STRIDOR

Stridor is an abnormal, high-pitched sound produced by turbulent airflow through a partially obstructed airway at the level of the supraglottis, glottis, subglottis, or trachea.Its tonal characteristics are extremely variable (ie, harsh, musical, or breathy); however, when combined with the phase, volume, duration, rate of onset, and associated symptoms, the tonal characteristics of the sound may provide additional diagnostic clues.

In all cases, stridor should be differentiated from stertor, which is a lower-pitched, snoring-type sound generated at the level of the nasopharynx, oropharynx, and, occasionally, supraglottis.[]](javascript:showrefcontent('refrenceslayer');)

Stridor is a symptom, not a diagnosis or a disease, and the underlying cause must be determined. It may be inspiratory, expiratory, or biphasic, depending on its timing in the respiratory cycle, and the three forms each suggest different causes, as follows:

* Inspiratory stridor suggests a laryngeal obstruction
* Expiratory stridor implies tracheobronchial obstruction
* Biphasic stridor suggests a subglottic or glottic anomaly

In most cases of stridor, besides a complete history and physical examination, along with other possible additional studies, flexible or rigid endoscopy is required for an adequate evaluation of the etiology.

Pathophysiology

Gases produce pressure equally in all directions; however, when a gas moves in a linear direction, it produces pressure in the forward vector and decreases the lateral pressure. When air passes through a narrowed flexible airway in a child, the lateral pressure that holds the airway open can drop precipitously (the Bernoulli principle) and cause the tube to close. This process obstructs airflow and produces stridor.

Stridor may result from lesions involving the central nervous system (CNS), the cardiovascular system, the gastrointestinal (GI) tract, or the respiratory tract.

Etiology

**Acute stridor**

Laryngotracheobronchitis, commonly known as [croup](http://emedicine.medscape.com/article/962972-overview), is the most common cause of acute stridor in children aged 6 months to 2 years. The patient has a barking cough that is worse at night and may have low-grade fever.[]](javascript:showrefcontent('refrenceslayer');)

[Aspiration of foreign body](http://emedicine.medscape.com/article/1001253-overview) is common in children aged 1-2 years. Usually, foreign bodies are food (eg,nuts, hot dogs, popcorn, or hard candy) that is inhaled. A history of coughing and choking that precedes development of respiratory symptoms may be present.

[Bacterial tracheitis](http://emedicine.medscape.com/article/961647-overview) is relatively uncommon and mainly affects children younger than 3 years. It is a secondary infection (most commonly due to *Staphylococcus aureus*) that follows a viral process (commonly croup or influenza).

[Retropharyngeal abscess](http://emedicine.medscape.com/article/995851-overview) is a complication of bacterial pharyngitis that is observed in children younger than 6 years. The patient presents with abrupt onset of high fevers, difficulty swallowing, refusal to feed, sore throat, hyperextension of the neck, and respiratory distress.

[Peritonsillar abscess](http://emedicine.medscape.com/article/970260-overview) is an infection in the potential space between the superior constrictor muscles and the tonsil. It is common in adolescents and preadolescents. The patient develops severe throat pain, trismus, and trouble with swallowing or speaking.

Spasmodic [croup](http://emedicine.medscape.com/article/962972-overview), also termed acute spasmodic laryngitis, occurs most commonly in children aged 1-3 years. The presentation may be identical to that of croup.

Allergic reaction (ie, [anaphylaxis](http://emedicine.medscape.com/article/799744-overview)) occurs within 30 minutes of an adverse exposure. Hoarseness and inspiratory stridor may be accompanied by symptoms (eg, dysphagia, nasal congestion, itching eyes, sneezing, and wheezing) that indicate the involvement of other organs.

[Epiglottitis](http://emedicine.medscape.com/article/963773-overview) is a medical emergency that occurs most commonly in children aged 2-7 years. Clinically, the patient experiences an abrupt onset of high-grade fever, sore throat, dysphagia, and drooling.

**Chronic stridor**

[Laryngomalacia](http://emedicine.medscape.com/article/1002527-overview) is the most common cause of inspiratory stridor in the neonatal period and early infancy and accounts for as many as 75% of all cases of stridor.[]](javascript:showrefcontent('refrenceslayer');)Stridor may be exacerbated by crying or feeding. Placing the patient in a prone position with the head up alleviates the stridor; a supine position exacerbates the stridor.

Laryngomalacia is usually benign and self-limiting and improves as the child reaches age 1 year. In cases where significant obstruction or lack of weight gain is present, surgical correction or supraglottoplasty may be considered if the clinician has observed tight mucosal bands holding the epiglottis close to the true vocal cords or redundant mucosa overlying the arytenoids.

