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A Case Report and Review of Pregnancy in Pheochromocytoma

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Abstract

Pheochromocytoma in pregnancy is extremely rare in clinical practice, posing a dangerous and severe threat to both maternal and fetal safety. Its typical clinical manifestations include paroxysmal or persistent hypertension, accompanied by the triad of headache, sweating, and tachycardia. However, most cases in clinical practice present with atypical, nonspecific symptoms, making it easily confused with hypertensive disorders of pregnancy, and leading to a high risk of misdiagnosis. Early diagnosis and appropriate treatment are crucial in reducing maternal and fetal mortality. Surgical resection is the most effective treatment for pheochromocytoma in pregnancy, but there remains controversy regarding the timing and strategy for pregnancy termination and tumor resection. To explore the diagnosis and management of pheochromocytoma in pregnancy, this article presents a case analysis of against pheochromocy to main pregnancy. The patient was misdiagnosed as having severe preeclampsia during the third trimester. After treatment with volume expansion, antihypertensive therapy, and heart rate control, a cesarean section was performed to terminate the pregnancy, followed by laparoscopic resection of the pheochromocytoma postpartum. Both maternal and fetal outcomes were favorable. Through a review and analysis of domestic and international literature, this article aims to discuss the clinical characteristics, treatment strategies, and timing considerations for pheochromocytoma in pregnancy, providing a reference for the diagnosis and treatment of this condition.

Case Presentation

Patient Li, 32 years old, multipara, was admitted to the hospital on February 26th 2024 due to "32 weeks and 5 days of amenorrhea, with recurrent palpitations and headaches for 16 days." The patient had a history of regular menstrual cycles, LMP: July12, 2023. Fetal movement was felt at 4+ months of gestation, and abdominal circumference gradually increased with gestational age. Non-invasive prenatal testing showed low risk, and fetal system ultrasound revealed no abnormalities. The 75g glucose tolerance test indicated "gestational diabetes mellitus", for which the patient was advised to control blood glucose. Through diet and appropriate physical activity, with satisfactory glucose control. During early and mid-pregnancy, the patient did not experience dizziness, headaches, or palpitations, and blood pressure during prenatal checkups was normal. Sixteen days before admission, the patient experienced sudden dizziness, headaches, and palpitations accompanied by excessive sweating, lasting more than10 minutes, this resolved spontaneously. The patient did not seek medical attention. Twelve days before admission, she experienced similar symptoms at night and went to a local hospital, where her blood pressure was measured at 180/100 mmHg. After 10 minutes, repeat measurement showed 121/72 mmHg. Liver function tests revealed ALT: 105 U/L, AST: 45 U/L, and an electrocardiogram showed sinus tachycardia (134 beats/min) and T-wave abnormalities (suggesting possible ischemia of the anterior and inferior walls). Routine blood tests showed no significant abnormalities. The patient was immediately transferred to a higher-level hospital. Urinalysis indicated proteinuria (2+), but sub sequent tests showed negative proteinuria and 24-hour urine protein quantification was 143 mg. ProBNP was 2190 pg/ml. Abdominal ultrasound showed a slightly hyperechoic area (~93*79 mm) in the right liver, possibly a hemangioma. Renal and adrenal ultrasound showed mild hydronephrosis of the right kidney. Echocardiography revealed slight thickening of the interventricular septum and mild regurgitation of the mitral, tricuspid, and pulmonary valves. Brain MRI showed no abnormalities. The initial diagnosis was "severe preeclampsia, secondary myocardial injury: cardiac function class II, abnormal liver function." Treatment included magnesium sulfate for anticonvulsant therapy, labetalol 100 mg Q8H, and nifedipine 30 mg QD for blood pressure control, dexamethasone to promote fetal lung maturation, digitalis for cardiac strengthening, furosemide for diuresis, and ademetionine for liver protection. During hospitalization, the patient continued to have intermittent episodes of dizziness, headaches, palpitations, and sweating, with blood pressure fluctuations that normalized 10-20 minutes after active antihypertensive therapy. After some improvement, the patient was discharged upon signing consent and continued oral labetalol 100 mg Q8H and nifedipine 30 mg QD for blood pressure control.

