



REVIEW ARTICLE

Acute upper respiratory tract infections - outpatient diagnosis and treatment

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Abstract

Objective: To present an updated review of the most common upper respiratory infections (URI) in children seen by the pediatrician in outpatient clinics, for better diagnostic and therapeutic decisions.

Source of data: References from Medline database were reviewed. The most relevant articles were selected.

Summary of the findings: Acute rhinopharyngitis, sinusitis, streptococcal tonsillitis and viral croup are presented in a concise and critical view. Differential and etiological diagnosis limitations and the abusive use of antimicrobials in these illnesses are also discussed.

Conclusions: URI are the most common cause of visits to pediatrician clinics. Therefore, update and critical concepts, as well as references are essential for a proper management of these illnesses, decreasing the indication of unnecessary diagnostic tests and avoiding non-effective and harmful treatments.

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Introduction

Upper respiratory tract infection (URTI) is one of the most frequent diseases observed at centers for pediatric care, and results in significant morbidity worldwide.¹ URTI is the most common cause in children treated against acute respiratory infection.^{2,3} The difficulty found by clinicians in establishing the differential and etiologic diagnosis of URTI and the occasionally indiscriminate use of antimicrobial drugs justify the inclusion of this article in a supplement of *Jornal de Pediatria*.⁴⁻⁶

The aim of the present article is to briefly review the most common types of URTI in a pediatrician's routine practice. Basic elements that help to improve diagnosis and treatment, based on up-to-date literature data, whenever possible, are presented. Acute rhinopharyngitis, acute sinusitis, acute streptococcal tonsillopharyngitis and acute viral laryngitis will be discussed as well.

Acute rhinopharyngitis

This term involves common cold and other disorders caused by acute viral rhinitis. Acute rhinopharyngitis is the most frequent type of upper respiratory infection in childhood. Children younger than five years may have between five and eight episodes a year. This situation is

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almost exclusively caused by viruses, such as rhinovirus, coronavirus, respiratory syncytial virus (RSV), parainfluenza virus, influenza virus, and coxsackie viruses, adenovirus and some rarer types of viruses.¹ Due to the inflammation of the nasal mucosa the ostia of the paranasal sinuses and eustachian tubes may become obstructed, which allows the development of secondary bacterial infection (sinusitis and acute otitis media). Some etiologic agents, such as RSV and adenovirus, may be associated with the development of lower respiratory tract infection.

The flu, caused by the influenza virus, is usually classified separately from the common cold and is characterized by URTI with greater clinical repercussion. The child may present with high-grade fever, prostration, myalgia and chills.

Symptoms like runny nose, cough, and pharyngitis may not be so important, since more intense systemic symptoms occur. Fever, diarrhea, vomiting and abdominal pain are common in younger children. Cough and fatigue may last for weeks.

- Mode of transmission: droplets produced by coughing and sneezing (just as an aerosol) or by the contact of contaminated hands with the airway of healthy individuals.
- Communicability: remarkable in closed and semi-closed communities, such as household, day care centers (important to infant morbidity), schools, among others.
- Incubation period: 2-5 days.
- Period of communicability: from a few hours before to some days after the onset of symptoms.

Signs and symptoms

Rhinopharyngitis may commence with sore throat, runny nose, nasal congestion, sneezing, dry cough, and fever of varying degree, usually higher in children younger than five years. Some patients with this infection do not have fever. Certain types of viruses may cause diarrhea.

The following signs or symptoms may occur:

- In infants: restlessness, easy crying, unwillingness to eat, vomiting, sleep disorders, breathing difficulty due to nasal congestion in younger infants.
- In older children: headache, myalgia, chills.

The physical examination reveals congestion of the nasal and pharyngeal mucosa and hyperemia of the tympanic membranes. The latter finding, separately, is not a diagnostic element of acute otitis media, especially if the child cries during otoscopy. Nonspecific mild disorders of the tympanic membrane may be associated with viral infections, given that these agents may be associated with middle ear infections.^{7,8}

Complications

Some bacterial complications may occur during viral respiratory infections. Some of these complications include persistent fever for over 72 hours, recurrent hyperthermia after this period or intensified prostration. In addition, the occurrence of breathing difficulty (tachypnea, retractions or grunting) indicates the possibility of acute bronchiolitis, pneumonia or laryngitis. The most frequent bacterial complications are acute otitis media and sinusitis.

