Bronchiolitis

Prof. Wasantha Karunasekera

Lecture outline

- Introduction
- Epidemiology
- Aetiology
- Pathophysiology
- Clinical features
- Investigations
- Management
- Prevention

Introduction – Bronchiolitis

- Infection of the small, distal airways (bronchioles) which leads to inflammation, narrowing and ultimately wheezing
- Leads to atelectasis of some alveoli and over-inflation of the other alveoli
- Predominantly a viral disease

Epidemiology

- Common among children of 2 years and younger
  Specially in infants (90% between 1-9 months)
- M>F ; Death is 1.5 times more in males
- 150 million new cases occur annually; 11-20 million (7-13%) of these require hospital admission
- 95% of all cases occur in developing countries
- RSV alone was estimated to cause 66,000 to 199,000 deaths among children younger than 5 years of age

Aetiology

- Respiratory syncytial virus (RSV) (75% in hospitalized children)
- Rhinovirus
- Parainfluenza virus
- Adenovirus
- Human metapneumovirus
- Human Boca virus
- Influenza A
- Mycoplasma pneumoniae infection particularly in older children

Respiratory syncytial virus (RSV)

- RNA virus, two subtypes A & B
- Incubation period 2-5 days
- The disease is highly contagious
- Viral shedding in nasal secretion continues for 6-21 days following onset of symptoms

