The Successful Anesthetic Management of Cesarean Section for Quadruplets

Department Anesthesiology and Pain Medicine, Chungnam National University College of Medicine, Daejeon, Korea

Jeong Hyun Lee, M.D., Soo Chang Son, M.D., Seok Hwa Yoon, M.D., Woo Seok Jeong, M.D., and Ho Yon Cho, M.D.,

Received: July 27, 2007
Corresponding to: Soo Chang Son, Department Anesthesiology and Pain Medicine, Chungnam National University Hospital, 640, Daesa-don, Jung-gu, Daejeon 301-040, Korea. Tel: 82-42-280-7850, Fax: 82-42-280-7968, E-mail: scson@cnu.ac.kr

Grand multifetal pregnancies (4 or more), usually caused by ovulation induction agents and assisted reproductive technologies, challenge all members of a perinatal team and put mothers and infants increased risk. Important anesthetic considerations include greater incidence of complications that in the singleton pregnancy, risks related to the large pregnant uterus, impaired uterine contraction prior to delivery secondary to fetal oxygenation, and preparation of sufficient man-power and instruments. The importance of neonatal resuscitation cannot be overemphasized. We report a successful general anesthetic management for an emergent quadruplet cesarean section at 31 weeks 5 days gestational age. (Korean J Anesthesiol 2007; 53: S 48~50)

Key Words: cesarean section, general anesthesia, quadruplets.

The incidence of pregnancy with more than 2 fetuses has been significantly increased since the introduction of ovulation inducing agents and assisted reproductive technologies (ART). Grand multifetal pregnancies (4 or more) challenge all members of the perinatal team. Satisfactory maternal and fetal outcomes require obstetrician, anesthesiologist, and neonatologist expertise, and all must be well informed of the management plan. We report the successful anesthetic management of an emergency quadruplet gestation cesarean section at 31 weeks 5 days gestational age.

CASE REPORT

A 36-year-old primigravida (body weight 61 kg, height 153 cm) with a history of in vitro fertilization and embryo transfer, presented at 31 weeks 5 days for prodromal labor and low abdominal pain. Emergency cesarean section was planned. All laboratory values were within normal limits, except for a hematocrit of 30.4%. The patient had leg edema and headache, but there was no evidence of pre-eclampsia. Airway assessment revealed a Mallampati score of grade II. Intravenous metoclopramide 10 mg, intravenous ranitidine 50 mg, and oral 0.3% sodium citrate 30 ml were prescribed for antacid prophylaxis, and intravenous glycopyrrolate 0.1 mg was administered as premedication. Preoperative monitoring (electrocardiography and pulse oxymeter) was instituted; initial blood pressure was 120/80 mmHg and heart rate was 80 bpm. The surgical table was placed in lateral tilt for left uterine displacement, venous access was established via 16 gauge intravenous cannulae, and colloid (Voluven®, Fresenius Kabi, Germany) infusion was started to prevent a hypotensive event. After preoxygenation, rapid sequence induction with cricoid pressure was achieved using thiopental sodium 250 mg, and succinylcholine 80 mg; a 7.5 mm endotracheal tube was intubated under Cormack and Lehane laryngoscopic grade I view on laryngoscopy. Rocuronium 50 mg was administered to achieve muscle relaxation. Immediately after induction, systemic blood pressure was 140/80 mmHg. Lungs were initially manually ventilated using the circle system with fresh gas flow of nitrous oxide 2 L/min, oxygen 2 L/min, and 3% sevoflurane. The patient was then connected to the ventilator (O2/N2O 2 L/min/2 L/min; 1% sevoflurane, tidal volume 500 ml; respiratory rate 12/min in order to maintain SpO2 and EtCO2 ranging between 28—32 mmHg). The obstetrician delivered the babies by classic median cesarean section within 60—170 seconds (Table 1). Blood pressure remained stable without vasopressors. The lowest systolic BP was 100 mmHg before delivery. A separate neonatal
Table 1. Neonatal Data

<table>
<thead>
<tr>
<th>Baby</th>
<th>Sex</th>
<th>U-D Interval (sec)</th>
<th>Presentation</th>
<th>APGAR score 1 min</th>
<th>APGAR score 5 min</th>
<th>Weight (g)</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Girl</td>
<td>60</td>
<td>Vertex</td>
<td>6</td>
<td>7</td>
<td>1,250</td>
<td>No IVH, no VSD, transferred to NICU, O₂ supply via oxygen tent for 1 day</td>
</tr>
<tr>
<td>B</td>
<td>Girl</td>
<td>90</td>
<td>Vertex</td>
<td>6</td>
<td>7</td>
<td>1,130</td>
<td>Same as above</td>
</tr>
<tr>
<td>C</td>
<td>Boy</td>
<td>110</td>
<td>Breech</td>
<td>6</td>
<td>7</td>
<td>1,450</td>
<td>Same as above</td>
</tr>
<tr>
<td>D</td>
<td>Girl</td>
<td>170</td>
<td>Breech</td>
<td>6</td>
<td>7</td>
<td>1,310</td>
<td>Same as above</td>
</tr>
</tbody>
</table>


