

Bronchiolitis

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Summary

Bronchiolitis is a lower respiratory tract infection (LRTI) characterized by inflammation of the bronchioles in children < 2 years of age. Respiratory syncytial virus (RSV) is the primary pathogen, although many viruses have been implicated in bronchiolitis. Patients first present with upper respiratory tract infection (URTI) symptoms (e.g., low-grade fever, nasal congestion) followed by a cough, wheezing, and, in severe cases, signs of acute respiratory distress. Bronchiolitis is a clinical diagnosis; diagnostic studies are usually not needed unless the child presents with severe illness that requires an evaluation for associated complications (e.g., superinfection, respiratory acidosis) or if the diagnosis is uncertain. Management consists of supportive treatment (e.g., nasal suction) and close monitoring. Severe illness requires hospitalization for additional management (e.g., IV fluids, respiratory support, nutritional support) and close monitoring of respiratory status. Bronchiolitis prevention includes RSV vaccination of pregnant individuals in the third trimester and routine passive immunization of all infants < 8 months of age with RSV monoclonal antibodies.

Definition:

E. Bronchiolitis

1. Definition. Bronchiolitis is inflammatory bronchiolar obstruction with cellular debris and mucus plugging, most commonly secondary to a viral lower respiratory tract infection.

Epidemiology:

2. Epidemiology

- a. Bronchiolitis is the most common lower respiratory tract infection in the first 2 years of life and the most common cause of hospitalization during the first year.
 - b. This disorder predominantly affects children younger than 2 years of age.
 - c. The male to female ratio is 2:1.
 - d. Epidemics occur from November to April.
 - e. Risk of infection is increased with day care attendance, multiple siblings, exposure to tobacco smoke, and lack of breastfeeding.
 - f. More significant disease occurs in patients with chronic lung disease, congenital heart disease, history of prematurity, immunodeficiency diseases, and genetic abnormalities, as well as in infants younger than 3 months of age.
- 50% of children experience bronchiolitis during the first 2 years of life
 - Peak age at 2 to 6 months.
 - The incidence falls rapidly between the ages of 1 and 5 years
 - 10% of healthy children with bronchiolitis and wheezing require hospitalization.
 - Boys > girls in a ratio of 1.5: 1.

Etiology:

- Acute bronchiolitis = respiratory tract inflammation with swelling of small bronchioles → airway obstruction → inadequate expiratory airflow.
- Bronchiolitis is life-threatening.

- Most common: respiratory syncytial virus (RSV), a paramyxovirus

• Less common

- Parainfluenza virus
- Influenza virus
- Adenovirus
- Rhinovirus
- Coronavirus
- Metapneumovirus

④ Etiology: viral infection

50% RSV
50% parainfluenza influenza adenovirus mycoplasma

- Viral bronchiolitis is extremely contagious, spread by:

1. Hand carriage of contaminated secretions = the most frequent mode of transmission.
2. coughing aerosols

Clinical Findings:

4. Clinical features

- a. Onset is gradual, with upper respiratory symptoms, such as rhinorrhea, nasal congestion, fever, and cough.
- b. Progression of respiratory symptoms includes tachypnea, fine rales, wheezing, and increased work of breathing.
- c. Hypoxemia may occur.
- d. Apnea may occur, especially in young infants and in children with a history of apnea of prematurity.
- e. CXR may reveal hyperinflation with air trapping, patchy infiltrates, and atelectasis.
- f. Improvement is usually noted within 2 weeks. More than 50% develop recurrent wheezing.
- g. Complications may include apnea, respiratory insufficiency, respiratory failure, and death. Bacterial superinfection occurs rarely.
- h. Immunity is incomplete, although repeat infections tend to be less severe.

Bronchiolitis = inflammation of small bronchioles.....

① History :

< 2 Years

1st attack

History of URTI 2 days before

↳ runny nose

deterioration (cough + wheezes)

mcc of wheezes :

Bronchiolitis

Asthma

سبب الالتهاب الرئوي الحاد

So, in general:

- if caused by RSV → IP= 4 - 6 days.
- Bronchiolitis classically presents as a progressive respiratory illness that is similar to the common cold in its early phase with cough, coryza, and rhinorrhea → progresses over 3 to 7 days to noisy, raspy breathing and audible wheezing.
- low-grade fever with irritability, which may reflect the increased work of breathing.
- young infants infected with RSV may have apnea as the first sign of infection.
- Physical signs of bronchiolar obstruction include:
 1. prolongation of the expiratory phase of breathing
 2. intercostal retractions & suprasternal retractions
 3. Air trapping with hyperexpansion of the lungs
 4. During the wheezing phase, percussion of the chest : only hyperresonance.
 5. Auscultation: diffuse wheezes and crackles throughout the breathing cycle.
 6. grunting and cyanosis (more severe disease)

Diagnosis:

