

Patient Safety Tip of the Week

August 8, 2023

Another Spinal Injection of Tranexamic Acid

We just recently did another column on inadvertent spinal injection of the highly neurotoxic substance **tranexamic acid** (see our February 21, 2023 [“Tranexamic Acid Errors Just Won’t Go Away”](#)). Since then, yet another incident has been reported but it has some elements worthy of a new column.

The new report ([Harby 2023](#)) involved a 31-year-old man who underwent surgery for a right leg fracture. Anesthesia was administered via an injection of 20 mg (4 ml) of hyperbaric bupivacaine 0.5% at the L3-L4 interspace. About 120 seconds after receiving the injection, the patient had significant back and gluteal discomfort, followed by myoclonic movements in the lower limbs and a generalized convulsion. Arterial blood pressure was elevated to 170/100 mmHg, and his heart rate increased to 120 beats per minute. Immediate intravenous sedation with midazolam and fentanyl, followed by phenytoin (1000 mg) by intravenous infusion when seizures persisted. General anesthesia was induced by a thiopental sodium and atracurium infusion, and he was intubated and mechanically ventilated. Maintenance of anesthesia was attained with isoflurane and atracurium, and subsequent doses of thiopental sodium were given to control seizures. The attending anesthesiologist suspected intrathecal administration of the incorrect medicine after discovering a used tranexamic acid ampule in the trash. Subsequently, cerebrospinal fluid (CSF) lavage was done by inserting two spinal 22-gauge Quincke tip needles on level L2–L3 (drainage) and the other on L4–L5. Intrathecal normal saline infusion (150 ml) was done in 1 hour by passive flow. The patient was stabilized, and he was transferred to the intensive care unit (ICU).

Seizures continued intermittently and he remained under general anesthesia and a thiopental drip, with intermittent tachycardia and fluctuating blood pressure requiring other interventions. On the third day after surgery, sedation was discontinued. On the fourth day postoperatively, he opened his eyes in response to voice instructions, followed simple directions, and breathed on his own. Cranial computed tomography revealed no abnormality. He was extubated, and was discharged from the ICU on the sixth day and transferred to the ward 48 hours after weaning from mechanical ventilation. The patient

was ultimately discharged home and monitored at 6-month and 1-year intervals and found to be in excellent condition with no neurological symptoms.

The use of **cerebrospinal fluid lavage** was based upon an article by Tsui ([Tsui 2004](#)), in which that intervention was used following inadvertent intrathecal administration of lidocaine and bupivacaine (that case did not involve tranexamic acid). It's, of course, impossible to know whether the CSF lavage played a beneficial role in this case, but it was certainly an innovative approach once the possibility of spinal injection of tranexamic acid was considered. One of the problems in previously reported cases has been unfamiliarity of the syndrome by clinicians. In the present case, it seems the early appearance of myoclonus and seizures tipped off the anesthesiologist to consider the possibility. The occurrence of seizures implies that the tranexamic acid has already reached the cranial cavity. But perhaps the CSF lavage might have prevented even more from reaching the brain.

The authors do note that, due to the frequency of this error, the manufacturer recently altered the look of the two ampules (photo appears in their article). They note that previously referenced case reports were the result of misreading between tranexamic acid and 0.5% hyperbaric bupivacaine ampules, which appeared identical from the outside.

There are two important points we need to make. First, don't store dangerous medications in a location where someone might inadvertently pick it up, prepare it, and administer it. We learned that lesson many years ago when concentrated potassium chloride was sometimes inadvertently given IV to patients, resulting in fatalities. We also stressed it in our columns on the mistaken administration of methylene blue instead of the intended trypan blue in ophthalmology cases (May 20, 2014 "[Ophthalmology: Blue Dye Mixup](#)" and September 2014 "[Another Blue Dye Eye Mixup](#)"). So, **don't keep tranexamic acid in locations where you don't need it.**

Second, **barcoding** is an obvious technological solution to help avoid such misadministration. But, as we pointed out in see our June 2022 What's New in the Patient Safety World column "[Where Are You Barcoding?](#)", many OR's have yet to implement barcoding. ISMP ([ISMP 2022](#)) noted that Crystal Clinic Orthopaedic Center, which adopted barcode scanning technology in all perioperative and procedural settings prior to medication administration, requires some anesthesia-provider medications to be scanned and documented on the medication administration record (MAR). Tranexamic acid was specifically mentioned as one of those medications.

