How Do You Know It’s Croup?

David Johnson, MD
Presented at various CME events featured at the University of Calgary

Croup is usually caused by the virus parainfluenza and is most prevalent in the late fall to early winter months. It occurs most commonly in children between six months and three years of age, but can also occur in children as young as three months and as old as 15. Boys are affected more often than girls.

The symptoms of croup are commonly preceded by non-specific cough, rhinorrhea, and fever. The characteristic barking cough, stridor, and respiratory distress usually develops suddenly during the evening or at night, but occasionally, can develop gradually through the course of a day. Stridor typically occurs only during inspiration, but with more severe distress can be biphasic. Fever can occur. Most children who present with acute onset of upper airway obstruction characterized by stridor and chest indrawing have croup. In general, the diagnosis of croup is straightforward, but rare and problematic causes of stridor must first be considered and excluded.

What is the differential diagnosis?

The most common alternative diagnosis is bacterial tracheitis, which is also the most difficult to distinguish from croup. In fact, bacterial tracheitis is thought to be a superinfection of croup. It can be most readily distinguished by the presence of high fever, toxic appearance, and poor response to epinephrine. Management
of the disease includes intravenous antibiotics, with these patients frequently requiring intubation and respiratory support.

The second most likely alternative diagnosis is epiglottitis. A young child with epiglottitis most commonly presents with a sudden onset of high fever, dysphagia, drooling, toxic appearance, anxiety and sits forward in a “sniffing position”. Contrary to croup, these patients do not display a barking cough. Securing the airway is the most crucial aspect of management, and should only be attempted by physicians extremely experienced in airway management. Any child in whom epiglottitis is being considered should be referred by ambulance and accompanied by a physician. Rarely, children can present with acute onset of stridor due to an occult foreign body lodged, most commonly in the upper oesophagus. Very rarely, retropharyngeal abscess and peritonsillar abscess can present with stridor.

**What about triage?**

Children with croup can be broadly categorized as having four levels of severity (Table 1). Though the major concern of parents and health practitioners is the potential for respiratory compromise, most children can be safely managed at home, with very few requiring artificial airway support.

**What is the course of the disease?**

Symptoms most commonly become substantially worse at night, and improve during the day. For the most part, obstructive symptoms resolve within 48 hours, with only a small percentage of children remaining symptomatic for up to five or six days. Though the onset of respiratory distress often occurs suddenly, respiratory failure occurring within minutes is rare; failure typically occurs over several hours. Signs of respiratory failure and imminent respiratory arrest include:

- reduction in respiratory effort,
- lethargy,
- pallor, and
- dusky appearance.

**Exploring treatment options**

**Mist**

Mist wanes, bedside humidifiers, and mist tents should not be recommended. Mist tents, in particular, should not be used because they frequently make young children agitated due to
Croup

Oxygen

The administration of oxygen should be reserved for children with hypoxia and significant respiratory distress. “Blow-by”—administration of oxygen through a plastic hose with the end opening held near the child’s nose and mouth—is often the most beneficial way of administering oxygen.

Helium-oxygen mixtures

Administering helium to children with croup has been proposed because lower-density gas can potentially decrease turbulent airflow in a narrowed airway. This treatment modality may have some benefit in children with very severe respiratory distress. However, there is insufficient evidence to advocate its general use.

Analgesics/antipyretics

No controlled trials have been published specifically addressing the use of analgesics or antipyretics in children with croup. However, it is reasonable to suppose they make children more comfortable by reducing fever and pain.

Antitussives and decongestants

No experimental studies have been published regarding the potential benefit of antitussives or decongestants in children with croup. Furthermore, there is no rational basis for their use and, therefore, should not be administered.

Antibiotics

As croup is virtually always due to a viral infection, empiric antibiotic therapy is not rational. Furthermore, superinfection of children with croup is such a rare phenomenon (less than one in 1,000) that the use of antibiotics for prophylaxis is also not rational.

Epinephrine

Based on historic data, the administration of epinephrine in severe croup cases substantially reduces the number of patients requiring an artificial airway. Epinephrine has been shown to substantially reduce respiratory distress within 10 minutes of administration and last for more than an hour (Table 2).

<table>
<thead>
<tr>
<th>Severities of croup</th>
<th>Occasional barky cough</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>none to limited stridor at rest</td>
</tr>
<tr>
<td></td>
<td>none to mild suprasternal and/or intercostal indrawing (retractions of the skin of the chest wall)</td>
</tr>
<tr>
<td>Moderate</td>
<td>Frequent barky cough</td>
</tr>
<tr>
<td></td>
<td>easily audible stridor at rest</td>
</tr>
<tr>
<td></td>
<td>suprasternal and sternal wall retraction at rest</td>
</tr>
<tr>
<td></td>
<td>little to no distress or agitation</td>
</tr>
<tr>
<td>Severe</td>
<td>Frequent barky cough</td>
</tr>
<tr>
<td></td>
<td>prominent inspiratory and occasional expiratory stridor</td>
</tr>
<tr>
<td></td>
<td>marked sternal wall retractions</td>
</tr>
<tr>
<td></td>
<td>significant distress and agitation</td>
</tr>
<tr>
<td>Impending respiratory failure</td>
<td>Barky cough (often not prominent)</td>
</tr>
<tr>
<td></td>
<td>audible stridor at rest (occasionally hard to hear)</td>
</tr>
<tr>
<td></td>
<td>sternal wall retractions (may not be marked)</td>
</tr>
<tr>
<td></td>
<td>lethargy or decreased level of consciousness</td>
</tr>
<tr>
<td></td>
<td>often dusky without supplemental oxygen</td>
</tr>
</tbody>
</table>

