

Single-dose dexamethasone for mild-to-moderate asthma exacerbations

Effective, easy, and acceptable

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Abstract

Question I prescribe oral steroids for children in my community when they suffer asthma exacerbation. How many doses of steroids are recommended? Do all children need to take steroids for 5 days?

Answer Traditionally, mild-to-moderate pediatric asthma exacerbations have been treated with a short course of oral steroids—often 5 days of prednisone or prednisolone. However, recent evidence suggests a similar outcome can be achieved with a single dose of dexamethasone, which has a longer half-life and powerful anti-inflammatory effects, along with easier administration and compliance. Single-dose dexamethasone offers a simple and reliable treatment for these patients in office, urgent care, and emergency department settings.

Dose unique de dexaméthasone pour les exacerbations de l'asthme de faibles à modérées

Efficace, facile et acceptable

Résumé

Question Je prescris des stéroïdes par voie orale aux enfants dans ma communauté quand ils souffrent d'une exacerbation de l'asthme. Combien de doses de stéroïdes recommande-t-on? Tous les enfants doivent-ils prendre des stéroïdes pendant 5 jours?

Réponse Habituellement, on traitait les exacerbations de l'asthme avec un court régime de stéroïdes par voie orale - souvent de la prednisone ou de la prednisolone pendant 5 jours. Par ailleurs, de récentes données probantes font valoir l'obtention d'un résultat semblable avec une seule dose de dexaméthasone, qui a une demi-vie plus longue et des effets anti-inflammatoires puissants. Elle est aussi plus facile à administrer, et la conformité au traitement est meilleure. La dexaméthasone en dose unique offre un traitement simple et fiable pour ces patients, que ce soit en cabinet, pour des soins urgents ou à l'urgence.

Asthma is one of the most common reasons for children to present for acute evaluation. Some exacerbations warrant admission for inpatient care, but many can be managed effectively on an outpatient basis with a combination of avoiding environmental triggers, inhaled β -agonists, a short course of oral steroids, and close follow-up.

Traditionally, a short course of steroids (prednisone or prednisolone for 5 days) has been recommended.¹ Still, there is growing evidence that a single dose of dexamethasone is not only easier to take and more acceptable to patients and their caregivers, but it is also equally effective.

Effectiveness

Two pediatric studies have compared the use of 2 doses of oral dexamethasone (day 1 and day 2) with 5 days of prednisone (or prednisolone). One study of 533 children reported 10-day relapse rates of 7.4% with

dexamethasone versus 6.9% with prednisone ($P=.84$).² The other study, which had 89 children, also noted no significant difference in 10-day relapse rates between the 2 groups ($P=.27$) and no significant difference in vomiting (5 of 51 with dexamethasone vs 7 of 38 with prednisone, $P=.24$).³

Single-dose dexamethasone regimens also have been compared with 3- or 5-day use of prednisone. Single-dose regimens are of greatest interest to health care providers in ambulatory care settings because of the potential to improve compliance, as has been documented in studies of a variety of other single-dose therapies.⁴ Besides better compliance, several other mechanisms might contribute to the effectiveness of single-dose dexamethasone. First, its half-life (approximately 36 to 54 hours) is approximately double that of prednisone (approximately 12 to 36 hours).⁵ Second, dexamethasone is generally thought to have 5 times the anti-inflammatory potency of prednisone; however,

when compared against a larger dose of prednisone in recent studies, the difference in potency was less significant.⁶ Third, most of the asthma-improving effect of prednisone occurs in the first 3 days of treatment; the doses on days 4 and 5 appear to have little, if any, effect on outcome, which makes the effectiveness of a single dose of dexamethasone seem more reasonable.⁷

Intramuscular single dose

Three studies reported the use of a single dose of intramuscular (IM) dexamethasone. Klig et al⁸ conducted a pilot study with 42 children, half of whom received 0.3 mg/kg of IM dexamethasone (maximum 15 mg) once and half of whom received 2 mg/kg of oral prednisone (maximum 100 mg) for 3 days. The primary outcome measure was parental report of a lack of symptomatic improvement or the need for urgent care or hospital visits during the 5 days after enrolment, which occurred in only 2 of 21 dexamethasone patients versus 0 of 21 prednisone patients ($P=.49$). In a second study, Gries et al⁹ found similar improvements in clinical asthma scores within the first 5 days of therapy. This study contained a group of 15 children receiving a single dose of IM dexamethasone (1.7 mg/kg) and a group of 17 children receiving 5 doses of oral prednisone (2 mg/kg). In a third randomized trial, Gordon et al¹⁰ found similar asthma scores at 4 and 14 days among 126 children receiving either 1 dose of IM dexamethasone (0.6 mg/kg, maximum 15 mg) or 5 daily doses of prednisone (2 mg/kg, maximum 50 mg). Furthermore, a recent abstract described better parental satisfaction after a single dose of 0.6 mg/kg IM dexamethasone (maximum 15 mg) compared with 5 days of 2 mg/kg of oral prednisolone (maximum 60 mg).¹¹