Risk factors for severe bro litis

- Male sex
- Age < 3 months
- Low birth weight
- Prematurity
- Airway anomali

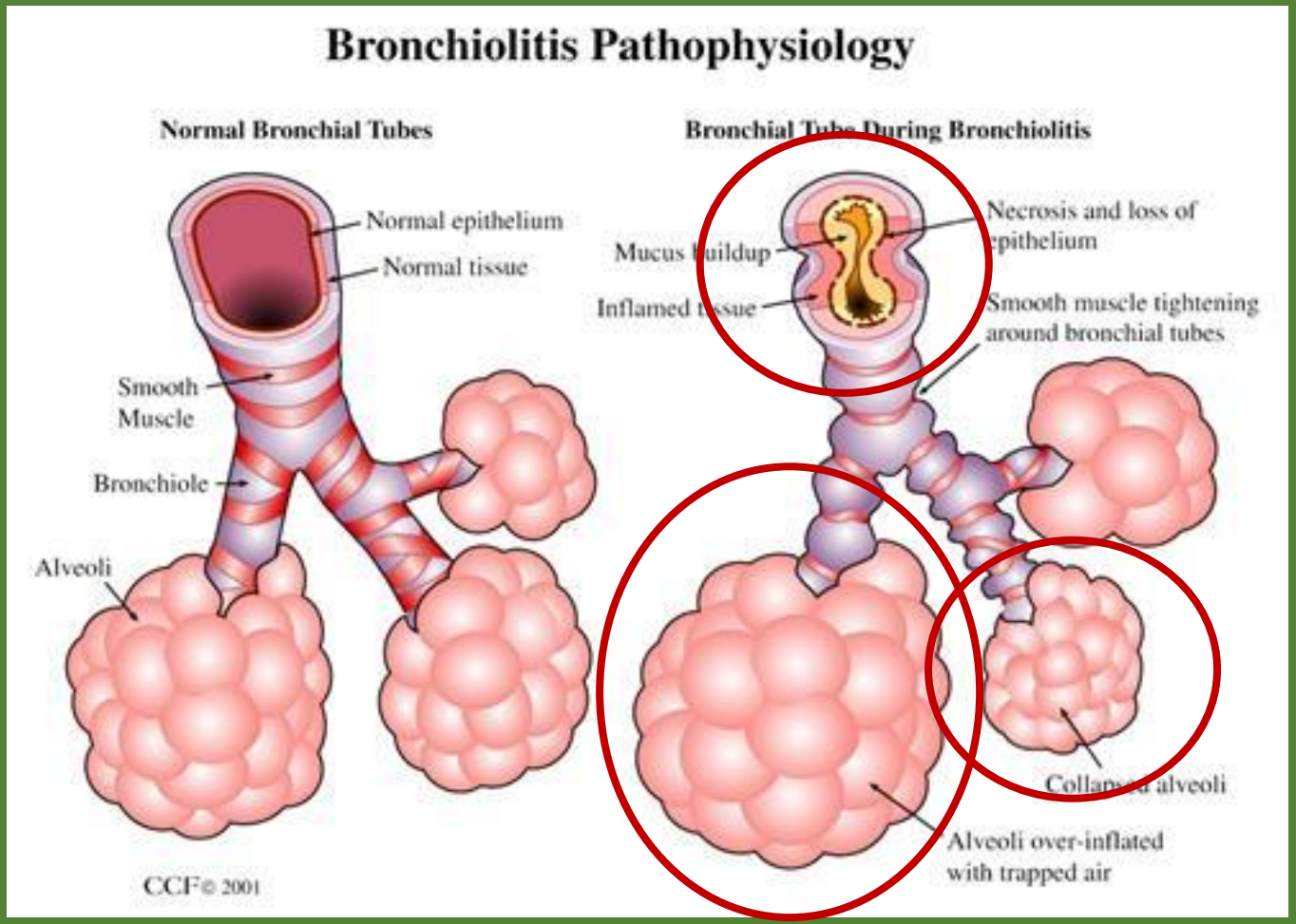
oups

noking

dysplasia
/ acquired neurolomuscular disease
eart disease with pulmonary hypertension
al or acquired immune deficiency

