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CASE REPORT

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Maternal hypothermia from environmental exposure in the third trimester

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ABSTRACT

A primigravida at 32 weeks gestation developed hypothermia after prolonged exposure to the elements at -30.0°C. Her core temperature dropped to 29.8°C with associated foetal bradycardia. Passive rewarming was undertaken with forced warm air blankets and warmed IV fluids. The foetal heart rate normalised once normothermia was achieved. Serial foetal assessments showed appropriate growth and normal Doppler studies. She went to on deliver a healthy term infant. This case highlights conservative management and prioritising of maternal well-being with a good maternal and foetal outcome.

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Pregnancy; hypothermia; accidental hypothermia; fetal bradycardia

Case

A primigravida at 32 + 0 weeks gestational age was brought to the emergency department via ambulance. Her medical history was significant for depression, anxiety and FASD, as well as substance use including crack cocaine and intravenous crystal meth use. This pregnancy had been otherwise uncomplicated. A bystander reported the patient had been outside in an alley for several hours following a domestic dispute. Weather reports indicate temperatures between −29.0°C and − 35.0°C with wind chill [1]. On arrival at the emergency department, the patient had a core temperature of 29.8°C. Other maternal vital signs were within normal limits. Examination found an altered level of consciousness, slurred speech, bruising to the jaw and knees, and frostbitten fingertips. Intravenous dextrose was administered for symptomatic hypoglycaemia. Substance use was confirmed by the patient, who reported recreational use of benzodiazepines as well as a second unknown substance over the evening. Her preliminary screen in the emergency department did not reveal any ethanol, acetaminophen or salicylates.

The foetal heart rate was auscultated by Doppler and found in the range of 80–90 beats per minute. The obstetrical team was immediately involved in the management of the foetal bradycardia. On bedside ultrasound, the foetus was cephalic with a heart rate of 60–80 beats per minute. Maternal-foetal medicine was consulted and the consensus decision was that the foetal bradycardia represented a normal response to maternal hypothermia rather than a reflection of non-reassuring foetal status. The patient was re-warmed according to standard emergency medicine protocols using warmed intravenous fluids and forced warm air blankets. Maternal temperature was monitored by a rectal probe.

Several hours later, normothermia (36.7°C) was achieved and the foetal heart rate was found to have recovered to 120–140 beats per minute. Laboratory studies showed an elevated creatinine kinase as well as mildly elevated liver enzymes which improved on repeat studies. The patient was admitted to the obstetrical antepartum unit for further monitoring. Later that day, she left against medical advice, but underwent ongoing serial ultrasounds for foetal surveillance (at 32 and 36 weeks gestational age). The foetus demonstrated good interval growth and all Doppler studies were within normal limits.

The patient presented in spontaneous labour at 40 + 3 weeks gestational age and had an uncomplicated vaginal delivery of a male infant weighing 3440 g. Apgar scores of 5 at 1 min and 7 at 5 min were assigned. Cord gases demonstrated a pH of 7.19 with a base excess of −3.0 and a lactate of 4.7. There were no concerning findings on newborn exam. The postpartum course was uneventful and the patient discharged home on the first postpartum day.

Discussion

Hypothermia in pregnancy is a relatively uncommon occurrence, and this is reflected in the paucity of

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published data. To our knowledge, this case represents only the second case of severe accidental hypothermia resulting in foetal bradycardia published in the literature [2]. Within medicine, differentiation is usually made between accidental (or environmental) hypothermia, defined as a decrease in core temperature from overwhelming environmental stress [3], and induced (or therapeutic) hypothermia, used as a treatment modality by purposely manipulating core temperature [4,5]. This is achieved using cooling techniques in intensive care settings with the goal of decreasing tissue injury, mainly for neuroprotection after cardiac arrest [5].

The main trials evaluating therapeutic hypothermia initially excluded pregnant patients, although this has more recently been challenged. Rittbenberg et al. initially describe a case where therapeutic hypothermia was used in a patient at 13-week gestation after cardiac arrest, who went on to deliver a healthy infant at term [4]. Other cases have since been published with infant neurodevelopmental outcomes followed up to 36 months and found to be reassuring [6,7]. In most cases, foetal bradycardia was noted with once goal maternal temperature of approximately 33°C was achieved. Maternal hypothermia in the context of sepsis has also been reported as a cause of foetal bradycardia, with baseline foetal heart rate recovery and good foetal outcomes reported after appropriate interventions to restore normothermia [8].

Within the sphere of accidental hypothermia, moderate hypothermia is understood to be a core temperature between 28°C and 32°C and can be associated with mental status changes, slurred speech, loss of fine motor skills and cardiac arrhythmias [9]. Severe hypothermia is below 28°C and associated with respiratory apnoeas, bradycardia, hypotension, pulmonary oedema [9]. Cardiac arrest is more likely below 20°C [9]. Enzymatic activity is also severely affected at low temperatures, which is especially relevant for appropriate coagulation in the obstetric patient, placing them at increased risk of platelet dysfunction and disseminated intravascular coagulation [3,5,9,10].

The association between maternal temperature and foetal heart rate is not completely understood; however, it is known that hyperthermia is associated with foetal tachycardia, and hypothermia correspondingly with foetal bradycardia [11,12]. Several hypotheses exist for the heart rate changes, including decrease in foetal metabolism in colder temperatures, overt foetal distress or changes in placental blood flow [12]. Early animal studies showed uterine blood flow decreased with hypothermia, with preserved oxygen transfer across the placenta [13], but this has not yet been fully elucidated.

Warming therapies depend on the degree of hypothermia but generally progress from least to most invasive. At core temperatures greater than 32°C, passive rewarming including warm blankets, foil insulators or warmed and humidified air [3,10]. Warmed intravenous fluid and blood are also commonly used but have been suggested to carry a less significant benefit [9]. Peritoneal lavage and/or pleural irrigation, though more invasive, may be more effective in core warming [9]. In the most severe cases, cardiopulmonary resuscitation can be required, as well as the use of haemodialysis, cardiopulmonary bypass (CBP) or extracorporeal membrane oxygenation (ECMO) for rapid rewarming [3,9,10]. In instances of both accidental and therapeutic hypothermia, maternal rewarming was associated with the return of foetal heart rate to normal range [2,4,11].

Conclusion

We wish to increase awareness of the possibility of foetal bradycardia in accidental hypothermia and demonstrate a positive outcome using a conservative approach. We find this to be especially relevant given the extreme winter climate noted in some areas of Canada. This case emphasises the importance of prioritising maternal well-being and the ability of the foetus to compensate in challenging circumstances.

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