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Anesthesia for cesarean section in a thyrotoxicosis patient complicated with severe preeclampsia

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Sriprachittichai P, Rodanant O, Migasena R. Anesthesia for cesarean section in a thyrotoxicosis patient complicated with severe preeclampsia. *Chula Med J* 1999 Oct; 43(10): 739-45

We report a 31-year-old G5P3-0-1-0 33-week gestational age parturient with untreated thyrotoxicosis, severe pregnancy-induced hypertension and congestive heart failure who was scheduled for urgent cesarean section. Continuous epidural anesthesia with lidocaine was performed successfully and safely. In this article, we discuss the risks of pregnant patients with the above problems and the advantages of the anesthetic technique chosen for this woman. Both the mother and the neonate were discharged with unremarkable complications.

Key words : *Anesthesia, Obstetric; Complications, Thyrotoxicosis, Preeclampsia, Congestive heart failure.*

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รายงานการให้ยาระงับความรู้สึกในการผ่าตัดคลอดโดยวิธีให้ยาชาเฉพาะที่บริเวณช่อง epidural อย่างต่อเนื่องแก่ผู้ป่วยหญิงอายุ 31 ปี G5P3-0-1-0 อายุครรภ์ 33 สัปดาห์ที่กำลังมีภาวะหัวใจล้มเหลว อันเนื่องมาจากโรคต่อมธัยรอยด์เป็นพิษ ซึ่งขาดการรักษาอย่างเพียงพอและพิษแห่งครรภ์ระดับรุนแรง คณะผู้รายงานได้อภิปรายถึงผลกระทบของปัญหาทั้งสามต่อผู้ป่วย ข้อดีและความเสี่ยงของการเลือกใช้วิธีระงับความรู้สึกดังกล่าว

The combination of pregnancy and congestive heart failure (CHF) challenges the anesthesiologist's skill. Pregnancy imposes demands on the circulation but CHF and anesthesia during delivery may compromise the cardiovascular system which is using all of its reserves to maintain cardiac output. Poorly controlled thyrotoxicosis and severe pregnancy-induced hypertension can precipitate CHF. Termination of pregnancy will greatly help to manage those problems. We present the case of a pregnant patient with those three conditions who was scheduled for urgent cesarean section.

This was a 31-year-old G5P3-0-1-0 parturient with a history of Graves' disease diagnosed in early 1997. The thyroid condition was treated with I-131 in June 1997. The patient, however, had not continued the proper treatment after the radiotherapy. She presented to the emergency room with a chief complaint of progressive dyspnea for four hours. At that time her gestational age was 33 weeks. The cause of dyspnea was CHF secondary to poorly controlled thyrotoxicosis and severe pregnancy-induced hypertension. On the day of admission she could not lay down flatly and the dyspnea was extremely advanced

On physical examination she was fully alert, not pale or cyanotic, tachypnea and in a sitting position. Her vital signs were: BP 212/103 mmHg, HR 125/min regularly, RR 36/min and BT 36.8°C. Height and body weight were 155 cms. and 68 kgs., respectively. The neck vein was 4 cms above the sternal notch. The thyroid gland was generally enlarged with bruit. A cardiac examination showed the apex was at the 7th intercostal space, mid-clavicular line. No heave or thrill were noted. S3 gallop and

systolic ejection murmur at the left upper sternal border grade III were detected. Bilateral fine crepitations and occasional wheezing were found on chest examination. The spleen and the liver could not be palpated. The hepatojugular reflux test was positive. The uterine fundal height was 2/4 above the umbilicus without evidence of contraction. The fetal heart rate was 144/min. Pitting edema bilaterally was noted on both legs and feet.

From laboratory investigations, the CBC showed normal value. The urine analysis, protein was 2+ while the others were within normal limits. Her abnormal blood chemistry was that of free triiodothyronine (FT3) 14.52 pg./ml. (1.5-3.6 pg./ml.), free thyroxine (FT4) 4.00 ng./ml. (0.8-1.8 ng./ml.) and thyroid stimulating hormone (TSH) < 0.005 μ IU./ml. (0.3 - 4.1 μ IU./ml.). The arterial blood gas revealed normal finding. The chest film showed cardiomegaly and pulmonary edema on a portable supine AP radiograph. The left ventricular hypertrophy by voltage criteria and a left atrial enlargement as well as a right atrial abnormality were interpreted from the electrocardiography (ECG). Echocardiography was revealed that all cardiac valves appeared normal with a mildly dilated left atrium and right ventricle, as well as concentric left ventricular hypertrophy. The ejection fraction (EF) was 65%.