Moreover, episodes of viral infections are one of the most important triggering mechanisms of acute childhood asthma, especially the one caused by the respiratory syncytial virus and rhinovirus.^{9,10}

Diagnosis

The diagnosis of rhinopharyngitis is essentially clinical.

The differential diagnosis should include initial signs and symptoms of several diseases: measles, pertussis, meningococcal or gonococcal infection, streptococcal pharyngitis, hepatitis A and infectious mononucleosis.

In the presence of recurrent URTI with nearly permanent symptoms during winter and spring, the clinician should suspect of allergic rhinitis.

Complementary exams

The identification of the virus is unnecessary. In some important epidemic situations, the investigation of respiratory viruses may help with the control or prevention of the disease by health professionals.

General treatment

- Rest during fever bouts.
- Hydration and food ad lib.
- Nasal hygiene and decongestion: nasal irrigation with isotonic saline, followed later by slight aspiration of nasal fossae with appropriate handheld aspirators. Infants younger than six months may show discomfort with nasal congestion caused by viral rhinopharyngitis. Therefore, special care should be given to infants before breastfeeding and during sleep.
- Air humidification: beneficial effects have not been confirmed.
- Antipyretic and pain-killer: acetaminophen or ibuprofen.
- Topical nasal decongestant: when nasal hygiene is not effective, topical decongestants may be used moderately in older children for no more than five days, due to the risk of rhinitis medicamentosa. There is no scientific evidence that this medication can be safely used in younger children or that it prevents acute otitis media.¹¹
- Oral antitussive and antihistaminic drugs: these drugs are not recommended due to their inefficiency and

several adverse effects.¹² The combination of antihistamines with systemic decongestants is not efficacious in younger children.¹³

- Antimicrobial agents: although prescribed regularly by pediatricians, these medications are contraindicated, since they do not prevent secondary bacterial infections in viral infections and cause adverse effects, such as the increase of resistant bacterial strains in the nasopharynx.^{1,5,6,14,15}

Specific treatment

There is no specific treatment against most viruses; however, in the case of influenza, some medications have been available.¹⁶⁻¹⁸

The use of amantadine or rimantadine can prevent nearly 70-80% of diseases caused by the influenza A virus. Both drugs reduce the severity of the disease and shorten its duration in healthy individuals, when administered within the first 48 hours after the onset of symptoms. Amantadine may be used in children older than one year, but rimantadine can only be used in those older than 13. The efficiency of these drugs in the prevention of severe complications in high-risk patients is still unknown. The use of amantadine or rimantadine has the following drawbacks: inefficiency in case of infection caused by the influenza B virus, development of viral resistance during treatment and adverse effects on the central nervous system (restlessness, difficulty in concentrating and, rarely, tremors or seizures). Nevertheless, these two drugs are significantly cheaper than the new neuraminidase inhibitors (oseltamivir and zanamivir), which are indicated to one-year-olds and seven-year-olds, respectively.¹⁶⁻¹⁸ Thus, as the identification of the etiologic agent is not necessary (influenza A), as the treatment should be implemented within 48 hours after the onset of symptoms, and due to age restriction and interaction with some medications, the use of amantadine and rimantadine is restricted to risk groups, for which the vaccine is recommended.

Prognosis

Self-limited disease (5-7 days) with good prognosis in previously healthy children. Infants, malnutrition or immunodepression are risk factors for complications.

Information and instructions to family members

- Explain that the use of antimicrobial agents is not necessary, since they are not effective against viral infection, do not prevent bacterial complications, are costly and may cause adverse effects.
- The same applies to the use of antitussive or antihistaminic drugs.
- Tell parents or family members they should be attentive to the occurrence of breathing difficulty, high-grade

fever, prostration, purulent nasal discharge for over 10 days, earache, or persistent cough for over 10 days.

