Patient Safety Tip of the Week

December 4, 2012

Unintentional Perioperative Hypothermia: A New Twist

When we came across one of the Pennsylvania Patient Safety Authority's excellent articles a few years ago on unintentional perioperative hypothermia (PPSA 2008) we debated whether to do a column on it. Yes we know that avoidance of hypothermia is a SCIP measure and it is important. But it just didn't sound like a topic we thought the majority of our readers would be interested in.

But we've subsequently seen a few cases of unintentional perioperative hypothermia with a new twist and there just happened to be a new article on this unusual phenomenon (Ryan 2012). Specifically, there appears to be a syndrome related to cases (most often obstetrical) in which **spinal anesthesia with morphine** is used and patients develop **hypothermia with paradoxical sweating**. Though most cases in the literature have followed cesarean sections, the case described by Ryan et al. was in a patient who underwent a knee arthroplasty. Spinal anesthesia was used with 11 mg of isobaric 0.5% bupivacaine, 15 micrograms of fentanyl, and 150 micrograms of morphine. The patient's temperature reached a low point of 33.6 degrees C four hours after surgery, though at times her temperature could not be recorded by any route. Despite the hypothermia she felt hot and was diaphoretic without shivering. Warming efforts using forced air warming blankets, infusion of warmed intravenous fluids, and hourly bladder irrigation with warm saline were not successful in elevating her temperature. But a quick literature search by the authors showed **the syndrome often responds to benzodiazepines** and their patient rapidly became normothermic after receiving a small sublingual dose (0.5 mg) of lorazepam. The authors go on to discuss the cases in the literature and the current theory of the pathogenesis of this syndrome. The theory is that enough of the morphine ascends in the subarachnoid space to reach the hypothalamus where it interacts with receptors important in thermoregulation. Essentially this leads to **alteration of the hypothalamic thermoregulatory set point** causing the body to feel hot and sweat in attempt to adapt to heat. Benzodiazepine receptors are also found in the hypothalamus and are probably also involved in thermoregulation.

In at least 2 cases hypothermia after intrathecal morphine has improved promptly after administration of **naloxone**. In one case (Sayyid 2003) the patient's temperature had dropped to 33.6 degrees C after a cesarean section and the patient was sweating excessively despite the hypothermia. She also had nausea, vomiting, pruritis and some

sedation. Following naloxone administration all the above symptoms disappeared and she developed shivering and cessation of sweating concomitant with rising body temperature.

In the other case (Mangus 2011) a patient developed hypothermia unresponsive to usual warming measures several hours after a cesarean section in which she received intrathecal morphine. Severe pruritis and lethargy were also present. Naloxone was administered intravenously in incremental doses and her temperature began to rise within 5 minutes. The pruritis and lethargy also improved and her pain control was never compromised.

Hess et al reported on 14 patients who developed hypothermia following cesarean sections in which they had received spinal anesthesia with bupivacaine, morphine and fentanyl (Hess 2005). All had diaphoresis and felt hot. Four of the 14 were given lorazepam and had prompt resolution of symptoms and rapid increase in temperature. The remainder, who received conventional management of hypothermia, were hypothermic and symptomatic for 6 hours on average. The authors subsequently observed 100 consecutive patients and found 6% developed symptomatic hypothermia lasting for several hours.

There is some evidence suggesting that this phenomenon might be dose-related. In a randomized controlled trial Hui and colleagues randomized patients undergoing elective cesarean section to receive either 150 micrograms of morphine or normal saline along with the bupivacaine in their spinal anesthesia (Hui 2006). They found that both groups developed hypothermia but that the maximum decrease in temperature was greater in the morphine group and of longer duration. This suggests that even a low dose of morphine may intensify the hypothermic effect of spinal anesthesia. However, they point out that many of the cases in the literature had much higher doses of morphine. In fact, they note that larger doses are avoided because they are often associated with nausea, vomiting, pruritis and shivering. Note that nausea, vomiting and pruritis were prominent in the cases described by Mangus and Sayyid.

Interestingly, this phenomenon receives little or no attention in most of the major guidelines on perioperative hypothermia (ASPAN 2010, PPSA 2007, NICE 2008, AORN 2007 and AORN 2013) though the NICE guideline specifically excludes pregnant women.

The importance of these cases is twofold. First, you may want to limit the dose of intrathecal morphine used. Second, you need to amend your hypothermia management protocols to take this phenomenon into account. Specifically there should be **a prompt to consider the phenomenon** if the expected improvement in hypothermia is not occurring within a reasonable amount of time after conventional warming procedures have been instituted. Perhaps even a prompt at the beginning of your protocol to look for signs you would not expect with hypothermia (i.e. sweating, hot feeling, vasodilation) might suggest this unusual etiology for the hypothermia. The presence of nausea and pruritis might be an additional clue. In either case the prompt should remind you to consider a trial of either low dose benzodiazepine or naloxone.

You probably should have a formal protocol you follow for prevention and management of perioperative hypothermia. Use one of the above mentioned guidelines to start with. Another recent article (Ford 2012) provides some good case scenarios to help you choose when and how you might intervene. But make sure that whatever protocol you choose you add that prompt we noted above to at least consider the possibility of the morphine-induced syndrome because its management requires additional considerations.

Update: See our January 23, 2018 Patient Safety Tip of the Week "Unintentional Hypothermia Back in Focus"

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