

Anesthetic management of a pregnant woman undergoing laparoscopic surgery for pheochromocytoma -A case report-

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Pheochromocytoma is a rare catecholamine producing tumor. Anesthetic management for the resection of pheochromocytoma is hard and challenging issue to anesthesiologist, because of its potentially lethal cardiovascular complications. It becomes more complicated when the patient is pregnant. Clinicians must keep the safety of both mother and fetus in mind. The timing of surgery for pheochromocytoma in pregnancy is very important for the maternal and fetal safety and depends on the gestational age when diagnosis is made, clinical response to medical treatment, the surgical accessibility of the tumor, and the presence of fetal distress. We report anesthetic experience of a laparoscopic resection for pheochromocytoma in 25th week gestational woman. (Korean J Anesthesiol 2013; 64: 373-375)

Key Words: Laparoscopic surgery, Pheochromocytoma, Pregnancy.

Pheochromocytoma is a rare catecholamine producing tumor and difficult to manage for anesthesia because of the hemodynamic instability. It is more complicated if the patient is pregnant. A pheochromocytoma in a pregnant patient is one of the most threatening medical conditions for mother and fetus. The pheochromocytoma in pregnancy occurs more rarely, and the incidence has been reported less than 0.2 per 10,000 pregnancies [1]. During pregnancy, if a pheochromocytoma is undiagnosed or untreated until delivery, maternal and fetal mortality are 48% and 54.4% respectively [2], but maternal and fetal mortality can be decreased to 4% and 11% by early recognition and proper management [3].

Although treatment of choice for pheochromocytoma is surgical resection, the decision for the operation should be considered for the maintenance of pregnancy and maternal and fetal safety during pregnancy. Moreover, considerations such as the size of pheochromocytoma, the uterus size at diagnosis, accessibility of surgical procedure, response to medical treatment, and maternal desires for the baby should be considered to decide the timing for surgical treatment.

We report a case of pheochromocytoma in pregnancy which was laparoscopically resected under general anesthesia at 25th gestational week successfully.

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Case Report

A 27-year-old previously healthy woman was referred from local obstetric clinic to our hospital at 22th week gestational age with persistent uncontrolled high blood pressure (BP). Her BP was 170/100 mmHg, and she complained of intermittent headache and epigastric pain at admission. Pregnancy-induced hypertension (PIH) was diagnosed and antihypertensive treatment was begun. Despite the maximal dose of antihypertensive treatment (hydralazine 100 mg/day), BP persisted uncontrolled.

Another cause of hypertension besides PIH was suspected, so further evaluation was performed. Plasma and urine norepinephrine levels were at 3,053.8 pg/ml (normal reference: 15–80 pg/ml) and 1,011.6 mcg/day (15–80 mcg/day) and urine metanephrine 8.1 mg/day (0–0.8 mg/day). MRI scanning of the abdomen revealed a 4 × 4 cm sized cystic mass in the right adrenal gland, suggesting a pheochromocytoma. A multidisciplinary consultation among anesthesiologist, urologist, obstetrician, and endocrinologist was held to determine the most appropriate management of this pregnant patient. We decided to do a surgical resection of pheochromocytoma because the size of fetus (maximum estimated fetal weight: 700 g) and tumor (4 × 4 cm) were small enough to secure the laparoscopic surgical field. She was treated with doxazosin, a selective α 1-blocker, as a preoperative α -blockade for 14 days. Her BP ranged from 120/80 to 130/90 mmHg with doxazosin. Laparoscopic adrenalectomy was set for the 25th gestational week.

Arriving at operating room, her BP was 120/85 mmHg and heart rate was 95 beats/min. After sufficient pre-oxygenation, anesthesia was induced with 200 mg of thiopental, 50 mg of rocuronium, and continuous infusion of remifentanyl (target effect site concentration 5 ng/ml) using a target controlled infusion system (Orchestra[®] Fresenius vial, Brezims, France). After tracheal intubation, her blood pressure was 120/75 mmHg and continued at that level. Anesthesia was maintained with 1–3 vol% of sevoflurane and continuous infusion of remifentanyl (target effect site concentration 2–5 ng/ml), and the patient's lung was ventilated with volume controlled mode with 50% oxygen.

