

CROUP:

History:

Croup and recurrent croup are associated with bronchial asthma. The association seems essentially based on the presence of hyperreactive airways and less on the presence of atopy, although the latter can be considered an aggravating factor.

- few days of runny nose
- slow onset of fever
- sore throat
- **brassy, bark-like cough** - the three signs of an upper respiratory obstruction;
- **hoarse voice** - these define the croup syndrome
- **stridor**
- biphasic stridor usually means fixed narrowing, like subglottic stenosis or
- **? SWALLOWED ANYTHING WEIRD? Rule out foreign body obstruction.**
- **Insect sting?** Could this be anaphylaxis? Ask about peanuts and iodine.
- **Drooling and dysphagia? → epiglottitis.**
- **Illness started out like croup but developed into something with high fever, toxicity, and worsening respiratory distress? CONSIDER BACTERIAL TRACHEITIS.**
- **The symptoms of airway obstruction disappear over 3–5 days.**
- **Croup runs its natural course over 7 days**

PAST HISTORY:

- previous episodes, hospitalisations, ICU stay
- history of asthma
- croup in the family
- allergies

PHYSICAL EXAM:

- **ASSESS SEVERITY. Red flags are as follows:**
 - o **Lethargy:** means increased respiratory effort is wearing the child down.
 - o **Stridor at rest, tracheal tug, chest wall retraction:** mean obstruction is severe
 - o **CYANOSIS, LOSS OF CONSCIOUSNESS:** intubate right away.
 - o **Oxygen saturation via SATS finger probe is unreliable.**
- also **AUSCULTATE + PERCUSS** (pneumonia?)
- also look at **PHARYNX:** ?tonsillitis?

INVESTIGATIONS: do not over-investigate.

- o **Chest X-ray** to rule out major chest issues, pneumonia, pneumothorax, tumour, retrosternal goitre

DIFFERENTIALS:

Bacterial Tracheitis
 Diphtheria
 Epiglottitis
 Inhalation Injury
 Laryngomalacia
 Measles
 Peritonsillar Abscess
 Retropharyngeal Abscess
 Subglottic Stenosis

PATHOPHYSIOLOGY:

Hyper-responsive airways mean you get inflammatory oedema of the tracheal lining and of the vocal cords, especially when challenged with a viral pathogen. The kids also have a floppy airway as it is, due to the immaturity of their laryngeal cartilages; so increased panicky inspiratory effort can collapse their airways, causing stridor.

Angioneurotic edema
 Laryngeal fracture
 Laryngeal hemangioma
 Laryngeal stenosis
 Laryngeal tumor
 Spasmodic croup
 Uvulitis
 Vocal cord paralysis

MANAGEMENT:

- **MILD CROUP, active child : treat the parents.**
 - Low-dose single dose oral corticosteroids, maybe, for the child.
- **MODERATE CROUP, unhappy distressed child: oral corticosteroids**
 - May use nebulised corticosteroids (these seem better) esp. if pills are not tolerated
 - Observe these ones for progression into severe croup.
 - Watch for ~ 4 hours, discharge when settled with no stridor.
 - Response still incomplete after 12 hours? Repeat the steroids. Consider admission.
- **SEVERE CROUP, agitated or lethargic child:**
 - **4 litres O2 via mask**
 - **Nebulised adrenaline**
 - **Oral, nebulised or IM corticosteroids**
 - **Admit to hospital.**
- **LIFE-THREATENING AIRWAY OBSTRUCTION, cyanosed unconscious child:**
 - **100% O2 via mask**
 - **Nebulised adrenaline**
 - **Nebulised or IV corticosteroids**
 - **INTUBATE and contact ICU**

An adrenaline neb should produce an immediate and dramatic response. If it does not. consider another diagnosis.

- **In preschool age children how common is croup?** Not rare... Croup affects about 2% of preschool-aged children every year. The incidence of total resp tract infections is highest in the first year of life, and the attack rate for croup is highest in the second year of life. Boys 1.4 times more likely than girls. Croup occurs predominately in late fall and early winter. Denny FW, Murphy TF, Clyde WA Jr, et al. *Croup: an 11-year study in a pediatric practice*. Pediatrics 1983; 71: 871-876 cited in Dominic A Fitzgerald and Henry A Kilham *Croup: assessment and evidence-based management* MJA 2003; 179 (7): 372-377

