Urine Trinder Spot Test: A Rapid Salicylate Screen for the Emergency Department

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Study objective: To determine whether the urine Trinder spot test, performed by emergency physicians, is a sensitive bedside screen for salicylates.

Design: Prospective, blinded human protocol with subjects serving as their own controls.

Setting: Urban Level I medical center.

Participants: Ten male and two female volunteers with negative urine toxicologic screen results before the start of the study.

Interventions: Each participant ingested 975 mg of nonenteric coated aspirin. Serum and urine samples were collected before ingestion and 2 and 4 hours after ingestion. Three emergency physicians and a toxicology technician independently performed Trinder spot tests. Results were recorded as positive or negative for salicylate on the basis of color change (a purple reading was considered positive).

Results: All postingestion urine specimens were detected by all testers with 100% sensitivity. Two false positives occurred in the preingestion samples. Serum quantitative assays confirmed the presence of salicylates in all postingestion specimens.

Conclusion: This pilot study suggests that emergency physicians can use the Trinder spot test as a sensitive bedside salicylate screen, potentially saving time and quantitative assay expense.

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INTRODUCTION

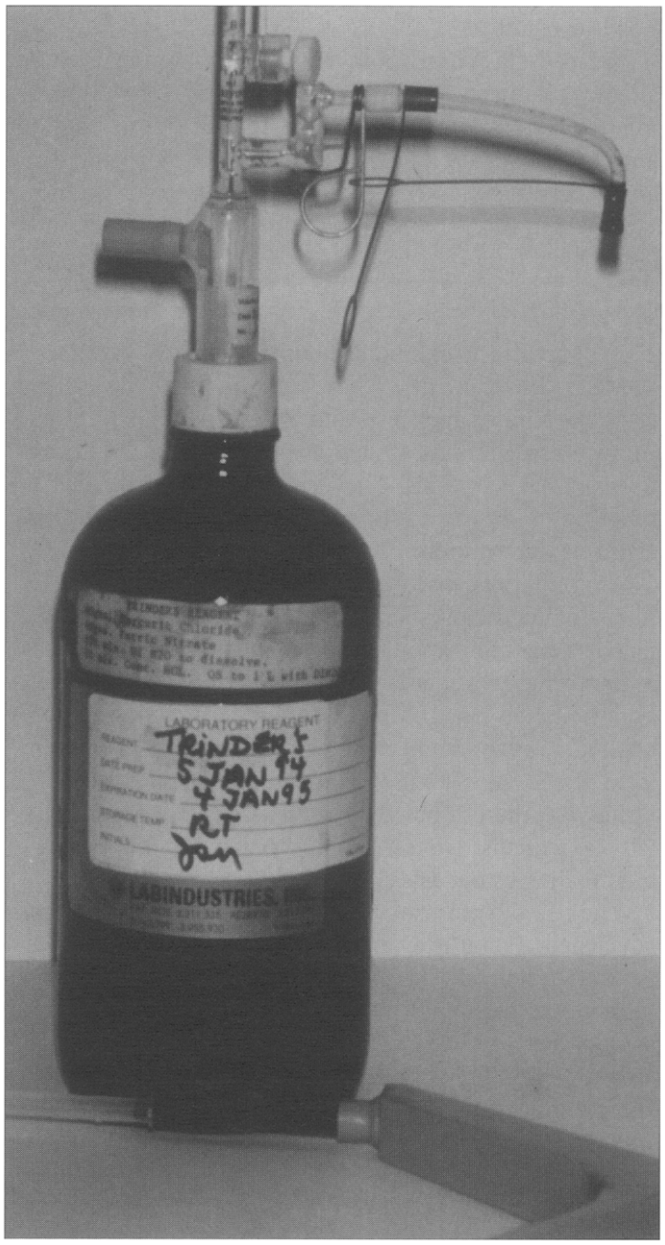
It is common practice to order a serum quantitative salicylate level or urine qualitative salicylate screen in suspected salicylate overdose, even when the likelihood of such an ingestion is low. Although several authors have suggested simple bedside screens that can be used in lieu of more costly quantitative assays[2-6], it has not been common practice to use such tests in our emergency department. The purpose of this study was to assess the sensitivity of a common spot test for salicylates when used by emergency physicians.

MATERIALS AND METHODS

The study protocol was reviewed and approved by the Wilford Hall Medical Center Institutional Review Board. Twelve volunteers, 10 men and 2 women (mean age±SD, 33.0±6.8 years), participated in the study. Each subject submitted a preexperiment urine sample for standard toxicologic analysis. This analysis was performed, in part, with the Enzyme-Multiplied Immunoassay Technique (EMIT; Syva Company). The EMIT screens for the presence of barbiturates, benzodiazepines, phencyclidine, amphetamine, cannabinoids, cocaine metabolite, methadone, methaqualone, and opiates. In addition, spot tests for acetaminophen, phenothiazines, and salicylates were performed in our laboratory. Toxicologic screen results had to be negative for the subject to be included in the study. The authors and laboratory personnel were blinded to the identity of each subject and to the time of serum and urine sample collection. The individual in charge of collecting and labeling specimens was not an author or a participant in the study. Urine and serum samples were collected from each subject before he or she ingested 975 mg of nonenteric coated aspirin. Urine and serum samples were then collected 2 and 4 hours after ingestion.

