Case Report

Delirium due to Scopolamine Patch in a 4-Year-Old Boy

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The scopolamine patch is usually used to reduce postoperative nausea and vomiting associated with anesthesia and/or surgery. It is also commonly used for the prevention of motion sickness. Transdermal scopolamine patches have been used for decades and there are few reports in the literature of toxic psychosis associated with the product. Most documented cases of acute psychosis following administration of scopolamine or other anticholinergic agents have been from the adult population. Here we present a 4-year-old boy with deteriorated cognitive function and changed mental status acutely. Besides flushing skin and psychotic behaviors including bizarre actions, hallucinations, aggressive behavior, hyperactivity, and incoherent speech were also noticed. Symptoms and signs were resolved after removal of scopolamine patch and conservative management. This case is possibly one of the youngest patients to exhibit such toxic effects. We hope to relay information about common agents with anticholinergic effects to clinical practitioners and remind that drug-induced psychosis should be considered in children with acute changes in behavior.

Key Words: anti-cholinergic agents, delirium, scopolamine patch

Scopolamine patches are mostly prescribed in adult patients to reduce postoperative nausea and vomiting (PONV) associated with anesthesia and surgery. They are also used in surgical patients for mild analgesic and sedating effects. Delirium or mental confusion can occur after application of scopolamine patch. However, predisposing factors for scopolamine-induced delirium are not known. Most of these cases have been reported in the adult population, especially in the elderly. To our best of knowledge, this case is the youngest toxic report.

Case Report

A 4-year-old boy exhibiting cognitive deterioration was presented to the emergency room in a dissociative mental state. The symptoms had been developed over the previous 8 hours, with
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featured bizarre behavior (he perceived his finger as a pencil and asked his mother to sharpen it), hallucinations (pointed out nonexistent objects; grasping or picking at imaginary objects), aggressive behavior (hanging his head against the wall), hyperactivity, and incoherent speech.

Upon arrival at the emergency department, the boy was incoherent and hyperactive and was held still by his father. Flushing skin was noted all over his body, especially in the head and neck region. His presenting vital signs were as follows: body temperature, 38.1°C; heart rate, 112 beats/min; respiratory rate, 20 breaths/min; and blood pressure, 104/74 mmHg. Physical examination revealed mildly dilated pupils with normal light reflex and generalized skin erythema which was hot to touch, particularly in the head and neck region. The cognitive deficits were quite remarkable because he was not oriented to place or time and was unable to recognize previously familiar people. Besides urinary retention, no focal neurological abnormalities were noted. There was no history of head trauma, and no definitive injuries were identified. Two dime-sized patches were found behind both ears. His parents said that these patches were placed by the patient’s grandmother 1 day before to prevent motion sickness from an upcoming long-distance journey. Each patch contained 1.5 mg of scopolamine.

The patient’s mother provided a past medical history of the boy, which is significant for allergic rhinitis and the patient was not taking any prescription medications at that time. The grandmother replaced the applied scopolamine patches on next day, presuming that there would be an enhanced effect of preventing motion sickness. Laboratory results for serum sodium, potassium, chloride, blood urea nitrogen, creatinine, alanine aminotransferase, aspartate aminotransferase, sodium bicarbonate, creatine kinase, creatine kinase-MB, glucose, magnesium, free calcium, and C-reactive protein were within normal limits. The hemoglobin concentration was 12.9 g/dL and the leukocyte count 12 × 10⁹/L, with 80.2% segment form of neutrophils. The drug screen was negative for salicylates, methanol, amphetamine, cocaine, cannabinoids, benzodiazepine, opiates, or phencyclidine. The chest X-ray was normal. Due to his bizarre behavior and suspicion of scopolamine intoxication, he was admitted for further evaluation. Removal of the patches with conservative treatment was initiated, and toxicologist was consulted.

That evening after admission the patient was still hyperactive and he was given chloral hydrate per rectal to promote sleep. The skin rash faded gradually after removal of the patches and the fever subsided. However, his mother reported that the patient complained of dizziness and blurred vision.

On the next day, the patient’s vital signs were stable but he was still hyperactive. Speech improved and became coherent but he still had difficulty in initiating sentences. He continued to complain about blurred vision and dizziness so we consulted an ophthalmologist. No definitive cause of blurred vision was found due to lack of patient cooperation for the visual acuity tests.

On the third day, he became relatively improved compared to the previous 2 days but his mother found that he still had memory deficits, including difficulty in recognizing a close neighbor and incompletely singing a familiar Taiwanese children’s song. Fortunately, he continued to improve and was discharged on Day 4 to outpatient treatment. He was completely recovered 2 days later.