It should be kept in mind that the presentation of laryngomalacia in older children (late-onset laryngomalacia) can differ from that of congenital laryngomalacia.[]](javascript:showrefcontent('refrenceslayer');)Possible manifestations of late-onset laryngomalacia include obstructive sleep apnea syndrome, exercise-induced stridor, and even dysphagia. Supraglottoplasty can be an effective treatment option.

Patients with [subglottic stenosis](http://emedicine.medscape.com/article/864208-overview) can present with inspiratory or biphasic stridor. Symptoms can be evident at any time during the first few years of life. If symptoms are not present in the neonatal period, this condition may be misdiagnosed as asthma. Congenital subglottic stenosis occurs when an incomplete canalization of the subglottis and cricoid rings causes a narrowing of the subglottic lumen. Acquired stenosis is most commonly caused by prolonged intubation (see also[Glottic Stenosis](http://emedicine.medscape.com/article/864439-overview)).

[Vocal cord dysfunction](http://emedicine.medscape.com/article/137782-overview) is probably the second most common cause of stridor in infants. Unilateral vocal cord paralysis can be either congenital or secondary to birth or surgical trauma (eg, from cardiothoracic procedures). Patients with a unilateral vocal cord paralysis present with a weak cry and biphasic stridor that is louder when awake and improves when lying with the affected side down.

Bilateral vocal cord paralysis is a more serious entity. Patients usually present with aphonia and a high-pitched biphasic stridor that may progress to severe respiratory distress. This condition is usually associated with CNS abnormalities, such as Arnold-Chiari malformation or increased intracranial pressure. Vocal cord paralysis in infants usually resolves within 24 months.

Laryngeal dyskinesia, exercise-induced laryngomalacia, and paradoxical vocal cord motion are other neuromuscular disorders that may be considered.

Laryngeal webs are caused by an incomplete recanalization of the laryngeal lumen during embryogenesis. Most (75%) are in the glottic area. Infants with laryngeal webs have a weak cry and biphasic stridor. Intervention is recommended in the setting of significant obstruction and includes cold knife or CO2 laser ablation.

Laryngeal cysts are a less frequent cause of stridor. They are usually found in the supraglottic region in the epiglottic folds. Patients may present with stridor, hoarse voice, or aphonia. Cysts may cause obstruction of the airway lumen if they are very large..)

Laryngeal hemangiomas (glottic or subglottic) are rare, and half of them are accompanied by cutaneous hemangiomas in the head and neck. Patients usually present with inspiratory or biphasic stridor that may worsen as the hemangioma enlarges. Typically, hemangiomas present in the first 3-6 months of life during the proliferative phase and regress by age 12-18 months.

Medical or surgical intervention for laryngeal hemangiomas is based on the severity of symptoms. Treatment options consist of oral steroids, intralesional steroids, laser therapy with CO2 or potassium-titanyl-phosphate (KTP) lasers, and surgical resection. Oral propranolol has proved to be an effective medical treatment in the appropriate population (it is contraindicated in children with severe asthma, diabetes, or heart disease).

Laryngeal papillomas occur secondary to vertical transmission of the [human papillomavirus](http://emedicine.medscape.com/article/219110-overview) from maternal condylomata or infected vaginal cells to the pharynx or larynx of the infant during the birth process. These are primarily treated with surgical excision, with questionable use of cidofovir and interferon in refractory cases.A high rate of recurrence of disease is noted, with a need for multiple surgical debridements and a small risk of malignancy (5% malignant degeneration).

[Tracheomalacia](http://emedicine.medscape.com/article/426003-overview), if present in the proximal (extrathoracic) trachea, can be associated with inspiratory stridor. If it is present in the distal (intrathoracic) trachea, it is associated more with expiratory noise. Tracheomalacia is caused either by a defect on the cartilage, resulting in loss of the rigidity necessary to keep the tracheal lumen patent, or by an extrinsic compression of the trachea.

Stenosis of the proximal trachea can cause stridor. Tracheal stenosis can be[congenital](http://emedicine.medscape.com/article/837827-overview) or secondary to extrinsic compression. Congenital stenosis is usually related to complete tracheal rings, is characterized by a persistent stridor, and necessitates surgery based on symptom severity.

The most common extrinsic causes of stenosis include vascular rings, slings, and a double aortic arch that encircles the trachea and esophagus. Pulmonary artery slings are also associated with complete tracheal rings. External compression can also result in tracheomalacia. Patients usually present during the first year of life with noisy breathing, intercostal retractions, and a prolonged expiratory phase.