

# Bronchial asthma/PGS

Template:PGS

Bronchial asthma **is a lifelong chronic respiratory disease**

- the number of asthmatics is about 300 million (worldwide).

In the last 20 years, we **have observed an increase** especially in children and adolescents - it is becoming the most common chronic disease in children (even in the Czech Republic)

- the health, socio-economic impact of asthma on the patient, his family and society is increasing.

**Often insufficiently and late diagnosed and treated**

- in the Czech Republic, there are an estimated 250,000-35,000 asthmatics now undiagnosed.

Asthma **cannot be completely cured, the goal is effective control of the disease and its symptoms**

- we most often deal on an outpatient basis,
- while untreated asthma causes irreversible functional changes and impairs patient performance.

## Definition

**GINA** (Global Asthma Initiative) has released information (Revision 11/2007) highlighting the inflammatory nature of:

**Asthma is a chronic inflammatory disease of the airways**, involving many cells and cellular agents. It is a chronic inflammation that **causes a concomitant increase in bronchial reactivity, which leads to** recurrent episodes of wheezing, shortness of breath, chest tightness and coughing (especially at night and early in the morning). Usually accompanied by **extensive variable bronchial obstruction**, which **is reversible spontaneously or after treatment**.

## Epidemiology

**Prevalence:**

- total asthma in the Czech Republic - about 8%.
- by children - more than 10%.

**Mortality:**

- in the Czech Republic very low (last 10 years) **about 1/100 thousand residents**.

**Increased risk of asthma in families of allergy sufferers and atopics** (especially allergic rhinitis, atopic dermatitis).

## Etiology and pathogenesis

**formation** of the asthma

- internal (host) and external (external) risk factors apply.
- **Internal factors** that affect the likelihood of developing asthma include:
  - **genetic predisposition** (to the onset and development of asthma),
  - **atopy**
  - **airway hyper-responsiveness**
  - **gender** may also participate (children: more common in boys, adults: in women).
- **External factors** - lead to higher susceptibility, exacerbation or are the cause of persistent symptoms:
  - **inhaled allergens**
  - **occupational sensitizers**

they first sensitize the airways (as early as the 17th week of intrauterine life) and then maintain asthmatic inflammation.

- in residential buildings especially **mites, allergens of domestic animals**,
- from the external environment especially **pollen and mold**.

**Tobacco smoke**, passive and active smoking (especially mothers in pregnancy) and air pollution.

- after the sensitization phase and as so-called triggers, they cause exacerbations.
- ev. **non-specific stimuli**:
  - respiratory infections,
  - exertion,
  - hyperventilation,
  - weather changes,
  - foodstuffs,
  - emotional tension, etc.

## Clinical picture of asthma

It can be created at any age.

- **dyspnoea** is typical:
  - with **wheezing** on the chest,
  - feeling of **tightness or heaviness in the chest**,
  - **irritating cough** (predominant / as the only sign),
- problems most often **at night / morning**.

Characteristic:

- great status **variability**,
- **rapid development** of symptoms,
- **shortness of breath *at rest***,
- a lot of **whistling** on the lungs, **prolonged exhalation**,
- serious conditions ie. even the so-called "**silent lungs**" without spastic phenomena.
- **outside the exacerbation - also asymptomatic** with a completely normal physical finding.

Often present **comorbidities**:

- **allergic rhinitis**,
- ev. atopic dermatitis,
- thus complementing the clinical picture of asthma.

## Diagnosis

### History

It is very important to confirm lung function tests. A variable and reversible obstructive ventilation disorder is characteristic.

### Spirometry

Gold standard (flow / volume loop examination): we can detect **obstructive ventilation failure**, ie:

- **reduction of FEV<sub>1</sub>** (forced expiratory volume in 1 second) **below 80% of the appropriate value** and / or
- **reduction of the FEV<sub>1</sub> / FVC ratio** (FVC - forced vital capacity) **below 70%**.

The parameter of lung function for outpatient monitoring of patients is PEF (ie peak expiratory flow),

- reduced value - bronchial obstruction.

