Steroid-induced psychosis in a child with croup: A case report

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Abstract

Corticosteroids are effective for the treatment of many chronic and acute diseases but have many well-known adverse effects, which limit their use in some conditions. Steroid-induced psychosis is a rare side effect especially in the pediatric population. Although the estimated incidence of steroid-induced psychosis in adults is approximately 6%, it is rarely reported in the pediatric population. Moreover, it is poorly characterized and described in the literature. We report the case of a 4-year-old boy with no known medical or psychiatric history who presented to the emergency department with respiratory complaints. After observation and monitoring, the patient was diagnosed as having croup. A single dose of 8 mg dexamethasone was started intravenously. Within 3 h after the injection, the patient experienced psychiatric disturbances, including abnormal behaviors, anxiety, disorientation, decreased speech, and sleep disturbance. During the first 48 h of admission, the symptoms improved gradually, without using further medication during the rest of his hospital stay.

Keywords
Steroid, corticosteroid, psychosis, croup, neuropsychiatric disturbance, neurological symptoms

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Introduction

Croup is a common respiratory disease in the pediatric population. Laryngotracheitis, laryngotracheobronchitis, and laryngotracheobronchopneumonitis belong to the croup spectrum.¹ ² The pediatric incidence of croup is 3% between ages 6 months and 3 years and more frequent in girls than in boys.¹ ² The major cause of croup is viruses, accounting for 80% of all cases, among which parainfluenza virus accounts for 75%.³ ⁴ Clinical diagnosis is the standard diagnosis of croup. It includes many common symptoms accompanying the disease, such as barking cough, acute stridor, and hoarseness due to airway narrowing. The symptoms may worsen with emotional stress and in the night time, usually lasting 24–48 h.¹ Of all croup cases, <5% require hospital admission, of which only 1%–3% need intubation. The mortality rate in intubated cases is approximately 0.5%.³ ⁵ Croup is treated according to its severity, which is often classified using the Westley croup scoring system.⁵ Corticosteroids could be used for croup of any severity.⁶

Corticosteroids belong to a class of steroid hormones secreted naturally by the adrenal cortex and involved in many important biological functions in human body. They are used in the treatment of a wide range of diseases, such as autoimmune diseases, asthma, arthritis, eye and skin disorders, and some types of cancer.⁶ ⁷ Although corticosteroids are effective for several diseases, their many adverse effects limit their use. These adverse effects appear depending on the treatment dose and duration.⁸ ⁹ The most common adverse effects are immunosuppression, adrenal suppression, osteoporosis, gastrointestinal complications, and neuropsychiatric disturbances.⁸ Many corticosteroid-induced somatic symptoms are well recognized.⁷ Some adverse effects such as neuropsychiatric disturbances were mostly described but poorly characterized in case reports.⁷ Steroid-induced psychosis is used to describe a wide range of neuropsychiatric symptoms resulting from the use of corticosteroids. It is a well-recognized phenomenon in adults, with an incidence of approximately 6% but rarely reported in the pediatric population, with no reliable incidence rate.⁷ ¹⁰ As steroid psychosis has a broad definition and mixed neuropsychiatric symptoms, its true incidence is

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difficult to determine. The symptoms include agitation, mood lability, insomnia, anxiety, hallucination, altered mental status, and delirium.7 Hodkins et al. performed a systematic review of the literature for steroid-induced psychosis among pediatric and adolescent populations. The study identified 15 cases of steroid-induced psychosis in patients treated with steroids for different diseases such as asthma, autoimmune diseases, and cancer. Moreover, in the reported cases, asthma was the most common indication for steroid therapy in pediatric patients.11 Based on our literature search, we believe the present case is probably the first reported pediatric case diagnosed with croup and developed steroid-induced psychosis.

Case

A 4-year-old Saudi boy with a weight of 14 kg with no known medical or psychiatric history was brought to the emergency department of King Saud Hospital in Unaizah, Qassim, Saudi Arabia. He presented to the emergency department with fever associated with a dry, non-paroxysmal (barking) cough. He had no history of vomiting, diarrhea, headache, or abnormal movement. His growth and development were appropriate for his age. Moreover, in terms of his family history, no one of his family members was reported to have a history of psychiatric disturbances or was on any antipsychotic medications.

His parents reported that he was well until the day before, when he developed a fever with a body temperature of 38.6°C. It was associated with dry, barking cough, which progressed with time and was associated with shortness of breath. They first observed stridor 2 h before the emergency department visit.

On physical examination, the patient looked distressed, with nasal flaring and good hydration and no cyanosis. His body temperature was 38.2°C; respiratory rate, 44 breaths per minute; heart rate, 113 beats per minute; and oxygen level, 98% at room air. He had red, swollen tonsil, and expiratory stridor with intercostal retraction. Thus, he was diagnosed as having croup.