- If any of these disorders occur, telephone or personal contact with the health center or pediatrician should be established.
- Family members or other people with viral respiratory infection should wash their hands properly and healthy children should not get in contact with URTI patients.
- Patients with cold, indication of surgery with general anesthesia and intubation: the surgery should be postponed for six weeks in children with remarkable signs and symptoms of URTI.¹⁹

Preventive measures

- Wash hands properly and avoid contact with secretions and fomites from the patient.
- Primary prevention: avoid contact of vulnerable patients (younger than three months and immunocompromised) with infected individuals, especially at schools and day care centers.
- There is no study that shows the benefits of using vitamin C to treat URTI in children as far as the lower frequency or lesser severity of rhinopharyngitis are concerned.
- Vaccine against influenza: it is not formally indicated in healthy children, although it apparently reduces the incidence of acute otitis media.²⁰ Even so, the epidemiological impact might still be low, since most cases of URTI are not caused by influenza. Therefore, in these instances, indication is made on a case-by-case basis. The vaccine is mandatory in patients with asthma, chronic cardiopulmonary diseases, hemoglobinopathies, kidney diseases or chronic metabolic disorders, diseases that require the continuous use of aspirin or immunodeficiencies.²¹
- In cases of children with recurrent URTI who attend day care centers, which results in increased morbidity during the winter and spring seasons, the risk of maintaining the child in the day care center and the benefits from withdrawing him/her from it should be pondered.

Acute sinusitis

Acute sinusitis can be defined as the bacterial infection of the paranasal sinuses for over 30 days, time after which the symptoms resolve completely.²²

Paranasal sinuses contain cavities that are encompassed by four bone structures: maxillary, ethmoid, frontal and sphenoid. These cavities communicate with the nasal fossae through small orifices (ostia). Maxillary and ethmoid sinuses are present in newborns but their size is small in the first two years of life, which raises a debate over the indication of radiological studies before this age. The frontal and sphenoid sinuses develop after the age of four and reach their final size only during puberty.

Usually, the maxillary and ethmoid sinuses are the most affected. Ethmoiditis often appears after the sixth month of life. Maxillary sinus infection shows clinical signs after the first year of life. Frontal sinusitis is rare before the age of 10.

The most commonly found bacterial agents include *Streptococcus pneumoniae*, nontypeable *Haemophilus influenzae*, and *Moraxella catarrhalis*. Viral infectious agents may be associated with cases of sinusitis.^{4,23} Its relation as isolated cause in some cases or even as a predisposing factor is still unclear.

Some other factors are associated with sinusitis: other types of obstruction of the sinus ostium (nonviral), allergic rhinitis, viral rhinopharyngitis, adenoiditis, smoking (active and passive), septal deviation, foreign body and nasal tumors, immunodeficiencies, asthma and cystic fibrosis, diving activities.

Signs and symptoms

The onset may be slow or abrupt. In mild forms of sinusitis, initial signs of URTI last for over 10 days or there is persistence or recurrence of nasal symptoms (congestion and purulent nasal discharge) after a period of clinical improvement. Halitosis may follow. Daytime cough, which usually worsens at night, is also present. Fever may occur in some cases. In moderate to severe forms or in older children, the signs mentioned here may be more intense, occasionally combined with eyelid edema, headache, prostration, discomfort or pain, either spontaneous or provoked, at the site of the affected sinus(es) or in the teeth.¹ Periorbital cellulitis is a sign of ethmoiditis.

The examination of the nose reveals mucosal congestion and purulent discharge in the middle meatus. Purulent postnasal drip may be observed in the nasopharynx.

Complications

Possible complications include chronic sinusitis, frontal osteitis, maxillary osteomyelitis, periorbital cellulitis, orbital and subperiosteal abscess, meningitis, thrombosis of the cavernous sinus and of the superior sagittal sinus, epidural abscess, subdural empyema and brain abscess.

Diagnosis

The diagnosis of acute sinusitis is clinical. Clinical history, combined with the results of physical examination, allows the diagnosis of sinusitis in children. X-ray of facial sinuses is seldom necessary.²⁴

The differential diagnosis should include prolonged uncomplicated viral infection, allergic rhinitis, foreign body in the nose and adenoiditis.

Otolaryngological evaluation should be requested in the following cases:

- recurrent sinusitis (acute bacterial sinusitis, interspersed with asymptomatic periods of more than 10 days);
- chronic sinusitis (episodes of inflammation of paranasal sinuses for over 90 days);
- acute sinusitis with persistent pain or other local complications.

