Bronchial asthma

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ASTHMA BRONCHIALE

DEFINITION

- CHRONIC INFLAMMATORY DISORDER
- HYPERREACTIVITY OF BRONCHI
- REVERSIBLE OBSTRUCTION OF BRONCHI
EPIDEMIOLOGY

- **World**
  - Prevalence: 1-18% with maximum in developed countries
  - Incidence: in adults 1%
  - Mortality approx. 250,000 persons per year
  - The most common chronic disease in childhood
  - Coincidence with allergic rhinitis in 80% of patients - ARIA

- **CZE**
  - Prevalence: 8% in whole population, in children 12-15%
  - Incidence: up to 30% = 30,000 new diagnoses
  - Very low mortality due to quality of health care (2006 + 101 per.)
# CLASSIFICATION

## BY CONTROL OF DISEASE - GINA 2006

<table>
<thead>
<tr>
<th>Parameters</th>
<th>CONTROLED</th>
<th>PARTLY CONTROLED</th>
<th>NOT CONTROLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day signs</td>
<td>None (max 2x week)</td>
<td>≥ 2x week</td>
<td></td>
</tr>
<tr>
<td>Disruption of daily routine</td>
<td>None</td>
<td>Anyone</td>
<td>≥ 3 signs of partly controled asthma in one week</td>
</tr>
<tr>
<td>Night signs/wake up</td>
<td>None</td>
<td>Anyone</td>
<td></td>
</tr>
<tr>
<td>Need of rescue medication</td>
<td>None (max. 2x week)</td>
<td>≥ 2x week</td>
<td></td>
</tr>
<tr>
<td>Lung function tests</td>
<td>Normal</td>
<td>&lt; 80% FVC</td>
<td></td>
</tr>
<tr>
<td>Number of exacerbation</td>
<td>None</td>
<td>≥ 1x per year</td>
<td>1x in one week</td>
</tr>
</tbody>
</table>
CLASSIFICATION

- Due to severity of disease
  - Dependent on need of medication

<table>
<thead>
<tr>
<th>Tíže onemocnění</th>
<th>Léčba</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermittent asthma</td>
<td>RABA in need</td>
</tr>
<tr>
<td>Mild persistent asthma</td>
<td>Low dose ICS therapy, low intensity therapy (Teophyllin, antileukotriene)</td>
</tr>
<tr>
<td>Moderate persistent asthma</td>
<td>Low or moderate ICS dose + LABA, plus extra medication (antihistamine, antileukotriene, teophyllin)</td>
</tr>
<tr>
<td>Severe persistent asthma</td>
<td>High dose ICS + LABA + extra medication, hospitalization</td>
</tr>
</tbody>
</table>
ETIOLOGY

A. HEREDITARY FACTORS
• Polygenic multifactorial inheritance
• Known > 150 gens with connection to asthma and another allergic diseases
• Atopy = Ability to produced allergen specific IgE immunoglobulin

B. ENVIRONMENTAL FACTORS
• Environment, economics status, nutrition status, hygienic status, infections, working surroundings
PATOPHYSIOLOGY

• **Asthma = chronic INFLAMMATORY disease...**
  • Specific picture of cellular subpopulations development
    • Predominance of **Th2** → enrichment of eosinophils, basophils, activation of mast cells, ...
    • **Pro inflammatory mediators**- IL-4, PGE2, LTR, PAF, ...

• **Bronchial hyper reactivity development**
  • Genetically determined- chromosome 5q, ADAM23 chromosome 20q, polymorphisms genes pro β2-rcp. ADRB2
  • Consequence of chronic inflammation

• **Reversible bronchial obstruction development**
  • Acute constriction of bronchi- normally protective- irritation of bronchi
  • Swelling of bronchial wall
  • Production of high viscosity sputum
  • Re-modulation of bronchi due to inflammation = irreversible phase
CLINICAL SIGNS

COUGHING

INHALER

BREATHING DIFFICULTY

FEELING TIRED

CHEST PAIN

WHEEZING

SHORTNESS OF BREATH

SLEEPING PROBLEM

ASHTMA SIGN AND SYMPTOMS

https://www.vecteezy.com/vector-art/142088-free-asthma-icon-vector
Clinical signs

• Definition of asthma exacerbation

= episodes of progressive increase in shortness of breath, cough, wheezing or chest tightness.

