Pediatric allergology

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Pediatrická klinika FN Brno

Asthma in children

The prevalence of asthma

- is increasing world-wide
- asthma affects 10% -15% children
- it is underdiagnosed and undertreated
- asthma is the most frequent chronic disorder in children

Asthma definitions :

Bronchial asthma is a **chronic inflammatory disorder of the airways.**

Chronically inflamed airways are **hyperresponsive**.

They become **obstructed** and airflow is limited when airways are exposed to various **triggers**.

Asthma may be preventable

- **primary prevention:** for infants with a family history of asthma and atopy: avoiding exposure to passive smoking, domestic dust mite and cat
- **secondary prevention:** avoiding exposure to smoking, allergens in children with allergic disorder

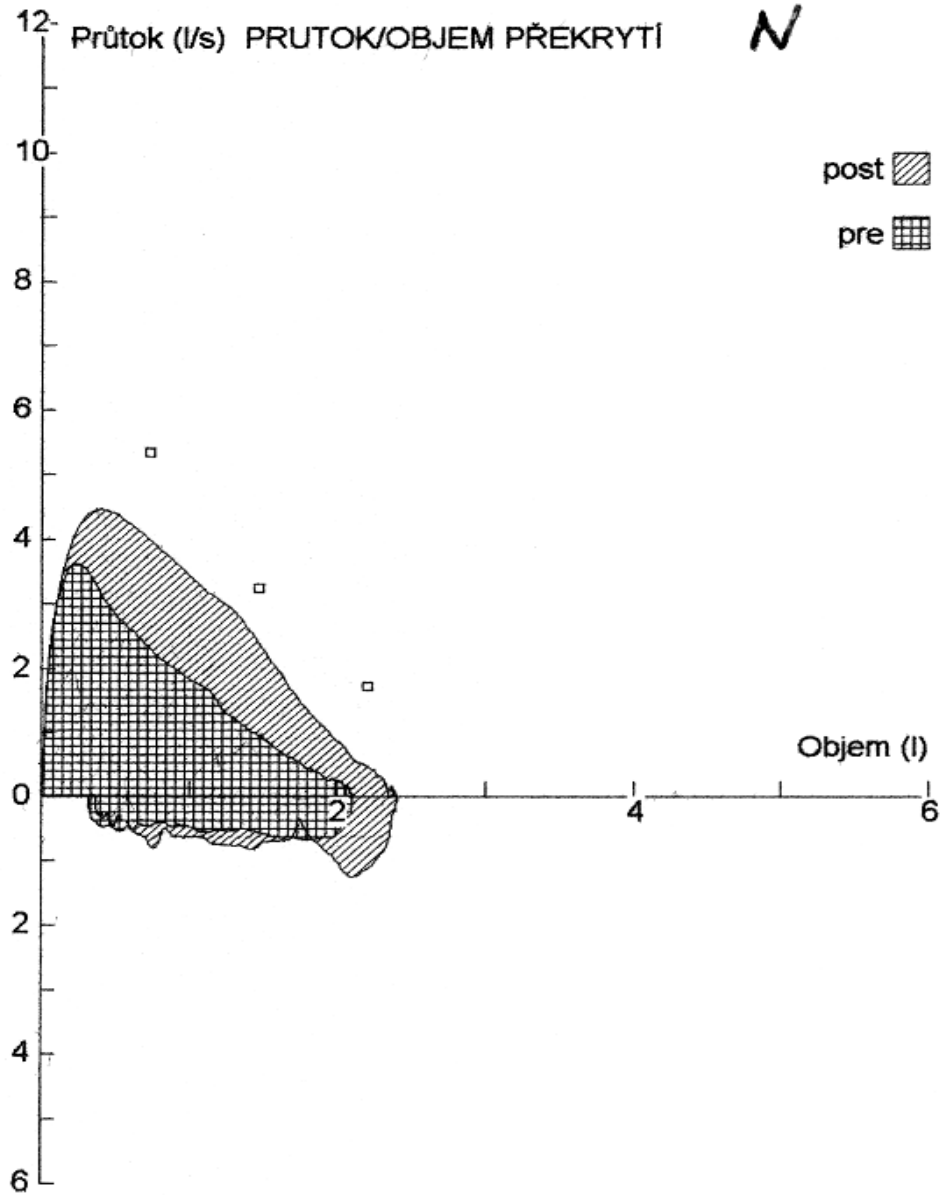
Diagnosing asthma

- **airways obstruction in the history**: cough, wheezing, difficult breathing and chest tightness
  consider asthma if any of symptoms are present
- **lung funcion testing + bronchodilator response**
- **FENO**
- skin prick testing

BDT in children

- information about reversibility of airflow obstruction
- flow-volume loop (5 years and older)
- salbutamol 4 puffs (400 mcg) using the spacer
- after 30 minutes flow-volume loop
- **positive result of BDT means**

>12 % increase FEV_1



FEV_1 63% n.h.

