Problems in Family Practice

Stridor in Childhood

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The acute onset of stridor in a young child usually represents viral croup, particularly during the fall and early winter. If the clinical picture is entirely consistent with this diagnosis and gas exchange is maintained, management with cool mist at home is appropriate. Rapid deterioration is unusual in viral croup; however, if obstruction is prolonged or becomes unusually severe, racemic epinephrine aerosols, hospitalization for careful observation, a brief course of corticosteroid therapy, and, rarely, endotracheal intubation may be required. Many of the other causes of acute stridor in childhood represent true pediatric emergencies: epiglottitis, foreign body aspiration, bacterial tracheitis, allergic airway edema, and retropharyngeal abscess, all requiring management with a consultant.

Chronic stridor in infancy most often represents laryngomalacia, a developmental abnormality of the laryngeal cartilage which usually resolves by the second year of life and rarely requires specific treatment. Other causes of chronic stridor in childhood include subglottic hemangioma, vocal cord paralysis, and a long list of abnormalities. In the older child with chronic stridor or in the infant whose clinical picture is unusual for laryngomalacia, airway roentgenograms, barium studies, or laryngoscopy/bronchoscopy should be obtained to establish the definitive diagnosis.

The management of a child with stridor represents a challenging paradox for the primary care physician. Stridor may be a sign of critical upper airway obstruction or a process that might rapidly progress to critical obstruction. If such is the case, the difficulty of securing an artificial airway in pediatric patients requires that expert consultation be obtained as quickly as possible. On the other hand, stridor in children is usually a sign of a self-limited problem that represents little threat of sudden deterioration.

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Differential Diagnosis

Stridor, the high-pitched sound of air passing at high velocity through a narrowed airway, is almost always a sign of obstruction in or above the trachea. Stridor is usually louder in inspiration than in expiration because the upper airway and the portion of the trachea outside the chest tend to

narrow in inspiration. Because inspiratory airway narrowing is prominent when the airway wall is floppy or compliant, children, who have less stiff airways than adults, are prone to develop inspiratory stridor. Mild stridor is usually noticed first when the child is breathing rapidly or deeply as with crying or exercise. If airway narrowing progresses, stridor is prominent even when the child is breathing at rest, and, if severe, is heard in expiration as well as in inspiration. Occasionally a patient presents with stridor that is more prominent during expiration, which suggests obstruction in the intrathoracic trachea or below. Stridor that is the same in both phases of respiration indicates a rigid obstruction, which is unaffected by changes in airway size with breathing.

Because a great variety of conditions can lead to narrowing of the upper airway, the appropriate management of a child with stridor depends on identification of the specific cause of that child's illness. In the majority of children with stridor, upper airway obstruction represents an acute process that has only existed for hours or days. In a few children, stridor represents a chronic process that has been present since birth or has gradually developed over weeks or months. Since these two situations are clinically distinct, it is helpful to consider the differential diagnosis and management of acute and chronic stridor separately.

Acute Stridor

When a child has developed acute stridor, one of the following six specific processes is usually responsible: viral croup, epiglottitis, bacterial tracheitis, foreign body aspiration, retropharyngeal abscess, or allergic reaction. Croup is overwhelmingly the most common, particularly during the fall and winter months, and is also the most benign. The other conditions represent medical emergencies; their prompt differentiation from croup may be life saving.

Croup

Viral croup affects primarily children between three months and three years of age. Airway narrowing in croup is caused by edema of the trachea just below the vocal cords. Most cases of croup present during the months of October and November and are due to infection with parainfluenza virus type 1. Parainfluenza type 3, influenza, and respiratory syncytial virus may be responsible for cases of croup that appear sporadically throughout the year. The severity of a particular child's croup depends to some extent on the viral agent responsible. Those associated with influenza A and respiratory syncytial virus may be particularly severe. Host factors also play a role. Many children experience only a single episode of croup, whereas others have several. Recurrent episodes typically strike suddenly at night and resolve quickly, and have been called "spasmodic croup." Although allergic children may be prone to such recurrent episodes, the differentiation of spasmodic croup from viral croup is difficult in the individual child and is not of great clinical importance, since the treatment, at present, is the same. Even in spasmodic croup an underlying viral infection is usually the initiating event.

