

Hypothermia Following Intra-Thecal Morphine Injection during Cesarean Section a Case Report and Literature Review

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Abstract

Introduction: Perioperative hypothermia is a common phenomenon with a wide differential diagnosis. We present a unique case of hypothermia following cesarean section under spinal anesthesia.

Case report: A 32 years old female, first IVF pregnancy with twins, underwent cesarean section under spinal administration of bupivacaine and morphine. About four hours after operation's end, body temperature was measured at 35.4°C per rectum, which later reached a nadir of 32.8°C, restoring to normal range only after four hours. During the incident, the patient was hemodynamically stable, with vital signs at the normal range.

Discussion: This case presents differential diagnoses, the most relevant of which are infection, hypovolemia, endocrinopathy, environmental conditions, iatrogenic causes and the administration of anesthetics. We discuss supporting and contradicting evidence for each relevant diagnosis, reaching a concluding diagnosis of intrathecal-morphine induced hypothermia.

Summary: This case highlights the importance of differential diagnosis and temperature follow-up after spinal injection of morphine.

Keywords: Hypothermia; Intrathecal; Morphine; Cesarean section; Complication

Introduction

Hypothermia is defined as a core temperature below 35°C. The most commonly used definitions found in the literature are as follows:

Mild hypothermia – Core temperature 32-35°C, Moderate hypothermia – 28-32°C, Severe hypothermia – below 28°C

While mild to moderate perioperative hypothermia is a fairly common phenomenon, it has plenty of possible causes, and distinguishing between them is of utmost importance when treating a hypothermic patient. We present here a unique case (with informed consent of our patient) of moderate hypothermia following cesarean section, and discuss the relevant differential diagnosis; in hope this discussion may help physicians when diagnosing similar cases [1-3].

Case report

A 32-year old female patient, weight 75 kg, was scheduled for an elective caesarean section (CS) at 36+5 week gestation, due to IVF twin first pregnancy and breech presentation of one fetus. Additionally, a bi-cornis uterus was suspected.

Medical history includes anti-dsDNA positive, discovered by hypercoagulability workup due to past 2 miscarriages and laparoscopic endometrectomy 5 years ago. Otherwise, the patient was healthy.

In 28 w of pregnancy the patient completed a course of antenatal corticosteroids due to early contractions.

In early stages of pregnancy the patient was treated with aspirin which was later replaced by 40 mg daily low-molecular weight heparin. Anticoagulation was stopped 48 hours prior to CS.

Operation was performed as scheduled, under spinal anesthesia.

Prior to procedure the patient was well with good vital signs, normal temperature and complete blood count. She was fasting, receiving parenteral fluids (1000 ml of Ringer lactate solution) and prophylactic intravenous 1g ceftriaxone.

One shot spinal anesthesia was conducted by a senior anesthesiologist, using a 27 G Pencil Point needle, in L3-4 interspace (midline access) of 10 mg hyperbaric bupivacaine (0.5%)+150 µg morphine preservative free. After injection patient was in supine position with left lateral tilt, under monitoring of blood pressure, saturation and 3 leads ECG.

Operation lasted one hour, during which patient received oxygen by nasal cannula (6 liter per minute) and received 700 ml intravenous Ringer lactate solution.

The patient was covered with warm blankets and did not complain of chills. During CS her blood pressure (BP) was 100-120 mmHg systolic, 45-50 mmHg diastolic, heart rate (HR) was 60-100/minute and oxygen saturation (SaO₂) was 99-100%. No vasoactive medication was required. Body temperature was not monitored at that point. Post-procedural urinary bag volume was 100 ml.

During her two hours stay at post anesthetic care unit (PACU), the patient was stable with BP 100-110/50-60 mmHg, HR 55-65/minute SaO₂ 98-100%. Following reduction of anesthesiology effect, the patient was transferred to maternity ward

After two more hours in the maternity ward, the patient complained of a strange sensation, describing it as "feeling out of herself". At physical examination patient was in full consciousness, with BP 129/75 mmHg, HR 52/minute, SaO₂ 96% and no dyspnea. However, body temperature was measured at 35.4°C per rectum, accompanied with sweating and no shivering.

At that point complete blood counts, electrolytes, glucose level, clotting test, blood gas and bacterial cultures were taken to rule out sepsis. Patient was resubmitted to PACU for surveillance, at which body temperature reached 32.8°C per rectum. The patient was covered with hot blankets and received intravenous hot fluids. During the whole incident BP was 90-130/55-75 mmHg, HR 50-90/minute, SaO₂ 96-100% and the patient remained in full consciousness.

Gradually, body temperature was restored and returned to 36.7°C orally after four hours. The patient fully recovered and was returned to maternity ward for observation for seven additional days, during which no recurring episodes of hypothermia were recorded.

Discussion

This case of moderate hypothermia following regional anesthesia during CS presents differential diagnoses, the most relevant of which are infection, hypovolemia, endocrinopathy, environmental conditions, iatrogenic causes and the administered anesthetics.