Table 2. Arterial Blood Gases Analysis

<table>
<thead>
<tr>
<th>Baby</th>
<th>pH</th>
<th>PCO₂ (mmHg)</th>
<th>PO₂ (mmHg)</th>
<th>HCO₃⁻ (mEq/L)</th>
<th>BE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>7.33</td>
<td>37</td>
<td>75</td>
<td>19.5</td>
<td>−7.4</td>
</tr>
<tr>
<td>B</td>
<td>7.29</td>
<td>38</td>
<td>94</td>
<td>18.3</td>
<td>−7.6</td>
</tr>
<tr>
<td>C</td>
<td>7.28</td>
<td>30</td>
<td>87</td>
<td>14.1</td>
<td>−11.4</td>
</tr>
<tr>
<td>D</td>
<td>7.27</td>
<td>41</td>
<td>73</td>
<td>18.8</td>
<td>−7.2</td>
</tr>
</tbody>
</table>

The number and rate of multiple pregnancies has been dramatically increased. In 2004 in the United States a total of 127,977 ART procedures were reported to the Centers for Disease Control and Prevention. Ovulation induction agents and assisted reproductive technologies, such as in vitro fertilization, gamete and zygote intrafallopian transfer, and intracytoplasmic sperm injection, have caused a rise in multiple pregnancies. Multiple pregnancies are associated with increased risk for mothers and infants, including 1) pregnancy related complications (such as fetal malpresentation, umbilical cord prolapse, dysfunctional uterine contractions, preterm labor, abruptio placenta, premature rupture of membranes, uterine atony, and immediate postpartum hemorrhage), 2) premature delivery, 3) low-birth weight infants, and 4) long-term disability of infants.

Maternal complications include pre-eclampsia, anemia, edema, and excessive weight gain, etc. Marino et al. reported antenatal and postpartum complications of triplet gestations. Antenatal complications included pre-eclampsia (37.6%), pregnancy-induced hypertension (32.3%), anemia (15.6%), HELLP syndrome (5.2%), acute fatty liver of pregnancy (4.2%), and supraventricular tachycardia (3.1%). Postpartum complications were hemorrhage (6.2%), disseminated intravascular coagulopathy (2%), and pneumonia (2%). It is important to take appropriate measures to meet and manage these complications. The following measures are recommended: 1) Blood and blood component products should be immediately available, 2) Intravenous access with a large-bore catheter should be in place, and 3) Delivery should be in an operating room or delivery room equipped and staffed to perform immediate cesarean section.

The presence of a large gravid uterus predisposes the mother to significant respiratory compromise, aortocaval compression...
resulting in hypotension, and increased incidence of uterine atony and postpartum hemorrhage. Our patient first loaded with bolus of intravenous fluids and was then placed in lateral tilt position.

Approximately 95% of ART triplets or high-order multiples have low birth weight and 98% are preterm. Strauss et al. reviewed 112 multifetal pregnancies retrospectively; quadruplets were delivered at a mean gestational age of 29 weeks 5 days. Respiratory distress syndrome occurred in 65% of quadruplets, intracranial hemorrhage was diagnosed in 15%, and retinopathy of prematurity in 10%. Although mortality and morbidity do not exceed those in the singleton or twin pregnancies at an identical gestational age, the risk of multifetal pregnancies is still significant. The babies in our study were preterm, with a gestational age of 31 weeks 5 days, body weight ranged from 1,130 to 1,450 g (3rd−50th percentile), and stable Apgar scores, as shown in Table 1.

A single, ideal anesthetic technique does not exist for every patient. There is adequate support in the literature, however, for using both regional and general anesthesia. Although systolic blood pressures remain within physiological range, a significant decrease can be demonstrated immediately after induction of regional anesthesia. Although Apgar scores of infants of mothers with general anesthesia are shown to be lower than regional anesthesia, neurologic and adaptive capacity scores within 4 hours are not statistically different. Sendag et al. reported a significantly lower mean umbilical artery blood pH in newborns exposed to lumbar epidural anesthesia, with occasional severe fetal acidemia. Also, Petropoulos et al. showed that umbilical artery PO2 was higher when general anesthetic was administered, compared with the regional anesthesia. Abnormal fetal presentations may necessitate uterine relaxation. General anesthesia can provide adequate and rapid uterine relaxation, whereas regional anesthesia may be associated with a lack of uterine relaxation. Technical difficulties in performing a block is anticipated due to exaggerated lordosis and edema, and risk of hematoma associated with coagulopathy and pre-eclampsia, may make regional anesthesia unsuitable in some patients. Patients with respiratory distress and pulmonary edema may require positive pressure ventilation. In cases of fetal distress, it may be necessary to administer general anesthesia. Due to her large gravid uterus, our patient could not lie on her side with knees flexed and pulled against the abdomen, therefore we thought that general anesthesia would be the safest option.

Finally, the importance of adequate interdisciplinary preparation and cooperation cannot be overemphasized. While the anesthesia team was preparing the mother for surgery, nursing teams from labor and delivery and NICU were preparing for resuscitation of the babies. Our team maintained close communication with each other, which is an absolute requirement for the safety of fetus and mother.

In summary, we report successful anesthetic management of a quadruplet cesarean section with favorable maternal and neonatal outcomes. The important anesthetic considerations for multifetal gestation were presented: 1) Greater complication rate than that in the singleton pregnancy; 2) High risk related to large pregnant uterus; 3) Impaired uterine contractions prior to delivery secondary to fetal oxygenation; and 4) Preparation for sufficient man-power and instruments.

REFERENCES