On February26, 2024, the patient again experienced dizziness, headaches, palpitations, and sweating, accompanied by nausea, vomiting, and dyspnea. Blood pressure was measured at 221/150 mmHg, and after taking nifedipine controlled-release tablets 30 mg and labetalol 100 mg, her blood pressure remained elevated, prompting her to seek treatment at our hospital. Upon arrival, her blood pressure was 220/120 mmHg, and after 5 minutes of rest, repeat measurement showed 123/75 mmHg. She was admitted for emergency treatment. On admission, her physical examination showed: T36.8°C, P138 bpm, R

36 breaths/min, BP246/132 mmHg. She was conscious and alert, with an accelerated heart rate, no obvious lung abnormalities, and no tenderness or rebound tenderness in the abdomen, which was enlarged corresponding to her gestational age. Fetal heart rate was 138 bpm, and there was mild edema in both lower limbs. Liver function tests showed ALT: 213.90 U/L, AST: 151.70 U/L. Thyroid function tests showed FT3: 3.72 pmol/l, TSH: 5.84 uIU/ml, BNP: 2442.3 pg/ml. Routine blood and urine tests and coagulation profile were normal.

The diagnosis was considered as: 1. Severe preeclampsia, 2. Secondary myocardial injury: cardiac function class II, 3. Gestational diabetes mellitus, 4. Pregnancy complicated by liver dysfunction, 5. Pregnancy complicated by subclinical hypothyroidism, 6. G2P1, 32 weeks and 5 days pregnant. Treatment included magnesium sulfate for anticonvulsant therapy and labetalol for blood pressure control. Blood pressure continued to fluctuate, accompanied by paroxysmal dizziness, headaches, palpitations, and sweating. Further testing of catecholamine metabolites (all elevated, with norepinephrine predominating) revealed normetanephrine 602.6 pg/ml, norepinephrine 29315.5 pg/ml, 3-methoxytyramine 135 pg/ml, normetanephrine 24208 pg/ml, epinephrine 321 pg/ml, and dopamine 287.8 pg/ml. Abdominal CT scan revealed a right adrenal mass (~86*80*80 mm) compressing the liver, with unclear differentiation from nearby bowel, liver, and right kidney, raising suspicion of pheochromocytoma. The diagnosis was revised to pregnancy complicated by pheochromocytoma. After multidisciplinary consultation (obstetrics, urology, cardiology, endocrinology, anesthesiology, and critical care), the patient was transferred to the ICU on February 28, 2024, for treatment with phenoxybenzamine for blood pressure control, metoprolol for heart rate control, and volume expansion. After two weeks of treatment, blood pressure and heart rate were well controlled, with the patient gaining 0.55 kg since admission. On March 14, 2024 (at 35 weeks of gestation), the patient underwent a cesarean section under general anesthesia. Uterine contractions were weak, and to prevent postpartum hemorrhage, a posterior uterine wall suture and B-Lynch suture were performed. The newborn weighed 2730 g with Apgar scores of 10-10-10. Postoperatively, the patient continued taking oral phenoxybenzamine and metoprolol for blood pressure and heart rate control, with blood pressure fluctuations between 124-168/78-105 mmHg and controlled heart rate, though she occasionally experienced mild dizziness and palpitations. A repeat abdominal CT scan on March21, 2024, showed an increase in the size of the right adrenal mass (98*90*91 mm compared to 86*80*80 mm on February 27, 2024) **(Figure 1).** After sufficient volume expansion, the patient gained 3 kg post-delivery, with occasional fluctuations in blood pressure and heart rate, which were mostly around 120/80 mmHg and 70-80 bpm, respectively.