PEF 59% n.h.

FEF_{50} 55% n.h.

FEV_1 84% n.h.

PEF 78% n.h.

FEF_{50} 86% n.h.

Forced vital capacity

- total volume that can be expelled during a maximal effort
- should be normal except that in moderate to severe obstructive disease, gas trapping may prevent expiration to normal levels
- very effort-dependent

Forced expired volume in 1 (FEV_1)

- volume that is expelled in the first second of the forced expiration
- **the most useful** overall index of lung function
- reflects the **global severity of the airways obstruction**
- relatively independent of effort

Peak expiratory flow (PEF)

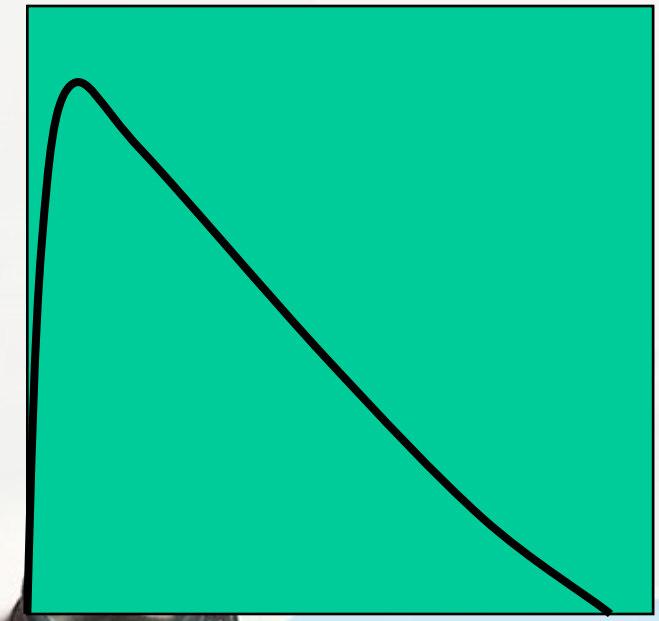
- maximum expiratory flow achieved during forced expiration
- easy to measure at home
- reflects chiefly the severity of obstruction in the **larger** airways (can be normal when the patient has marked small airways obstruction)
- very effort-dependent

Maximum mid - expiratory flow (FEF or MMEF)

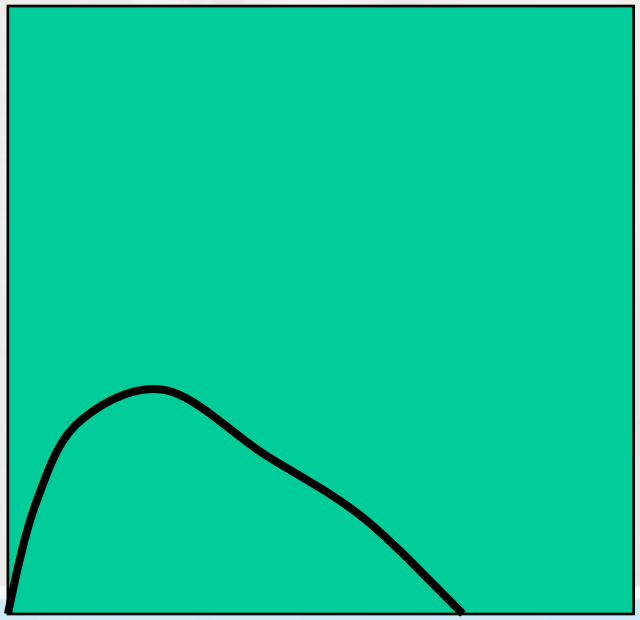
- maximum expiratory flow when half of the forced vital capacity has been expelled
- reflects chiefly the severity of the obstruction in the **smaller** airways
- may well be abnormal when the PEF and even the FEV_1 are normal
- largely independent of effort

