

Diagnosis And Treatment Of Croup And Asthma

Posted on December 4, 2023

Etiology: What Causes These Diseases?

Croup is an acute upper-airway syndrome, most often caused by a viral infection. Parainfluenza viruses are common causes, but respiratory syncytial virus, influenza, adenovirus, coronaviruses, and other respiratory viruses may produce the same clinical pattern. It is not a [chronic obstructive pulmonary disease](#). The illness is most common in young children because their subglottic airway is narrow, so a small amount of swelling produces a large increase in resistance.

Asthma is a chronic inflammatory airway disease characterized by variable respiratory symptoms and variable expiratory airflow limitation. It is influenced by genetics and environmental exposures. Triggers may include viral infections, allergens, exercise, smoke, air pollution, weather, strong odors, and occupational or household exposures. Asthma affects the lower airways rather than the larynx. A trigger does not create the disease by itself in every child; it provokes symptoms in a susceptible airway.

Pathogenesis

What Happens at the Cellular, Tissue, or Organ Level?

In croup, viral infection produces inflammation and edema in the larynx, trachea, and especially the subglottic region. The narrowed upper airway creates turbulent inspiratory airflow, causing stridor and the characteristic barking cough. Routine croup does not normally progress to tissue necrosis. Severe obstruction, exhaustion, or hypoxemia can occur, but most cases are mild and self-limited.

In asthma, airway epithelial and immune responses contribute to inflammation, mucus production, bronchial smooth-muscle constriction, and airway hyperresponsiveness. The combination narrows intrathoracic airways, particularly during expiration. Recurrent or poorly controlled inflammation can contribute to structural airway changes over time. Asthma is not caused by low red-blood-cell levels and does not ordinarily damage red blood cells.

How Does That Alter the Function of the Associated

System?

Croup primarily impairs movement of air through the upper airway. A child may compensate by breathing faster and using additional respiratory muscles. Agitation can worsen obstruction because airflow demand increases. Swallowing and fluid intake may decrease when breathing is difficult, but digestive dysfunction is not the underlying mechanism.

Asthma increases resistance to expiratory airflow. Air may become trapped, ventilation becomes uneven, and breathing requires more work. During a severe exacerbation, impaired ventilation can cause low oxygen and, later, rising carbon dioxide. Dehydration may accompany illness or poor intake but is not the central cause of an asthma attack.

How Does It Affect the Body as a Whole?

A child with significant croup may become fatigued, anxious, dehydrated, or hypoxemic. Severe signs include stridor at rest, marked retractions, reduced air entry, altered consciousness, cyanosis, or impending respiratory failure. Croup does not reduce immunity by infiltrating white blood cells.

Asthma can disturb sleep, exercise, school attendance, and family life even when acute attacks are absent. Severe exacerbations can cause hypoxemia and exhaustion. Chronic symptoms may increase anxiety and reduce activity, but well-controlled asthma allows most children to participate fully in ordinary life.

Clinical Manifestations

What Signs Will You Observe or Measure?

Croup usually follows cold symptoms and presents with a barking cough, hoarse voice, and inspiratory stridor, often worse at night. Clinicians assess stridor at rest, chest-wall retractions, air entry, color, alertness, heart rate, respiratory rate, and oxygen saturation. Fever may be absent or low; high fever, toxic appearance, drooling, inability to swallow, a muffled voice, or sudden onset raises concern for diagnoses such as bacterial tracheitis, epiglottitis, abscess, foreign body, or anaphylaxis (National Heart & Institute, 2020).

Asthma signs include wheeze, prolonged expiration, cough, retractions, reduced air entry, and variable [symptoms related to triggers](#). A “silent chest,” difficulty speaking, drowsiness, cyanosis, or poor response to reliever treatment suggests a life-threatening attack. Wheeze can be absent in severe obstruction and is not specific to asthma.

What Symptoms Will the Client Experience or Feel?

Children with croup may feel throat discomfort, fear, and difficulty drawing air in. Parents commonly report a seal-like cough and noisy breathing. In asthma, children may describe chest tightness, shortness of breath, cough, or inability to keep up with activity. Nighttime or early-morning symptoms and recurrent episodes after triggers support the history.

What Abnormal Laboratory and Diagnostic Tests Confirm or Support the Diagnosis?

Croup is usually a clinical diagnosis. Routine blood tests, viral testing, and radiographs are unnecessary in a typical case. Imaging is reserved for an atypical presentation or concern for another diagnosis. The classic subglottic narrowing sometimes called a “steeple sign” is neither required nor perfectly sensitive or specific.

Asthma diagnosis combines a pattern of variable symptoms with evidence of variable airflow limitation when feasible. In children able to perform spirometry, reduced expiratory airflow that improves after bronchodilator supports the diagnosis. Peak-flow variability may provide additional evidence. Fractional exhaled nitric oxide can support identification of type 2 airway inflammation in selected cases but cannot diagnose asthma by itself. In preschool children, clinicians often rely on recurrent symptom patterns, exclusion of alternatives, and response to a monitored treatment trial.