According to the degree and variability of obstruction, subjective difficulties and the frequency of the need to use relief medication, asthma was divided into degrees:

Degree of asthma	daily symptoms	night signs	exacerbation	lung function	daily variability	β2-agonists (rapid onset)
1.st. = intermittent	< once a week	≤ twice a month	short	FEV <sub>1</sub> ≥ 80 %, PEF ≥ 80 %	< 20 %	< daily
2.st. = light persistent	> once a week, < once a day	> twice a month	effect on daily activities and sleep	FEV <sub>1</sub> ≥ 80 %, PEF ≥ 80 %	20-30 %	< daily
3.st. = moderate persistent	daily	> once a week	disturbance of normal daily activities and sleep	FEV <sub>1</sub> 60-80 %, PEF 60-80 %	> 30 %	daily
4.st. = severe persistent	daily	often	restriction of physical activity	FEV <sub>1</sub> ≤ 60 %, PEF ≤ 60 %	> 30 %	daily

- FEV<sub>1</sub> - forced exhaled volume in 1 second, FEV<sub>1</sub> value (in% of appropriate value (NH)).
- PEF - peak expiratory flow, PEF value (in% of personal best value (ONH))).

If all indicators are not met, resp. characteristics of the given degree, we will place the patient in a higher degree.

Obstruction:

- is reversible (except the most severe stages with fixed obstruction),
- **confirms bronchodilation test (BDT)**:
  - standard BDT is performed by administering 400µg salbutamol to the patient (ideally by inhalation attachment), the result is determined by spirometry after 30 minutes. We compare postbronchodilatory values with pre-bronchodilator (default):
  - positive is significant with an improvement in FEV1  $\geq$  12% and at the same time a 200ml or improvement in PEF  $\geq$  15%. At rest, we can measure completely normal values of lung function;
- therefore, we perform a test for the presence of airway hyperresponsiveness using a **bronchoconstriction test** with a non-specific agent.

## Screening for allergies

screening of the proportion of allergies - detection of risk factors and triggers;

- **skin (prick) tests** with standardized allergens and / or
- serum levels of **specific IgE**.

We will confirm positive findings from the **anamnesis**.

- **Total IgE** alone is not essential for the diagnosis of allergies.

In the case of **occupational asthma**, it is essential to prove causality;

- workplace **exposure test** or
- **specific bronchoprovocation test** with suspect substance.

We will perform an allergy examination whenever asthma is suspected.

We are not postponing the initiation of asthma treatment due to waiting for the results of the allergological examination.

## Diferencial diagnosis

Dg. bronchial asthma supports the **co-occurrence** of allergic rhinitis or atopic dermatitis, ev. positive family history of allergies.

In dif.dg. we consider diseases:

- with signs of **dyspnoea, cough, wheezing, chest tightness** and / or
- with **bronchial obstruction** - especially the possibility of chronic obstructive pulmonary disease (COPD) must be considered:
  - typical: **chronic, persistent, progressively progressive and irreversible bronchial obstruction**.
  - about **10% of patients** have **asthma + COPD** at the same time.
- dif.dg. reasoning is sometimes more difficult for **active smokers**.
- **aspiration of foreign bodies** (especially in children and seniors),
- so-called **pseudoasthma** (most often from **vocal cord dysfunction (VCD)**).

## Diagram

Clinical picture + history + physical examination:

1. **pneumological examination** (+ possible collection of material for morphological examination)
2. **spirometry**:
  - obstruction => bronchodilation test:
    - positive => ASTHMA
    - negative => COPD / other disease with obstruction
  - normal => bronchodilation test
    - positive => ASTHMA
    - negative => it is not a disease with a ventilation disorder
  - restriction susp. - dif.dg. eg IPF, cardiac insufficiency,
3. **allegorogical examination**
  - negative => atopy not proven
  - positive => ATOPY proven => **ATOPIC ASTHMA**

In asthma and atopic asthma, we start therapy: allergen vaccination, pharmacotherapy, regimen measures.

## Classification of bronchial asthma

Older classification **according to the severity of the clinical condition before starting treatment** (table above) - disadvantages:

- does not consider the fact of different treatment responses, different treatment success rates.
- The severity of asthma or the response to treatment may change during the course of the disease.