The clinical picture of croup is characteristic. Usually the child has had signs of an upper respiratory tract infection for several days and then gradually develops a barking or harsh cough. Fever is generally mild or absent. Often the child wakes abruptly during the night, or from a nap, with stridor. Stridor is inspiratory in the beginning, and the child does not appear particularly toxic or fatigued. A brassy cough is prominent and hoarseness or a change in the voice is usually, but not always, present. The level of inspiratory obstruction fluctuates with time and is generally worse at night and better in the day. Clinical improvement occurs by the third or fourth day. In occasional patients, stridor becomes severe even at rest and is prominent in expiration as well as in inspiration. Respiratory failure is rare in croup, and when it develops, usually does so gradually, after the child has had a high level of obstruction for several days; acute decompensation is rarely seen. Many children with croup have evidence of lower as well as upper respiratory tract viral infection and may be mildly hypoxemic; serious pneumonia, however, is unusual.

Epiglottitis

Infection of the epiglottis and the supraglottic soft tissues by Hemophilus influenzae type B represents a major pediatric emergency for two reasons. First, rapidly developing inflammation can severely narrow the upper airway within hours. Second, generalized sepsis and toxicity compro-

mise the child's ability to compensate for the airway obstruction. Abrupt respiratory arrest and circulatory collapse are well recognized complications of H influenzae epiglottitis in both children and adults.

The clinical picture of epiglottitis is usually distinct from that of croup. Children with epiglottitis often have had no previous upper respiratory tract infection and develop severe stridor over a period of hours coincident with the development of high fever and signs of toxicity. The barking cough and hoarseness typical of croup are usually not present, whereas drooling and inability to swallow oral secretions are characteristic. In an effort to maintain the pharyngeal airway, patients with epiglottitis lean forward, a posture that is uncommon in croup.

Foreign Body Aspiration

The possibility of foreign body aspiration should always be considered whenever stridor develops in a child, particularly in a child who is developmentally delayed or too young to give a reliable history. A foreign body lodged in the glottis will prevent phonation; otherwise, the only characteristic clue of an aspirated foreign body is a history of the abrupt onset of stridor, often associated with brief choking or coughing, in the absence of signs of systemic illness. Stridor caused by foreign body aspiration is a medical emergency, as mucosal swelling or a shift in the position of the object can rapidly lead to total airway occlusion. A foreign body lodged in the esophagus may compress the trachea anteriorly and present as stridor.

Bacterial Tracheitis

In croup, viral infection of the upper airway causes obstruction in the area immediately below the glottis; in bacterial tracheitis bacterial infection of the upper airway causes stridor and obstruction resulting from edema and copious, thick secretions that may be present throughout the length of the trachea. This syndrome, which may occur spontaneously or as a delayed complication of viral croup, is well described in older pediatric texts but for unexplained reasons has been rarely discussed in publications over the last 20 years. It appears that bacterial tracheitis is again becoming a serious pediatric disease. As in epiglottitis, most patients with bacterial tracheitis are febrile and toxic. They may, however, have the barking cough and hoarseness typical of croup. The airway obstruction is less variable than that of croup and does not usually improve in response to inhalation of racemic epinephrine aerosols. If secretions are not cleared and appropriate antibiotic therapy instituted, this syndrome may also lead to abrupt airway obstruction and asphyxiation.

Retropharyngeal Abscess

Extension of infection from the oropharyngeal soft tissues into the retropharyngeal space may result in an abscess or cellulitis that compresses the trachea and supraglottic area anteriorly and leads to stridor. In addition to airway compression, a retropharyngeal abscess may rupture into the airway, leading to acute obstruction or aspiration with subsequent widespread pneumonia. Many children with this process have had a history of tonsillitis or pharyngitis in the recent past and appear febrile and toxic. They also may have palpable tender swelling in the neck, severe dysphagia, and neck pain.

