Severe fetal bradycardia in a pregnant surgical patient despite normal oxygenation and blood pressure

[Bradycardie fœtale sévère chez une opérée enceinte malgré une oxygénation et une tension artérielle normales]

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Purpose: To report and discuss a case of fetal bradycardia in a parturient under anesthesia for cholecystectomy despite normal maternal oxygenation and arterial blood pressure.

Clinical features: A 27-yr-old woman (gravida 2 para 1), with a fetus of 34 weeks gestation, received general anesthesia for cholecystectomy. After anesthesia induction and tracheal intubation, anesthesia was maintained with oxygen, sevoflurane and iv remifentanyl infusion. While preparing for surgery, the fetal heart rate decreased within about half a minute to 70 beats·min⁻¹ and remained at that level. The maternal blood pressure, heart rate and oxygen saturation were normal. An emergency Cesarean delivery was performed. The infant had Apgar scores of 1 at one minute, 5 at five minutes, 7 at ten minutes and required resuscitation after birth.

Conclusion: Ideally, women having non-obstetric surgery during the third trimester of pregnancy will have intraoperative fetal heart rate monitoring.

Objectif : Présenter un cas de bradycardie fœtale chez une parturiente sous anesthésie pour cholécystectomie malgré l'oxygénation et la tension artérielle maternelles normales.

Éléments cliniques : Une femme de 27 ans (gravida 2 para 1), enceinte de 34 semaines, a subi une cholécystectomie sous anesthésie générale. Après l'induction de l'anesthésie et l'intubation endotrachéale, l'anesthésie a été maintenue avec de l'oxygène, du sévoflurane et une perfusion iv de rémifentanyl. Pendant la préparation pour l'opération, la fréquence cardiaque fœtale a chuté à 70 battements·min⁻¹ en moins de 30 sec environ et est demeurée à ce niveau. La tension artérielle, la fréquence cardiaque et la saturation du sang en oxygène étaient normales chez la mère. Une césarienne d'urgence

a été réalisée. L'enfant présentait un indice d'Apgar de 1 à une minute, de 5 à cinq minutes, de 7 à dix minutes et a dû être réanimé après la naissance.

Conclusion : Idéalement, il faut surveiller la fréquence cardiaque fœtale peropératoire chez les parturientes qui subissent une opération non obstétricale au troisième trimestre de la grossesse.

As many as 2% of pregnant women undergo non-obstetric surgery during pregnancy¹ and cholecystectomy is one of the common surgical procedures performed. Pancreatitis and cholecystitis can complicate cholelithiasis and lead to significant maternal and fetal morbidities. Some surgeons, therefore, advocate cholecystectomy during pregnancy rather than delaying surgery until delivery has occurred.² One of the controversies in anesthesia for a pregnant patient having non-obstetric surgery is intraoperative fetal heart rate monitoring. A recent review on anesthesia for pregnant patients having non-obstetric surgery and obstetric anesthesia textbooks recommended fetal heart rate monitoring during anesthesia and surgery whenever possible.³⁻⁵ Some obstetricians believe that the fetus would not be compromised as long as maternal oxygenation and circulation remain normal. Horrigan *et al.*⁶ suggested that fetal monitoring by obstetric personnel was unnecessary during surgery in pregnant patients. We report a case of fetal bradycardia in a parturient under anesthesia for cholecystectomy despite normal maternal oxygenation and arterial blood pressure.

