Transient Psychosis in an Immune-Competent Patient After Oral Trimethoprim-Sulfamethoxazole Administration

Mohsen Saidinejad, MD; Michele Burns Ewald, MD; and Michael W. Shannon, MD, MPH

ABSTRACT. We describe a rare adverse reaction to trimethoprim-sulfamethoxazole (TMP-SMX; Septra, Bactrim) in an immune-competent female adolescent. She was prescribed TMP-SMX for a urinary tract infection, which she had developed while being treated in the hospital for an extensive leg cellulitis. Shortly after receiving her third dose of TMP-SMX, she developed an acute altered mental status with agitation as well as vivid visual and auditory hallucinations. After prompt discontinuation of TMP-SMX, the patient slowly began to improve and was able to return to her baseline mental status within 10 days. No residual mental status changes were present. Despite the recent emergence of multidrug-resistant bacterial pathogens, TMP-SMX, one of the first-generation broad-spectrum antibiotics, continues to be widely prescribed, in part because of its low cost and its easy availability. It is generally well tolerated and is associated with relatively few adverse effects. More common toxicities associated with TMP-SMX include hypersensitivity reactions, bone marrow suppression, and gastrointestinal side effects. Central nervous system toxicity is very rare; when reported, it has been in an immune-compromised or an elderly patient. Pediatrics 2005;115:e739–e741. URL: www.pediatrics.org/cgi/doi/10.1542/peds.2004-1352

Trimethoprim-sulfamethoxazole (TMP-SMX) is a widely prescribed antibiotic agent for the management of several uncomplicated infections. In addition, it remains a first-choice agent for prophylaxis against Pneumocystis carinii pneumonia. At therapeutic doses, it is relatively safe and effective. Serious side effects are seldom reported in immune-competent patients. We describe a case of acute psychosis in a young immune competent patient who had ingested TMP-SMX. The patient made a full recovery within 10 days of discontinuing the medication.

CASE REPORTS

A 19-year-old female adolescent who had a history of spina bifida and paraplegia and had been on no chronic medications other than occasional ibuprofen for analgesia presented to the emergency department with an extensive cellulitis of her left foot. She was admitted to the hospital for intravenous antibiotic management with oxacillin. The patient also had a history of urinary retention, which required intermittent bladder catheterization, and several previous urinary tract infections (UTIs), for which she had always been treated successfully with amoxicillin. More recently, ciprofloxacin was used to treat her UTI. On her first hospital day, a catheterized urine specimen was obtained from the patient and was noted to be cloudy. A urinalysis confirmed the presence of a UTI. Antibiotic therapy was initiated with twice-daily TMP-SMX (160 mg of TMP and 800 mg of SMX per double-strength tablet). This was the first occasion when TMP-SMX was used to treat her UTI.

On the second hospital day, shortly after receiving her third dose of TMP-SMX, the patient suddenly became confused and agitated. She was found staring at the wall of her hospital room and shouting inappropriate words while seeming to follow imaginary objects on the wall with her eyes. Administration of lorazepam (2 mg) seemed to improve the patient’s agitation; however, she did not regain lucidity after the episode. She remained awake but continued to be confused and could not follow verbal commands. A computed tomography scan of her head did not reveal any acute bleed or mass. An evaluation of her electrolytes revealed mild hyponatremia (Na = 131 mEq/L) and hypophosphatemia (phosphorus = 1.9 mg/dL) but was otherwise unremarkable. Her glucose was also normal. A lumbar puncture revealed a slight protein elevation (protein = 52 mg/dL), but the remainder of her cerebrospinal fluid analysis was normal. A comprehensive toxicology screen was negative as was a qualitative HIV testing. Finally, all bacterial and fungal cultures were negative.

Because of the acute nature of the patient’s mental status changes, a review of her medications was conducted and TMP-SMX was suspected as the agent responsible for the abrupt change in the patient’s mental status. Her other medications, which were oxacillin and multivitamins, did not seem to have a side effect profile that would produce such central nervous system (CNS) disturbances. On additional questioning of her family regarding any other medications, the patient’s parents did not report any antipsychotics or other chronic medications. A detailed family history revealed mood disorders in 2 distant cousins on the paternal side of the family and also a second cousin on the maternal side of the family with schizoaffective disorder. No other psychiatric illnesses were reported in the family.

At this time, TMP-SMX was discontinued and intravenous ceftriaxone was initiated for the continued management of the patient’s UTI. Over the following 24 hours, the patient had sustained intermittent hallucinations, although they seemed to change from visual to predominantly auditory ones in nature. She was able to communicate to the hospital staff that she was hearing voices and that these voices were angry with her. She was evaluated by the neurology and psychiatry services, and on hospital day 3, olanzapine (Zyprexa) therapy was initiated.

On hospital day 4, the patient was transferred to the psychiatric ward of a tertiary care hospital for additional evaluation. Her serum chemistries at this time all were within the normal range.
Psychiatric evaluation of the patient did not reveal any findings consistent with the Diagnostic and Statistical Manual of Mental Disorders IV, Revised, diagnosis for a primary psychiatric disorder. She remained on olanzapine, oxacillin, and ceftriaxone. On hospital day 6, the patient was able to communicate with the hospital staff that she felt exhausted and that the voices and the images had stopped. She continued to improve and was released on the hospital day 8 with the psychotic episode entirely resolved. The patient stated that she was eager to return to school. A follow-up visit 2 days later with her pediatrician revealed no residual altered mental status.