Infection – hypothermia may be a symptom of sepsis. This diagnosis is supported in our case by the fact that the patient underwent both surgery and spinal anesthesia, which impose a potential risk of acute abdominal or spinal infection. This diagnosis was ruled out since all blood tests, taken immediately after the initial report of hypothermia, were found to be normal. Moreover, the fact that the patient was hemodynamically stable throughout the event and the transient nature of the episode both make this diagnosis improbable, even prior to receiving culture results. Therefore, no antibiotic treatment was initiated.

Hypovolemia – Massive blood loss may cause hypothermia [4]. In our case the patient was found to be hemodynamically stable, with no hypotension or compensatory tachycardia, and with normal urine output. Vaginal tests revealed minimal bleeding. Her abdomen was soft and insensitive, with no signs of peritoneal bleeding or irritation. In the lumbar injection site there was no hematoma and the patient did not complain of pain - ruling out severe bleeding in the spine following a complication of spinal anesthesia.

Endocrinopathy – Hypoadrenalism and hypothyroidism should also be considered in the differential diagnosis of hypothermia [2, 5]. This DD was supported by the mild bradycardia displayed by the patient during the hypothermic episode (HR reaching 52/minute) [6]. In our case, hormonal tests were ordered. Since body temperature was restored, no endocrinology tests were eventually taken, and bradycardia was attributed to the hypothermia itself [5].

Environmental – Hypothermia may be caused by the conditions in the OR, i.e. low room temperature, administration of unheated fluids or heat loss to environment following abdominal incision [7]. Heat loss during operation can be caused by each of the known mechanisms: radiation, conduction, convection and evaporation. Environmental causes were ruled out in our case since hypothermia appeared two hours after completion of the operation, and did not improve as a consequence of active warming in PACU.

Iatrogenic as a result of anesthetics – It is known that general anesthesia may cause hypothermia as a result of changes in the set-points of thermo-regulators, inhibition of shivering mechanism due to muscle relaxants, and vasodilatation due to loss of sympathetic tone. Hypothermia may result also from regional anesthesia, mainly due to sympathectomy, and dis-balance to the shivering and vasoconstriction mechanisms [7-11]. In our case, however, hypothermia occurred two hours after operation completion, when the effect of regional anesthetics subsided, sympathetic activity was restored and the patient could move her legs freely.

Since all aforementioned causes were ruled out in our case, it is reasonable to assume that the cause of hypothermia was the administration of intrathecal morphine. There are a few reports in medical literature indicating a causal link between spinal administration of variable dosages of morphine (100-250 µg) and hypothermia [9,12,13]. All of these cases describe hypothermia following CS, except two which occurred after knee arthroplasty [9] and after split thickness skin grafting [14]. There is also a report that associates hypothermia with intraventricular administration of morphine [15]. The link between morphine dosage and body temperature, as was discovered in animals, is that low dosage of morphine may cause hyperthermia while higher dosages may cause hypothermia [16]. However, within the hypothermic-causing range (100-250 µg), our literature survey reveals that severity of hypothermia is independent of dosage. Within this range, all reported episodes of hypothermia were moderate.

The mechanism by which spinal morphine causes hypothermia, is not yet fully understood, but it was hypothesized that morphine changes hypothalamus' thermal set-point, causing the body to sense heat regardless of low temperature, and respond accordingly by sweating and vasodilatation [9]. Consequently, although hypothermic, the patient complains of heat instead of chills, and the compensatory mechanism of shivering is not activated, as was the case with our patient. The potential to cause hypothermia seems to be unique to morphine, whereas other opioids such as fentanyl do not affect thermal regulation because of their short half-life and different solubility.

All previous reports of morphine-induced hypothermia are very similar to our case in several aspects: All cases report moderate hypothermia (33.2-33.6°C) ensuing a considerable time after operation, lasting 2-22 hours, unaffected by active warming, characterized by patient's report of a sense of heat, sweating and lack of shivering, despite the low body temperature [9]. In most cases, hypothermia withdrew spontaneously, but there are reports of treatment with lorazepam, which increases GABA activity [17].

Summary

The phenomenon of hypothermia after intrathecal injection of morphine has been observed in a handful of case reports in medical literature, most ensuing after CS. Hypothermia was reported after spinal anesthesia even with no administration of morphine, but it lasted for a shorter time period and the nadir temperature was less extreme.

In several cases a vast improvement was achieved by administration of lorazepam. Nevertheless, even with no treatment, hypothermia eventually withdrew and no complications were observed.

However, one should bear in mind that there are various causes for hypothermia and that it is important to perform DD in order to rule out fatal states such as sepsis or hypovolemia.

Intrathecal doses of morphine are associated with pruritus, urinary retention, nausea, and delayed respiratory depression. Our case joins other reports to add hypothermia as an important side-effect of intrathecal morphine. Therefore, we recommend that body temperature should be regularly monitored at PACU following intrathecal administration of morphine in addition to heart rate, BP and saturation.

We view our case as a reminder of the importance of wide DD and temperature follow-up after spinal injection of morphine.

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