In these studies of mild-to-moderate pediatric asthma, IM dexamethasone appears to be as effective as 3 to 5 days of oral prednisone or prednisolone.

Oral single dose

Intramuscular dexamethasone injections are painful and can be difficult to administer, so oral administration is a preferred route, especially owing to a suggested 80% bioavailability.¹²

One study followed up with 110 children at 5 days after randomization to either a single dose of oral dexamethasone (0.6 mg/kg, maximum 18 mg) or oral prednisolone (1 mg/kg per dose, maximum 30 mg) twice daily for 5 days. Overall hospital admission rates at 5 days were 9 of 56 for dexamethasone and 10 of 54 for prednisolone ($P=.80$).¹³ Patient self-assessment scores done twice daily show a median of 5 days to return to baseline in both groups.

Brown et al¹⁴ reviewed 672 patient records to assess the effect of adding oral dexamethasone to the emergency department triage standing orders for patients with asthma presenting with an exacerbation. The

addition of early oral dexamethasone at triage was associated with a lower admission rate: 24% before versus 17% after ($P=.017$).

Compliance

The compliance rates following emergency department visits for both general pediatric prescriptions¹⁵ and asthma-control medications¹⁶ are suboptimal. Single-dose treatment given in the ambulatory care setting might improve compliance.

Most of the single-dose dexamethasone studies point out its compliance advantage over multiple days of prednisone. In a study from Vancouver, BC, 10 of 261 families never filled their prednisone prescriptions, despite the fact that doing so was part of the terms they had agreed to for the study and despite being informed that there would be follow-up questions about taking the medicine.² In a study from the US Army Medical Center in Hawaii,⁹ 3 of 17 children receiving prednisone refused more than 75% of their doses and 4 additional children missed at least 30% of their doses. As many as 70% of the parents of children receiving either oral prednisone or IM dexamethasone said they would prefer the IM injection for their children's next asthma exacerbations.


Acceptability

Any move to an oral preparation, especially in the pediatric population, must take into account palatability of the medication. In a single-blind taste test among 39 children 5 to 12 years old, the palatability of dexamethasone was significantly better than that of prednisolone (8.2 cm vs 5.0 cm on a 10-cm visual analogue scale; $P=.03$).¹⁷ Furthermore, the relatively smaller volume of a dexamethasone dose allows its taste to be masked easily with flavoured syrup.

Incidence of vomiting was also raised as a concern with prednisone and prednisolone preparations. Kim et al reported an 18% vomiting rate for generic prednisolone versus a rate of 5% for the better-tasting prednisolone sodium phosphate oral solution formulation in 188 children.¹⁸ In contrast to the frequent emesis seen with prednisolone, dexamethasone is considered to have an antiemetic effect. Indeed, anesthesiologists use it frequently as a postoperative antiemetic,¹⁹ and oncologists sometimes use it to minimize chemotherapy-related vomiting.²⁰

Direct studies of dexamethasone for asthma support its tolerability. No vomiting was reported after an oral dexamethasone dose in a study of 61 children.¹³ Another study reported 1 (0.3%) case of emesis with dexamethasone versus 11 cases (3%) with prednisone ($P=.008$).² Finally, when emergency physicians substituted oral dexamethasone for prednisone in triage, post-steroid emesis was reduced from 27 of 336 cases to 0 ($P<.001$).¹⁴

Conclusion

Growing evidence suggests that single-dose dexamethasone (oral or IM) for mild-to-moderate pediatric asthma exacerbation is as effective as multiday prednisone regimens, with better taste and improved compliance. Larger-scale studies, including those to determine the safest and most effective dose, are still needed in order to build confidence in a single-dose approach for children with mild-to-moderate asthma. 

Competing interests

None declared

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