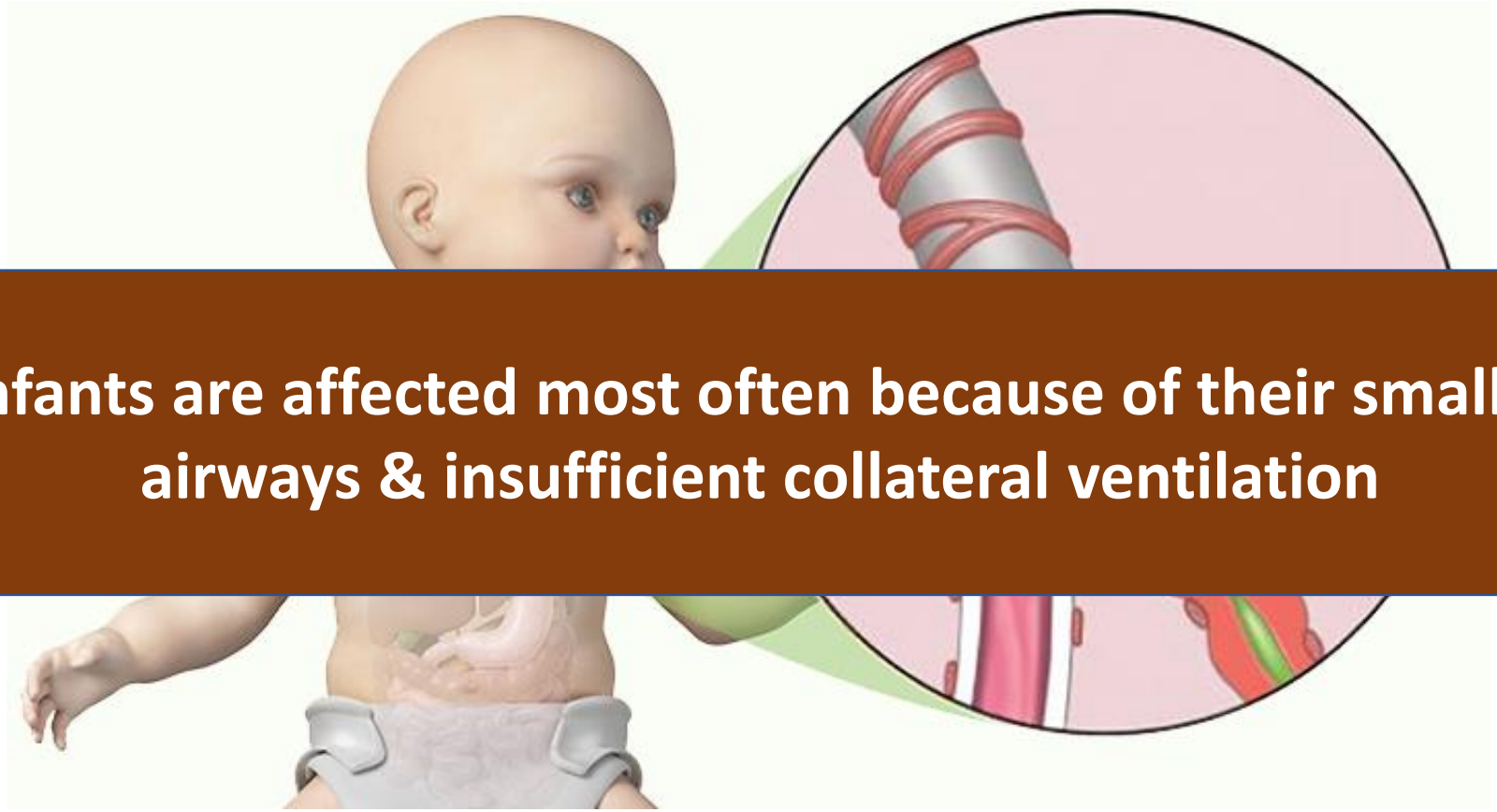
Need close observation /admission

Pathophysiology of Bronchiolitis



Pathophysiology of Bronchiolitis

- The inflammation, edema & debris result in obstruction of bronchioles ⇒ increased airway resistance, hyperinflation, atelectasis
- Airways tend to collapse during expiration due to compliant chest wall and reduced tone of smooth muscles of the airways
- Ventilation-perfusion mismatching (V/Q mismatch)
- Cytokines & chemokines released by damaged epithelium amplify the immune response
  (histamine, cytokines, leukotrienes, TNF alfa and interleukins)



Infants are affected most often because of their smaller airways & insufficient collateral ventilation

Pathophysiology of Bronchiolitis

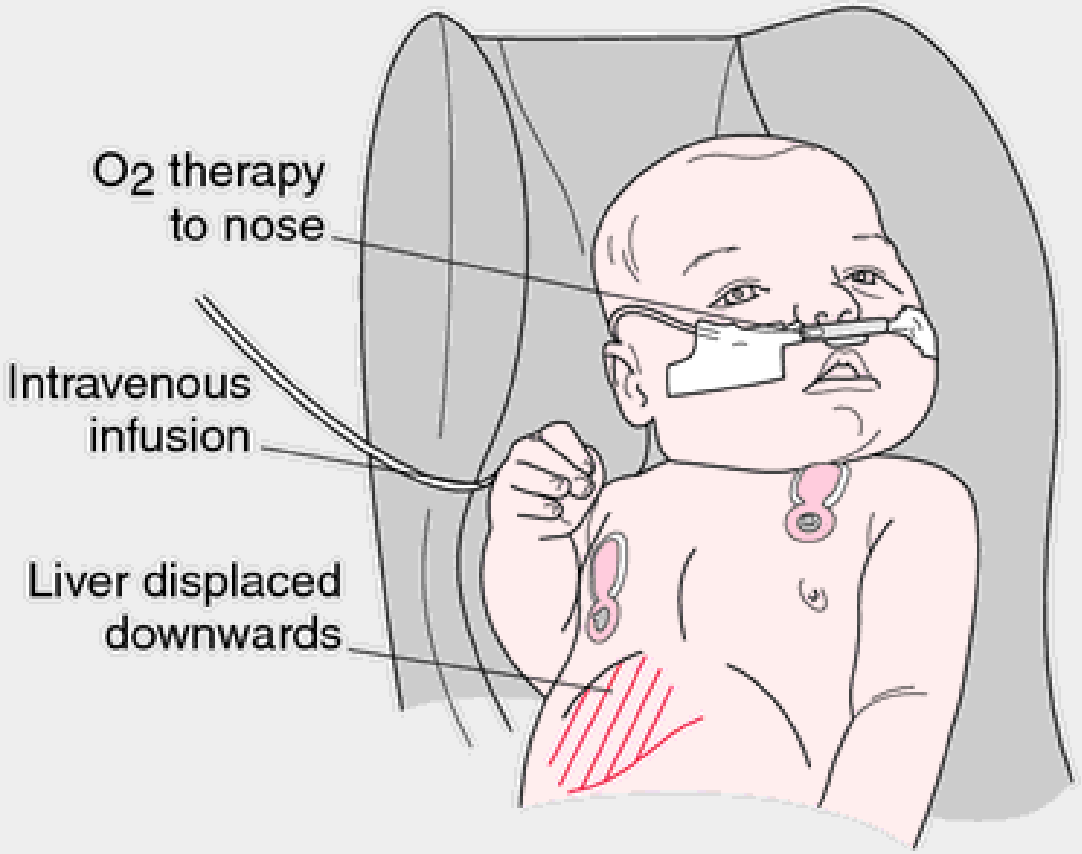
- Necrosis of respiratory epithelium occurs within 24 hours
- Proliferation of goblet cells - excessive mucous production
- Epithelial regeneration with non-ciliated cells impairs elimination of secretions
- Lymphocytic infiltration causes sub mucosal edema
- Recovery begins by regeneration of epithelium after 3 -4 days
- However, cilia do not appear for as long as 2 weeks