LABORATORY AND IMAGING STUDIES

- Routine laboratory tests are not required to confirm the diagnosis.
 1. mild leukocytosis 12,000 - 16,000/ μ L frequent but not specific
 2. Assess gas exchange in severe cases.
 3. Pulse oximetry is adequate for monitoring O2 sat (visual evaluation –poor assessment)
 4. Regular visual assessments and cardiorespiratory monitoring of infants are necessary because respiratory failure may develop precipitously in very tired infants.
 5. Antigen tests (usually by immunofluorescence or ELISA) of nasopharyngeal secretions for RSV, para-influenza viruses, influenza viruses, and adenoviruses are the most sensitive tests to confirm the infection.
 6. Rapid viral diagnosis also is performed by PCR
 7. The chest radiograph shows :
 1. hyperexpansion of the lungs(increased lung radiolucency and flattened or depressed diaphragms)
 2. lungs may appear normal or ↑ density→ viral pneumonia or localized atelectasis.
- The or may show areas

② Diagnosis :

→ Clinically

→ chest x-ray : hyperinflation (as bronchial asthma)

→ CBC & electrolyte Not significant

→ Criteria for moderate-severe bronchiolitis

→ Criteria for severe bronchiolitis

Notes:

Crackles

Rales

A pathologic breath sound on auscultation characterized by discontinuous, intermittent rattling. Etiologies include pneumonia, atelectasis, pulmonary fibrosis, bronchiectasis, interstitial lung disease, and pulmonary edema.

Wheezes

Sibilant wheezes

A high-pitched, continuous respiratory sound that occurs due to narrowing of the airways below the thoracic inlet (e.g., due to bronchospasm, inflammation, or obstruction). Often heard during expiration in asthma, COPD, anaphylaxis, bronchitis, and foreign body aspiration. May also be heard during inspiration in severe cases.

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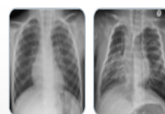
Sonor wheezing

A physical examination finding of low-pitched breath sounds on lung auscultation. Caused by secretions and/or obstructions in the airway. Often heard in patients with pneumonia, cystic fibrosis, chronic bronchitis, or COPD.

Chest x-ray in bronchiolitis

Potential findings

- Normal
- Nonspecific findings, e.g., peribronchial thickening, hyperinflation of the lungs, interstitial infiltrates, atelectasis
- Superimposed complications, e.g., pneumonia



DDx:

- Differentiate asthma from bronchiolitis by physical examination may be impossible, the major differential factors are:

BRONCHIOLITIS	ASTHMA
fever	No fever, unless a RTI is the trigger for the asthma attack
first year of life	older children
no history (personal or family) of asthma	history (personal or family) of asthma

- Other Wheezing deferential diagnosis:

1. foreign body in the airway : A focal area on radiography that does not inflate or deflate
2. congenital airway obstructive lesion
3. Cystic fibrosis: poor growth, chronic diarrhea, and a positive family history.
4. exacerbation of BPD
5. pneumonia
6. **Cardiogenic asthma**, confused with bronchiolitis in infants, is wheezing associated with pulmonary congestion secondary to left-sided heart failure.
7. GERD: chronic or recurrent & history of frequent emesis.

Differential diagnoses [2]

- No URTI symptoms
 - Congenital heart disease
 - Foreign body aspiration
 - Congenital airway abnormalities (e.g., vascular ring)
- Wheeze
 - Polyphonic
 - Asthma
 - Congestive heart failure secondary to congenital heart disease [7]
 - Monophonic: foreign body aspiration
 - See also "Wheezing in children".
- Asymmetric crackles: bacterial or viral pneumonia
- Cough
 - Pneumonia
 - Pertussis
 - See also "Differential diagnosis of acute cough" and "Bronchitis."
- Neonatal fever: neonatal sepsis

Management:

So, In general:

⑤ management: it is controversial !!

IV. Fluid, due to poor oral intake

O₂ if needed [if saturation < 95%]

Nebulization

Steroid Therapy

Severe Resp. distress

early infancy < 2 months

recurrent apnea attacks

cyanoctic heart dz

hypotonia

immunocompromised

Admission criteria

1. NPO

2. IV. Fluid

O₂ if saturation < 95%

Nasal O₂ 1-2 L/min

gradual decrease of

mask: can be done on 5 L/min but should follow up it every (15 min)

No Need for AB in bronchiolitis; viral

antibiotics

infiltration in CXR

suspect pneumonia

suspect complication

Risky pt

criteria for sepsis

if admitted to ICU

mechanical ventilator

O₂ if needed

hypertonic saline 3%

by mask

Salbutamol Nebulization

0.5 cm Salbutamol + 1.5 cm Normal Saline

Dose = 0.15 - 0.25 mg/kg

Salbutamol concentration 0.5%

can be repeated 3 times/shour

adrenaline Nebulizer

adrenaline [3ml without NS]

concentration 1:1000

2 doses 30 min apart

No Role of steroid in Bronchiolitis (controversial)

adrenaline

hypertonic saline

vital sign

Mechanical ventilation

deteriorating consciousness level

Co₂ retention

hypoxia (+ O₂ saturation)

Cause of bronchiolitis

deterioration

when discharge the pt

when not admit the pt

good O₂ saturation

good oral intake

No signs of distress

clear good consciousness

Nasal drop for stuffy nose

Small frequent feeding

upright position

deterioration

Approach [1][7]

- Determine the need for immediate respiratory support.
 - Hypoxemia: oxygen therapy via nasal cannula
 - Refractory hypoxemia, signs of respiratory distress, respiratory failure: intubation, CPAP, or high-flow nasal cannula
- Start supportive measures including adequate hydration, relief of nasal congestion and/or obstruction, and monitoring.