- **In preschool age children how common is asthma?** Very common. 1997, 27% of Australian children had current wheeze, and this is increasing by 1.4% per year. (i.e have wheezed in past 12 months; children who wheeze are symptomatic about 14% of the time.) The prevalence of persistent asthma (wheezing episodes with abnormal airway function between episodes) in children has increased from 5% to 9% in the past 20 years. Woolcock AJ, Bastiampillai SA, Marks GB, Keena VA. The burden of asthma in Australia. Med J Aust 2001; 175: 141-145. In

In children with croup how useful is a lateral neck xray in determining diagnosis? Not very. Poor quality retrospective study of 61 children says: a request for a lateral X-ray of neck in croup is an inefficient use of diagnostic facilities. Dawson KP, Steinberg A, Capaldi N. The lateral radiograph of neck in laryngo-tracheo-bronchitis (croup). [Journal Article] Journal of Quality in Clinical Practice. 14(1):39-43, 1994 Mar.

What viruses cause croup? PARANINFLUENZA viruses, mainly type 1(60%). The rest is shared between respiratory syncytial virus, influenza viruses A and B, and Mycoplasma pneumoniae. Quoting eMedicine.com article by Antonio Muniz

Is positive family history of croup a risk factor? Yes. Recurrent croup was **significantly associated** with a patient history of asthma and wheezy bronchitis and a family history of croup. This study confirms and extends observations indicating that recurrent croup involves a persistent and inherited airways hyper-reactivity that is triggered by viral and other stimuli, including those related to temperature. Cohen B, Dunt D. Recurrent and non-recurrent croup: an epidemiological study. [Journal Article] Australian Paediatric Journal. 24(6):339-42, 1988 Dec.

How many kids with croup will go on to develop asthma? About a third. The odds ratio to develop asthma was 2.91 (CI 2.19 - 3.86) for children with a history of croup, 2.60 (CI 1.93 - 3.51) for a family history for asthma and 8.60 (CI 4.99 - 14.80) for the combination of family history and croup. Asthma was diagnosed in 37.3% of children with croup and a positive family history. Nicolai T, Mutius EV. Risk of asthma in children with a history of croup. [Journal Article] Acta Paediatrica. 85(11):1295-9, 1996 Nov.

In children with moderately severe croup, how do IM corticosteroids compare to nebulised corticosteroids in reducing hospital stay and reducing likelihood of admission? No difference, really. Slight advantage for nebs in this one study. "Nebulized budesonide, oral and parenteral dexamethasone have the same effectiveness for treatment of croup and the choice depends on conditions of the patient and the physician." Cetinkaya F, Tufekci BS, Kutluk G. A comparison of nebulized budesonide, and intramuscular, and oral dexamethasone for treatment of croup. [Clinical Trial. Journal Article. Randomized Controlled Trial] International Journal of Pediatric Otorhinolaryngology. 68(4):453-6, 2004 Apr. (\$steroid\$ and croup) and nebuli\$ and (IM or intramuscular or intramuscular).mp.

Does adrenaline reduce length of admission or rate of intubation in these kids? Compared to nebulised saline? Somewhat. [max benefit is seen in 60 minutes] Reduced length of admission because they get better very quickly and you only need to observe them for 2-3 hrs. Does reduce rates of admission and intubation, so long as it is used TOGETHER WITH STEROIDS. Racemic epinephrine was significantly more effective than saline at 10 (P less than .01) and 30 minutes (P less than .05) but not at 120 minutes after the treatment. Westley CR, Cotton EK, Brooks JG. Nebulized racemic epinephrine by IPPB for the treatment of croup: a double-blind study. [Clinical Trial. Journal Article. Randomized Controlled Trial] American Journal of Diseases of Children. 132(5):484-7, 1978 May. Poor study, 20 pts aged 5mth to 5 years. [Kristjansson](#), S., Berg-Kelly, K. and Winso, E., 1994. Inhalation of racemic adrenaline in the treatment of mild and moderately severe croup. Clinical symptom score and oxygen saturation measurements for evaluation of treatment effects. *Acta Paediatrica* 83, pp. 1156-1160. larger RCT study. Applauds adrenaline. McDonogh AJ. The use of steroids and nebulised adrenaline in the treatment of viral croup over a seven year period at a district hospital. [Journal Article] Anaesthesia & Intensive Care. 22(2):175-8, 1994 Apr. Gosford hospital, close to home. Large retrospective analysis, sings praises to the timely use of adrenaline and steroids.

!! L-epinephrine is at least as effective as racemic epinephrine in the treatment of laryngotracheitis and does not carry the risk of additional adverse effects. L-Epinephrine is also more readily available worldwide, is less expensive, and can be recommended for this purpose. "Racemic" means equal mixture of Dextro and Levo-isomers.