Flow - volume loop

normal

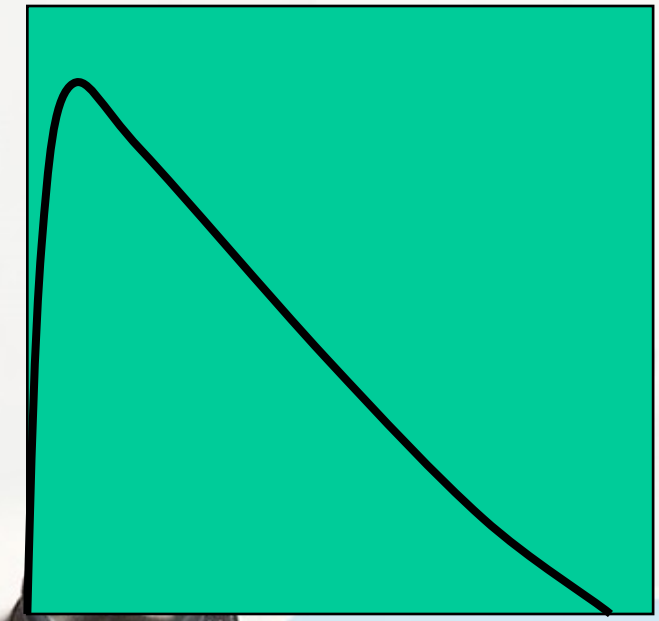


no cooperation

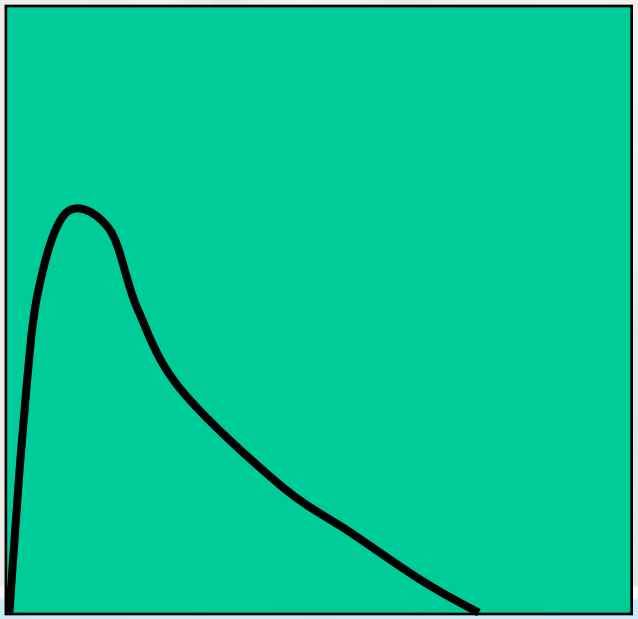


Flow - volume loop

normal

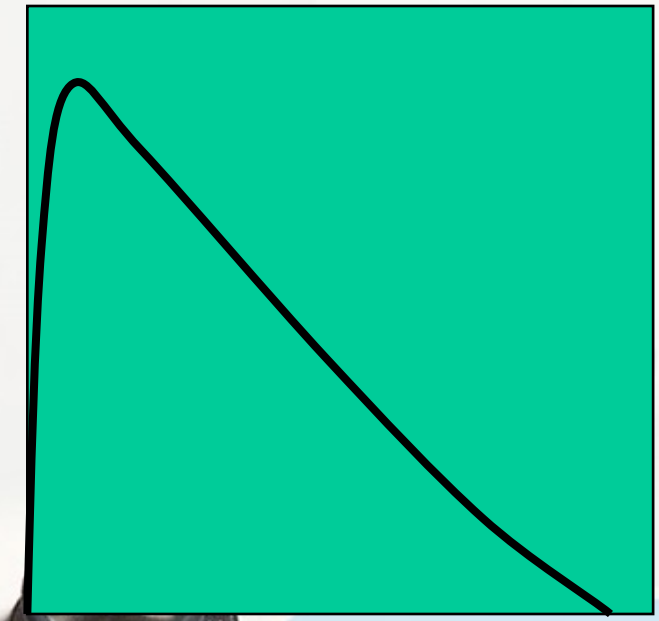


mild obstruction

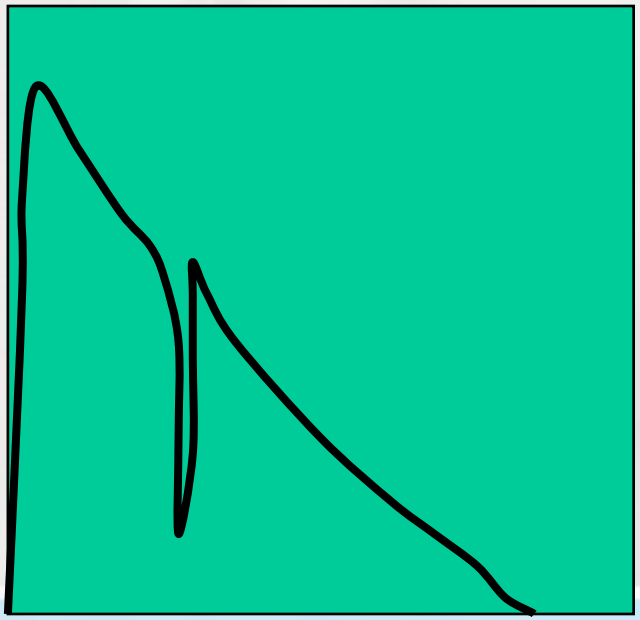


Flow - volume loop

normal



cough



eNO – marker of eosinophilic inflammation

Differencial diagnosis:

- reccurent viral respiratory infections (viral induced hyperresponsitivity or early-onset asthma)
- adenoid hypertrophy (ORL)
- extraesofageal reflux
- foreign body aspiration (cerebral palsy! - chest x-ray)
- cystic fibrosis (FTT! - sweat test)
- congenital heart disease
- immunodeficiency
- tracheomalatia, bronchomalatia

STEP 1 - intermittent asthma

- day symptoms: < 1 time a week, asymptomatic between attacks
- nighttime symptoms: < 2 times a month
- FEV_1 , PEF $\geq$ 80% predicted values, variability 20 %
- rare in children
- episodic moderate or severe exacerbation is moderate persistent asthma
- **low dose ICS or LTRA**

STEP 2 - mild persistent asthma

- day symptoms: ≥1 time a week, but < 1 time a day
- night-time symptoms: ≥ 2 times a month
- FEV_1 , PEF ≥ 80% predicted values, variability 20 % - 30%
- **children: ICS - BDP (BUD, 1/2 FP):**
  100 - 400 ug/day – double the step 1 dose

STEP 3 - moderate persistent asthma

- day symptoms: daily, use b_2 agonist daily, attacks affect activity
- nighttime symptoms: > 1 time a week