The new classification is based **on the level of control**

- strict requirements: every week with exacerbation is a week without asthma control and a reason to review maintenance treatment,
- 3 levels: under control, under partial control or under insufficient control.

Úroveň kontroly	denní příznaky	omezení aktivit	noční příznaky (buzení)	potřeba úlevových léků	funkce plic	exacerbace
Asthma under control (all signs met)	none ( $\leq$ twice a week)	none	none	none ( $\leq$ twice a week)	normal	none
Asthma under partial control (any of the signs met)	> twice a week	any	any	> twice a week	< 80% PV or PBV *	$\geq$ once a year
Asthma under inadequate control (any of the signs met)	$\geq$ 3 signs of partial control per week					1 in any week

PV = proper value, PBV = personal best value

## Therapy

Bronchial asthma therapy and asthma attack are discussed by 2 other certification questions:

- Bronchial asthma therapy
- Bronchial asthma attack therapy

## VPL surgery equipment

In the **first line** (general practitioner, outpatient specialist, RZP doctor), in addition to anamnesis and physical examination, the following should be available for the initial treatment of asthma exacerbations:

- **exhalation meter,**
- **pulse oximeter,**
- **spacer** for children and adults or nebuliser
- fast-acting **inhaled  $\beta$ 2-agonists,**
- **oral corticosteroid** (Prednisone 20mg or Medrol 16mg)
- ev. **oxygen source.**

Acute exacerbations of asthma should lead to an analysis of the causes that caused it.

## Long-term asthma monitoring

The general practitioner monitors his asthma:

- **frequency and severity of symptoms and exacerbations,**
- **PEF** values,
- **limitation** of normal activities, missed days from school / job, limitation of leisure activities,
- proper **inhalation techniques,**
- **side effects of antiasthmatics, comorbidities and comedics,**
- compliance with **non-pharmacological prevention, regime measures** (incl. compliance with non-smoking).

## Special situations in asthma

### Planned operations

Preparing the patient for the planned operation:

- with regard to age, ECG and X-ray S + P are required in the preoperative examination, but spirometry is not required in patients with a proven or possible obstructive ventilation disorder,
- it is recommended **to double antiasthmatic treatment in advance,** as **intubation may provoke bronchospasm,**
- in **uncontrolled asthma,** do not hesitate **to increase the dose of anti-inflammatory treatment,** ev. use **systemic corticoids** (20-40 mg prednisone in adults) **10-14 days before the planned operation.** Corticosteroids p.o. is discontinued on the day of surgery and **100-200 mg of hydrocortisone** (or equivalent) is applied.

### Pregnancy

- prevalence **in pregnancy is increasing** (now about 8.5%),
  - is **the most common chronic disease in pregnancy,**
  - in pregnancy, **1/3 of asthma improves, in 1/3 it does not change and in 1/3 it worsens** (most

- often in the 24th-36th week of pregnancy, at the end and during childbirth it rarely worsens),
  - **within 3 months of giving birth, 3/4 of the women will return to their previous condition.**
- **Inadequately controlled** asthma is a far greater risk to both mother and fetus than any pharmacotherapy (including systemic corticosteroids).
  - must be **carefully monitored and checked more often** - cooperation and mutual information of asthmatologists, gynecologists and general practitioners. **No antiasthmatics are contraindicated** in pregnancy or lactation.
- **Exacerbation** of asthma in pregnancy is managed by intensive treatment with monitoring of oxygen saturation (SatO<sub>2</sub> min 95%, otherwise do not hesitate with **oxygen therapy** - to prevent hypoxic damage to the fetus).

## Other chronic diseases in asthmatics - the effect of comedication

### Atopic eczema

- **The first of the diseases of the allergic process,**
- arises **in 90% in the period from birth to 6 years.**
- It is often associated with asthma (30% of children and 50% of adults with atopic eczema also have asthma) - this is called **dermorespiratory syndrome.**
- **to influence skin and respiratory symptoms,** we administer drugs **systemically:**
  - **oral corticosteroids, antileukotrienes and antihistamines.**
  - most treatments for both diseases are topical.