Consider the following recommendations that have appeared in our prior columns, taken from the World Health Organization ([WHO 2022](#)), the US Food and Drug Administration alert ([FDA 2020](#)), ISMP Canada ([ISMP Canada 2022](#)), NAN (National Alert Network) Alert ([NAN 2020](#)), and ISMP ([ISMP 2022](#)):

- Don't store tranexamic acid in locations where you don't need it
- If you do sometime need it, store tranexamic acid injection vials separately from other drugs, in a way that makes the labels visible to avoid reliance on identifying drugs by the vial cap color

- To prevent reliance on identifying the drug by viewing only the vial caps, never store injectable drug vials in an upright position, especially when stored in a bin or drawer below eye level. Store them in a way that always makes their labels visible.
- Add an auxiliary warning label to note that the vial contains tranexamic acid and should never be administered intrathecally
- Check the container label to ensure the correct product is selected and administered
- All syringes used in the OR must be clearly labeled
- Utilize barcode scanning when stocking medication cabinets and preparing or administering the product
- Utilize barcode scanning prior to dispensing as well as when accessing the drug in surgical and obstetrical areas
- Minimize look-alike vials (caps) by purchasing these products from different manufacturers if necessary
- Consider purchasing labels that state, “Contains Tranexamic Acid” to place over the vial caps
- Consider NRFit syringes and connectors for local anesthetics used for regional anesthesia administered via the neuraxial route. NRFit connectors are incompatible with Luer connectors, thus preventing misconnections with drugs intended for IV use, such as tranexamic acid.
- Consider the use of pharmacy-prepared or commercially available premixed containers of tranexamic acid, which would be less likely to be confused with local anesthetic vials. Pharmacy preparation and labeling of syringes or infusions would help alleviate these errors.

If your facility uses tranexamic acid, it would be wise to perform a FMEA (failure mode and effects analysis) to identify and mitigate any current vulnerabilities you find.

Some of our prior columns on inadvertent spinal administration of tranexamic acid:

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| June 4, 2019 | “Medication Errors in the OR – Part 3” |
| July 9, 2019 | “Spinal Injection of Tranexamic Acid” |
| June 14, 2022 | “Spinal Tranexamic Acid Again!” |
| February 21, 2023 | “Tranexamic Acid Errors Just Won’t Go Away” |

References:

Harby SA, Kohaf NA. Accidental intrathecal injection of tranexamic acid: a case report. J Med Case Reports 2023; 17: 55
<https://jmedicalcasereports.biomedcentral.com/articles/10.1186/s13256-023-03768-6>

Tsui B. Common sense medicine: using cerebrospinal lavage to treat accidental excessive intrathecal drug injection in obstetric patients. *Anesth Analg* 2004; 98: 434-436

https://journals.lww.com/anesthesia-analgesia/Fulltext/2004/02000/Reversal_of_an_Unintentional_Spinal_Anesthetic_by.30.aspx

World Health Organization. Risk of medication errors with tranexamic acid injection resulting in inadvertent intrathecal injection. 2022

<https://www.who.int/news/item/16-03-2022-risk-of-medication-errors-with-tranexamic-acid-injection-resulting-in-inadvertent-intrathecal-injection>

US Food and Drug Administration. FDA alerts healthcare professionals about the risk of medication errors with tranexamic acid injection resulting in inadvertent intrathecal (spinal) injection. 2020

<https://www.fda.gov/drugs/drug-safety-and-availability/fda-alerts-healthcare-professionals-about-risk-medication-errors-tranexamic-acid-injection-resulting>

ISMP Canada. ALERT: Substitution Error with Tranexamic Acid during Spinal Anesthesia. *ISMP Canada Safety Bulletins* 2022; 22(6):

<https://ismpcanada.ca/wp-content/uploads/ISMPCSB2022-i6-Tranexamic-Acid-Spinal-Anesthesia.pdf>

ISMP (Institute for Safe Medication Practices). An Interview: Success with Barcode Scanning to Enhance Perioperative Medication Safety. *ISMP Medication Safety Alert! Acute Care Edition* 2022; 27(16): August 11, 2022

<https://www.ismp.org/resources/interview-success-barcode-scanning-enhance-perioperative-medication-safety>

NAN (National Alert Network) Alerts. Dangerous Wrong-Route Errors with Tranexamic Acid. *ISMP* 2020; September 9, 2020

<https://www.ismp.org/alerts/dangerous-wrong-route-errors-tranexamic-acid>

<http://www.patientsafetysolutions.com/>

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