# Why do we use steroids for croup?

## Bjornson CL et al. A randomized trial of a single dose of oral dexamethasone for mild croup. N Engl J Med 2004; 351: 1306-13.

**Take Home Message:** Children with mild croup who are treated with dexamethasone are less likely to return to a healthcare provider and have fewer symptoms in the day after treatment than children who are treated with placebo.

**Highlights:** Corticosteroids are known to be effective for moderate-to-severe croup.[i] The majority of children who present with croup, however, have only mild symptoms, so Bjornson et al. published this trial in 2004[ii] to determine if corticosteroids would benefit children with mild croup as well. They randomized 720 children with mild croup (a Westley croup score[iii] of 2 or less: barking cough without stridor at rest, and mild or no retractions) to receive either 0.6 mg/kg of dexamethasone or placebo. Significantly fewer children from the dexamethasone group returned to a health care provider for croup within seven days (7.3% vs. 15.3%). The adjusted odds ratio, i.e., the odds of a return for care in the placebo group as compared with the dexamethasone group, was 2.4. The number needed to treat to prevent one return visit was calculated to be 13.

They also found that children who had received dexamethasone were significantly less likely to have higher croup scores in the first day after treatment than those who had received placebo; these differences had disappeared by the third day after treatment, and the majority of children's symptoms had resolved by this day. Additionally, the children in the dexamethasone group had significantly fewer hours of sleep lost than the children in the placebo in the days after treatment.

Though the disease burden is low in mild croup, based on the results of this study, it is now recommended that children with mild croup also receive steroids. [iv]

**The Nitty-Gritty:**

- **Design:**
    - Multicenter, randomized, double-blind, placebo-controlled trial
    - N= 720
        - Dexamethasone group (n=359)
        - Placebo group (n=361)
    - Setting: 2001-2003
    - Enrollment: 4 Canadian pediatric emergency departments
    - Primary outcome: Return to a health care provider for croup within seven days after treatment
    - Analysis: Intention-to-treat
- **Population:**
    - **Inclusion Criteria:** Mild croup: seal-like, barking cough that began with previous 72 hours and Westley croup score of 2 or less (out of 17 points)
    - **Exclusion Criteria**

- § Symptoms or signs of another cause of stridor (e.g. epiglottitis, bacterial tracheitis, presence of a supraglottic foreign body)
- § History of congenital or acquired stridor, chronic pulmonary disease, asthma, severe systemic disease, exposure to varicella within the previous 21 days, known immune dysfunction
- § Treatment with corticosteroids within preceding 2 weeks
- § Treatment with epinephrine before enrollment
- § Enrollment in another clinical trial in the previous 4 weeks
- § Inability of parent to speak English or French
- § Lack of a telephone in the home
- § Prior visit to an emergency department due to croup during this episode of illness

o **Baseline Characteristics** – From the dexamethasone group; there were no statistically significantly differences between groups unless indicated (listed as dexamethasone vs. placebo). Plus-minus values are means +-standard deviation

- § Male sex: 61%
- § Age: 35+-23 months
- § Respiratory rate: 28+-6 breaths/minute

§ Heart rate: 130+-21 beats/minute

§ Oxygen saturation: 98+-2%

§ Croup score:

- 0: 38%
- 1: 38%
- 2: 24%

§ Spasmodic croup: 44%

§ Duration of symptoms prior to enrollment:

- Prodromal fever: 0.6+-1.0 days
- Rhinorrhea: 1.6+-4.1 days
- Barking cough: 0.7+-2.5 days

§ History of:

- Croup: 33%
- Asthma: 8 vs. 13% (P=0.04)
- Other medical problems: 2%

- § Prior hospitalization for croup: 5%
- § Prior intubation: 0%
- § Family history of :
  - Croup: 34 vs. 26% (P=0.03)
  - Asthma: 44%

- **Intervention**:
  - o Children were randomized to dexamethasone (0.6 mg per kilogram) or placebo
  - o Additional treatments were provided at the discretion of the attending physician
  - o Families were called on days 1,2,3, 7, and 21 after day of treatment and asked about return to health care provider as well as symptoms and given a Telephone Outpatient Score

- **Outcomes:** comparisons are dexamethasone group vs. placebo group
  - o **Primary outcome:** Return to a health care provider for croup within seven days after treatment: 7.3% vs. 15.3% (P<0.001; 95% CI for difference, 3.3-12.5%; adjusted OR 2.4, 95% CI 1.4 to 3.9; NNT to prevent one return visit is 13, 95% CI 8-31)
  - o **Secondary outcomes:**
    - § Presence of ongoing croup symptoms

- In first 24 hours: larger proportion of children in placebo group with high scores (greater severity of croup) than in dexamethasone group: OR, 3.2; 95% CI, 1.5-6.8; P=0.003).

- Day 3: differences between groups largely disappeared

§ Hours of sleep missed by the child due to croup symptoms: 2.9+-3.8 hours vs. 4.2+-4.7 hours (P<0.001)

- **Adverse Events:** none attributable to treatment

- **Criticisms**

o Even though no adverse events were found in this study, there still may be a risk of serious adverse events(approximately 8/1000 based on the sample size) from giving steroids to virtually every child with croup[v]

[i] Kairys S et al. Steroid treatment of laryngotrachetitis: a meta-analysis of the evidence from randomized trials. Pediatrics 1989; 83:683-93.

[ii] Bjornson CL et al. A randomized trial of a single dose of oral dexamethasone for mild croup. N Engl J Med 2004; 351:1306-13.

[iii] Westley CR et al. Nebulized racemic epinephrine by IPPB for the treatment of croup: a double-blind study. Am J Dis Child 1978; 132:484.

[iv] Cherry JD. Croup. N Engl J Med 2008; 358:384-391.

[v] Vernacchio L and Mitchell AA. Oral dexamethasone for mild croup. N Engl J Med 2004; 351: 2768-9.