Left radial artery and right subclavian vein were cannulated for hemodynamic monitoring. Vital signs were stable till the manipulation of the tumor. Sodium nitroprusside (SNP) was continuous infused to maintain BP, and it was ranging from 115/65 mmHg to 140/70 mmHg during manipulation of the tumor. After ligation of vein draining the tumor, her BP decreased to 70/40 mmHg even though SNP was discontinued. Fluid resuscitation and phenylephrine infusion were started promptly. The patient's BP increased soon to 100/65 mmHg and held at that level till the end of the operation. Neuromuscular block was reversed with pyridostigmine and glycopyrrolate. She awoke

and extubated uneventfully in the operation room. The patient's BP was 125/80 mmHg without support of phenylephrine. After surgery the fetus was reactive and normal in non-stress test and ultrasonography. On the 6th day of operation, she was discharged and engaged to follow up in a week.

Discussion

Pheochromocytoma is a neuroendocrine tumor, secreting catecholamines derived from adrenal chromaffin cells. This rare tumor causes secondary hypertension due to uncontrolled release of catecholamines including norepinephrine, epinephrine, and rarely dopamine [4]. It is a great challenge to the anesthesiologist because of severe complications arising from hypertensive crisis that can occur during general anesthesia, tracheal intubation and surgical manipulation. Furthermore, careful postoperative care is necessary because of severe hypotension from the decrease of catecholamine secretion after surgical resection.

Development of anesthetic technique and monitoring, short acting vasoactive drugs, establishment of premedication and improvement of surgical approach such as laparoscopic adrenalectomy and robot-assisted adrenalectomy have dramatically improved the outcome of patients undergoing surgical resection for pheochromocytoma [5,6].

However, pheochromocytoma in pregnancy still presents several intractable problems. First, early diagnosis of pheochromocytoma is essential to improve both maternal and fetal outcome. However, pheochromocytoma in pregnancy is difficult to diagnosis unfortunately, because it is extremely rare (less than 0.2 per 10,000 pregnancy), and it can be easily misdiagnosed as a relatively common pregnancy related disorder such as simple hypertension or fulminant eclampsia [7]. Also, the use of radiologic examination is very limited in pregnant patients. Second, hemodynamic management is more difficult as the pregnancy progresses. In pregnancy, the vascularity of the tumor is increased so that more catecholamine is secreted, intra-abdominal pressure increases as the fetus is growing, and fetal movement stimulates pheochromocytoma that can cause a hypertensive crisis [8]. The hypertensive crisis can lead to utero-placental insufficiency with resultant intra-uterine growth retardation, fetal hypoxia and death [9]. The risk is greater at the third trimester of the pregnancy, and the greatest at delivery. Third, fetal termination should be considered with pregnancy in pheochromocytoma because of perioperative hemodynamic instability when pheochromocytoma is removed before delivery.

The other problem is when to perform the operation (definitive treatment). Timing remains a challenging and controversial issue, depending on the gestational age when diagnosis is

made, clinical response to medical treatment, the accessibility of the tumor, and the presence of fetal distress. Ahlawat et al. [3] recommend that adrenalectomy is performed if diagnosis is confirmed prior to 24th gestational week and tumor size is less than 7 cm. After 24 weeks gestation, surgical removal is recommended after elective Cesarean section when the fetus is matured, because after 24th gestational week, the uterine size can preclude adequate surgical exploration. Oh et al. [10] and Kim et al. [11] reported their cases for pheochromocytoma diagnosed at the 26 and 28 weeks gestation so that they decided to do the surgical removal of tumor after Cesarean section waiting until the fetus matured by controlling hypertension.

In our case, the patient was at 23 weeks gestation when diagnosis was made. After preoperative α -blockade for 14 days, at her 25th week of gestation, it was difficult to decide whether laparoscopic adrenalectomy would be performed at this time or not. The authors thought that a surgical approach was possible because of the relatively small size of the uterus and tumor. Fortunately the laparoscopic surgical view was good. Also, the patient responded well to preoperative medical treatment so the authors thought the operative hemodynamic change was not severe.

Generally, the most important preoperative preparation is proper preoperative antihypertensive treatment. Bruynzeel et al. [12] reported that preoperative mean arterial blood pressure above 100 mmHg is a risk factor of intraoperative hemodynamic instability. Alpha-adrenergic blockade should be started as soon as possible after diagnosis. Establishment of appropriate α -adrenergic blockade generally requires 10 to 14 days of treatment [9]. Tachycardia or dysrhythmia can be treated with β -adrenergic blocker. Beta-adrenergic blocker can be used only in presence of effective α -adrenergic blockade.

