

SHORT REPORT

Crushed prednisolone tablets or oral solution for acute asthma?

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Abstract

In a randomised trial, treatment with prednisolone in two formulations (oral solution or crushed tablets) was compared in 78 young children with acute asthma. Prednisolone oral solution was better tolerated than crushed tablets (less vomiting, superior taste); clinical resolution was similar.

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In the treatment of acute severe asthma, systemic corticosteroids are preferably given by the oral route,^{1,2} but nausea and vomiting may necessitate parenteral administration. The refusal to take prednisolone crushed tablets orally because of their bitter taste³ may lead to poor compliance and slower resolution of acute asthma. We compared the tolerability and clinical effects of prednisolone crushed tablets and oral solution for acute asthma in a randomised controlled trial.

Methods and results

Seventy eight children (48 boys), aged 3 months to 8 years (mean age 24 months), presenting to our hospital with acute severe asthma and no other significant illness, in whom the attending physician considered treatment with systemic steroids indicated, participated in the study. The study was approved by the hospital's Ethics Review Board. Parents gave written informed consent.

Patients were allocated randomly to prednisolone (1 mg/kg twice daily for five days) as crushed tablets or as oral solution. Parents were advised to administer the crushed tablets with lemonade or custard. The prednisolone oral solution (5 mg/ml) was made by the hospital pharmacy and contained banana essence as flavour enhancer, sorbitol as sweetener, and methylparahydroxybenzoate as preservative. Further treatment consisted of frequent administrations of inhaled bronchodilators. Patients were admitted to hospital if they were under 2 years of age with a first asthma attack, if there was severe dyspnoea, or if transcutaneous oxygen saturation in room air was less than 92%.

If three successive attempts to administer study drug resulted in vomiting, the patient

was withdrawn from the study. Asthma severity was scored at the beginning and at the end of the study with a standardised ten point clinical asthma score.⁴ Parents kept a diary in which they scored the child's dyspnoea daily on a visual analogue scale (VAS) from 0 (no dyspnoea) to 10 (dyspnoea as severe as on the day of presentation in the hospital). The taste of the prednisolone formulation was scored on a VAS from 1 (nice taste) to 10 (foul taste).

Six to eight days after the initial visit, patients were seen by a paediatric pulmonologist, who had not seen the patient at the initial visit, and was unaware of the prednisolone formulation received. The parents were asked whether their child had recovered completely. The physician examined the child for wheezing. Assuming that 95% of children with acute severe asthma could complete the five day course of prednisolone oral solution,³ with 90% power, a sample size of 35 patients in each group was needed to detect a 25% difference in tolerability between groups with 95% confidence.

Most patients had their first attack of acute asthma requiring hospital evaluation. Ten patients (13%) were using inhaled corticosteroids prior to the study. Fifty patients (64%) were admitted to hospital. Baseline characteristics of the two treatment groups were comparable.

There were 14 withdrawals. One patient (on crushed tablets) was admitted to intensive care. Four patients (all on oral solution) did not show up for the second study visit. When contacted by telephone, the parents told us that these children had recovered completely. Nine patients (23%) withdrew from the crushed tablets group because of repeated vomiting on the first study day, compared to none (0%) in the oral solution group ($p = 0.001$).

VAS taste scores were better for oral solution (mean 3.8, SEM 0.5) than for crushed tablets (mean 7.4, SEM 0.5) (95% confidence interval for difference 2.0 to 5.1, $p < 0.001$). The changes in dyspnoea VAS scores during the study period in both study groups were similar (fig 1). At follow up, 62% of patients from the crushed tablets group and 83% from the solution group had recovered completely according to their parents ($p = 0.06$). Wheezing at follow up was slightly more common in patients from the crushed tablets group (28%) than in patients from the oral solution group (11%, $p = 0.1$).

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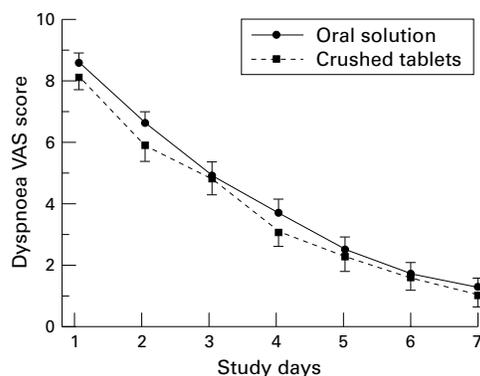


Figure 1 Change in dyspnoea VAS score during treatment with prednisolone oral solution or crushed tablets. Markers represent mean values; bars represent standard errors.

Discussion

This study shows that prednisolone oral solution is better tolerated than crushed tablets in the treatment of acute severe asthma in children. Vomiting was observed in 23% of patients using crushed tablets, and in none of the patients on oral solution. The superior taste of the prednisolone oral solution compared to tablets has been reported previously.³

There were no differences between dyspnoea scores in both study groups. Apparently, both prednisolone formulations, when tolerated, are equally effective in relieving dyspnoea in children with acute asthma. The observed trend towards improved resolution of acute asthma in the group treated with oral solution at follow up is likely to be an underestimation of the true effect because of the selective withdrawal of patients using crushed tablets. It is, therefore, likely that prednisolone oral solution

may not only be better tolerated but also be more effective than prednisolone crushed tablets in acute asthma. This could be a result of increased compliance to therapy with the more palatable solution, but also to differences in pharmacokinetics between the two formulations.⁵

Prior to the availability of oral solutions, physicians had to resort to parenteral administration of corticosteroids when (crushed) tablets were not tolerated. Over the past decade, several commercial oral corticosteroid solutions have become available, the cost effectiveness of which appears to be lower than that of simple, non-commercial formulations such as the one used in our study.⁶ Prednisolone oral solution, because it is effective, well tolerated, and cheap, should be considered as the treatment of choice for acute severe asthma in children.

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