**DISCUSSION**

TMP-SMX, a widely prescribed first-generation, broad-spectrum antibiotic medication, is composed of a sulfonamide with TMP. The sulfonamides have been used clinically since 1935 as the first antibiotic agents directed against a wide variety of bacterial pathogens. In 1968, the combination of sulfonamides and TMP was first registered for clinical use. TMP-SMX acts by producing a sequential blockade of folic acid synthesis. The sulfonamides are competitive inhibitors of para-aminobenzoic acid, an intermediate compound in the synthesis of folic acid. TMP binds and irreversibly inhibits the enzyme dihydrofolate reductase, preventing the reduction of dihydrofolic acid to tetrafolic acid. Subsequently, a decrease in the production of folic acid itself is observed. Combining TMP and SMX provides a synergistic effect, making this a bactericidal antibiotic, whereas, individually, sulfonamides and TMP are bacteriostatic.

TMP-SMX is absorbed rapidly from the gastrointestinal tract and reaches therapeutic concentrations in all body fluids, including expressed breast milk. For this reason, it is contraindicated for breastfeeding preterm infants. It is also not indicated in individuals with glucose 6-phosphate dehydrogenase deficiency state. An increased risk as a result of their relative folate absorption is observed. For patients with chronic renal or hepatic failure, the elderly are also at risk due to impaired drug elimination. The elderly are also at the onset of mental status changes in the patient described in this case report. TMP-SMX is generally well tolerated by most immune-competent patients and is a cost-efficient therapy directed toward specific pathogens. Recent emergence of bacterial resistance to TMP-SMX has resulted in a slight decrease in the prescription rate of this medication for Pneumocystis carinii pneumonia prophylaxis, as well as for several other clinical indications. Overall, TMP-SMX continues to be prescribed widely, in part as a result of its cost-effectiveness.

Several adverse reactions have been associated with the ingestion of TMP-SMX. The most commonly reported adverse effects of TMP-SMX are gastrointestinal in nature, including nausea, anorexia, vomiting, and diarrhea. Hypersensitivity reactions also occur frequently with the longer acting sulfonamides. Drug fevers have been seen in immune-compromised patients, particularly those with HIV. Other adverse events reported in the literature include electrolyte abnormalities such as hyperkalemia and hyponatremia. Rare toxicities associated with TMP-SMX include hematologic abnormalities, such as severe thrombocytopenia, hepatitis, and pancreatitis.

CNS adverse reactions associated with TMP-SMX are very rare and, when reported, have occurred in immune-compromised patients or the elderly. The exact mechanism for the CNS toxicity of TMP-SMX in these patients is not known, but it is thought that impaired metabolism and clearance of the drug may result in accumulation of toxic drug levels. This fact, combined with the excellent CNS penetration of TMP-SMX, may contribute to CNS complications. In addition, frequent infections and prolonged therapy with TMP-SMX in the immune-compromised patient may result in sustained higher drug levels. Cases of aseptic meningitis or delirium in immune-compromised and elderly patients have been reported. In contrast, cases involving immune-competent patients with CNS adverse events are rarely reported. One recent case in the literature described an immune-competent patient who developed transient tremors while taking TMP-SMX, which resolved in 2 days after discontinuation of the medication.

**SUMMARY**

CNS adverse reactions after TMP-SMX administration are very rare and, when present, occur in the elderly and the immune compromised. The finding of acute transient psychosis in a young, immune-competent patient after the administration of TMP-SMX is extremely rare and has not been reported previously in the pediatric literature. In light of this report, health care providers may consider a discus-
sion of this very rare adverse affect when prescribing TMP-SMX.

REFERENCES

Transient Psychosis in an Immune-Competent Patient After Oral Trimethoprim-Sulfamethoxazole Administration
Mohsen Saidinejad, Michele Burns Ewald and Michael W. Shannon
Pediatrics 2005;115:e739; originally published online May 2, 2005;
DOI: 10.1542/peds.2004-1352

Updated Information & Services
including high resolution figures, can be found at:
/content/115/6/e739.full.html

References
This article cites 13 articles, 1 of which can be accessed free at:
/content/115/6/e739.full.html#ref-list-1

Citations
This article has been cited by 4 HighWire-hosted articles:
/content/115/6/e739.full.html#related-urls

Subspecialty Collections
This article, along with others on similar topics, appears in the following collection(s):
Toxicology
/cgi/collection/toxicology_sub
Allergy/Immunology
/cgi/collection/allergy:immunology_sub

Permissions & Licensing
Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:
/site/misc/Permissions.xhtml

Reprints
Information about ordering reprints can be found online:
/site/misc/reprints.xhtml
Transient Psychosis in an Immune-Competent Patient After Oral Trimethoprim-Sulfamethoxazole Administration
Mohsen Saidinejad, Michele Burns Ewald and Michael W. Shannon
Pediatrics 2005;115:e739; originally published online May 2, 2005;
DOI: 10.1542/peds.2004-1352

The online version of this article, along with updated information and services, is located on the World Wide Web at:
/content/115/6/e739.full.html