Table 1: Severities of croup
Glucocorticoids
Steroids are the mainstay of therapy for croup. On the basis of more than 20 randomized controlled trials and two meta-analyses, corticosteroids have been shown to reduce the duration and necessity of intubations and hospitalization, as well as the need for reintubation and the rate of return to a health-care practitioner for persistent croup symptoms.\textsuperscript{7-11} In a recently completed large, multi-centre Canadian study, involving 720 children with mild croup, it was shown that those treated with dexamethasone, as compared with placebo had;

- half the rate of return to a health-care practitioner (7\% vs. 15\%),
- had substantially less severe croup symptoms,
- lost less sleep in the 48 hours after treatment,
- their parents experienced less stress in the 24 hours following treatment, and
- both their families and the health-care system incurred slightly fewer costs.\textsuperscript{12}

Benefits appeared to be just as great in those children with very mild symptoms and those who had had croup symptoms for several days at the time of assessment. No adverse effects occurred in either treatment group. Therefore, all children diagnosed with croup should be treated with corticosteroids, with the exception of a rare child with known immune deficiencies or recent definite exposure to varicella.

Dexamethasone appears to be equally effective when given orally or parenterally.\textsuperscript{13} The traditional dose of dexamethasone is 0.6 mg/kg. However, there is some evidence that lower doses (0.15 mg/kg) are equally as effective.\textsuperscript{14} On the other hand, a meta-analysis of controlled trials suggests higher doses of corticosteroids yield a clinically important response in a greater proportion of patients.\textsuperscript{7} No controlled studies have been published examining whether or not multiple doses of corticosteroids provide greater benefit than a single dose. However, given the short duration of croup symptoms in most patients, a single dose of corticosteroid is probably sufficient.

Inhaled budesonide has been shown to be equivalent to oral dexamethasone in effectiveness.\textsuperscript{15} However, because it is generally more traumatic to administer and substantially more expensive, budesonide should not be routinely used. In patients with severe or near respiratory failure, the simultaneous administration of budesonide and epinephrine is logical and may be more effective than epinephrine alone. In addition, for children who vomit oral medications, inhaled steroids may be a reasonable alternative.

Take-home message
- Most children with acute onset of upper airway obstruction, characterized by stridor and indrawing, have croup.
- One of the most common alternative diagnoses, bacterial tracheitis, can be distinguished by the presence of high fever, toxic appearance, and poor response to epinephrine.
- Any child considered to have epiglottitis should be referred by ambulance and accompanied by a physician.
- With very few exceptions, all children with croup should be treated with corticosteroids.
### Croup

**Table 2: Pharmacotherapy**

<table>
<thead>
<tr>
<th>Drug category</th>
<th>Dose and duration</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adrenergic agonist</strong>&lt;br&gt;• Epinephrine</td>
<td>• Racemic epinephrine 0.5mL of 2.25% solution diluted in 3 mL of NS or sterile water via nebulizer&lt;br&gt;• L Epinephrine 1:1,000 solution 5 mL via nebulizer&lt;br&gt;• May be repeated back-to-back in children with severe respiratory distress</td>
<td>• Racemic epinephrine &amp; L epinephrine are equivalent in terms of effect and safety&lt;br&gt;• The duration of effect of epinephrine doses not exceed 2 hours. Patients should not be discharged from medical care for at least 2 hours after receiving a dose of epinephrine.</td>
</tr>
</tbody>
</table>
| **Corticosteroids**<br>• Dexamethasone | • 0.6 mg/kg PO/IM/IV once<br>• May repeat dose in 6 to 24 hours | • Oral dexamethasone is well-absorbed and achieves peak serum concentrations as rapidly as with intramuscular administration (without the pain!)
• Several controlled trials suggest oral and intramuscular administration yield equivalent results
• Experience suggests clinical improvement will begin as early as 2 to 3 hours after treatment
• No evidence to suggest multiple doses provide additional benefit over a single
• Reduces
  - Rate & duration of intubation
  - Rate & duration hospitalisation
  - Rate of return to medical care
  - Duration of symptoms in children with mild, moderate, & severe symptoms
• In most cases, budesonide offers no advantages over dexamethasone and is substantially more expensive |
| • Budesonide | • 2 mg (2 mL) solution via nebulizer | • May be useful in patients with vomiting, severe respiratory distress; budesonide and epinephrine can be administered simultaneously |

**NS:** Normal saline  **IM:** Intramuscularly  **PO:** Orally  **IV:** Intravenously
Croup

References
14. Geelhoed GC, MacDonald WBG: Oral dexamethasone in the treatment of croup: 0.15 mg/kg versus 0.3 mg/kg versus 0.6 mg/kg. Pediatr Pulmonol 1995; 20: 362-8.

www.stacommunications.com

For an electronic version of this article, visit:
The Canadian Journal of CME online.

Alzheimer Disease

Dispelling the myths

Myth: Alzheimer Disease is preventable.

Reality: Because there is no known cause for Alzheimer Disease, there is no conclusive evidence that Alzheimer Disease can be prevented. There is, however, a growing amount of evidence that lifestyle choices that keep mind and body fit may help reduce the risk. These choices include physical exercise, a healthy diet including fresh fruits, vegetables and fish, as well as keeping your brain active.

There are many myths surrounding Alzheimer Disease — about the cause, the prevention and the people who have it.

Get the facts.

Visit our Web site at www.alzheimer.ca or contact your local Alzheimer Society.

Help for Today. Hope for Tomorrow.

Alzheimer Society