Allergic Stridor

Airway obstruction may develop as a manifestation of an immediate allergic reaction. Early symptoms are usually absent and total airway obstruction may develop precipitously. Most patients with acute allergic airway edema have known allergies.

Chronic Stridor

Many of the causes of chronic stridor are unusual; a partial list is given in Table 1. It is helpful to refer to such a list whenever a child presents with longstanding stridor. The majority of children with chronic stridor are infants. The most common and benign cause of chronic stridor in infancy is laryngomalacia. Subglottic hemangioma and a vascular ring are other causes of which the primary care physician should be aware. Many of the causes of chronic stridor are unusual and will not be discussed here. Stridor related to such chronic

Table 1. Causes of Stridor in Childhood

Acute Stridor
Viral croup
Bacterial tracheitis
Bacterial epiglottitis
Foreign body aspiration
Retropharyngeal abscess
Allergic reaction
Chronic Stridor
Vocal cord paralysis
Laryngomalacia (benign laryngeal stridor)
Laryngismus stridulus (rickets)
Laryngeal papilloma
Thyroglossal duct cyst
Congenital goiter
Ectopic thyroid
Subglottic hemangioma
Tracheoesophageal fistula
Tracheal stenosis
Vascular ring
Post tracheostomy stricture
Psychogenic stridor

processes may be so mild that symptoms are not noted at base line, but appear recurrently whenever the child has an upper respiratory tract infection; therefore, differentiation from acute causes of stridor may be necessary.

Laryngomalacia

In a few infants, the epiglottis and cartilage supporting the larynx are more compliant than usual and allow the supraglottic tissues to collapse and narrow the airway with each inspiration. When this is the case, the epiglottis loses its usual configuration, resembling the blade of a spoon, and its lateral edges fold in so that they are nearly touching. Infants with laryngomalacia have stridor that is primarily, if not exclusively, inspiratory and that is most noticeable when respiratory efforts are forceful. Conversely, stridor is often minimal or absent during sleep. Laryngomalacia gradually resolves over the first two years of life. During the first year, however, symptoms may be severe and tracheostomy is occasionally necessary. As in viral croup, abrupt deterioration is unusual, so that tracheostomy is rarely if ever required as an emergency procedure. Hospitalization with careful observation may be indicated, particularly during intercurrent respiratory tract infections.

Vascular Ring

The trachea runs directly anterior to the esophagus and behind the major vessels of the mediastinum. One or more of the great vessels may develop abnormally so that the trachea and esophagus or, more rarely, the trachea alone is trapped between two or more vessels or the ligaments connecting them. Usually airway compression occurs within the pleural space and causes wheezing or stridor during expiration. Occasionally the vascular ring is high and causes inspiratory stridor. Symptoms are usually noted shortly after birth but may appear with a viral infection in the first few months of life. Generally, obstruction becomes more severe with growth, and surgical correction of the vascular anomaly is necessary.

Subglottic Hemangioma

During the first year of life a hemangioma may develop in the upper trachea. Such hemangiomas behave much like cutaneous hemangiomas in infancy in that they grow quickly after birth and frequently disappear spontaneously after a year or so. A subglottic hemangioma presents as mild stridor at birth or shortly thereafter, which becomes inexorably worse and, if untreated, can cause critical airway obstruction.

