Adding Lidocaine to IV Potassium Infusions Can Cause Safety Problems

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PROBLEM: A physician prescribed three sequential intravenous (IV) potassium chloride infusions of 40 mEq in 250-mL bags for a patient with severe hypokalemia. Each bag was to be given over a period of four hours. Soon after the first bag was started, the patient complained of burning pain at the infusion site. Following hospital policy, the physician then prescribed lidocaine 25 mg to be added to each subsequent bag of potassium chloride to reduce vein discomfort.

From the night drug cabinet, a nursing supervisor selected what she thought were six 1-mL ampules of lidocaine HCl injection 10 mg/mL (three for each remaining bag) (1% Xylocaine-MPF [methyl paraben free], AstraZeneca). However, she accidentally picked out six polypropylene plastic ampules of Xylocaine-MPF (10 mg/mL in Polypamp DuoFit containers), 10 mL each (100 mg). These ampules are designed for needle-free systems and have twist-off caps that are compatible with Luer and tapered syringes.

The nursing supervisor handed the ampules to a staff nurse and instructed her to add the contents of 2.5 ampules to each subsequent IV bag. An element of confirmation bias was introduced, and the nurse simply followed the supervisor’s directions without recognizing that she was adding 250 mg (25 mL)—not 25 mg—of lidocaine to each bag. The patient thus received 500 mg of lidocaine over the course of the night. Fortunately, the patient had a pacemaker, and even if adverse effects had occurred, they were suppressed. Under different circumstances, an adverse effect from lidocaine toxicity could have resulted.

The hospital attributed the error, in part, to unclear labeling of this newer form of Xylocaine packaging. Other reporters had also complained about the similarity of these packages to respiratory therapy products in low-density polyethylene plastic and about the difficulty in reading the label when the ampule was removed from its original packaging. The label, printed in black type, is hard to read in poor lighting or when the opaque, colorless plastic ampules are held against a dark background.

In addition to this incident, the Institute for Safe Medication Practices (ISMP) received a report in which regular insulin (not lidocaine) was added to a potassium infusion. Multiple bags were prepared this way, resulting in recurrent hypoglycemia before the error was discovered.

In another case, a nurse added potassium chloride to a bag of lidocaine instead of adding lidocaine to the potassium chloride. Just to confuse matters more, lidocaine is available in several formulations (e.g., with or without preservatives or epinephrine and in 1% or 2% concentrations). Allergic reactions to lidocaine are rare, but the possibility exists.

SAFE PRACTICE RECOMMENDATION: Certainly, poor labeling played a part in this error. Xylocaine MPF ampules in Polypamp DuoFit containers should remain in their overwraps until right before they are used in order to help clarify the amount of drug contained in each.

The quantity of 10-mL lidocaine ampules available in floor stock can also be problematic. Had fewer ampules been available in the night cabinet, the supervisor might have taken a second look at the amount needed for a dose or might have called a pharmacist. Another crucial factor: adding lidocaine to a potassium chloride infusion should be performed in the pharmacy whenever possible.

More to the point is this basic question: Do the benefits of adding lidocaine to potassium chloride infusions outweigh the risks?

Each safety scenario presented earlier must be carefully considered. Any time an extra step is involved in a procedure—in this case, adding another drug—the likelihood of errors increases. In the past, we at ISMP have discouraged health care personnel from adding lidocaine to IV potassium infusions because this step has the potential to mask an infection or a vein injury presenting as phlebitis and, we suspect, to mask the symptoms of a potassium chloride overdose by preventing the burning sensation that characteristically occurs along the vein.

Only a few studies have shown improved patient tolerance to potassium when it was administered with lidocaine through the peripheral veins. Lim et al.1 found lidocaine effective in 28 patients when it was given as a 3-mL bolus before an infusion of 20 mEq of potassium chloride in 100 mL of 5% dextrose. Pucino et al.2 also found lidocaine effective in reducing pain in 18 hypokalemic patients who received infusions of potassium chloride 20 mEq in 65 mL of diluent, with and without lidocaine 50 mg. However, the number of patients in these studies was small, and the methods used were not comparable.

Effectiveness depends on the infusion rate, the drug’s concentration, and the infusion site. Thus, it isn’t surprising that health care practitioners responding to an informal survey found lidocaine ineffective and had chosen alternatives such as optimizing oral replacement; increasing potassium dilution; slowing the IV rate; lowering the solution’s osmolality; splitting and administering the dose in less concentrated solutions via two veins simultaneously; and employing a safe, rational, standardized protocol with replacement parameters that include access via a large-bore vein as appropriate.

REFERENCES

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The reports described in this column were received through the USP–ISMP Medication Errors Reporting Program (MERP). Errors, close calls, or hazardous conditions may be reported on the ISMP (www.ismp.org) or the USP (www.usp.org) Web site or communicated directly to ISMP by calling 1-800-FAILSAFE or via e-mail at ismp-info@ismp.org.