Croup (Laryngotracheobronchitis) — Causes and Treatment

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Croup is a disease caused by a viral infection that results in swelling inside the trachea and interferes with normal breathing. Patients develop a characteristic barking cough. Croup is also known as laryngotracheobronchitis.

Definition

Croup is a common pediatric disease of the upper respiratory tract caused by a viral infection, rarely by a bacterial infection. It is marked by inflammation of the larynx and trachea that can extend to bronchi, interfering with normal breathing and leading to a seal-like barking cough and an inspiratory noise called stridor. It is also known as laryngotracheitis or laryngotracheobronchitis.

Pathophysiology of Croup

A viral infection triggers the infiltration of white blood cells, especially histiocytes, neutrophils, plasma cells, and lymphocytes, which ultimately leads to swelling inside the
trachea, larynx, and then the large bronchi. The swelling partially obstructs the airway, leading to its narrowing of the airway. Heavy breathing during exercise and other vigorous physical activities results in stridor.

Epidemiology of Croup

Children aged 6 to 36 months are primarily affected by croup. The peak incidence of croup occurs in children between the ages of 6 months and 6 years and can afflict children up to the age of 15 years. Fifteen percent of emergency hospitalizations of children is caused by croup.

The disease is more prevalent in the fall and affects 50% more boys than girls. It is prevalent in North America; 5 to 6 cases per 100 toddlers are seen in the second year of their life.

Transmission

Croup is contagious within the first few days, particularly the first or second day. The virus can be transmitted in the form of droplets released by sneezing and coughing.

Risk Factors of Croup

**Change of season:** The change in weather between fall and winter or winter and spring may trigger the onset of croup.

**Prematurity:** Children who were premature at birth and are between the ages of 6 months and 6 years are more at the risk.

**Age:** Those aged 6 months to 15 years are much more likely to develop croup.

**Asthma:** Children with asthma are more at risk for this disease.

**Viral infection:** Causative organisms include parainfluenza, respiratory syncytial virus, metapneumovirus, adenovirus, influenza A and B, and mycoplasma.

Signs and Symptoms of Croup

- Characteristic barking cough
- Stridor
- Low-grade fever
- Hoarseness
- Acute enlargement of the tonsils
- Difficulting in eating (dysphagia)
- Coryza
- Hoover’s sign (inward movement of the lower rib cage during inspiration)

Causes and Diagnosis of Croup

Croup is commonly caused by a virus (75% of cases), less commonly by bacteria. In most cases, the causative agent is **parainfluenza virus type 1 and 2** (a member of the **paramyxovirus** family). Croup can also be caused by the **measles virus**, **respiratory syncytial virus**, and **adenovirus**.

**Croup caused by bacteria is divided into:**
- Bacterial tracheitis
- Laryngotracheobronchitis
- Laryngeal diphtheria
- Laryngotracheobronchopneumonitis

*Corynebacterium diphtheriae* causes laryngeal diphtheria while laryngotracheobronchitis, bacterial tracheitis, and laryngotracheobronchopneumonitis are due to secondary bacterial growth.

**The most common bacteria associated with croup are:**

- *Staphylococcus aureus*
- Haemophilus influenza
- *Streptococcus pneumonia*
- *Moraxellacatarrhalis*

**Diagnosis**

No specific laboratory tests or imaging procedures are required for croup. Diagnosis can be made by the clinical appearance of a barking cough and stridor. The severity of croup can be detected by the following laboratory tests:

- **Lateral neck radiograph** to rule out any other cause, such as a peritonsillar abscess. In cases of croup, X-ray usually shows a ‘steeple sign,’ which reveals narrowing of the upper airways.
- **Bronchoscopy** may be indicated in patients with recurrent episodes of croup.

Generally, however, laboratory investigations are avoided, so as not to cause unnecessary distress to the child.

**Severity**

Severity of the disease can be assessed by **Westley score:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Number of points assigned for this feature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Chest wall retraction</td>
<td>None</td>
</tr>
<tr>
<td>Stridor</td>
<td>None</td>
</tr>
<tr>
<td>Cyanosis</td>
<td>None</td>
</tr>
<tr>
<td>Level of consciousness</td>
<td>Normal</td>
</tr>
<tr>
<td>Air entry</td>
<td>Normal</td>
</tr>
</tbody>
</table>

- A total score that is equal to or less than 2 indicates mild croup, with barking cough and hoarseness, and no stridor at rest.
- A total score of 3–5 indicates moderate croup.
- A total score of 6–11 indicates severe croup, obvious stridor, and obvious Hoover’s sign.

A total score of 12 or more indicates approaching respiratory failure, with prominent
symptoms other than barking cough and stridor.

**Treatment of Croup**

After a complete evaluation by both physical and clinical examination, treatment should be initiated:

- The patient should be made to inhale oxygen via the ‘blow-by’ method. Usually, the use of mask or nasal formula should be avoided, to avoid distress in children.
- Endocardial intubation may be required in 0.2% of cases to reduce narrowing of the airway.
- Corticosteroids, such as dexamethasone and budesonide, are given orally or by injection; improvement is usually seen in 6–8 hours.
- Racemic epinephrine can be given by nebulization to control the severity of the disease.
- Hot steam or humidified air use does not seem to provide effective relief in croup.
- Cough medicines with dextromethorphan or guaifenesin should be avoided.
- Heliox will give minimal support.
- Antiviral neuraminidase inhibitors should be given to patients with severe croup.

Antibiotics are only prescribed in cases of primary or secondary bacterial infection. Vancomycin and cefotaxime are recommended in these cases.

**Prognosis**

Croup is a **self-limiting disease** that usually resolves within a day or two in 80% of cases. Most cases improve in 3–7 days. Hospitalization is needed in only 5% of cases. Croup is a life-threatening illness but it rarely progresses to death; if it does, this is usually because of cardiac arrest.

**Complications**

- Pneumonia
- Pulmonary edema
- Bacterial tracheitis
- Cyanosis

**References**


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