To reduce the risk of massive intraoperative bleeding during pheochromocytoma resection, the patient underwent right adrenal artery embolization on April 16, 2024, under local infiltration anesthesia, followed by laparoscopic right adrenal pheochromocytoma resection on April 17, 2024, under general anesthesia. Intraoperatively, the right adrenal tumor was approximately 10 cm in size, highly vascularized, with an intact capsule. The tumor had a close relationship with the liver and adjacent inferior vena cava. The tumor was completely resected **(Figure 2)**, and the surgery proceeded smoothly. Intraoperative

blood pressure and heart rate fluctuations were minimal, with about 800 ml of blood loss and transfusion of 4 units of packed red blood cells. Postoperative pathology confirmed a right adrenal pheochromocytoma **(Figure 3).** The patient recovered well and was discharged 12 days postoperatively. The repeat abdominal CT scan after the surgery showed nothing on the right adrenal gland on April 28, 2024 **(Figure 4),** and Follow-up at 3 months showed no discomfort, the adrenocorticotropic hormone and cortisol of the patient have return to normal.

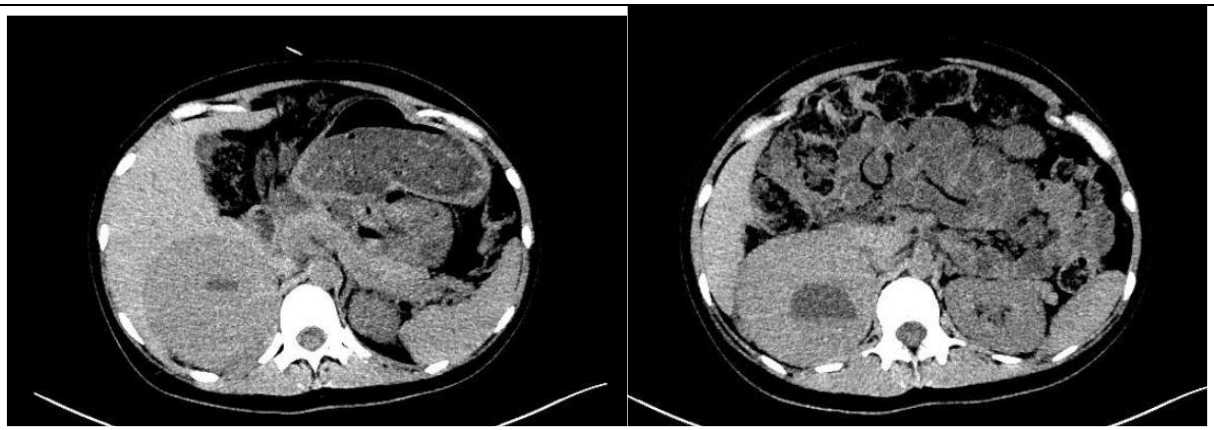

Figure 1: (a) the CT scan of the Pheochromocytoma on February 27, 2024; (b) the CT scan of the Pheochromocytoma on March 21, 2024.