Discussion

Delirium is characterized as rapid onset of changes in mental status and loss of memory. This disease has various synonyms, including encephalopathy, acute organic brain syndrome, acute confusional state, and, less commonly, acute toxic psychosis. Clinical manifestations of delirium include confusion, memory loss, disorientation to time and space, delusions and hallucinations, and incoherent speech. Occasionally, the symptoms fluctuate over time. The cause for delirium is thought to be a global disturbance in cerebral cortex functioning sparing the cerebellum. Excessive neurotransmitter release and abnormal signal transduction are thought to be the mechanisms for delirium.
Overactivity of muscarinic receptors in the reticular activating system which is located in the cerebral cortex and hippocampus, may cause disturbances to cognition and thereby contribute to typical manifestations of delirium.

Scopolamine patches are mostly prescribed in adult patients to reduce postoperative nausea and vomiting (PONV) associated with anesthesia and surgery. They also have mild analgesic and sedating effects for some surgical patients. The transdermal scopolamine may also be used to reduce drooling in children with disabilities or brain damage. Scopolamine is an antimuscarinic drug, with effects similar to those of atropine. Scopolamine is derived from an alkaloid of belladonna (Atropa belladonna, commonly known as deadly nightshade), and it works by depressing the action of the nerve fibers near the vomiting center of the brain and central nervous system. In therapeutic doses, it antagonizes acetylcholine at muscarinic receptors, but in high doses, it can also antagonize nicotinic receptors. The lethal dose of scopolamine has been reported to be $\geq 2–4$ mg. The plaster contains a reservoir of 1.5 mg of scopolamine programmed to deliver 0.5 mg over a 3-day period. A priming dose (140 $\mu$g) is incorporated into the adhesive layer to saturate certain binding sites within the skin and to accelerate the achievement of steady-state blood levels. The remainder is released at a constant rate of approximately 5 $\mu$g per hour. The scopolamine patch attains that concentration after 6 hours and a steady state of about 100 pg/mL is achieved 8–12 hours after application. In this pediatric case, he was treated with scopolamine patches over both postauricular areas and received repeated applications of plasters one day later. Due to his acute confusional state and the clinical manifestations of anticholinergic effects, scopolamine intoxication is highly suspected.

Common complications or side effects from scopolamine include, but are not limited to: confusion, hallucination, fatigue, short-term memory loss, difficulty with urination, blurred vision, skin redness, and changes in heart rate. Reduced accommodation, nearsightedness, and strabismus are the common visual side effects from transdermal scopolamine. The phrase “red as a beet, hot as a hare, dry as a bone, blind as a bat, mad as a hatter” can be used to describe a person with anticholinergic intoxication. This represents the flushed skin, hyperthermia, dry mucous membranes, blurred vision, and confusion or delirium that a patient may manifest. Adverse effects were not correlated with plasma scopolamine concentrations.

Most cases of scopolamine intoxication can be treated by discontinuing the offending drug and providing them with supportive care to reduce fever, cool the patient, and maintain hydration. Benzodiazepines can be used to decrease the patients’ agitation and restlessness. For patients who experience toxic psychosis for up to 48 hours and pose a danger to both themselves and others, it may be necessary to hospitalize these patients for close observation and management. In previously reported cases, most patients were treated with supportive care and benzodiazepines and recovery typically occurred within 24–48 hours. However, in our case, the patient completely recovered after about 96–120 hours. This may be due to the younger age of our patient and higher dosage of scopolamine absorbed. The serum level of scopolamine was not measured due to laboratory limitations. Physostigmine, an acetylcholinesterase inhibitor, is reserved for patients with serious anticholinergic-induced agitation, delirium, and hallucinations. A test dose of physostigmine, usually 0.5 or 1 mg, administered intramuscularly, subcutaneously, or intravenously may be given while the patient is observed. The patients’ vital signs should be monitored for possible arrhythmias or hypotension from physostigmine-induced cholinergic crisis. Relative contraindications to physostigmine administration such as renal hypertension, hyperthyroidism, diabetes, and coronary artery disease should be excluded before this drug is prescribed.

The safety of scopolamine patches has not yet been determined in children and the effects of this drug may be cumulative; therefore the drug’s use in pediatric patients is not recommended.
Furthermore, scopolamine patches should never be cut into pieces as cutting destroys the time-release mechanism of the drug. The take home message of this case is to relay information about common agents with anticholinergic effects to clinical practitioners and that drug-induced psychosis should be considered in pediatric patients with acute changes in behavior.

References