Evaluation

The first priority in evaluation of a child with stridor is to establish whether gas exchange is adequate. The child in whom inadequate gas exchange has developed abruptly is air hungry, agitated, and tachypneic. If respiratory failure has developed over days, the patient appears exhausted and may be breathing slowly. In either case, the breath sounds are decreased, and the patient is usually ashen. An alert, pink child, even one with dramatic stridor, is maintaining adequate gas exchange. Although respiratory failure from upper airway obstruction is easily recognized by the careful physician, arterial blood gas analysis

may be useful to confirm or rule out early respiratory failure in the child whose severe stridor has lasted for days; in such children it may be difficult clinically to separate exhaustion that is caused by a lack of rest from exhaustion as a result of respiratory failure. The second priority is to determine whether the child is at risk of developing abrupt critical airway obstruction, which requires that the specific cause of stridor be identified. In this regard it is necessary to ascertain either the specific cause of the stridor or that the clinical picture is entirely consistent with either viral croup or laryngomalacia. If any doubt remains after an initial evaluation with or without roentgenograms of the upper airway, consultation with a pulmonologist, otolaryngologist, or surgeon skilled in endoscopy is appropriate.

Two aspects of stridor may be particularly helpful in diagnosis. The first is the phase of respiration in which stridor is most noticeable. A second is the child's voice. Any process that affects the vocal cords will result in hoarseness or an inability to phonate. A normal voice or cry indicates that the vocal cords are not affected.

Acute Stridor

The diagnosis of viral croup can usually be confirmed, even over the telephone, by ascertaining that the child has had a typical prodromal illness, is alert and maintaining adequate gas exchange without marked anxiety, and is not toxic, highly febrile, drooling, dysphagic, or maintaining a leaning-forward posture. The presence of neck or throat pain, the possibility of foreign body aspiration, and a history of allergic reactions or recent episodes of tonsillitis should also be considered. Most cases of acute stridor occurring in the yearly or every-other-year epidemics of parainfluenza type 1 infection in the fall represent viral croup. During these epidemics it is particularly important to remember that each child with stridor might have a life-threatening illness rather than simple viral croup.

If any aspects of the history are atypical for croup, the child should be seen in an environment equipped for handling airway emergencies. The physical examination is guided by an awareness that, in epiglottitis or foreign body aspiration, respiratory arrest may be precipitated by disturbing the child in general or the oropharynx in particular. Initially the patient should be observed for toxicity, adequacy of gas exchange, posture, drooling, hoarseness, or evidence of swelling around the neck. Vital signs, including an axillary rather than an oral or rectal temperature, should be obtained. The neck should be examined for adenopathy or masses, and the chest auscultated without asking that the child change posture or lie down. Finally, the oropharynx should be inspected. Stimulation of the pharynx by a tongue blade may precipitate respiratory arrest in the toxic child with epiglottitis, but the oropharynx can usually be adequately examined by simply asking the child to open his mouth. The posterior pharyngeal wall should be inspected for inflammation or anterior displacement. Pale edema of the uvula or pharyngeal tissues suggests an allergic reaction. With the child's mouth opened widely, it is frequently possible to visualize the epiglottis, confirming the presence or absence of epiglottitis. If epiglottitis is suspected, and the epiglottis cannot be visualized without a tongue blade, roentgenographic studies should be obtained promptly rather than further attempts made at direct visualization. If the history and physical examination are suggestive of croup, the child is alert and afebrile, and the epiglottis cannot be directly visualized, some physicians elect to depress the tongue cautiously to rule out the possibility of early epiglottitis.

If the history and results of the physical examination are not typical for croup, it is appropriate to obtain lateral and anterior-posterior soft tissue films of the upper airway. The child who is toxic or has tenuous gas exchange should be taken immediately to the operating room for direct laryngoscopy and intubation, or, if films are thought necessary, should be accompanied by a physician equipped with oxygen and supplies necessary for establishing an airway. The child's posture should be altered as little as possible during efforts to obtain an adequate film. The lateral view is used first to evaluate the epiglottis, which is normally narrow but in epiglottitis assumes a profile similar to that of a thumb (Figure 1). Widening of the retropharyngeal shadow on the lateral film raises the possibility of an abscess (Figure 2); the retropharyngeal soft tissues anterior to the vertebral bodies should be no more than 1.5 times the anterior-posterior diameter of the fourth vertebral body. In bacterial tracheitis, the tracheal shadow on either film may or may not be