Complementary exams

- Hemogram: shows abnormalities that are compatible with acute bacterial infection.
- Nasal swab culture: does not seem to help with the identification of the intrasinus agent, due to lack of correlation between the findings.¹
- X-ray: should not be used for the diagnosis of uncomplicated acute sinusitis. The most common findings for this diagnosis are: presence of air-fluid level, complete opacification of the sinus cavity and mucosal thickening of the wall of the maxillary sinus greater than 4 mm.¹
- Computed tomography: useful in refractory cases or if bone, orbital or intracranial complications are suspected.
- Sinus aspiration: recommended for immunocompromised children or for cases extremely refractory to adequate antimicrobial agents.¹
- Nasal endoscopy: when predisposing nasal anatomic factors are involved.

General treatment

- Initial rest.
- Air humidification in very dry places.
- Painkiller and antipyretic: acetaminophen or ibuprofen.
- Topical or systemic decongestants: there is no scientific evidence of their benefits in this case.

Specific treatment

- *Antimicrobial agents*: several broad-spectrum antibiotics may be used in the treatment of acute sinusitis.²⁵ The most widely recommended alternatives are:

Amoxicillin: still the drug of choice.²⁵ Dosage: 60-80mg/kg/day, given orally, 8/8h, for 14-21 days.

Cefuroxime or amoxicillin combined with clavulanic acid: if beta-lactamase producing bacteria are suspected (epidemiological data or lack of response to first-line antimicrobial agents).

Clarithromycin and azithromycin are other options.

The initial antimicrobial agent should be replaced if signs and symptoms do not abate within 72 hours. Severe cases require hospital admission and treatment with intravenous antibiotics.

Some authors have shown that the course of uncomplicated acute sinusitis might not be altered with the

use of the antimicrobial agent, with great tendency towards spontaneous resolution.^{26,27} Further studies are necessary to better evaluate the role of antimicrobial agents in the treatment of uncomplicated acute sinusitis before deciding to contraindicate antibacterial drugs.

- *Corticosteroids*: some studies have shown that the use of topical nasal corticosteroids, combined with antimicrobial agents, may be beneficial by improving the symptoms of acute sinusitis in children and adolescents.²⁸⁻³⁰ The use of systemic corticosteroids may be indicated in cases of acute sinusitis associated with previous history and acute symptoms suggestive of allergic rhinitis or asthma.
- *Surgical treatment*: based on the specialist's judgment. Used for drainage of the affected sinus, due to some complication.

Prognosis

The prognosis is good for healthy children when the treatment is appropriate. Children with allergic rhinitis or other risk factors have greater propensity for recurrent or chronic episodes of sinusitis. Garbutt et al. showed that children with acute sinusitis, treated with placebo, had as good clinical improvement (79%) as those treated with appropriate antibacterial agents (79% and 81%).²⁶

Information and instructions to family members

- Observe the occurrence of increasing or persistent pain at the site or fever, edema and hyperemia in the affected area or in the periorbital region. In these cases, contact a pediatrician.
- Return for routine follow-up in two weeks.
- Avoid contact with cigarette smoke.
- Avoid diving activities up to total resolution of the process.

Preventive measures

- Treat allergic rhinitis, whenever present (prophylaxis).
- Avoid diving activities during URTI.
- Avoid smoking (active and passive).
- Surgical correction of predisposing factors.

Acute streptococcal tonsillopharyngitis

Acute streptococcal tonsillopharyngitis (ASTP) is an acute infection of the nasopharynx, usually produced by a beta-hemolytic streptococcus, *Streptococcus pyogenes* group A. It is often accompanied by systemic signs and symptoms. It usually affects children older than five years, but it may occur, not uncommonly, in those younger than three years.^{31,32} This streptococcal infection is more frequent at the end of fall, winter and spring, in temperate climates.

The incubation period is of 2-5 days. Transmission often occurs by direct contact with the infected person, through respiratory secretions. Outside epidemic periods, ASTP accounts for approximately 15% of the cases of acute pharyngitis.¹

The importance of this disease lies in the fact that, aside from the suppurative complications directly caused by the infection, it may provoke late-onset suppurative reactions, such as rheumatic fever (RF) and acute diffuse glomerulonephritis (ADGN), according to the type of strain. RF may be effectively prevented with the use of appropriate antimicrobial agents. However, early antimicrobial therapy against ASTP does not seem to remarkably reduce the risk of ADGN.³³

The carrier status often does not have relevant consequences to the carrier. In these cases, communicability is usually low and this self-limited situation may persist for several months.³⁴

Signs and symptoms

The onset is mostly sudden, with high-grade fever, sore throat, prostration, headache, chills, vomiting and abdominal pain. The examination of the nasopharynx shows intense congestion and increase in tonsil size, with presence of purulent exudate and soft palate petechiae. Bilateral cervical adenitis may also occur.