Avoid bronchodilators, epinephrine, corticosteroids, antibiotics, and chest physiotherapy unless there are comorbidities (e.g., asthma, croup, cystic fibrosis, acute otitis media). [1]

Admission criteria for bronchiolitis [1][7][8]

- Unwell appearance, lethargy
- Moderate to severe signs of respiratory distress (including significantly elevated respiratory rate for age)
- Ongoing respiratory support required
- Need for supplemental hydration
- History of apnea
- Consider if:
 - Risk factors for severe bronchiolitis are present
 - Supportive care at home is not feasible [8]

Inpatient management of bronchiolitis [1][7]

Respiratory support

- Frequently monitor routine vital signs including O₂ saturation
- Adjust short-term oxygen therapy as needed.
- Provide regular external nasal suction. [1]

Caloric and fluid support

- Ensure patients receive the recommended daily intake for their age.
- Encourage normal oral feeds (e.g., with breastmilk, formula, regular diet for age) as tolerated.

Respiratory distress increases caloric and fluid requirements but also increases the risk for aspiration during oral feeds. Nutritional and fluid support via a feeding tube (orogastric or nasogastric) and/or intravenously is often necessary. [1]

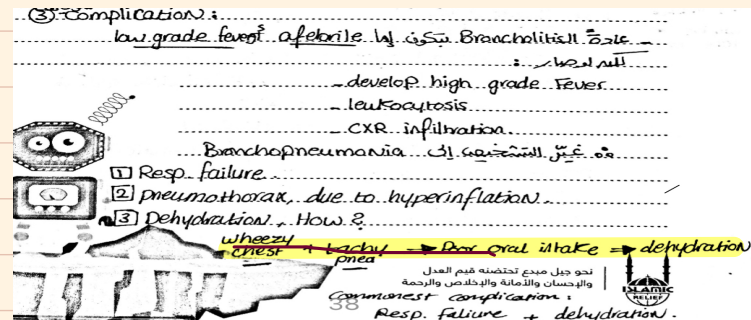
TREATMENT

- supportive therapy, including:
 - monitoring
 - control of fever
 - good hydration
 - upper airway suctioning
 - Oxygen administration (by nasal cannula is often, with intubation and ventilatory assistance for respiratory failure or apnea).
- Indications for hospitalization include:
 - young age (< 6 months old)
 - moderate to marked respiratory distress (sleeping RR > 50 to 60 breaths/min)
 - hypoxemia (Po₂ < 60 mm Hg or oxygen saturation < 92% on room air)
 - apnea
 - inability to tolerate oral feeding
 - lack of appropriate care available at home
 - High-risk children with bronchiolitis should be considered.
- Children with chronic lung disease such as BPD, hemodynamically significant cyanotic and acyanotic congenital heart disease, neuromuscular weakness, or immunodeficiency are at increased risk of severe, potentially fatal disease.
- Temporary use of bronchodilators improve wheezing and respiratory distress in infants and young children as outpatients. (modest, short-lived, and do not reduce hospitalization)

Complications:

- Most hospitalized children show marked improvement in 2 to 5 days with supportive treatment alone.
- There may be tachypnea and hypoxia after admission, progressing to respiratory failure requiring assisted ventilation.
- **Apnea is a major concern for very young infants with bronchiolitis.**

- Apnea
- Respiratory failure
- Pneumonia
- Dehydration
- Otitis media



Prognosis:

- Most cases of bronchiolitis resolve completely
- Minor abnormalities of pulmonary function & bronchial hyperreactivity may persist for years.
- Recurrence is common, tends to be mild, and should be treated similarly to the first episode.
- The incidence of asthma higher for children hospitalized for bronchiolitis as infants, but it is unclear whether this is causal or if children prone to having asthma are more likely to be hospitalized when they develop bronchiolitis.
- Mortality rate=1% to 2%, highest among infants with preexisting cardiopulmonary or immunologic impairment.
- With timely diagnosis and adequate treatment, the prognosis is good.
- Bronchiolitis in infancy is associated with an increased risk of developing asthma.

Prevention:

Administration of respiratory syncytial virus vaccine to pregnant individuals minimizes the risk of bronchiolitis in young infants. ^[14]

- Monthly injections of **palivizumab**, an RSV-specific monoclonal antibody, initiated just before the onset of the RSV season confers some protection from severe RSV disease.
- Palivizumab is indicated for :
 1. some infants < 2 years old with chronic lung disease (bronchopulmonary dysplasia)
 2. very low birth weight infants
 3. infants with hemodynamically significant cyanotic and acyanotic CHD.

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