Growth effects of systemic versus inhaled steroids in chronic lung disease

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Methods: Sixteen babies with CLD randomly received inhaled budesonide (100 µg four times daily for 10 days via Aerochamber) or systemic steroids (dexamethasone 0.5 mg/kg/day, reducing over nine days). Linear growth (lower leg length, LLL) was measured by knemometry twice weekly. Results: The gestational age, birth weight, postnatal age, and LLL velocity (LLLvel) were similar between the two groups at the start of treatment. At the end of the treatment period, LLLvel was reduced in the dexamethasone group (mean −0.01 mm/day) but had increased in the budesonide group (mean 0.48 mm/day). Mean weight gain was non-significantly lower in the dexamethasone group (5.8 g/kg/day) compared to the budesonide group (mean 12.7 g/kg/day).

Conclusion: Inhaled budesonide has less short term effects on growth than systemically administered dexamethasone.

RESULTS

Aim: To compare the effects of inhaled and systemic steroids on growth in very low birthweight (VLBW) infants with chronic lung disease (CLD).

Methods: Sixteen babies with CLD randomly received inhaled budesonide (100 µg four times daily for 10 days via Aerochamber) or systemic steroids (dexamethasone 0.5 mg/kg/day, reducing over nine days). Linear growth (lower leg length, LLL) was measured by knemometry twice weekly.

Key message

- Systemic steroids have immediate adverse effects on growth
- Inhaled steroids appear to have less acute effects on growth

Abbreviations: BMF, breast milk fortifier; CLD, chronic lung disease; LLL, lower leg length; LLLvel, LLL velocity; VLBW, very low birthweight
mean LLLvel at the end of the study was −0.01 mm/day in the dexamethasone group and 0.48 mm/day in the budesonide group (p < 0.001; table 1). Five of the eight infants in the dexamethasone group had a negative LLLvel at the end of the study period, indicating shortening of the lower leg. No infants in the budesonide group had a negative LLLvel after treatment.

The mean weight gain, prior to randomisation did not differ significantly between the two groups (table 1). Prior to enrolment in the study, two infants in the dexamethasone group had received breast milk fortifier (BMF) for five and seven days respectively, and two in the budesonide group had received BMF for six and 10 days respectively. During the study no infants in the dexamethasone group receive BMF; three in the budesonide group received BMF for four, five, and 10 days respectively. There was no statistically significant difference in inspired oxygen concentration at the start of the study between the two groups. The energy intake of the two groups did not differ significantly either prior to or during the study (table 1). Over the study period weight gain was higher in the budesonide compared to the dexamethasone group, but this trend did not reach statistical significance (table 1). In the dexamethasone, but not the budesonide group, there was a significant reduction in mean inspired oxygen requirement (p = 0.0027; table 1). During the study period, changes in LLLvel and inspired oxygen concentration were significantly different between the two groups (p = 0.0011, p = 0.0132 respectively; table 2).

**DISCUSSION**

We have shown that inhaled steroids did not have an adverse effect on short term growth as indicated by LLLvel. The mean LLLvel of the infants in the budesonide group (0.48 mm/day) was similar to that reported by Gibson and colleagues’ in 324 infants of 23–42 weeks gestation. The dexamethasone treated infants tended to have a lower weight gain than those who received budesonide. This was despite similar energy intakes in the two groups before and during the study. The similar weight gain of the two groups prior to randomisation does suggest that the difference seen during treatment reflects a further adverse effect of systemically administered corticosteroids in VLBW infants with CLD. It was not possible to blind staff or researchers to which treatment individuals received. To minimise any bias, however, both LLLvel and weight gain were calculated only after the infant had been discharged. The lack of effect of inhaled rather than systemically administered steroids on LLLvel is also seen in young children with asthma. Although the number of infants included in our study was small, we did see a significant impact of dexamethasone on growth. That, and the highly significant difference between the two groups we highlight, further suggests our findings are genuine. Studies comparing systemic to inhaled steroids have shown that the latter route is less efficacious. A greater amount of steroids, however, has usually been given systemically. Increasing the inhaled dose may then improve efficacy, but could increase side effects. On the basis of the present findings, we suggest that measuring LLLvel by knemometry would be a useful method to indicate whether higher doses of inhaled steroids would have more adverse effects, as shown by impairment of short term growth.

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REFERENCES