The presence of rough, macular and punctate exanthema (boiled lobster appearance), dark red lines (Pastia's lines) and circumoral pallor (Filatov's disease) are characteristic of scarlet fever.

Diagnosis

Some authors attempted to define a model of clinical signs that could help physicians to establish the diagnosis of ASTP with greater certainty.³⁵⁻³⁷ The results of these studies are yet controversial. Attia et al.³⁵ proposed a predictive model for the diagnosis of this disease, by means of a prospective study. These authors used convergent, positive and negative predictive signs as the basis for the clinical diagnosis with a greater certainty. Among positive predictors are: remarkable increase in tonsil size, painful swelling of the cervical lymph nodes, scarlatiniform rash and absence of coryza. Another author, in a meta-analysis, points to the presence of tonsillar exudate and history of exposure to streptococcal throat infection in the last two weeks as a positive predictive factor.³³ On the other hand, Nawaz et al.,³⁷ using clinical criteria, did not find a high positive predictive value for the diagnosis of ASTP. The definitive diagnosis of ASTP is established only by nasopharyngeal culture. However, given these inconclusive studies, it is important that pediatricians adopt practical guidelines for children who present with fever and sore throat. The authors think that, when physical examination reveals pharyngeal congestion, remarkable increase in tonsil size (with or without exudate), painful swelling of cervical

lymph nodes and absence of coryza, pediatricians can perform the presumptive diagnosis of ASTP and select the appropriate treatment.

The differential diagnosis should include:

- Viral pharyngitis: coryza, cough, hoarseness and bullae or ulcerations in the nasopharynx.
- Pharyngitis caused by *Mycoplasma* and *Chlamydia*: more frequent in adolescents.
- Mononucleosis, cytomegalovirus infection, toxoplasmosis (with its own signs, including involvement of distant organs and structures).
- Meningococcal or gonococcal pharyngitis (history and epidemiological data).
- Diphtheria: white-grayish plaques adhered to the nasopharynx, occasional invasion of the uvula, laryngeal involvement.
- Pharyngitis caused by other streptococci, *Hemophilus* or *Moraxella*: rare.
- Other disorders: nasopharyngeal tumor and agranulocytosis.

Complications

- Cervical lymph node abscess: erythema, edema and fluctuation.
- Peritonsillar abscess: more intense pain and swallowing difficulty, muffled or nasal voice, prominence of the tonsils and of the palatoglossal arch, displacement of the uvula to the unaffected side.
- Sepsis: toxemia and shock.
- Toxic shock syndrome: toxemia, hypotension, maculopapular rash.
- Acute otitis media.
- Reactive arthritis (nonsuppurative): polyarticular signs and symptoms that do not meet Jones criteria for acute RF appear during the acute phase of pharyngitis. Some patients develop silent or detectable carditis only later, with all the consequences of this type of involvement.
- Rheumatic fever.
- Streptococcal glomerulonephritis.

Complementary exams

Quick test for direct identification of throat swab material: there is a current preference for this method over culture (gold standard), when high-sensitivity reagents are used. When available, it should be used for confirming the diagnosis. It is not necessary to perform culture for high-sensitivity tests with negative results.³⁸ The high cost of this test does not allow its indication as routine procedure in medical practice in Brazil. In more restricted sensitivity tests, a negative result requires throat culture.

Other specific tests for differential diagnosis: mononucleosis, *Mycoplasma*, gonococci, etc.

General treatment

- Rest during fever bouts.
- Increased intake of nonacid and nongaseous fluids and of foods with pasty consistency, preferably cold or ice-cold.
- Painkiller and antipyretic: acetaminophen or ibuprofen.
- Irrigation of the pharynx with warm isotonic saline solution.

Specific treatment

Antimicrobial agents: they shorten the acute phase and minimize complications. The first-line antibiotics are penicillin G or amoxicillin.

- Phenoxymethyl penicillin (Oral penicillin V):
Dosage - < 27kg: 400,000 U (250mg), 8/8 hours, for 10 days.
> 27kg: 800,000 U (500mg), 8/8 hours, for 10 days.
- Benzathine penicillin G: warrants treatment in cases in which poor treatment adherence is suspected.
Dosage - < 27kg: 600,000 U, IM, single dose.
> 27kg: 1,200,000 U, IM, single dose.