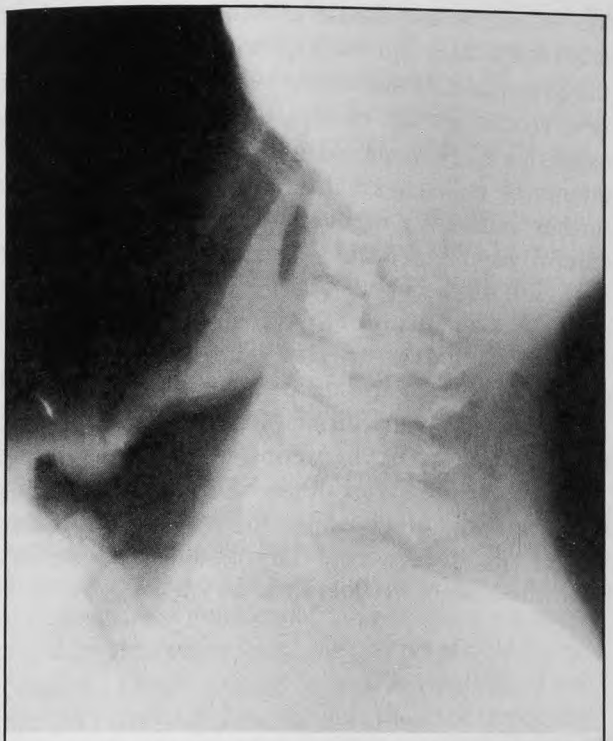

Figure 1. Lateral airway film from a child with epiglottitis. The hypopharynx is dilated and the epiglottis is swollen and blunted

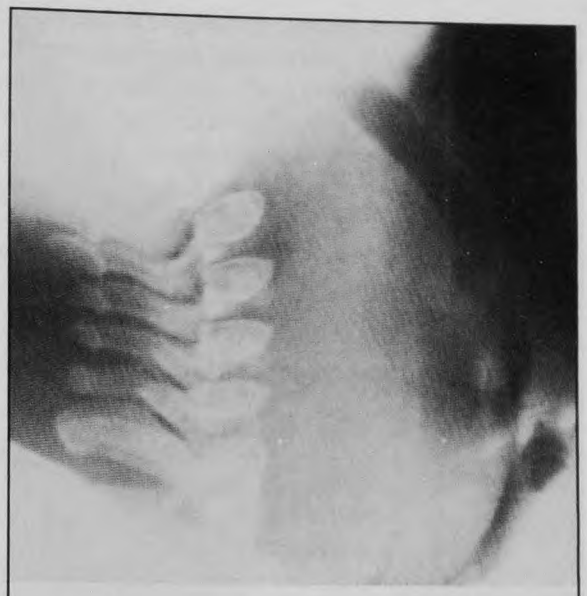

Figure 2. Lateral airway film from a child with retropharyngeal abscess. The retropharyngeal soft tissues are massively swollen, displacing the pharynx and trachea anteriorly

irregularly narrowed throughout its length. Although evidence of an aspirated foreign body may be diagnostic, it should be noted that such foreign bodies are often radiolucent. An esophageal foreign body may displace the trachea anteriorly on the lateral film. The anterior-posterior film should be inspected for lateral displacement of the trachea and for subglottic narrowing of the tracheal air shadow consistent with croup. Normally, the tracheal air shadow tapers just below the glottis over 1 cm or 1.5 cm. In croup, the tracheal shadow may be narrowed over a longer segment and may assume the configuration of a steeple. This sign is, however, notoriously inconsistent (Figure 3).

If the history, physical examination, and airway films do not confirm the diagnosis of croup, consultation should be obtained for consideration of more invasive procedures such as direct laryngoscopy or bronchoscopy. In a child with typical radiologic findings of croup who is toxic, highly febrile, and whose illness is resistant to treatment the diagnosis of bacterial tracheitis should be considered, as these two entities may coexist.

