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Onset of Lone Atrial Fibrillation During Labor Under Epidural Analgesia

Robin B. Stedman, MD, MPH, Michael A. Prejean, Jr., MD, Melissa Russo, MD

Department of Anesthesiology, Ochsner Clinic Foundation, New Orleans, LA

ABSTRACT

Background: Practice standards recommend that the induction of epidural analgesia for labor begin with a test dose of local anesthetic with epinephrine. During the test dose period and following anesthetic administration, the anesthesiologist measures the parturient's pulse with continuous pulse oximetry to help detect the intravascular placement of the epidural catheter as evidenced by the abrupt onset of tachycardia.

Case Report: We report the onset of tachycardia in a healthy parturient following induction of continuous epidural analgesia. The tachycardia was ultimately diagnosed as lone atrial fibrillation—a finding not previously reported in the literature.

Conclusion: We initially thought the diagnosis portended undetected cardiac disease, but further assessment found no cardiac abnormalities.

INTRODUCTION

The risk of administering epidural epinephrine (reduced placental blood flow) after an epidural test dose is outweighed by the benefit (detection of intravascular placement of a catheter to prevent unintended systemic injection of local anesthetic). At times, tachycardia with causes other than inadvertent intravascular injection complicates the interpretation of the test dose.

Address correspondence to
Robin B. Stedman, MD, MPH
Department of Anesthesiology
Ochsner Clinic Foundation
1514 Jefferson Highway
New Orleans, La 70121
Tel: (504) 842-3755
Fax: (504) 842-2036
Email: rstedman@ochsner.org

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We report a case in which the epidural test dose and subsequent doses of local anesthetic preceded the onset of atrial fibrillation in the parturient. However, approximately 30 minutes passed between the administration of the test dose and the onset of atrial fibrillation. Tachycardia after such a long interval would not be attributable to a positive test dose. This case provides a rare and unexpected example of tachycardia occurring during labor. The arrhythmia did not signal any underlying cardiac structural abnormality in this patient or an intravascular injection.

CASE REPORT

A 23-year-old woman presented to the labor and delivery unit in active labor. She was gravid 2 para 1 abortion 0 and near term at nearly 40 weeks' gestational age. She was morbidly obese at 109 kg in weight and 163 cm in height (body mass index=39.9 kg/m^2). Her past medical history was positive for seasonal asthma that required occasional use of inhaled albuterol. Albuterol had not been recently administered. She received routine pregnancy examinations beginning in early pregnancy, and the course of her pregnancy was uneventful. Fifteen months earlier, she had chosen epidural analgesia for the vaginal birth of a healthy child without complication.

Upon admission, she was having uterine contractions every 2-3 minutes. Her vital signs were as follows: blood pressure 130/68 mmHg, heart rate 91 bpm, temperature 98.4°F, and saturation of 100% on room air. An intravenous line was started, blood was drawn for laboratory tests, and the patient received an infusion of 1 L of lactated Ringer solution in preparation for placement of a continuous epidural for analgesia. We easily placed the lumbar epidural at L3-4, threaded a spring-wound catheter 4 cm, and tested it with 3 mL lidocaine 1.5% with epinephrine 5 μg/mL. After 5 minutes, we saw no evidence of intravascular or intrathecal injection, so we incrementally dosed the epidural with bupivacaine 0.125% to a total volume of 10 mL. An infusion of bupivacaine 0.1% with fentanyl 2 μg/mL was begun at 10 mL/h. Fetal heart rate was about 140 bpm. Similarly, the

maternal heart rate, continuously monitored via pulse oximetry, ranged from 90-128 bpm. Blood pressure was monitored every 5 minutes and decreased from 140/80 mmHg to 113/54 mmHg over the next 30 minutes. The patient received no sympathomimetics, tocolytics, or oxytocin. The mother reported relief of pain secondary to contractions.

Thirty-four minutes after injection of the initial test dose, the maternal heart rate increased abruptly to 180 bpm. The patient was not aware of a change in heart rate. We immediately reassessed the status of the epidural catheter. Catheter aspiration was negative, and the level of analgesia was appropriate with diminished sensation to cold to the level of the umbilicus. An electrocardiogram demonstrated obvious atrial fibrillation, and the cardiology department was consulted. Following the intravenous administration of 5 mg of metoprolol, the heart rate decreased to 80-110 bpm, although the rhythm remained irregular. Cardiotocography was unaffected by the maternal heart rate, and the fetal heart range ranged from 120-140 bpm. Labor progressed rapidly, resulting 1 hour later in spontaneous vaginal delivery of a viable female weighing 3,420 g. Meconium was noted, and Apgar scores were 6 and 8 at 1 and 5 minutes, respectively. An umbilical artery blood sample found the following: pH=7.31, pO_2=17, pCO_2=51.5, HCO_3=27.2, and BE=+1. Later, pathological examination of the placenta revealed no structural abnormalities although there was evidence of acute, mild chorioamnionitis.