The patient's problems were impressed as

- 1.) G5P3-0-1-0 33-week gestational age parturient with severe pregnancy-induced hypertension,
- 2.) thyrotoxicosis - induced cardiomyopathy and
- 3.) CHF. Termination of pregnancy by cesarean section was planned after thyrotoxicosis and CHF were controlled as much as possible. After 33 hours of proper preoperative preparation, she was moved from

the intensive care unit (ICU) to the theatre in semi-Fowler's position. Her BP, HR and RR were 170/108 mmHg, 124/min regularly and 28/min respectively. The physical examination findings were not different from the ones on admission. Invasive arterial pressure monitoring and central venous line were established. The central venous pressure (CVP) at the beginning was 2 cmH₂O. The ECG and pulse oximeter (SpO₂) were employed as well. At that time, her ECG showed sinus tachycardia and SpO₂ was 100%. Continuous epidural anesthesia (CEA) was given. An 18-gauge epidural catheter was inserted at the L3-4 level with an aseptic technique in a sitting position. The patient was in semi-Fowler's position after the insertion finished. Exclusion of intravascular and subarachnoid insertion was confirmed by a test dose with 15 mcg. of epinephrine and 3 ml. of 2% lidocaine, then mean arterial pressure (MAP) dropped from 100 to 90 mmHg and CVP declined to 1 cmH₂O. 6% Haesteril was infused to maintain MAP under CVP guidance. 14 ml. of 2% lidocaine were gradually titrated within 30 minutes (intermittent top-ups of 2 ml.) under close monitoring by clinical signs and all mentioned monitors. MAP was between 80-100 mmHg. CVP was stable at 2 cmH₂O. HR was 120-130 beats/min. No arrhythmia was detected. The surgeon made an incision when loss of pinprick sensation at T6 and loss of cold perception at T4 developed. The patient's position was 20° head-up. Within 20 minutes the operation was completed. However, when approaching the amniotic fluid sac, there was evidence of thick meconium-stained amniotic fluid. The Apgar score of the male newborn was 2 and 9. His appearance was small for the date with little fat deposition. His birth weight was 2,000 gm. At the

end of the surgery the patient was given 500 ml. of 6% Haesteril and 200 ml. of normal saline solution. CVP was 6 cmH₂O. The amount of urine flow in the operating room was 100 ml./hour. She was received 4 mg. of epidural morphine and 10 ml./hour of 0.125% bupivacaine epidurally to provide postoperative analgesia. She was transferred to the ICU with stable conditions.

In the postoperative period, her clinical improved dramatically within postoperative day (POD) 1. However, tachycardia and tachypnea (24-26/min) returned to within normal limits on POD 4. She was moved to an intermediate care unit on POD 3 and discharged on POD 10.

Discussion

Cardiac problems during pregnancy occurs in 0.4-4.1% of patients and is the leading nonobstetric cause of maternal mortality, ranging from 0.4% among Class I or II patients of the New York Heart Association's functional classification, to 6.8% among those in Classes III and IV.⁽¹⁾ CHF is a major determinant of perioperative risk. EF <40% associates with increased operative risk.⁽²⁾ Fortunately, our patient's EF was 65%. Cardiac decompensation and death occur most commonly at the time of maximum hemodynamic stress, such as in the third trimester of pregnancy, during labor and delivery, and during the immediate postoperative period, all of which this patient had. The greatest increase in stroke volume, cardiac output and left ventricular work occurs immediately after delivery of the placenta, when cardiac output can increase to 80-150% above parturition.⁽¹⁾ These changes in cardiac output can be reduced by administration of neuraxial anesthesia.