Clinical features - history

- Coryzal prodrome
- Cough
- Low grade fever or hypothermia in early infancy
- Nasal congestion
- Respiratory distress
- Apnoea
- Feeding difficulties

Clinical features - examination

- Sharp dry cough
- Signs of respiratory distress:
- Tachypnoea , recessions, grunting, head nodding
- Hyperinflation of the chest
- Diffuse polyphonic wheezing
- Diffuse fine crepitations towards the end of inspiration and early expiration
- Hypoxia is the best predictor of severe illness. It correlates well with the degree of tachypnoea & poorly with wheezing and recessions



Apnea in infants <4 months

Sharp, dry cough

Cyanosis or pallor

Hyperinflation of the chest:
- sternum prominent
- liver displaced downwards

Subcostal and intercostal recession

Auscultation:
- fine end-inspiratory crackles
- prolonged expiration

Red flag signs

- Worsening work of breathing (for example grunting, nasal flaring, marked chest recession)
- Fluid intake is 50–75% of normal or no wet nappy for 12 hours
- Apnoea or cyanosis
- Exhaustion (for example, not responding normally to social cues, wakes only with prolonged stimulation)

Assessment

- Transcutaneous oxygen saturation (pulse oxymetry) as SPO2 is an good indicator of severity
- SpO2 <92% in room air needs oxygen inhalation
- Well correlated with tachypnoea and poorly correlated with wheezing and recessions

Natural history

- First time infections are usually severe. Subsequent attacks are usually mild
- Peak of symptoms between 48-72 hours after onset of cough and dyspnoea
- Median duration of symptoms – 12 days
- Most recover & some may have prolonged wheezing

- Other manifestation of RSV may co-exist such as otitis media, myocarditis, supraventricular & ventricular dysrhythmias & SIADH

Diagnosis

Mostly a clinical diagnosis based on ….

- age
- seasonal occurrence
- presence of coryza, wheezing & fine
- crepitations or both on auscultation of the lungs

Differential diagnosis

- Asthma
- Early phase of bronchopneumonia
- Aspiration syndrome
- Congestive cardiac failure
- Congenital anomalies of the lungs

Differential diagnosis

Consider a diagnosis of pneumonia if the child has:

- high fever (over 39°C) and/or
- persistently focal crackles

Consider viral-induced wheeze or early-onset asthma if they have:

- persistent wheeze without crackles or
- recurrent episodic wheeze or
- a personal or family history of atopy