Laboratory evaluation is of secondary importance in acute childhood stridor. The white blood cell count may be high, and the differential count shifted to the left in epiglottitis, bacterial tracheitis, or retropharyngeal abscess. Arterial blood gases are not routinely indicated unless gas exchange is compromised because respiratory failure associated with upper airway obstruction is usually clinically evident, and disturbance of the child may exacerbate the airway obstruction. Mild hypoxemia resulting from lower respiratory tract inflammation or edema is common in croup and epiglottitis.

Chronic Stridor

When evaluating a child with chronic stridor, it is helpful to review the many specific lesions that may narrow the upper airway (Table 1). A history of the pattern of onset and of any aspiration,

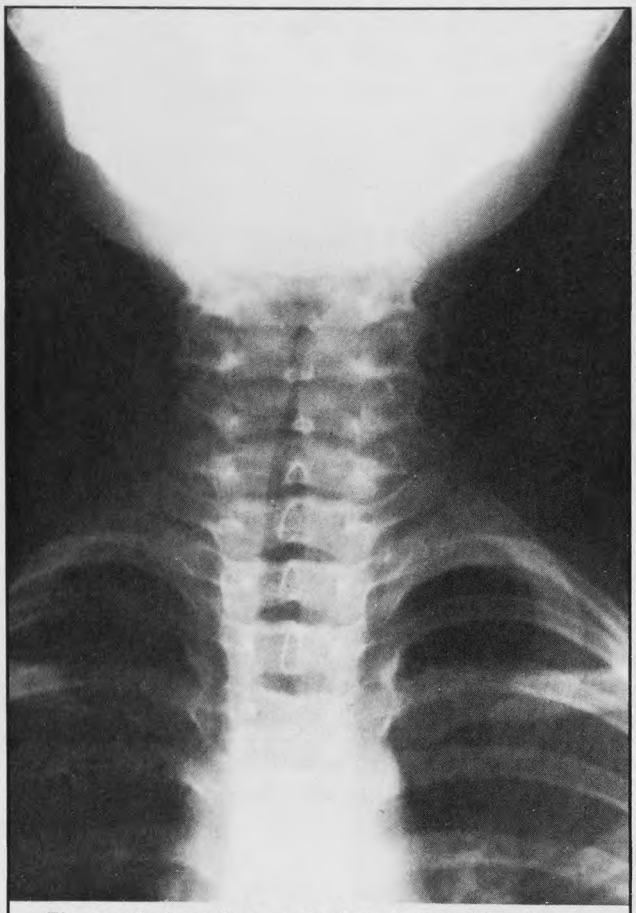

Figure 3. Anterior-posterior airway film from a child with croup. The subglottic trachea narrows gradually below the glottis over greater than 1.5 cm. Even in this case the differentiation of croup from normal is far from obvious

trauma, airway inflammation, or endotracheal intubation should be elicited. Changes in the voice or cry will indicate whether the glottis is involved. In some situations, recumbancy and increased respiratory effort exacerbate symptoms. Fixed lesions and those below the larynx are less affected by posture and effort. Specific history should be obtained regarding breathing during sleep, evidence of cyanosis or feeding difficulties, and failure to thrive.

The diagnosis of laryngomalacia can usually be made on the basis of the typical onset early in infancy, the presence of inspiratory stridor exacerbated by crying and improved during sleep, and the absence of failure to thrive or feeding difficulties. If the symptoms are classic and the stridor remains mild, it is usually unnecessary to proceed further in the evaluation. If the stridor becomes moderate or severe or is present in expiration, however, more extensive workup should not be delayed. In such infants or in older children with chronic stridor, further conservative evaluation is limited to a careful complete history and physical examination, soft tissue upper airway films, and barium swallow examination. In the infant the barium swallow should be carefully inspected for evidence of a vascular ring or tracheal narrowing. Most children with chronic stridor should be referred for direct laryngoscopy or bronchoscopy. These procedures can often be accomplished in the specialist's office using only mild sedation. In infants, the presence of laryngomalacia can be confirmed easily by fiberoptic laryngoscopy.