- FEV_1 , PEF 60 - 80% predicted values
- **children: ICS - BUD 400-800 mg/day + LABA**
- adults: ICS (BDP) < 1000 mg/day + LABA

STEP 4 - severe persistent asthma

- day symptoms: continuous, limited physical activity
- nighttime symptoms: frequent
- FEV_1 , PEF < 60 % predicted values
- **children:** ICS (BUD) >800 mg /day + LABA
- adults: ICS (BDP) >1000 mg/day + LABA

Asthma treatment

envir. control	➪	triggers avoiding
inhaled corticosteroid	➪	probably persistent asthma
inhaled b_2 agonist, prednisone	➪	asthma attack
ICS + long acting b_2 agonist	➪	moderate to severe persistent asthma
education	➪	compliance

The aim of treatment: **control of asthma**

- minimal chronic symptoms
- minimal episodes
- no emergency visits
- minimal need for **rapid b_2 agonist**
- **no limitations on activities**
- **(near) normal lung function**
- **minimal or no adverse effects from medicine**

An asthma management plan for mild persistent asthma

- Daily medication (long-term preventive): ICS, initially 200- 400 mg/day, a gradual stepwise reduction in treatment, if control is sustained for at least 3 months
- Quick-relief : b_2 agonist

An asthma management plan

- Daily medication (long-term preventive): the double dose of ICS +b_2 agonist
  Quick-relief : b_2 agonist

An asthma management plan

- repeated doses of b_2-agonist with the spacer: 2 puffs every 20 min. in the first hour

