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Case Report

Managing Adrenal Insufficiency in a Pediatric Asthma Patient: A Case of Transition from Inhaled Corticosteroids to Tiotropium Bromide and Ciclesonide

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Abstract

The use of inhaled corticosteroids (ICS) is a cornerstone in the management of asthma, significantly reducing inflammation and improving respiratory function. However, prolonged ICS therapy can lead to systemic side effects, including adrenal insufficiency (AI) [1,2], a condition where the adrenal glands fail to produce adequate levels of cortisol. AI can have serious implications for patient health, especially linear growth, necessitating careful management and alternative therapeutic strategies.

Keywords: Inhaled Corticosteroids (ICS); Asthma

One potential alternative for asthma management in patients with ICS-induced AI is the use of Spiriva (tiotropium bromide) and Ciclesonide, [3,4,9,10] an ICS with reduced systemic absorption and high pulmonary deposition [6,2,3].

This case study explores the utilization of Ciclesonide and Spiriva in patients who have developed adrenal insufficiency secondary to long-term inhaled corticosteroid use for asthma treatment [1,7]. By examining clinical outcomes, patient experiences, and the overall impact on asthma control, this study aims to provide insights into the viability of Ciclesonide and Spiriva as an alternative or adjunctive therapy in this unique patient population to decrease the risk of AI and poor growth.

Case

This case involves a 13-year-old patient with moderate persistent asthma who developed adrenal insufficiency (AI) secondary to long-term inhaled corticosteroid (ICS) use [1,7,2]. The patient was initially treated with Advair (fluticasone/salmeterol), but significant growth deceleration was observed shortly after starting the medication. This prompted a referral to an endocrinologist for further evaluation.

The endocrinologist's assessment revealed that the patient's weight and height were at the 3rd and 4th percentiles, respectively, with suboptimal growth velocity. Bone was 9 years with chronological 13 years with predicted adult height (PAH) 70 inches, consistent with the mid-parental height (MPH) of 69 inches. Physical examination shows Tanner stage 1 for pubic hair and prepubertal tests. Laboratory tests showed a normal thyroid function test, normal growth factor, negative celiac screen and was significant for low AM cortisol level, ACTH Stim test showed low stimulated cortisol level at 30 and 60 minutes with peak cortisol level of 0.5, confirming AI. At the time, the clinical reasoning was that adrenal insufficiency (AI) was contributing to the patient's poor linear growth. This is because cortisol deficiency can disrupt normal growth patterns in children. In cortisol deficiency, the lack of adequate glucocorticoid levels impairs growth hormone secretion and action.

To manage AI, the patient was started on physiological oral steroids with a weaning plan and their caregiver's received education on stress dose steroids and. Given the diagnosis of AI, endocrine team discussed with the pulmonology team for other options given

the patient will start oral steroid for the steroid weaning plan, pulmonology switched the patient's asthma treatment from Advair to Spiriva (tiotropium bromide) and Ciclesonide. Spiriva, a long-acting anticholinergic, and Ciclesonide, an ICS with reduced systemic absorption and high pulmonary absorption to maintain effective asthma control while minimizing further systemic corticosteroid exposure.

The patient was advice to repeat 8 am cortisol 2 days after completing the weaning of steroid. Results show low but improved from last time cortisol level (5.4 as compared to <0.2 during initial evaluation). ACTH stimulation test was ordered which shows improved cortisol level at 12 but still less than optimal level of > 15. During the follow up visit, am cortisol was repeated which came back in acceptance level [10]. Growth and puberty assessment were also progressing from Tanner stage was I for pubic hair and prepubertal testes to Tanner stage IV for pubic hair and testis is 15 ml bilaterally. Growth parameters demonstrated the patient's weight increasing from 3rd to 34th percentile and height from 4th to 13th percentile with growth velocity 14 cm/year.