Therapy

The management of a child with stridor depends on the nature of the particular process causing airway obstruction. Since the majority of children with acute stridor have viral croup and many infants with chronic stridor have laryngomalacia, the primary care physician should develop a rational approach to the management of children with these two problems. The primary care physician must also recognize promptly those children with potentially life-threatening upper airway obstruction and obtain expert consultation to deal with these critical situations. Not all children will be seen early in the course of their illness, however, so the physician must also be familiar with the initial management of critical upper airway obstruction, whatever its cause.

Critical Upper Airway Obstruction

When a child presents with critical upper airway obstruction, the possibility of foreign body aspiration should be immediately considered, and, if the history or physical examination is compatible and if airway obstruction is complete, the Heimlich maneuver should be tried. If this maneuver is not indicated or is unsuccessful, other steps should be taken to reestablish adequate gas exchange. In the majority of children with severe stridor, including those with epiglottitis, adequate

gas exchange can usually be maintained by careful and vigorous mouth-to-mouth or bag-and-mask positive pressure ventilation. Whatever the cause of the obstruction, efforts at positive pressure ventilation, with added oxygen if possible, should be initiated immediately.

Because of the difficulty of securing an artificial airway in children with stridor, attempts to establish an airway should be undertaken only if positive pressure ventilation has failed. Adequate positive pressure ventilation should not be interrupted to secure an airway unless conditions are optimal. If, however, ventilation by positive pressure is inadequate, a definitive airway can be established in one of three ways: endotracheal intubation, tracheostomy, or cricothyroid puncture. Endotracheal intubation can be extremely difficult in the presence of supraglottic inflammation, but, if equipment is available and the physician is experienced in this technique, intubation should be attempted. Tracheostomy can also be difficult unless the physician has had specific experience and training. Puncture of the cricothyroid membrane just below the thyroid cartilage in the midline with a 14-gauge or larger hollow-bore needle has provided adequate gas exchange in a few children.

Croup

Nearly all aspects of the therapy of viral croup are controversial. As croup is self-limited in the majority of children, it is important that therapies which might have serious side effects not be used unless the episode of croup is unusually severe. The major steps that may be helpful in croup are the administration of cool mist, aerosols of racemic epinephrine, corticosteroids, and, very rarely, endotracheal intubation. Other therapies have been popular in the past, for instance, subemetic doses of syrup of ipecac. Most of these treatments have never been shown to be effective. Ipecac is now not widely recommended, as it rarely seems to make a major difference in long-term outcome and raises the possibility of aspiration if vomiting is induced in an air-hungry child.

Cold air or cool mist remain the primary therapy for children with croup. Although there is little scientific evidence of their efficacy, it is clear from the experience of most physicians that taking a croupy child out into the cool night air often leads to improvement. Cool mist generated by an aerosol generator, vaporizer, or shower and concentrated in a hospital croup tent or makeshift tent at home seems an appropriate, if empirical, first step in management. Cool mist can be used continuously with caution taken to maintain the child's body temperature. Ultrasonic aerosol generators produce a very dense small particle mist that may be irritating, and heated mist or steam generators should not be used because of the danger of burns when used in proximity to a young child.

The second level of therapy in the treatment of croup is the administration of racemic epinephrine by aerosol. The usual dose is 0.5 mL of the standard 2.25 percent solution of racemic epinephrine diluted with 2.5 mL of water and nebulized continuously into an open face mask. The child breathes the aerosol until the nebulizer is empty. This dose can be used for children of any age, because the amount of drug absorbed is adjusted by the size of the child's own tidal volume. Aerosolized racemic epinephrine has been shown to decrease symptoms for up to two hours, presumably because of local mucosal vasoconstriction. After two hours, however, the degree of obstruction is no better than if the therapy had not been used. Therefore, a child should not be discharged home within two hours of a racemic epinephrine treatment. Because vasoconstrictor nose drops may be associated with rebound edema, some physicians have been concerned about the use of this therapy in croup. To date, however, exacerbation of croup by racemic epinephrine has not been documented. A child's response to aerosolized racemic epinephrine may be helpful in the diagnosis of the cause of stridor: lack of response is occasionally seen in croup, but should raise the suspicion that one of the other causes of acute stridor, such as bacterial tracheitis, is present. Because its effect is short-lived and its use does not affect the long-term course of croup, racemic epinephrine is best reserved for children with severe stridor who seem likely to require hospitalization. In the hospital, racemic epinephrine can be safely administered every one to two hours, if the child is observed closely.