In patients undergoing pheochromocytoma removal, hemodynamic instability like a roller coaster is characteristic. Intraoperative hypertension, hypertensive crisis, is associated with plasma norepinephrine and epinephrine release. It can occur when moving the patient on the table, during induction of general anesthesia, tracheal intubation, intra-abdominal pressure changes which is associated with pneumoperitoneum, and direct manipulation of tumor [13,14]. Acute hypertensive crisis can result in utero-placental insufficiency and fetal hypoxia. To minimize this, appropriate depth of anesthesia should be achieved for surgical stimuli and prior to laryngoscopy and tracheal intubation. Administration of intravenous lidocaine, opioid and short-acting vasodilator is useful at induction of anesthesia. Volatile agents can be used successfully for maintenance of anesthesia except halothane and desflurane. In our case remifentanyl (target effect site concentration 2–5 ng/ml) and sodium nitroprusside (0.5–1.5 mcg/kg/min) was infused for fluctuation in blood pressure. Remifentanyl can be safely used

because of its unique pharmacokinetics. It crosses the placenta but is rapidly metabolized and redistributed in the fetus [15].

In summary, the most important point of the management for the pheochromocytoma in pregnancy is to consider the both maternal and fetal aspects. Multidisciplinary team planning is essential for determining most appropriate and timely surgical treatment in patients diagnosed with pheochromocytoma during pregnancy. Careful preoperative hemodynamic optimization and painstaking perioperative anesthetic care can improve the maternal and fetal outcome.

References

1. Wissler RN. Endocrine disorders. In: Obstetric Anesthesia. Principles and Practice. 2nd ed. Edited by Chestnut DH: Now York, Mosby Year Book Inc. 1999, pp 828-32.
2. Schenker JG, Chowder I. Pheochromocytoma and pregnancy. Review of 89 cases. *Obstet Gynecol Surv* 1971; 26: 739-47.
3. Ahlawat SK, Jain S, Kumari S, Varma S, Sharma BK. Pheochromocytoma associated with pregnancy: case report and review of the literature. *Obstet Gynecol Surv* 1999; 54: 728-37.
4. Ito Y, Fujimoto Y, Obara T. The role of epinephrine, norepinephrine, and dopamine in blood pressure disturbances in patients with pheochromocytoma. *World J Surg* 1992; 16: 759-63.
5. Lenders JW. Pheochromocytoma and pregnancy: a deceptive connection. *Eur J Endocrinol* 2012; 166: 143-50.
6. Lentschener C, Gaujoux S, Tesniere A, Dousset B. Point of controversy: perioperative care of patients undergoing pheochromocytoma removal-time for a reappraisal? *Eur J Endocrinol* 2011; 165: 365-73.
7. Hudsmith JG, Thomas CE, Browne DA. Undiagnosed pheochromocytoma mimicking severe preeclampsia in a pregnant woman at term. *Int J Obstet Anesth* 2006; 15: 240-5.
8. Oliva R, Angelos P, Kaplan E, Bakris G. Pheochromocytoma in pregnancy: a case series and review. *Hypertension* 2010; 55: 600-6.
9. Dugas G, Fuller J, Singh S, Watson J. Pheochromocytoma and pregnancy: a case report and review of anesthetic management. *Can J Anaesth* 2004; 51: 134-8.
10. Oh YS, Lee JJ, Cho GT. Anesthetic Management of a patient with pheochromocytoma in pregnancy. *Korean J Anesthesiol* 1993; 26: 581-6.
11. Kim BS, In JY, Kim SH, Lee MA, Kwak HS. Anesthetic management of a patient with pheochromocytoma in pregnancy: a case report. *Korean J Anesthesiol* 2005; 49: 570-3.
12. Bruynzeel H, Feelders RA, Groenland TH, van den Meiracker AH, van Eijck CH, Lange JF, et al. Risk factors for hemodynamic instability during surgery for pheochromocytoma. *J Clin Endocrinol Metab* 2010; 95: 678-85.
13. Holldack HJ. Induction of anesthesia triggers hypertensive crisis in a patient with undiagnosed pheochromocytoma: could rocuronium be to blame? *J Cardiothorac Vasc Anesth* 2007; 21: 858-62.
14. Vater M, Achola K, Smith G. Catecholamine responses during anaesthesia for pheochromocytoma. *Br J Anaesth* 1983; 55: 357-60.
15. Hinova A, Fernando R. Systemic remifentanyl for labor analgesia. *Anesth Analg* 2009; 109: 1925-9.