### Allergic rhinosinusitis

- in coincidence with asthma it is referred to as the so-called **single allergic airway syndrome.**
- The pharmacotherapy of both is similar:
  - **intranasal corticosteroids, ICS, antihistamines, SAIT.**
- Inadequate control of allergic inflammation can cause problems in other parts of the airways.

### Corticosteroid diseases

- i.e. serious diseases treated with systemic corticoids (oral) - they also have a positive effect on asthmatic inflammation/airways. Asthma worsens / occurs when discontinuing total corticosteroids:
- simultaneously with **p.o.** We also give **small doses of ICS with corticoids,**
- when discontinuing systemic corticoids, we **can increase** them if necessary.

### Diabetes mellitus (DM)

- **Deterioration / induction of DM** by continuous administration of systemic corticoids (in the treatment of corticosteroid-dependent asthma), \* short-term treatment of systemic corticoids for **short-term worsening of diabetes,**
- large doses, especially p.o.  $\beta$ 2-agonists may **worsen the tendency to hypokalaemia** in diabetics.

### Cardiovascular diseases (coronary heart disease, hypertensive disease)

CHD, hypertensive disease may be **exacerbated** by asthma pharmacotherapy:

- **systemic corticoids,  $\beta$ 2-agonists.**

Asthma can be worsened by:

- **beta-blockers, acetylsalicylic acid** (preventive anti-platelet agent).

Differential diagnostic problems - a relatively common cough with ACEI.

### Thyrotoxicosis

Effects of  **$\beta$ 2-agonists:**

may increase **tachycardia**, side effects (tremor, tachycardia) cover up the developing thyrotoxicosis.

### In thyrotoxicosis:

- to detect a history of asthma before administering beta-blockers,
- thyrotoxicosis **may cause exacerbation / significant worsening of asthma.**

### Rheumatic diseases, diseases of the neuromuscular system

Administered NSAIDs may complicate asthma in **ASA and NSAID intolerance.**

### Gastroesophageal reflux, gastric and duodenal ulcers

GER and VCHGD are **exacerbated by** (long / short) **administration of systemic corticoids and theophyllines**.

**GER itself worsens asthma** (irritation of the autonomic nervous system of the esophagus) and **can lead to severe asthma**.

### Diseases with impaired hepatic or renal function

**Deterioration of the breakdown and elimination** of systemically administered antiasthmatics - **especially theophyllines**.

### Neurological diseases

Neurological diseases with extrapyramidal tremor:

- may be exacerbated by the administration of p.o./inhalation  $\beta_2$ -agonists,
- severe extrapyramidal tremor can cause poor inhalation techniques - worsen asthma.

### Psychiatric diseases

- **Exacerbation / induction by systemic corticoids** in corticosteroid-dependent asthma.
- **$\beta_2$ -agonists** can cause **depression**.
- In severe psychiatric illness, there is **low compliance and adherence to treatment** - it can

be the cause of severe asthma.

- **Uncontrolled asthma also leads to deteriorating mental health**.

### Prognosis

The prognosis is good for:

- early diagnosed and timely treated asthma,
- provided good compliance (pharmacological and non-pharmacological),

**except in cases of difficult-to-treat asthma** (OIA).

### Prevention

It is still only **secondary and tertiary prevention** has the following components:

- **pharmacological** (preventive treatment including allergen vaccination) a
- **non-pharmacological** (technical and regime measures, adjustments of the residential, school and work environment - with the task of **limiting exposure** to inducers and triggers of asthma).

The most common asthma comorbidity - **allergic rhinitis** often prevents the development of bronchial asthma. For **persistent rhinitis**, the **min once a year, spirometry** was performed to detect bronchial obstruction in time (sometimes in a clinically silent patient).

## Links

### Related articles

On the VPL portal:

- Bronchial asthma therapy
- Bronchial asthma attack therapy

In Wikiscript:

- Asthma
- Bronchial asthma / case report
- Asthmatic status
- Bronchial asthma therapy

### External links

[www.svl.cz/....astma-2008.pdf](http://www.svl.cz/....astma-2008.pdf) ([https://www.svl.cz/Files/nastenka/page\\_4771/Version1/astma-2008.pdf](https://www.svl.cz/Files/nastenka/page_4771/Version1/astma-2008.pdf))

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