The injection is less painful if the medication is previously warmed to body temperature.

Note: benzathine penicillin G should be the first choice in the treatment of ASTP in cases of potential nonadherence to treatment.

- Amoxicillin: 40-50 mg/kg/day, given orally, 8/8 hours or 12/12 hours, for 10 days.
- Erythromycin estolate (penicillin-allergic patients): 20-40mg/kg/day, given 2-3 times a day, for 10 days.
- Cephalexin: Dosage: 30mg/kg/day, 8/8 hours, for 10 days.

Note: tetracyclines and sulfonamides should not be used to treat ASTP.

Surgical drainage or sinus aspiration: may be indicated in cases of abscedation with fluctuation of the cervical lymph node.

Management of reactive arthritis: long-term cardiological follow-up to prevent carditis. Some authors recommend prophylaxis with penicillin for months or even years. If carditis occurs, it should be treated as RF.^{33,39,40}

Prognosis

Properly treated cases of ASTP have a good prognosis, with shortening of the acute phase and reduction of suppurative and nonsuppurative complications, such as RF.

Information and instructions to family members

Observe the evolution of the disease and contact the physician in case of:

- Intense swallowing difficulty.
- Muffled or nasal voice.
- Breathing difficulty.
- Reddish spots on the skin.
- Deterioration of other local or general disorders.
- Recurrent fever, joint pain, dark-colored urine, oliguria, or eyelid edema, during the development of the disease or one week after its onset.

Precaution with contamination of family members and other contacts:

- Avoid attendance at day care, school or parties for at least 24 hours after antimicrobial therapy is initiated.
- Seek medical assistance if other family members have sore throat or fever on the same occasion.

Preventive measures*Primary measures*

Against acute pharyngitis:

- Avoid contact with ASTP patients up to 24 hours after appropriate antimicrobial therapy has been initiated.
- Avoid attendance at day care, school or parties for at least 24 hours after antimicrobial therapy has been initiated.

Against RF:

- Treatment of ASTP with appropriate antimicrobial therapy up to the ninth day after disease onset is still effective.
- Try to eradicate streptococci from the patient's nasopharynx when he/she or any family member has previous history of RF.

Against ADGN:

- The risk of ADGN is not reduced with the use of antimicrobial drugs in the acute phase of ASTP.³³

Secondary measures

Contact of individuals with ASTP patients, who present with sore throat and fever:

- Investigate the presence of streptococci in the nasopharynx, treating those patients with positive results.

Recurrent ASTP:

- Determine, through laboratory tests, the presence of beta-hemolytic streptococci in the patient's nasopharynx.
- Avoid, whenever possible, contact of asymptomatic patients with recurrent ASTP with other patients with acute pharyngitis.
- Use cephalosporins, clindamycin, or amoxicillin combined with clavulanic acid for 10 days, in cases of recurrence due to the presence of beta-lactamase producing bacteria in the nasopharynx.
- Try to eradicate streptococci from the nasopharynx of family members whose children have recurrent ASTP.
- *Tonsillectomy:* severe recurrent ASTP (over five episodes of ASTP a year) is not a formal indication for tonsillectomy.^{1,41} However, it should be considered in cases of failure of antimicrobial therapy for the prevention of frequent recurrence or chronification, both of which are detrimental to the health of these children.

Acute viral laryngitis

Also known as viral croup. This laryngitis consists of inflammation of the subglottic portion of the larynx, which occurs during respiratory viral infection. The congestion and edema of this region cause a variable degree of airway obstruction.

Acute viral laryngitis often affects infants and preschool children and has a peak incidence at the age of two years. The development of the disease may be slow, with coryza, febricula and cough. In 24-48 hours the involvement of the subglottic region deteriorates, with mild to severe obstruction and proportional breathing difficulty. In most cases, airway obstruction lasts for 2-3 days and abates after five days.