Treatment Implications

Briefly Explain the Types of Treatment Used

All children with croup should be kept calm and handled gently. A single dose of dexamethasone is recommended for croup of any severity because it reduces symptoms and return visits. Moderate or severe croup is treated with nebulized epinephrine, which produces rapid but temporary improvement. Children require observation because the effect diminishes after roughly two hours. Oxygen is used for hypoxemia, and severe or atypical cases require experienced airway support. Humidified air has not shown reliable benefit.

Asthma treatment depends on age, symptom pattern, severity, and risk. A short-acting bronchodilator provides rapid relief during many exacerbations, while inhaled corticosteroid-containing treatment addresses airway inflammation. Current guidelines emphasize that asthma should not be managed with reliever medication alone when controller therapy is indicated. Treatment may include daily inhaled corticosteroids, inhaled corticosteroid-formoterol strategies in appropriate age groups, additional controller medicines, trigger reduction, allergy evaluation, and biologic therapy for selected severe disease. Every family should receive inhaler-technique education and a written asthma action

plan.

What Are the Goals of Treatment in Relation to Pathophysiology?

For croup, the goal is to reduce subglottic edema, maintain a patent airway, relieve distress, and identify the small number of children who need escalation. Dexamethasone reduces inflammation; epinephrine temporarily reduces mucosal swelling through vasoconstriction.

For asthma, goals are symptom control, prevention of exacerbations and airway damage, normal activity, minimal adverse effects, and reduction of avoidable triggers. Controller therapy targets inflammation, while bronchodilators reverse smooth-muscle constriction. Follow-up should assess symptoms, attacks, technique, adherence, exposures, and whether the diagnosis remains correct (Global Initiative for Asthma, 2026).

Are We Seeking Cure, Remission, or Palliative Care?

Croup is usually cured as the viral illness and airway inflammation resolve. Recurrent or atypical croup warrants evaluation for structural, reflux-related, allergic, or other airway conditions. Asthma currently has no universal cure, but it can often be controlled and may enter periods of remission, especially in some children. The clinical goal is long-term control and prevention, not palliative care. Severe breathlessness that does not respond to the action plan is an emergency.

When to Seek Emergency Help

Emergency services are needed when a child has severe difficulty breathing, bluish lips or skin, drowsiness, confusion, drooling with inability to swallow, stridor that is severe or worsening at rest, minimal air movement, or poor response to prescribed rescue treatment. Parents should follow the child's action plan and should not delay emergency care while attempting unproven home remedies.

Differential Diagnosis

A barking cough and stridor suggest croup, but clinicians must consider other causes when onset, age, fever, or examination is atypical. Foreign-body aspiration may begin suddenly. Epiglottitis can cause drooling, severe throat pain, and a tripod posture. Bacterial tracheitis may produce high fever and toxic appearance with poor response to standard croup therapy. Allergic reactions can cause rapid airway swelling. Keeping the child calm and avoiding unnecessary throat examination are important when severe upper-airway obstruction is possible.

Recurrent wheeze is not always asthma. Bronchiolitis, aspiration, congenital airway problems, cystic fibrosis, cardiac disease, vocal-cord dysfunction, and foreign body may resemble it. A diagnosis should be reconsidered when symptoms do not vary, growth is poor, onset was abrupt, or standard asthma treatment repeatedly fails.

Education and Prevention

Families need practical instructions that match the condition. For croup, they should know expected duration, how to recognize stridor at rest, and when to seek urgent care. Antibiotics are not useful for uncomplicated viral croup. For asthma, education includes correct spacer and inhaler technique, adherence, trigger reduction, vaccination and infection planning where appropriate, school coordination, and a written action plan.

Environmental control should be individualized. Removing every possible exposure is neither feasible nor evidence-based. Clinicians should identify triggers supported by history or testing and recommend combined measures when relevant. Tobacco and vaping smoke should be avoided around children. Follow-up after an exacerbation is an opportunity to assess controller treatment, technique, access, and family concerns.

Medication Safety and Technique

Correct delivery is essential. Young children often need a metered-dose inhaler with a spacer and mask, and caregivers should demonstrate technique rather than merely state that they understand. Nebulizers are useful in some situations but are not automatically superior. Medication doses and devices should be prescribed by a clinician according to age, severity, and local guidance.

Repeated reliance on rescue treatment without reassessment is unsafe. Families should know the difference between controller and reliever medicines, possible adverse effects, and the importance of follow-up. Steroid concerns should be discussed accurately so fear does not lead to uncontrolled airway inflammation.

Conclusion

Croup and asthma can both cause cough and respiratory distress, but they differ in location, mechanism, course, diagnosis, and treatment. Croup is usually an acute viral inflammation of the upper airway treated with dexamethasone and, when moderate or severe, nebulized epinephrine. Asthma is a chronic inflammatory disease of the lower airways requiring confirmation of variable symptoms and airflow limitation when possible, anti-inflammatory management, reliever treatment, education, and follow-up. Correctly distinguishing the conditions prevents harmful assumptions and directs treatment toward the actual pathophysiology (Canadian Paediatric Society, 2017).

References

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