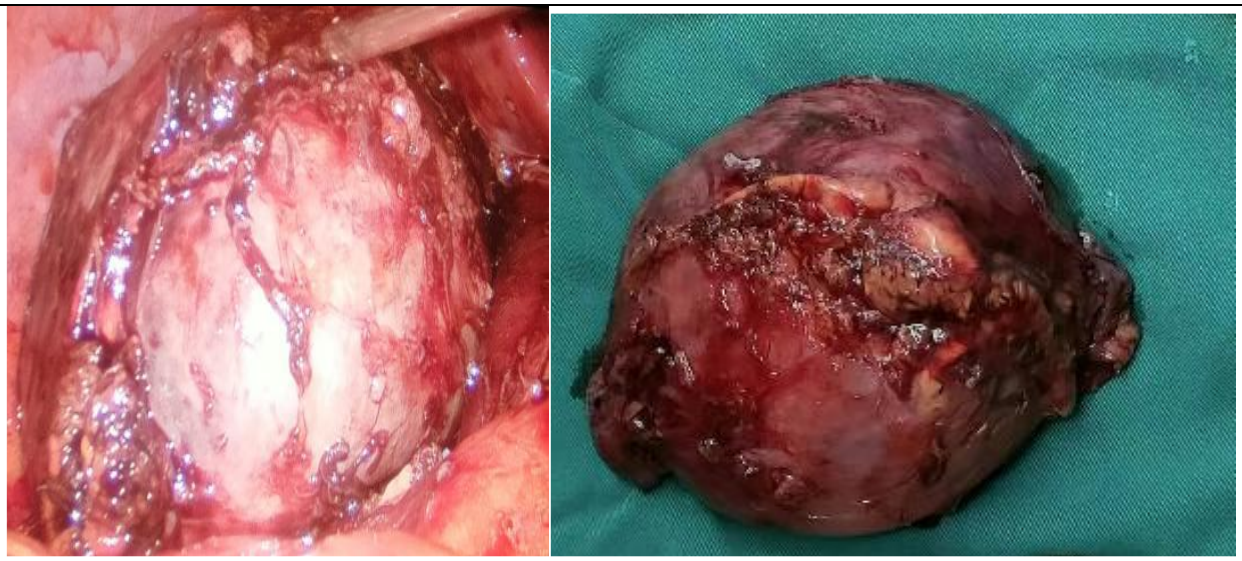

Figure 2: (a) The appearance of the tumor under laparoscopy; (b) The macroscopic appearance of the tumor.

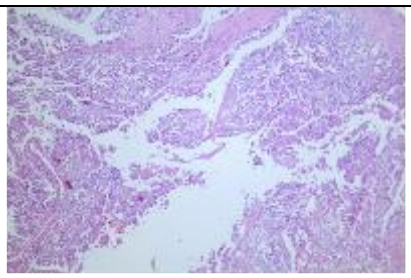

Figure 3: The pathological manifestations of the tumor.

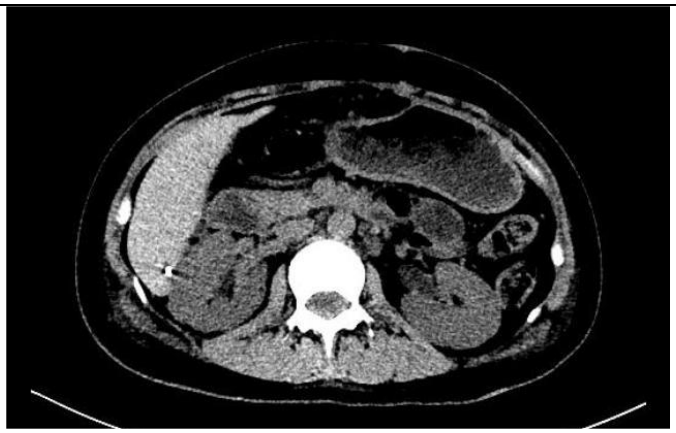

Figure 4: the abdominal CT scan after the surgery on April 28, 2024.

Pheochromocytoma in pregnancy (PIP) is extremely rare, with an incidence of 1 in 54,000. It is a tumor originating from the chromaffin cells of the adrenal medulla, exhibiting various sympathetic nervous system symptoms through the release of catecholamines, such as uncontrollable hypertension, heart failure, pulmonary edema, and cerebrovascular accidents. It can also lead to placental ischemia, placental abruption, intrauterine fetal distress, and even intrauterine fetal death **[1-4]**. For perinatal women and fetuses that are not diagnosed in time, the mortality rate can reach 40% to 50%. However, with timely diagnosis and treatment, the mortality rates drop to 5% and 15%, respectively **[5].** The incidence of PIP is low, and its symptoms and signs are highly variable and nonspecific, making it difficult to distinguish from hypertensive disorders complicating pregnancy (HDP), thus easily leading to missed or misdiagnoses. Once it manifests, the consequences can be severe **[5-7]**. Currently, there are few case reports of this condition in China, and there is a lack of available experience in diagnosis and treatment. This study retrospectively analyzes the clinical data of a patient with giant pheochromocytoma during pregnancy treated at the University-Town Hospital Affiliated to Chongqing Medical University, exploring the clinical characteristics, treatment strategies, and timing of this disease, with the aim of providing reference for its diagnosis and treatment.

