Case Report

Accidental intravenous infusion of a large dose of magnesium sulphate during labor: A case report

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Abstract

During labor and child delivery, a wide range of drugs are administered. Most of these medications are high-alert medications, which can cause significant harm to the patient due to its inadvertent use. Errors could be caused due to unfamiliarity with safe dosage ranges, confusion between similar looking drugs, mislabeling of drugs, equipment misuse, or malfunction and communication errors. We report a case of inadvertent infusion of a large dose of magnesium sulphate in a pregnant woman.

Key words: Drug error, inadvertent, magnesium sulphate toxicity, obstetric

Introduction

Drug administration errors appear to be a major source of iatrogenic harm to the hospitalized patients. A study has estimated that drug-related errors occur in one out of five doses given to patients in hospitals.[1] Administration errors were found to account for 38% of drug-related errors.[2,3] Many drug errors have been reported in the literature involving labor and delivery, with some resulting in fatalities.

Case Report

A 28-year-old primigravida was admitted to the antenatal ward for close fetal and maternal observation with dichorionic diamniotic twin pregnancy complicated by severe preeclampsia as well as abnormal doppler studies. The 24-h urine protein was elevated to 6 g, requiring labetalol 400 mg t.i.d., to control her blood pressure. Induction of labor was planned as there was persistence in the abnormality of doppler studies of twin babies.

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Physical examination revealed an easy looking airway and unremarkable cardiovascular and respiratory exam. Induction was carried out with amniotomy, oxytocin infusion and labor epidural used for pain control. She was started on magnesium sulfate for preeclampsia management. Her initial magnesium sulfate levels were 1.4 on the first day evening and 1.97 on the next day morning. Her reflexes were intact. The following day, the patient delivered both the babies vaginally. Post-delivery, she had significant immediate postpartum hemorrhage. There was a small second-degree perineal tear, which was repaired, but bleeding per vagina persisted. The nurse was instructed to open up oxytocin. The uterus was manually massaged. However, this failed to contract down the fundus. Therefore, 400 μg of misoprostol was placed rectally. By that time, she had already lost approximately 1 l of blood, but she was adequately resuscitated and her vitals were stable.

The uterus contracted post misoprostol, but shortly afterwards was filled with clots and blood. Therefore, one dose of hemabate (Carboprost Tromethamine) was given intramuscularly. At this stage, she complained of increased shortness of breath. Her saturation had dropped to 92%, and she was increasingly somnolent. A second intravascular (IV) line was started, as there was persistent excessive vaginal bleed. Bimanual massage was continued. The bleeding settled with administration of hemabate, but her level of consciousness continued to decrease. Anesthesiologist was called in for help and assessment. The patient was found to be having difficulty in responding verbally, but did continue to breathe unsupported. Her blood pressure was 107/46 mmHg and heart rate was 96/min. The bleeding had stopped, but her

respiratory efforts continued to decrease to such an extent that she required intubation. A rapid sequence induction and intubation was performed with 40 mg of propofol and 100 mg succinylcholine and her oxygen saturation was maintained at 100%. Blood samples were sent for blood gas analysis, serum electrolytes including calcium and magnesium levels, coagulation profile, and hemoglobin level. The working diagnosis at the time was magnesium toxicity versus possibility of pulmonary, amniotic fluid embolus, and brain edema secondary to preeclampsia maternal stroke or seizure. A trial of 1 g of calcium gluconate was given because the last magnesium level had been within the normal therapeutic range. During the physical examination, her pupils were non-dilated, but they were asymmetrical and reacting to light. She was promptly taken for a head computed tomography (CT) scan, which was negative. Chest CT conducted to rule out Pulmonary embolism was inconclusive. In the meantime, magnesium levels had returned to be within the toxic range at 8.6 mmol/l. Magnesium toxicity was perceived to be the etiology behind her respiratory arrest and neurologic suppression. She was admitted to the intensive care unit (ICU) for respiratory support and correction of magnesium levels. An additional 2 g of calcium was given and planned for forced diuresis with lasix. A cardiologist was consulted for a bedside echocardiogram to rule out any pulmonary embolus. There was no evidence suggesting PE. A minimal pericardial effusion was also noted.