The use of steroids in croup is particularly controversial. It is clear that it would be a mistake to treat the majority of children with croup with corticosteroids. Children who have been hospitalized with severe croup and fail to respond to mist and racemic epinephrine are treated with pharmaco-

logic doses of steroids in many centers despite a lack of convincing proof that they are efficacious.

Perhaps the most difficult judgment for the primary care physician is when to hospitalize a child with croup. The major indication for hospitalization is the need for careful observation so that an artificial airway can be established, if necessary. Hospitalization also allows for the administration of repeated doses of racemic epinephrine. A child at risk for respiratory failure with croup is usually fatigued and demonstrates stridor (including expiratory stridor) at rest. Such a child is best admitted for one or two days, particularly if the parents are exhausted from lack of sleep and may have lost the ability to recognize a gradual deterioration in the child's condition.

Other Causes of Acute Stridor

If one of the other causes of acute stridor is considered, the primary physician should share responsibility for the child's management with an appropriate consultant.

Each hospital or institution should be guided by a protocol for the care of a child suspected to have epiglottitis. Usually this calls for immediate establishment of an artificial airway in the operating room with both an anesthesiologist and an otolaryngologist participating. Once the diagnosis has been established and appropriate cultures of the epiglottitis and blood obtained, intravenous antibiotic therapy adequate to cover all strains of H influenzae type B should be started. Although remote complications of H influenzae disease, such as meningitis, are rare with epiglottitis, they should be considered.

Bacterial tracheitis is handled in much the same way as epiglottitis. Once the diagnosis is suspected, examination in the operating room is indicated, and tracheostomy or endotracheal intubation performed with careful attention to possible tracheal obstruction or obstruction of the tube by thick secretions. It is often difficult to decide when a child who has had a particularly prolonged course with viral croup should be suspected to have bacterial tracheitis. Fever, white blood count, toxicity, radiographs, and response to racemic epinephrine may all be helpful in this regard. Antibiotics adequate to cover at least staphylococcus and streptococcus should be initiated and continued until definitive cultures are available.

An aspirated foreign body in the airway or esophagus should be removed as soon as possible under direct visualization in the operating room. A retropharyngeal abscess should be surgically drained and appropriate antibiotics instituted. Acute allergic reactions should be treated immediately with epinephrine, intravenous corticosteroids, aminophylline, antihistamines, and establishment of an artificial airway if a clinical response is not evident.

Laryngomalacia

The management of laryngomalacia is limited to careful observation. Although the child may have less obstruction when calm or sleeping, it is usually futile to attempt to prevent the child from crying or being active. Specific therapy is limited to surgical management, which should be considered with appropriate consultation if the stridor becomes gradually more severe. The responsibility of the primary care physician is to recognize when the severity of an infant's stridor has reached the point that the diagnosis of laryngomalacia can no longer safely be assumed.

Other Causes of Chronic Stridor

When an older child has developed chronic stridor or when the diagnosis of laryngomalacia is not clear, consultation should be obtained for help with diagnosis. Therapy depends entirely on diagnosis. With subglottic hemangioma, tracheostomy and surgical or laser excision is often necessary, although such lesions may decrease in size with steroid treatment. A vascular ring requires surgical correction. A few children have been described with what appears to be psychogenic stridor, in which the vocal cords close voluntarily with inspiration, while the larynx and upper airway are otherwise entirely normal. If this diagnosis has been established, the primary care physician should play a major role in management.

Suggested Reading

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