Characterised by

• decrease in expiratory airflow that can be quantified and monitored by measurement of lung function (PEF or FEV1)

• severity of asthma exacerbations: mild, moderate, severe (life-threatening)

➢ Background = amplification of inflammation by specific trigger
1. PERSONAL HISTORY
2. LUNG FUNCTION TESTS
   • Spirometry with bronchial obstruction pattern
   • Reversibility of bronchial obstruction and proof of hyperreactivity
     • Bronchodilatační a bronchokonstrukční testy
3. FENO
   • Volume of NO in exhaled air- proof of eosinophilic inflammation
4. COMPLEMENTARY METHODS
   • Blood count + differential count of leukocytes
   • Immunoglobulin profile
   • Allergy testing
   • Oesinophylic cationic protein in induced sputum
OBSTRUCTION PARAMETERS
FEV1/VC < 75% (70%)
FEV1 < 80%
PULMONARY FUNCTION TESTING

BRONCHOMOTORIC TESTS

1. Broncho dilatation test
   • Prove of reversible obstruction
   • Administration of 400ug salbutamol x 80ug ipratropium
   • **Positive result** = after 30min after application increase of FEV1 ≥ 12% and increase of 200 ml

2. Bronchoconstriction test
   • Prove of bronchial hyper reactivity
   • Nonspecific = methacholine in cumulative dose of 8mg
   • Specific = known allergen
   • **Positive result** = decrease of FEV1 more than 20% in comparison with previous measurement
1. NON-FARMACOLOGICAL
   • Limitation of exposure to risk factors

2. PHARMACOLOGICAL
   a) RELEAVE
      • Short acting inhaled β2-agonists - SABA- salbutamol, fenoterol
      • Short acting inhaled anticholinergic - SAMA- ipratropium
      • I.v. and per oral methylxantins- teofyllin
   b) CONTROLLING
      • Inhaled corticosteroids
      • Long acting inhaled β2-agonists - LABA- salmeterol, formoterol, U-LABA vilanterol
      • Long acting inhaled anticholinergic - LAMA- tiotropium
      • Antileukotriens- montelukast, zafiralukast
      • Per oral long acting methylxantiny
      • Per oral or i.v. corticosteroids
      • Biologic therapy - anti-IgE omalizumab, anti-IL-5 mepolizumab
# Pharmacotherapy

<table>
<thead>
<tr>
<th>Severity of disease</th>
<th>Specification</th>
<th>The first line therapy</th>
<th>Alternative therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monotherapy</td>
<td>SABA</td>
<td>SAMA or P.o. SABA or P.o. LABA or p.o. short teophyllin</td>
</tr>
<tr>
<td>2</td>
<td>Monotherapy</td>
<td>ICS- low dose</td>
<td>Antileukotriens</td>
</tr>
<tr>
<td>3</td>
<td>Combination</td>
<td>ICS- low dose + LABA</td>
<td>Midle/high dose ICS ICS low dose + Teophyllin SR ICS low + Anti-LT</td>
</tr>
<tr>
<td>4</td>
<td>Combination- add another one</td>
<td>ICS- midle or high dose + LABA</td>
<td>+ Anti-LT + Teophyllin SR</td>
</tr>
<tr>
<td>5</td>
<td>Combination- add 1 or 2 drugs</td>
<td>Like 4th stage</td>
<td>+ P.o. steroids + Biological therapy</td>
</tr>
</tbody>
</table>
1. COMBINATION OF ACTIVE SUBSTANCES

- LABA- salmeterol, formoterol
- U-LABA- vilanterol
- LAMA- thiotropium
- IKS- beclomethasone, fluticasone, budesonid, ciclesonid, momethasone
- Antileukotriens- montelukast, zafiralukast
- Methylxantins- theophylline, syntophylline

2. INHALE SYSTEM

- Powder
- Aerosols
1. **Removal of the specific trigger**
2. **Oxygenotherapy** - $O_2$ in volume 4-6 l/min
3. **I.v. therapy**
   - i.v. corticoids - hydrocortison 200mg/dexo-methason 40mg
   - i.v. methylxantins - theophyllin 40mg (Syntophyllin®)
   - Possible application 4 times per day
4. **Inhale therapy**
   - β2-agonists - salbutamol (Ventolin®)
   - Combine solutions - salbutamol+ ipratropium (Berodual®)
   - Anticholinergic drugs - ipratropium (Atrovent®)
5. **Laboratory tests** - ABR, BC, mineralogram, sputum cultivation, serology
6. **Supporting therapy** - mucolytics, i.v. infusion of balanced solutions, ...
1. COPD
2. Pneumothorax
3. NET causes
4. Tracheal disorders (children especially)
5. Another lung diseases
6. Vasculitids
7. Pulmonary embolism
BRONCHIAL ASTHMA is *chronic inflammatory* disease characterized of typical pattern-reversible *obstructive disorder of ventilation* and *bronchial hyper reactivity*.

Due to known pathophysiology asthma is well treated disease. Patients are not limited with correct therapy.

In diagnostics- focused on personal history, pulmonary function tests.

Spirometry with obstructive pattern= typical shape + FVC/FEV1<75% (70), FEV1 <80%.

Pharmacotherapy- *relieving* and *disease controlling*

Combination of ICS + LABA could change life of asthmatic patient.
Thank you for your attention!