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Case report

A 27-yr-old woman (gravida 2 para 1), with a fetus of 34 weeks gestation, was admitted to the hospital with recurrent biliary colic and cholelithiasis. The patient was otherwise healthy. On examination, the patient's blood pressure was 110/65 mmHg, heart rate was 80 beats·min⁻¹, respiratory rate was 20 breaths·min⁻¹, and temperature was 36.2°C. The abdomen was tender, but showed no rebound tenderness. Murphy's sign was positive. Laboratory investigations showed a white blood count $15.9 \times 10^9 \cdot L^{-1}$, hemoglobin 103 g·L⁻¹, serum alanine aminotransferase 43 U·L⁻¹, serum aspartate transaminase 47 U·L⁻¹, and serum gamma glutamyl transferase 25 U·L⁻¹. Fetal heart rate was 120 beats·min⁻¹ with average variability. The patient received analgesic and antibiotic therapies. Two days later, the patient's temperature increased to 38.7°C, respiratory rate increased to 32 breaths·min⁻¹, blood pressure was 120/70 mmHg. White blood count increased to $22 \times 10^9 \cdot L^{-1}$ and showed a left shift. The attending surgeon decided to perform a cholecystectomy.

After oral citrate antacid prophylaxis, a low thoracic epidural catheter was inserted in the sitting position with no complication. A test dose of 3 mL 2% lidocaine with 5 µg·L⁻¹ epinephrine was injected. The patient then assumed a supine position with a wedge under the right hip. The patient was monitored with continuous electrocardiogram, non-invasive blood pressure, and pulse oximetry. External fetal heart rate monitoring was performed by an obstetric nurse. Fetal heart rate was about 130 beats·min⁻¹ before the start of anesthesia. Maternal blood pressure was 130/70 mmHg, heart rate 110 beats·min⁻¹ and oxygen saturation 99% prior to induction of anesthesia. After pre-oxygenation with 100% oxygen and application of cricoid pressure, anesthesia was induced with fentanyl 150 µg, propofol 150 mg and rocuronium 50 mg. An oral endotracheal tube was inserted and the position was confirmed by auscultation and end-tidal carbon dioxide monitoring. Anesthesia was maintained with 100% oxygen, sevoflurane at an end-tidal concentration of 0.6%, and remifentanyl 0.15 µg·kg⁻¹·min⁻¹. Arterial blood pressure was 120/75 mmHg, heart rate was 100 beats·min⁻¹, maternal oxygen saturation was 99%, end-tidal CO₂ was 36 mmHg for the first 15 min after the start of anesthesia. The fetal heart rate was 120 beats·min⁻¹ with reduced variability. While preparing for surgery but before surgical incision, the fetal heart rate decreased over a span of about half a minute to 70 beats·min⁻¹. The obstetrician tried to move the uterus further off the midline, and move the fetal head out of the pelvis. The maternal blood pressure, heart rate and oxygen saturation had not

changed during this time. Fetal heart rate decreased further to 60 beats·min⁻¹. An emergency Cesarean delivery was performed. The infant had Apgar scores of 1 at one minute, 5 at five minutes and 7 at ten minutes and required resuscitation after birth. The umbilical cord arterial gases were: PO₂ 7 mmHg, PCO₂ 64 mmHg, pH 7.17. The umbilical cord venous gases were: PO₂ 13 mmHg, PCO₂ 62 mmHg, pH 7.18. The umbilical cord was coiled and twisted tight on itself like a telephone cord. There was no knot in the umbilical cord. In his operative report, the obstetrician commented that "the (umbilical) cord was noted to be very tense and wound up very much like a rubber band in a model aircraft."

After completion of the Cesarean delivery, the surgeon completed the cholecystectomy without any problem. Nitrous oxide was added after delivery of the infant and the patient remained in stable condition throughout the two surgical procedures.

Discussion

The intraoperative monitoring of the fetus in a pregnant patient having non-obstetric surgery is a controversial subject. A recent review on anesthesia for pregnant patients having non-obstetric surgery and obstetric anesthesia textbooks recommended fetal heart rate monitoring during anesthesia and surgery when possible.³⁻⁵ These recommendations are based on anecdotal evidence of fetal compromise identified by fetal heart rate monitoring. Katz *et al.*⁷ demonstrated fetal tachycardia during accidental maternal hypoxemia and return to baseline fetal heart rate after maternal ventilation was corrected. There is no large systematic study of intraoperative fetal heart rates and subsequent events after non-obstetric surgery during pregnancy.