Clinical manifestations and easily confusable diseases and diagnoses

The diagnosis of PIP primarily relies on medical history, clinical signs, and auxiliary examinations. It's typical clinical manifestations include paroxysmal or persistent hypertension, accompanied by the triad of headache, sweating, and tachycardia.

In most cases, the symptoms are atypical and nonspecific, making it easily confused with HDP [3,8,9]. The key points for differentiating between HDP and PIP are as follows. Firstly, HDP generally occur after 20 weeks of gestation, whereas PIP can occur at any stage of pregnancy. Secondly, HDP typically present with persistent hypertension, often accompanied by proteinuria and lower limb edema, whereas PIP may present with persistent or paroxysmal hypertension, hypotension with the classic triad, hyperglycemia, and rarely proteinuria. Lastly, blood pressure in HDP usually returns to normal after delivery, whereas hypertension persists in PIP [5,10,11]. This patient had no prior history of underlying diseases. In the late stage of this pregnancy, paroxysmal hypertension was observed, but it could return to normal on its own, accompanied by dizziness, headaches, palpitations, and proteinuria. As a result, the patient was misdiagnosed with severe preeclampsia and treated with anticonvulsants, anti hypertensives, and sedatives. However, the paroxysmal hypertension persisted. In this case, the patient was initially misdiagnosed, and after being admitted to our hospital, treatment for preeclampsia proved ineffective. Following comprehensive laboratory and imaging examinations, the final diagnosis of pregnancy complicated by a giant pheochromocytoma was confirmed. A search on CNKI and PubMed for cases over the past 10 years where PIP patients were initially diagnosed with HDP yielded the following summary in **Table 1.**

Table1: Summary of cases misdiagnosed as HDP at home and abroad from 2013 to 2024.

Time of HDP Gnosis (weeks)	Time of tumor diagnosis (weeks)	Tumor Size (cm)	Symptoms	Preoperative medication	Tumor treatment Time (weeks)	Operation mode
26	Postpartum	7.2x3.9x8.5	Sweating, abdominal pain, palpitations, hypertension	Prazosin, propranolol	Postpartum2 weeks	Surgical
34	Postpartum	7.0x5.5x3.2	Hypertension, dyspnea, anorexia	Alpha and beta blockers	Postpartum	Surgical
38	38	4x4	Hypertension, headache	Prazosin, metoprolol	Postpartum 20 days	Surgical
20	29+6	5.1x4.3	Hypertension	Phenoxybenzamine and labetalol	36 weeks	Laparoscopic
33	Postpartum	5.6x4.9	Hypertension, sweating, orthostatic hypotension	Carvedilol, prazosin, amlodipine, alpha and beta	Postpartum	Surgical

				blockers		
35	35+	6.1x4.8x5.9	Hypertension, palpitations	Phenoxybenzamine, prazosin, labetalol, phentolamine	Postpartum 6 weeks	Laparoscopic
35	35	7.5x7.8	Hypertension, headache, palpitations	Phentolamine, prazosin, phenoxybenzamine	Postpartum 6 weeks	Surgical
28	33	6.2x7.8	Hypertension, palpitations	Alpha and beta blockers	Postpartum	Laparoscopic
24	35	4.9x4.5x4.2	Hypertension, headache, dyspnea	Alpha and beta blockers, calcium channel blockers	Postpartum 2 weeks	Laparoscopic
35	38	3.9x2.5x3.2	Hypertension, dyspnea	Alpha blockers, nifedipine	Postpartum 2 weeks	Surgical
28	33	6.5x5.8	Headache, palpitations, dyspnea	Phentolamine, phenoxybenzamine, nifedipine	Postpartum	Laparoscopic
31	34	10x7.5x7.5	Hypertension, dizziness, scotoma	Phentolamine, nifedipine, propranolol	Postpartum 2 months	Laparoscopic
34	36	6.0x4.5x6.6	Hypertension, Visual impairment	Phentolamine, nifedipine	Postpartum 2 months	Laparoscopic