The patient started treatment with 8 mg dexamethasone administered intravenously. Within 3 h after the injection, his mother noticed some abnormal behavior in the form of hitting one hand with the other in a strange way and some abnormal responses to questions from family members. The patient was re-examined lying in bed, without distress. Psychiatric evaluation revealed that he was agitated, irritable, confused, and he was restless with poor eye contact. Moreover, he had a fear from being away from his mother and disoriented to place and person. In addition, based on the child mother, the patient suddenly woke up with abnormal head movements, and it seemed that he was hearing voices. This suggested that the patient was experiencing auditory hallucinations. However, the hallucinations could not be firmly confirmed because of the patient’s age. The patient’s level of consciousness was 14 out of 15 using Glasgow Coma scale (GCS).12 Consequently, he was admitted for close observation and full examination. His complete blood count, glucose level, electrolyte count, and urine examination, liver function test, kidney function test results were normal. Cerebrospinal fluid analysis and brain magnetic resonance imaging revealed no abnormalities. The electroencephalogram (EEG) showed normal study. All cultures were negative.

During admission, the patient was hypoaactive, crying, refusing to engage with clinical and nursing staff. In addition, he was unresponsive to his mother or responsive but with incomprehensible sentences and had episodes of screaming that lasted for hours. He had decreased appetite with sleep-wake disturbances. After the first 48 h of admission, the symptoms gradually improved. On the fifth day of admission, the child was discharged because he was doing well, afebrile for >48 h with good activity, and responsive and communicating properly. At 2-weeks’ follow-up in the outpatient department, he was alert, cooperative, and interacting well with parents.

Discussion

The pathophysiology of steroid-induced psychosis is unclear, but synthetic steroids are known to activate glucocorticoid receptors that interfere with the cortical pathway of the hypothalamic-pituitary-adrenal axis, causing mood disorders.13 This phenomenon is classified by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) as medication-induced psychosis.14 The glucocorticoids could cause alteration in production and concentration of some neurotransmitter (e.g. dopamine and serotonin) which may contribute to psychiatric symptoms.7

It is dose-dependent phenomenon which means the psychiatric symptoms are more likely to happen with high dose of steroids. However, high steroid doses may not predict the severity and type of these symptoms and how long the symptoms last.11,14 Neuropsychiatric adverse effects may appear with very low dose equivalent to 2.5-mg prednisolone.7 Also, it may occur with any type of steroids. Some evidence in the literature suggested that oral dexamethasone have a higher risk to develop neurosynaptic symptoms other corticosteroids, but this need further validation.7

To meet the diagnosis criteria for steroid-induced psychosis, the symptoms should cause clinically significant distress, functional impairment, or the patient have at least hallucination or delusion after the steroids were given. Moreover, other factors that could cause neuropsychiatric symptoms, such as electrolyte imbalance, infection, and hypoglycemia must be ruled out.11,14

In this case, the patient was examined and observed closely to exclude any suspected diseases and was found to have no specific underlying disease, including psychiatric disorders. Steroid-induced psychosis manifest mild to severe symptoms, ranging from anxiety, insomnia, and irritability to mania, psychosis, delirium, and depression, among others.15

As the patient in this case experienced mixed symptoms of neuropsychiatric disturbances such as anxiety, disorientation, restlessness, agitation, and sleep disturbance, the pediatric team obtained psychiatric evaluation for the child,
which revealed that the symptoms were more likely due to the use of steroids. Many studies have shown that symptoms may develop at the beginning or late during steroid therapy and, in some cases, after treatment completion. Moreover, the duration of the symptoms varies.\textsuperscript{14,15} In most cases, the symptoms present within the first 5 days after treatment.\textsuperscript{15} Interestingly, in this case, the symptoms started to manifest shortly after administration of a single dose of dexamethasone. The psychotic symptoms persisted for almost 5 days thereafter. Several studies reported that in most cases, the psychiatric symptoms disappear on steroid therapy cessation or dose tapering.\textsuperscript{16–18} Psychopharmacological treatment using antipsychotic agents (e.g. olanzapine and risperidone) could be used when symptoms are too severe or when treatment discontinuation or dose tapering is insufficient to alleviate the psychiatric symptoms.\textsuperscript{15} Some studies suggested that lithium therapy could be used as prophylactic therapy to prevent steroid-induced psychiatric disturbances. Lithium therapy could be given to patients who previously developed psychiatric symptoms after steroid doses.\textsuperscript{15} Owing to the possible adverse effects of antipsychotic agents, we preferred full examination and close observation for the patient over the use of antipsychotics. The patient’s psychiatric symptoms improved without using further medications.

**Conclusion**

Only few studies have reported cases of psychiatric disturbance resulting from steroid treatment in the pediatric population. Our patient experienced psychiatric disturbance symptoms including abnormal behaviors, anxiety, disorientation, decreased speech, and sleep disturbance after receiving a single dose of dexamethasone. The symptoms gradually improved without any further intervention. This case report along with more evidence may help clinicians identify and manage the symptoms of this iatrogenic phenomenon.

**Declaration of conflicting interests**

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**Ethical approval**

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