To perform the Trinder spot test, we followed our laboratory's approved operating instructions. The Trinder reagent was premixed by the laboratory staff. It is a solution of 40 g mercuric chloride and 40 g ferric nitrate in 850 mL of type II deionized water. Concentrated hydrochloric acid (10 mL) is added to the solution. Finally, the solution is diluted to a volume of 1 L with type II deionized water. The reagent is stable for 1 year at room temperature. In the Trinder spot test, 1 mL of urine and 1 mL of Trinder reagent were mixed in a test tube. A color change occurs immediately if salicylate is present. All specimens were observed for color change immediately after addition of the Trinder reagent to the urine. If the color change had discernible violet or purple color, the result was considered positive. If the specimen merely darkened or no color change occurred, the result was considered negative. Each of the authors performed Trinder spot tests on all 36 urine samples (preingestion and 2-hour and 4-hour postingestion samples from 12 subjects). A toxicology technician who routinely performs the Trinder screen

Figure.
Only simple equipment, including a bottle of Trinder reagent and an adjustable pipette, is required for the Trinder spot test.



also tested the samples blindly. The laboratory performed quantitative salicylate assays on all serum samples.

RESULTS

The Trinder spot test correctly identified all samples collected 2 and 4 hours after salicylate ingestion. There were no false-negative results. These findings yield 100% sensitivity for a 975-mg oral dose of salicylate at the time periods tested. Two false-positive results were obtained by blinded emergency physicians; in these cases darkening of the sample was misinterpreted as a positive result.

Prestudy EMIT toxicologic screens were negative in all study subjects. Serum levels confirmed that all preingestion salicylate levels were essentially zero. The 2- and 4-hour serum levels (mean±SD, 6.4±1.23 mg/dL and 5.58±1.16 mg/dL, respectively) were consistent with serum levels expected after a 975-mg oral dose.

DISCUSSION

Several spot tests can be used at the bedside to detect salicylate in the urine.[7] These include the ferric chloride test, the Trinder spot test, and Phenistix reagent strips. All of these methods are less expensive than quantitative salicylate analysis. They provide useful information that might be delayed if one waited for quantitative levels to be determined.

A rapid, inexpensive, and sensitive salicylate urine screen would help the emergency physician use the quantitative assay more appropriately. In our institution the cost of performing a quantitative serum assay for salicylates is approximately $5, compared with $.20 for the Trinder qualitative assay. Because ours is a military hospital, there is no cost to the patient or a third-party payer. In a civilian facility the amount billed for these tests is approximately $18 for a qualitative test and approximately $20 for the quantitative serum assay.

The use of spot tests to screen for salicylates has been suggested[2-6], but they are not routinely used by emergency physicians. The Trinder method[1] is the most commonly used colorimetric quantitative assay, but it can also serve—and is used by our laboratory—as a qualitative spot test. The Trinder reagent can be stored and used at room temperature; a bottle with an autopipette can be placed in the ED for immediate use (Figure). The color change, to a purple or violet hue, is easily distinguished with the unaided eye. The Trinder spot test is not specific for salicylic acid. Phenothiazines in high concentration may react with the reagent. Chlorpromazine (20 µg/mL) and thioridazine (20 µg/mL) produce pink and blue colors, respectively. Acetoacetic acid (found in the urine of diabetic subjects) may produce a faint false-positive reaction. When this test is used as a quick ED screen, these potential false-positive findings are not of major concern. Of paramount importance to the emergency physician is the test's sensitivity; that is, its ability to identify the presence of salicylates in all patients who have ingested significant amounts.

Our findings suggest that interpretation of Trinder spot test results by emergency physicians is reliable and sensitive. However, several issues must be addressed before this test is used routinely in the ED. In a typical patient, as opposed to a volunteer, we cannot control for many factors, including interfering substances, time of ingestion, and the last time the patient urinated before presentation. To confirm that routine use of this bedside screen is accurate and worthwhile, our next step is to use it in a randomized, prospective study in our ED.

A final consideration is that regulations of the federal government and various accrediting and regulatory agencies require laboratory supervision for diagnostic testing performed in the hospital. For the result of a bedside screen to be a useful tool that can be used to guide patient care and be reflected in the medical record, this consideration must be addressed.

CONCLUSION

The Trinder spot test is quick, sensitive, and easily used by emergency physicians. Although the Trinder test cannot be considered to be specific for salicylate ingestion, a positive result indicates that a quantitative study should be ordered. A negative result 2 to 4 hours after ingestion, in our study population, indicated the absence of a significant salicylate ingestion. This pilot study suggests that emergency physicians can use the Trinder spot test as a sensitive bedside screen for salicylates, saving time and precluding further, more expensive tests.

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