Diagnosis

The diagnosis of PIP includes both qualitative and localization diagnostics. Qualitative diagnosis mainly involves measuring catecholamines and their metabolites, including Vanillylmandelic Acid (VMA), Metanephrine (MN), and Normetanephrine (NMN) **[6,7].** SHARMA et al. suggested that plasma Metanephrines (MNs) had high sensitivity and specificity, and a negative result could almost effectively rule out Pheochromocytomas/Paragangliomas (PPGLs), making it the preferred laboratory test **[25].** Localization diagnostics primarily include ultrasound and MRI. Ultrasound is convenient and radiation-free but has the drawback of lower sensitivity. MRI, on the other hand, is radiation-free, highly sensitive, and accurate in localization, making it the preferred imaging method during pregnancy **[4].** After admission, this patient underwent catecholamine metabolite testing, which showed a significant elevation, predominantly in MN and NMN. MN and NMN are inactive metabolites and can effectively reflect catecholamine levels in the tumor, providing a strong indication for the qualitative diagnosis in this

case. The patient was initially scheduled for an MRI, but upon entering the room, she became extremely anxious, causing a sudden spike in blood pressure and worsening dizziness and headaches. As a result, the plan was changed to an abdominal CT, which was faster. The CT results suggested the possibility of PIP. While CT has some value for the localization diagnosis of PIP, it does expose the fetus to some radiation, so it is not routinely used for imaging during pregnancy. However, since this patient was already in the late stage of pregnancy and the fetus was fully developed, individual considerations were made, making this case somewhat unique.

The timing and method of pregnancy termination

Regarding the timing of pregnancy termination, Agrawal et al. suggested that for cases in early or mid-pregnancy, if the patient requested pregnancy termination, induction of labor could be performed after blood pressure was controlled with medication [5]. For mid to late pregnancy cases, if blood pressure is well controlled with medication, pregnancy can be carried to full term before termination. If blood pressure is poorly controlled, termination of pregnancy can be considered after 34 weeks of gestation or after completing treatments such as promoting fetal lung maturation and fetal brain protection. If life-threatening conditions arise for the mother or fetus, termination should be performed immediately [26]. There is currently no consensus on the optimal delivery method for fetuses in PIP cases. Compared to vaginal delivery, cesarean section is considered a more controlled method. During vaginal delivery, the process is unpredictable, and the intense pain caused by uterine contractions may trigger a large release of catecholamines, leading to a hypertensive crisis, which can endanger both mother and child. During a cesarean section, the anesthesiologist can manage anesthesia and pain more precisely, minimizing the risk of sudden blood pressure fluctuations, which is particularly important for pheochromocytoma patients. Additionally, a cesarean section provides an immediate surgical intervention channel, which is advantageous in rapidly controlling emergencies to save the patient's life. Therefore, PIP patients often opt for cesarean section to terminate the pregnancy [4,27]. There have been cases where successful vaginal deliveries were performed under strict medical supervision, but in most cases, cesarean section remains the preferred and safest method of delivery [4]. This patient was in the late stages of pregnancy, complicated by a giant pheochromocytoma. A course of dexamethasone to promote fetal lung maturation had already been completed outside the hospital. Due to the patient's unstable condition, with sharp fluctuations in blood pressure, an emergency surgery could have resulted in severe intraoperative hypertension that would be difficult to control or refractory hypotension, both of which could endanger the safety of the mother and fetus. Moreover, since the gestational age was ≤34 weeks, and the fetal heart rate and movements were normal, there were no obstetric indications for an emergency cesarean section. After a multidisciplinary discussion, the patient was treated with phenoxybenzamine to lower blood pressure, metoprolol to control heart rate, and volume expansion for symptomatic support. After two weeks of treatment, at 35 weeks and 1 day of gestation, a cesarean section was performed to terminate the pregnancy. The surgery went smoothly, and the newborn had Apgar scores of 10-10-10, weighing 2730g and measuring 47cm in length. Both the

mother and baby had favorable outcomes, and postoperative treatment for blood pressure control and heart rate management continued.