The team visited the labor and delivery room, as the increase in magnesium level had occurred within a short period of time, a drug error was suspected. The duration and dose of the magnesium infusion that was started the night before matched with the amount of magnesium remaining in the bag. The garbage from the delivery room was checked for discarded bags and an empty bag labeled with magnesium sulfate was found in the garbage. Presumably this had been mistakenly hung by the nurse considering it to be oxytocin. Oxytocin-labeled IV bag was not found in the garbage. The working diagnosis was inadvertent magnesium sulfate toxicity secondary to misplacement of magnesium sulfate IV bag for oxytocin. Therefore, the patient had received 40 g of magnesium sulfate as an IV push.

By early evening of the day of delivery, her magnesium levels had returned to within therapeutic range. After extubation, she was alert, oriented, and asymptomatic and required no supplemental oxygen. She was observed in the ICU overnight and transferred to the postpartum floor in a stable condition.

Discussion

Magnesium is a crucial physiologic element that plays an important clinical role under many conditions. It's role in the management of obstetric complications is well established. It is commonly used in obstetric practice for the treatment of preeclampsia, eclampsia, and preterm labor. Occasionally, the administration of magnesium sulfate results in an accidental overdose and harm to the patient. A report in the *American Journal of Maternal Child Nursing* in 2004 reported 52 cases of accidental magnesium sulfate overdosing in labor and delivery settings.[4] Some of these errors were fatal or caused permanent harm to the mother. Many of these errors resulted from the unintended rapid infusion of the entire contents of a bag containing magnesium sulfate.[5-7]

Hypermagnesemia, though rare, is often iatrogenic due to inadvertent overdose of IV magnesium, and even with normal renal function the associated hypermagnesemia is clinically significant.[8] Elevated serum magnesium levels can result in a variety of clinical signs and symptoms that are dose-dependent and predominantly affect the cardiovascular and neuromuscular systems causing loss of deep tendon reflexes (DTRs) and progressive muscle weakness, including the diaphragm and other respiratory muscles, leading to acute respiratory failure. In addition, an overdose of the same can lead to hypotension, complete heart block, and cardiac arrest. It is important to remember that an untreated respiratory arrest leads to cardiac arrest as the cardiac muscle becomes hypoxic and ischemic.[4]

In the present case, the patient had postpartum bleeding due to uterine atony with hypoventilation following the accidental infusion of 40 mg of magnesium sulphate ($MgSO_4$). The patient was managed with IV calcium, fluids, and forced diuresis with lasix to assist excretion of magnesium sulfate.[8] The patient was on ventilatory support until the magnesium levels returned to normal and there was improvement in the conscious levels.

The presented scenario illustrates a medical error where a wrong medication was administered; this was primarily due to the similar appearance of $MgSO_4$ and oxytocin infusion bags manufactured by hospital pharmacy. It is available as 40 g MgSO4 in 1-l bags, while the oxytocin infusions are 20 units in 1-l bags. The labels were not much different in appearance, and there was no color coding either for easy differentiation. Review of literature in fields other than healthcare reveals that an error is often not the result of a single act, but precipitated by the co-occurrence of a number of factors that include physical, social, and ambient environments.[9] During critical situations, a person tends to see what they expect to see, and words are not usually recognized by what is written but by their shapes (the Poggenorf effect).

The incorrect drug administration was thought to be a chance occurrence due to simple human error. Therefore, we would like to suggest the development of hospital policies for the proper storage of high-risk medications and avoiding look-alike or similar appearance of packaging and labeling. Healthcare

providers must work in collaborative teams to improve patient safety. The lines of authority and areas of responsibility should be clearly defined between the workers, and there should be adequate communication among the personnel involved in the medication use.

High-risk medications should always be administered via an infusion pump and should be double checked before injecting to the patient.

Conclusion

$MgSO_4$ is among one of the most frequently used drugs in obstetric practice. However, despite years of use and provider familiarity, the administration of $MgSO_4$ occasionally results in accidental overdose and patient harm. Color coding of premixed bags, use of color-coded tags on lines, and vigilance in its use is required for safe care of mothers and babies.

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