSBP, Highest SBP; LSBP, Lowest SBP; POHS, Postoperative Hospital stay.

its function of magnification.

It is safer for having a more clear vision for small vessels. If met a tumor extending to big vessels, we should ligate the tumor vessels to prevent catecholamine entering blood. It could lower the risk of postoperative heart failure and pulmonary edema in case of violent drop of blood pressure if giving fluid infusion preoperatively (*8*).

Compared with traditional surgery, laparoscopic approach will ease the posteoperative pain because of 3 or 4 ports rather than a long incision. During the surgery, the operation of laparoscopic approach is more accurate and less damage to vessels or tissues, which contributes to fast postoperative recover and shortens the postoperative hospital stay (*9*). The appearance of the abdomen is more cosmetic than traditional surgery, which makes patients more satisfied about the surgery. The postoperative hospital stay is about 7 days, reflecting laparoscopic approach minimal invasiveadvantage.

Most of chromaffin cells are benign, and there is about 2~13% expressing malignant (*10*). However EP has more chances to mutate to be malignant, some researchers consider the rate is 10%, but someone thinks the rate is higher, even to 50% (*10*). Once researchers made a study and followed up 7 malignant pheochromocytoma patients and 5 malignant EP patients for 20 years, finding EP having the stronger ability of vascular invasion and lymph node metastasis (*1*). There is a cohort study based on large samples finding the survival time of malignant EP patients longer than malignant pheochromocytoma patients (*11*).

The main operation risk of EP is the management of blood pressure during surgery. Alpha-blockage should be used for at least 2 weeks before surgery if the patient has typical clinical symptoms, and when the heart rate is beyond 90 beats per minute, β-blockage should also be given (*12*). To a great extent, the measures will reduce the risks in surgery. In the period of surgery, blood pressure should be observed closely. If the blood pressure raises up to a abnormal range owing to touching the tumor, the operation should be stopped immediately and medicine, like sodium nitroprusside or ebrantil, could be given if necessary.

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