Preoperative preparation, timing, and method of tumor resection

Surgical resection is the most effective treatment for PIP [3]. Adequate preoperative preparation, an appropriate surgical method, and performing the surgery at the right time are key to ensuring the safety of both mother and baby. Before the resection of pheochromocytoma, preoperative preparation includes controlling blood pressure, correcting arrhythmias, and expanding blood volume. The use of adrenergic blockers preoperatively can reduce the risk of perioperative and postoperative complications, primarily including alpha-adrenergic blockers and beta-adrenergic blockers. BELLOMO et al. suggested the use of alpha blockers could reduce maternal mortality from 40% to less than 5% and fetal mortality from 50% to 15% [10]. This is thought to be because alpha blockers can counteract the effects of catecholamines while also potentially causing maternal hypotension, which can affect uteroplacental blood volume perfusion. Therefore, when using alpha blockers to lower blood pressure in PIP patients, it is also necessary to maintain adequate uteroplacental blood volume circulation [28]. The most commonly used alpha blockers in clinical practice include phenoxybenzamine and doxazosin, with phenoxybenzamine typically being used for preoperative preparation for 10 to 14 days [6,29]. Commonly used beta blockers include metoprolol and propranolol, which are aimed at treating arrhythmias and reflex tachycardia that may result from alpha blocker use [7,30]. Beta blockers should not be used alone and are usually introduced several days after starting alpha blockers [31]. Additionally, calcium channel blockers can also be considered as antihypertensive agents [32]. In this patient, alpha blocker phenoxybenzamine and beta blocker metoprolol were used preoperatively, and this treatment regimen demonstrated good efficacy in controlling blood pressure and heart rate, providing a stable hemodynamic foundation for the tumor resection surgery. There is still controversy regarding the optimal timing for pheochromocytoma resection in pregnant patients. Bartz-Kurycki et al. recommended early adrenal tumor resection during the first trimester [33]. Giampaolino et al. suggested that tumor resection was not advisable during the first or third trimester, with the second trimester being the optimal window for surgical intervention. They recommended performing surgery before 24 weeks of gestation, as management between 24 and 27 weeks was similar to that in the third trimester [34]. Tumor resection in the third trimester carries higher risks for both mother and fetus, and typically, blood pressure is controlled with medication first, followed by tumor resection after delivery [34]. The choice of surgical timing mainly depends on the gestational age, the location of the tumor, and the mother and fetus's response to medical treatment [28].

For PHEO patients, laparoscopic tumor resection is the preferred surgical approach [35]. Compared to open surgery, it offers advantages such as fewer postoperative complications, less intraoperative blood pressure fluctuation, smaller surgical trauma, and faster postoperative recovery, which also applies to PIP patients [36,37]. Regarding surgical approaches, both trans abdominal and retroperitoneal routes can be chosen [38]. Additionally, some international studies have reported the application of robotic technology in PIP surgeries [39]. Considering the