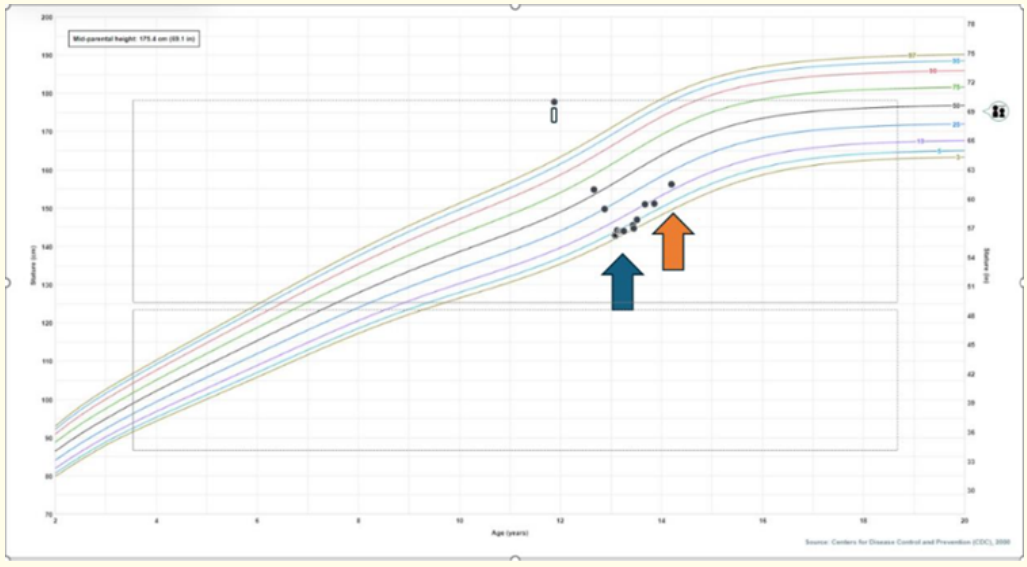

Figure 1

As pointed in the graph, blue arrow showing patient initial presentation with length at 3rd percentile and orange arrow showing length at 13th percentile after receiving the steroids.

Discussion

This case report highlights the complex interplay between asthma management with inhaled corticosteroids (ICS) and the potential development of adrenal insufficiency (AI) as a serious side effect, particularly in pediatric patients. A 13-year-old with moderate persistent asthma demonstrated significant growth deceleration following the initiation of Advair (fluticasone/salmeterol), raising concerns about underlying endocrine complications. The patient was referred to endocrinology, where a comprehensive evaluation—including growth chart analysis, delayed bone age, and suboptimal growth velocity—led to further testing. Laboratory findings confirmed AI, with low cortisol levels following stimulation, consistent with suppression from exogenous corticosteroid use.

This case underscores the well-documented risk of systemic side effects associated with long-term ICS use, especially during critical periods of growth and development. Following the diagnosis, the patient was started on physiologic oral glucocorticoids with a weaning protocol and educated on the use of stress-dose steroids during illness or physical stress. Encouragingly, subsequent follow-ups showed improvement in both weight and height percentiles, indicating a positive response to appropriate endocrine management.

A key component of the patient's recovery involved a strategic modification of asthma therapy. The pulmonologist transitioned the patient from Advair to a combination of Spiriva (tiotropium bromide), a long-acting anticholinergic, and Ciclesonide, an ICS known for its favorable pharmacokinetic profile [1,2].

Ciclesonide has high pulmonary deposition and low systemic bioavailability due to reduced gastrointestinal absorption, making it a safer alternative in patients at risk for steroid-related side effects.

This therapeutic switch proved successful in maintaining effective asthma control without exacerbating AI symptoms. The case illustrates the importance of individualized asthma treatment plans that account for both respiratory and endocrine health. In pediatric patients, particularly those experiencing growth abnormalities or other systemic effects, alternative inhalers with reduced systemic absorption should be considered.

Conclusion

This case study demonstrates that transitioning from inhaled corticosteroids (ICS) to Spiriva (tiotropium bromide) and ciclesonide in patients with adrenal insufficiency secondary to long-term ICS use can yield positive outcomes [10,11]. Following the switch and administration of steroid weaning plan, patients experienced notable improvements in growth parameters. Additionally, asthma control remained robust, highlighting Spiriva and ciclesonide effectiveness as alternative therapy.

In conclusion, this case reinforces the need for vigilance in monitoring children on long-term ICS therapy for signs of adrenal suppression and growth impairment. It also demonstrates that with early recognition, proper endocrine management, and thoughtful adjustment of asthma medications, the negative impact on growth and adrenal function can be mitigated. Personalized approaches to asthma care are essential for optimizing both pulmonary outcomes and overall health in children.

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