Besides, modest decreases in systemic vascular resistance secondary to peripheral sympathetic nervous system blockade from epidural anesthesia may permit an increased cardiac output prior to delivery.⁽³⁾ Those could have been interesting reasons to choose CEA for cesarean section in this patient by gradual titration of local anesthetics under invasive hemodynamic monitoring guidance. In the post-partum period, it might be used as a valuable therapeutic tool to extend sympathetic blockade and provide pain control, which can attenuate cardiac workload by decreased stress response.⁽⁴⁾

Regarding the local anesthetics of choice, the patient had been encountering a problem of CHF. In another word, her cardiac function was compromised. Lidocaine seems to have less cardiotoxicity than bupivacaine.^(1,5,6) In normal pregnant women, it is well known that the inadvertent intravascular placement of an epidural catheter can occur easily because of epidural venous plexus engorgement. In this case, the CHF itself also produced dilated venous circulation due to poor venous return to the heart. In combinations of CHF and pregnancy, the incidence of intravascular injection may increase. Those are the reasons why we used 2% lidocaine to provide anesthesia in this patient. Although Scanlon et al⁽⁷⁾ reported that lidocaine compromised neonatal neurobehavioral function when used for maternal epidural analgesia during labor, many studies^(8,11) failed to confirm these findings. Besides, there was no evidence of fetal distress in this patient before the amniotic sac was approached.

Hyperthyroidism occurs in about 0.05-0.2 % of parturients^(3,12) and is most often due to diffuse toxic goiter or, in another name, Graves' disease. In our

patient, there were clear evidences from clinical symptoms and signs and the thyroid function test to indicate hyperthyroidism in this woman. The diagnosis of hyperthyroidism during pregnancy is not as easy as in non-pregnancy since estrogen-induced increases in T4-binding globulin results in an increased T4 level.⁽³⁾ Nevertheless, both FT3 and FT4 in this patient were very high. In women who remain in a hyperthyroid state despite therapy, and in those whose disease is untreated, there is a higher incidence of preeclampsia and heart failure caused by the long-term myocardial effects of thyroxine.⁽¹²⁾ CHF in this patient, however, may have also been intensified by severe preeclampsia as well. We did concern about thyroid storm because it is not an uncommon complication in untreated parturients. Preoperatively, popylthiouracil (PTU) and super-saturated solution of potassium iodide (SSKI) were administered in order to inhibit further synthesis of thyroid hormones and the release of synthesized T3 and T4 from the thyroid gland. Dexamethasone was given to block the conversion of T4 to T3. Some have recommended propranolol but it was not used in our case because of the CHF. Since thyroid storm usually presents between 48 and 72 hours into the postoperative period, all those medications were continued for 72 hours postoperatively.

Severe preeclampsia was one of the problems we faced. It is an obstetric complication and can be a co-event in a parturient with hyperthyroidism as mentioned above. In this patient, BP > 140/90 mmHg, proteinuria and edema helped us to make a diagnosis easily. HELLP syndrome did not develop. Magnesium sulfate was given to control BP while antihypertensive agent, nitroglycerine, was infused

cautiously because of the CHF.

CEA was conducted as the chosen anesthetic technique. The reasons why it was chosen were 1) to assist in decreasing peripheral vascular resistance via sympathetic nervous system blockade both intraoperatively and postoperatively, which may benefit for CHF, 2) less fetal depression from anesthetic agents, 3) to avoid the risk of pulmonary aspiration, 4) less disturbance of postoperative ventilatory function, 5.) precisely controllable anesthetic levels, compared with spinal anesthesia, 6) less or no stress response to the surgery, 7) more stable BP by gradual titration of local anesthetics, and 8) to provide effective postoperative analgesia with fewer side effects than systemic opioids.

A case of a pregnant woman who had severe hyperthyroidism, preeclampsia and CHF underwent urgent cesarean section was reported from Japan.⁽¹³⁾ She had not been treated until 36 weeks of gestational age. At 38 weeks, fetal distress occurred and an urgent cesarean section was performed successfully under epidural anesthesia with preoperative treatments using iodide, hydrocortisone and PTU.

In summary, this 31-year-old G5P3-0-1-0 33-week gestational age parturient with untreated thyrotoxicosis, severe pregnancy-induced hypertension and CHF was scheduled for urgent cesarean section. CEA with lidocaine was performed successfully and safely. The mother and the neonate were discharged with unremarkable complications.

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