potential adhesion between the tumor and the inferior vena cava, the trans abdominal route was selected for the pheochromocytoma resection in this case. The procedure was performed using laparoscopic tumor resection, where the tumor and surrounding tissues were separated laparoscopically, providing adequate exposure of the tumor, followed by the tumor's resection. This patient was in the late stages of pregnancy, complicated by a giant pheochromocytoma, a condition with an even lower incidence and extreme rarity. In this case, it was decided to perform laparoscopic tumor resection after cesarean section, once the patient's blood pressure and heart rate were stabilized. Following uterine involution, the increased surgical space reduced the difficulty of the procedure. Preoperative evaluation indicated that the tumor was large and closely related to the inferior vena cava, posing a high risk of massive intraoperative bleeding. Therefore, right adrenal artery embolization was performed preoperatively to reduce the risk of intraoperative bleeding and minimize the likelihood of massive transfusion during and after surgery. This approach also helped maintain hemodynamic stability during the operation. Intraoperatively, it was found that the tumor had a close relationship with the liver and inferior vena cava. The space between the tumor, liver, and inferior vena cava was carefully separated, revealing a tumor approximately 10 cm in size with an intact capsule and a rich blood supply. The tumor was completely excised and sent for pathological examination. During surgery, there were minimal fluctuations in blood pressure and heart rate, with a total blood loss of 800 ml and the transfusion of 4 units of packed red blood cells. Postoperative pathology confirmed a right adrenal pheochromocytoma. The successful outcome of the surgery was closely related to proper perioperative management. Currently, there is no standardized protocol for determining the timing of pregnancy termination and pheochromocytoma resection, and management needs to be individualized based on the patient's condition. Regardless of the chosen approach, thorough and appropriate perioperative management can effectively reduce maternal, fetal, and neonatal mortality. It also helps maintain relatively stable hemodynamics during surgery, minimizes intraoperative bleeding, and promotes better postoperative recovery for the patient.

Genetic characteristics and their impact on maternal and fetal outcomes

Previously, pheochromocytoma was thought to occur mainly as sporadic cases. However, with the widespread use of next-generation sequencing methods, it has been revealed that approximately 40% of cases are associated with autosomal dominant genetic syndromes, with PHEO-PGL being the most common, accounting for 20% to 30% **[40]**. Susceptibility genes for PHEO-PGL include NF1, RET, VHL, and SDH-related genes, with SDH-related genes being predominant **[41].** BIGGAR et al. suggested which conducted genetic testing on 77 PIP patients, and found a positive rate as high as 30%, suggesting that there was also a high mutation rate among PIP patients. Therefore, it is essential to carry out genetic screening. However, due to limitations related to family, financial, and technical factors, large-scale screening for PHEO-PGL susceptibility genes is currently not feasible in China **[42].** Lenders et al. pointed out that all patients with PHEO and/or PGL should be considered for genetic syndromes, with priority given to the following groups: early-onset cases (under 45 years old), recurrent or

malignant tumors, multiple PGL/PHEO, bilateral adrenal pheochromocytoma, and those with a family history [43]. In our case, although genetic screening was not performed, we could not rule out a familial PHEO-PGL diagnosis. Immunohistochemistry is increasingly being used as a screening tool before germline testing, and SDHB immunohistochemistry has been proven to be a sensitive and reliable marker for any germline mutation in the SDH subunit genes [44]. Individuals with germline mutations related to PHEO-PGL should undergo lifelong clinical, biochemical, and imaging monitoring [45,46]. PIP is clinically rare but can pose a range of dangers to both the mother and the fetus. The primary harm to the mother is due to the large amounts of catecholamines secreted by the tumor, which affect the cardiovascular and nervous systems. This can induce cardiomyopathy, manifesting as myocardial heart failure, cardiogenic shock, or acute coronary syndrome, as well as hypertensive crises, syncope, and shock. Neurologically, it can cause conditions like cerebral infarction [8,9,47]. For the fetus, the catecholamines may cause uterine artery vasoconstriction in the mother, and since the uteroplacental circulation lacks self-regulation, it is directly influenced by maternal blood pressure. This can lead to spontaneous abortion, fetal growth restriction, intrauterine hypoxia, or even still birth [4,6,30]. Additionally, paroxysmal hypertension may cause placental abruption, while rebound hypotension can result in fetal intrauterine hypoxia and adverse fetal outcomes [3]. Most cases of PIP lack specific symptoms and signs, making it easy to confuse with HDP in clinical practice. Early diagnosis and timely intervention can greatly reduce maternal and neonatal mortality. The primary treatment for pregnancy complicated by pheochromocytoma is surgical. However, there is still debate regarding the optimal timing and approach for surgery. Proper perioperative management, multidisciplinary cooperation, and individualized treatment plans based on the patient's condition are crucial for improving maternal and fetal outcomes.

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