Amos *et al.*⁸ reported two intra-uterine fetal deaths and two incomplete abortions after laparoscopic procedures during pregnancy. Three of the four adverse events occurred in the postoperative period. Duncan *et al.*⁹ compared 2,565 women in Manitoba, Canada who had surgery during pregnancy against matched controls who did not have surgery. They found that surgery during pregnancy was associated with a significantly higher rate of spontaneous abortion. Mazze and Kallen¹⁰ studied 5,405 neonates born after their mothers had surgery during pregnancy using data from a Swedish registry. They found an association between surgery during pregnancy and low birth weight babies as well as death within 168 hr of birth. Kort *et al.*¹¹ reported that preterm labour was more common after surgery during pregnancy. Reedy *et al.*¹² used data from three Swedish Health Registries to compare the neonatal outcomes after maternal

laparoscopy or laparotomy during pregnancy. The women who had laparoscopy or laparotomy had an increased risk of delivering low-birth-weight babies (< 2500 g), delivering before 37 weeks gestation and delivering growth-restricted babies.

These retrospective reviews cannot separate the effects of maternal diseases, surgical interventions and anesthetic techniques on the adverse outcomes associated with surgery during pregnancy. A controlled study is needed to determine whether certain intraoperative fetal heart rate changes might be associated with adverse fetal effects.

Some obstetricians believe that the fetus would not be compromised as long as maternal oxygenation and circulation remain normal. They recommend assessing the fetal heart rate and uterine activity before and after the surgical procedure. Horrigan *et al.*⁶ performed a review of case reports of non-obstetric surgery during pregnancy, published between 1966 and 1995. Based on the case reports and their review of maternal-fetal physiology, the authors suggested that intraoperative fetal monitoring by obstetric personnel is unnecessary.

Intraoperative fetal heart rate monitoring requires proper obstetrical and neonatal personnel to be interpreted correctly. The fetal heart rates during anesthesia and surgical procedures in the absence of uterine contractions may be different from fetal heart rate changes in labour. While the absence of fetal heart rate variability can be a significant indicator of fetal stress during labour, fetal heart rate variability is significantly reduced in healthy fetuses under anesthesia. Misinterpretation of intraoperative fetal heart rate variability changes has led to premature delivery¹³ of an infant who required endotracheal intubation and mechanical ventilation. The infant's Apgar scores were 0, 2 and 6 at one, five and ten minutes. The pH of the umbilical vessel was normal (pH 7.23 mixed arterial/venous) indicating that the lack of beat-to-beat variation was not a result of fetal distress.

In the case described, the 34 weeks gestational age of the fetus led us to take a proactive course. We elected to monitor the fetus in the intraoperative period and intervened immediately when the fetal heart rate decreased to 60 beats·min⁻¹. The cause of the severe fetal bradycardia is unknown. The tense and tightly wound umbilical cord observed by the obstetrician might have produced some impairment of umbilical blood flow even before the anesthetic. Under anesthesia, the fetus might come to lie on the umbilical cord and compressed the umbilical cord against the uterine wall. The combination of increased vascular resistance from the tightly coiled state and further external compression might have caused a marked reduction in umbilical cir-

culation. Impaired umbilical blood flow could have led to fetal hypoxia even when maternal oxygenation and circulation were normal. If we had utilized a different regimen such as monitoring the fetal heart rates during a preoperative and then a postoperative period, the fetus might have suffered a much more prolonged period of stress and an adverse outcome.

In summary, we have reported a case of severe fetal bradycardia in a pregnant surgical patient despite normal maternal oxygenation and blood pressure. This is consistent with previous reports of intra-uterine fetal deaths, fetal growth retardation and abortions associated with surgical procedures during pregnancy.⁸⁻¹² Ideally, women having non-obstetric surgery during the third trimester of pregnancy will have intraoperative fetal heart rate monitoring.

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