Following delivery, the parturient was transferred to the postanesthesia care unit where cardiologists immediately examined her. She remained asymptomatic but in atrial fibrillation with a heart rate of 110 bpm. She continued to receive intravenous beta blockers every 6 hours. On postpartum day 1, atrial fibrillation persisted. A transesophageal echocardiogram performed with intravenous sedation found no thrombus in the left atrium or left atrial appendage. The patient had no structural abnormalities, and her left ventricular function was normal. Cardioversion successfully restored a normal sinus rhythm. Enoxaparin administered intravenously achieved a therapeutic anti-Xa level (0.5-1 IU/mL). The patient was discharged home in sinus rhythm. Later, she took warfarin for approximately 6 weeks, during which time she remained in normal sinus rhythm. Finally, warfarin was discontinued and replaced by aspirin 81 mg/d.

DISCUSSION

The cardiovascular system undergoes significant changes as it adapts to pregnancy. Some of these changes account for an increased risk of arrhythmias during labor and delivery. Potential factors that can promote arrhythmias in pregnancy and during labor and delivery include increased baseline heart rate and cardiac output, increased plasma catecholamine concentrations and adrenergic receptor sensitivity, atrial stretch, increased end-diastolic volumes caused by intravascular volume expansion, and hormonal and emotional changes.[1]

Atrial fibrillation is rare during pregnancy and is usually associated with another underlying cause, such as mitral stenosis, congenital heart disease, or hyperthyroidism. For this reason, a full cardiac workup should be undertaken to rule out undiagnosed conditions.[2] Therefore, when a pregnant woman develops atrial fibrillation, diagnosis and treatment of the underlying condition causing the dysrhythmia are among the first priorities. All currently available antiarrhythmic drugs have the potential to cross the placenta and to be excreted in breast milk and should be avoided if possible. In the event of hemodynamic instability, electrical cardioversion can be performed without fetal damage.[3]

The case reported here is known as lone atrial fibrillation, that is, atrial fibrillation without any identifiable cause after thorough evaluation. A review of lone atrial fibrillation in pregnancy revealed 3 cases reported in PubMed between 1955 and June 2010.[2] All occurred in the third trimester of pregnancy but before the onset of labor. In 2 patients, the arrhythmia resolved spontaneously. One of the 3 reported events occurred during an elective repeat cesarean section under single-shot spinal anesthesia after delivery of the fetus. The arrhythmia resolved with chemical cardioversion. Our case occurred during active labor after the onset of epidural analgesia; the arrhythmia was sustained over 24 hours and required electrical cardioversion.

Anesthesiologists have not reached a consensus on the appropriate epidural test dose. Some have even questioned the utility of a test dose. The epinephrine-containing test dose is the most commonly used method for detecting an intravascular catheter. Most often epinephrine is combined with an appropriate dose of local anesthetic to help identify an intrathecal injection. Careful aspiration, followed by an appropriate test dose, increases the likelihood that the anesthesiologist will detect an intravascular or intrathecal catheter so as to avoid a systemic reaction to local anesthetic.[4] At the same time as a potential reaction to the anesthetic is avoided, a possible reaction to epinephrine is introduced, including exaggerated hypertensive and tachycardic events.[5] Previous studies have evaluated the use of an epidural test dose of lidocaine with epinephrine in laboring women, noting low rates of false negatives and a high percentage of true positives.[6] Although we recognize there is no perfect epidural test dose, we

believe the safest approach to epidural anesthesia is careful observation, diligent aspiration, an appropriate test dose, and intermittent dosing of a dilute local anesthetic solution.

CONCLUSION

The test dose of an epidural catheter requires monitoring for several minutes to detect tachycardia signaling an intravascular injection. At times, maternal distress, anxiety, and other factors contribute to a high heart rate, so the clinician must be vigilant in assessing significant changes from baseline. The heart rate changes presented here were unusually high and sustained, but the patient was asymptomatic and unaware of the change in heart rate. The anesthesiologist ruled out a relationship to the epidural injection. The occurrence exemplifies a clinical condition that potentially confounds the interpretation of the test dose and is otherwise a significant medical event. An electrocardiogram led to the diagnosis. Atrial fibrillation is so rare in parturients that we first suspected undetected cardiac disease. However, no structural abnormalities were found, and the arrhythmia was eventually attributed to the stress of labor.

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