Investigations – ctd

- No place for routine x ray
- If performed , hyper inflated lungs & scattered atelectasis or lobar collapse are expected findings
- Atelectasis contributes to arterial desaturation

Investigations – ctd

- X ray could be justified for children requiring intensive care or to exclude congenital anomalies of the lungs

Investigations

- WBC/DC – often normal, there may be increased WBC due to stress. Risk of bacterial infection is low
- RSV PCR / other viral studies could be done on naso-pharyngeal aspirate
- Investigations might help the supportive care if the child is very sick

Management – NICE (updated on 2015)

Management of bronchiolitis is exclusively supportive care since it is a self limiting illness

Management – NICE (updated on 2015)

Need close observation or admission to hospital in following at risk groups

- Risk factors for severe disease
- Desaturations :
  Documentation of in air saturation and trends of oxygen requirements are mandatory
- Apnoea
- Severe respiratory distress
- Feeding difficulty or dehydration
- Maternal anxiety

Management – NICE (updated on 2015)

Supportive care :

- Oxygen supplementation to children with bronchiolitis if their oxygen saturation is persistently less than 92%
- Give fluids by nasogastric or orogastric tube in children with bronchiolitis if they cannot take enough fluid by mouth
- Enteral feeding is always better than IV fluids
- High flow nasal oxygen / CPAP (continuous positive airway pressure)
- Monitor vital parameters eg : PEWS (paediatric early warning score)

Management of hypoxia

- Humidified oxygen is indicated when SpO_2 is < 92% in room air
- Rate of 0.25-5 L/minute or up to 60% by nasal cannula / mask / head box / tent
- Oxygen supplementation is the prime determinant of hospitalization
- Intense monitoring needed
- Persistent uncorrectable hypoxia might need ventilatory support

Ventilatory support

Requires occasionally

- Invasive ventilation eg ET CPAP/ SIMV
- Non invasive ventilation eg: HFNO / nasal CPAP

positive end expiatory pressure to keep the collapsing alveoli open

Fluids and feeding

- Feeding difficulty is common due to respiratory distress
- Required fluid and calorie is more due to increased work of breathing
- Risk of aspiration with severe respiratory distress
- Fluids needed to replace deficit and to provide maintenance requirements
- If not taking or difficult to take orally need NG feeds or intravenous fluids
- Avoid excessive fluid administration as this may promote interstitial edema formation

Other general measures

- Monitor young infants for apnoea
- Temperature monitoring and control
- Clearance of the upper airway
- Normal saline nasal drops and regular oral or nasal suctioning to relive upper airway obstructions
- Slightly propped up position (30^{0})

Bronchodilator therapy

- Inhaled salbutamol or ipratropium bromide
- Not routinely used. If a trial of bronchodilator given it should be continued further only if a positive response is documented.

Other therapy

- Steroids should not be used routinely
- Might be useful to manage persistent wheeze (Inhaled or oral therapy)

- Super or co infection is very rare in bronchiolitis and antibiotics are no use

- Nebulization with 3% saline is proven to be effective

Other therapy

Ribavirin :

- Should not be used routinely
- It is indicated for immune deficiency and BPD , CHD
- Administered as aerosols

Management – NICE (updated on 2015)

Following are not indicated in treatment of bronchiolitis

- antibiotics
- hypertonic saline
- adrenaline (nebulised)
- salbutamol
- Montelukast
- ipratropium bromide
- systemic or inhaled corticosteroids
- a combination of systemic corticosteroids and nebulised adrenaline
- Chest physiotherapy
- Routine nasal suction

Complications

- Apnoeic spells
- Respiratory failure initially type 1 with exhaustion type 2
- Dehydration
- Lobar collapse
- Secondary infection rate is very low

Case fatality rate < 1%

Risk of childhood asthma is high

Prevention

- Hand decontamination
- Palivizumab (humanized monoclonal antibody against RSV) prophylaxis for premature babies to reduce the incidence and severity
- Administered before and during the RSV season
- Avoid exposure to smoking
- Avoid overcrowding
- Breast feeding in infancy


Thank you!