Parainfluenza I and II viruses and respiratory syncytial virus are the most frequent causative agents. Adenovirus, influenza A and B and measles viruses may also be involved. Less frequently, Mycoplasma may be involved in acute cases of upper airway obstruction.⁴²

Signs and symptoms

- Prodromes: coryza, nasal congestion, dry cough, and low-grade fever.
- Evolution: hoarse cough, dysphonia, aphonia or hoarse crying and inspiratory stridor. In cases of more severe obstruction, intensified stridor, suprasternal retraction, flaring of the alae nasi, expiratory stridor and restlessness occur. In extreme cases, in addition to intense dyspnea and restlessness, other signs and symptoms include pallor, cyanosis, stupor, seizures, apnea and death.

Differential diagnosis

It should include:

- Spasmodic laryngitis (stridulous laryngitis): quite common. In general, neither prodromes of viral infection nor fever are observed. Breathing difficulty, with more or less sudden onset, in the evening or at night and at bedtime. Symptoms often abate spontaneously, and are improved with air humidification or outings in search of medical assistance. Personal or family history of atopy or association with gastroesophageal reflux may exist.⁴²
- Acute epiglottitis: high-grade fever, pain or difficulty in swallowing one's own saliva (sialorrhea), absence of hoarseness, prostration and toxemia.
- Congenital airway malformation: the most frequent malformations include laryngomalacia, tracheomalacia and subglottic stenosis. Recurrent episodes of laryngitis, laryngitis that lasts for over five days in the first year of life or acute laryngitis in young infants suggest the association of congenital airway malformations.
- Foreign body: history of initial episode of suffocation, choking, coughing fit or cyanosis. Frequent occurrence of sudden-onset symptoms.
- Bacterial laryngotracheitis: quite often secondary to viral URTI. Occurrence of high-grade fever, toxemia, failure to supportive treatment.
- Laryngeal diphtheria: absence or incomplete vaccination against diphtheria. Presence of plaques in the nasopharynx and toxemia.
- Allergic laryngoedema: history of use of systemic medication or contact with substances, including inhaled ones, resulting in anaphylactic reaction.
- Retropharyngeal abscess: fever on characteristic clinical examination of the nasopharynx.

Complementary exams*Imaging exams*

- X-ray of the cervical region: in viral laryngitis, the epiglottis is normal and the lumen of the subglottic segment is narrowed (steep sign). A foreign body is only detected if it is radiopaque.
- Flexible bronchoscopy: contraindicated in cases of viral laryngitis. It is mandatory in cases of suspected congenital airway malformations (see Differential Diagnosis.)

Consultancy: in severe or recurrent cases the evaluation by an otolaryngologist or a pediatric pulmonologist may be necessary.

General treatment

Mild cases: home or outpatient treatment

- Light meals, with small and regular portions.
- Hydration.

- Air humidification (water vapor): controversial measure due to the paucity of scientific evidence (studies without a control group and with limited evaluation methods).
- Keep the family environment free from disturbance.

Moderate to severe cases (1-5% of the cases require emergency care): refer the patient to the hospital's pediatric emergency unit. Severe signs and symptoms that require immediate referral to an emergency unit and probably require hospitalization are: suspected epiglottitis, progressive stridor, significant stridor at rest, chest retractions, restlessness, high-grade fever, toxemia, pallor, cyanosis or stupor. These latter two are late signs of respiratory insufficiency. Age between 12 and 24 months of life is associated with a higher rate of severe cases.

- Inhaled corticosteroids: budesonide is an alternative to dexamethasone.⁴³ Its indication for the initial symptoms of laryngitis as a way to prevent severe forms of the disease is yet undefined.

Prognosis

Low mortality risk, if properly managed. Viral croup caused by influenza virus seems to be associated with a more severe course of the disease.⁴⁴

Information and instructions to family members

Observe aggravation of stridor, chest retractions, restlessness or prostration, high-grade fever or refusal to drink fluids. In these cases, contact the pediatrician or take the child to a pediatric emergency unit.

Preventive measures

Avoid contact, whenever possible, of children younger than two years with individuals with URTI.

Conclusions

Given the fact that URTI is one of the most common reasons for appointments with pediatricians, it is important that such professional use up-to-date concepts and diagnostic and therapeutic approaches in clinical practice. In the era of evidence-based medicine, healthcare providers should be continually encouraged to gain scientific information from reliable sources. The issue of a supplement as the current one may help disseminate this type of knowledge. Therefore, as far as URTI is concerned, the lesser indication of dispensable diagnostic exams and unnecessary treatments could benefit a significant number of children with these common respiratory infections.

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