no success: prednisone 1-2 mg/kg/day + b_2-agonist

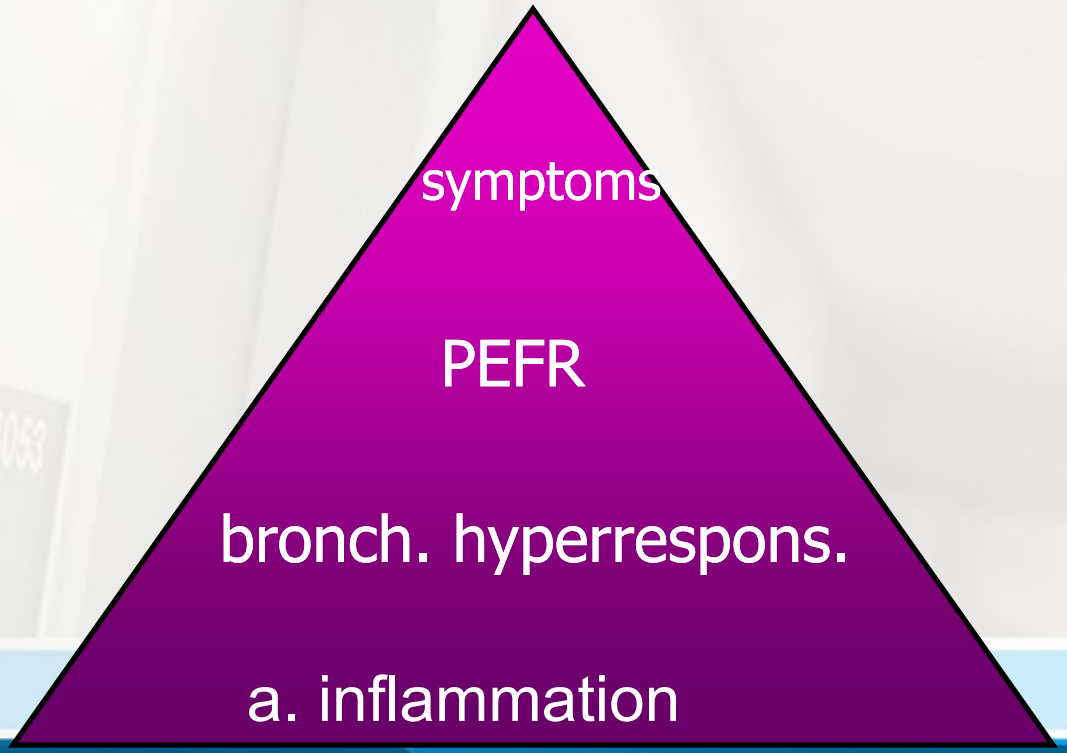
Inhaled corticosteroids

- are currently the most effective long-term preventive medications
- important is early diagnosis and treatment (prevention of airway remodelling)
- long-term treatment with minimal daily doses of ICS

Control of asthma

Low dose of ICS

High dose of ICS



T. Haahtela, Allergy 1999

Systemic side effects of ICS

suppression of HHA axis

osteoporosis

transient growth decelaration in children

cataract

glaucoma

ICS and the growth in children

Noncontrolled asthma itself leads to the growth deceleration but also to the shorter definitive stature.

G. Passalacqua, Allergy 2000

ICS and the growth in children

Long-term and retrospective studies proved that treatment with ICS (BDP, BUD 200 -800 mg/day) does not lead to the shorter definitive stature.

HP Van Bever, Pediatr Pulmonol 1999
MD Silverstein, J Allergy Clin Immunol 1997
T Inoue, J Asthma 1999
L Agertoft, S Pedersen, Respir Med 1994
E Norjavaara, J Pediatr 2000

Conclusion :

an early treatment and ongoing education, presented at every patient visit, is the key to success in all aspects of asthma management

Uncontrolled severe persistent asthma in the 7-years old girl

History

- atopic eczema from the age of 2 months
- uncontrolled persistent asthma from the age of 3 years (recurrent „obstructive bronchitis“ with severe noctural cough attacks and wheezing in cold months of a year one monthly, exercise - induced asthma), ATB therapy and mucolytics

History

- sensitization to house dust mites and pets
- asthma clinic from 4 years of age
- family history: the grandmother has severe asthma

Asthma management

- repeated ATB (8 times per year) therapy and mucolytics in the age of 4 years
- Tilade 3x2, Isoprinosin 4x1/2 tbl., Broncho-Vaxom, Lontermin 2x5 ml. Berodual p.p. in the age of 5 years
- **no effect on symptoms**

Asthma management

- Cromogen 5mg denně + Becotide dos. aer. 400-600 µg, Zyrtec 1x1 tbl. in the age of 6 years
- Foradil 1x1 in the age of 6,5 years, Prednisone in severe asthma exacerbations

Symptoms score

- in the last 3 months: three weeks of coughing with dyspnoe, one week school attendance
- two courses of prednisone per one year
- exercise-induced asthma, dyspnoe while singing, school absences

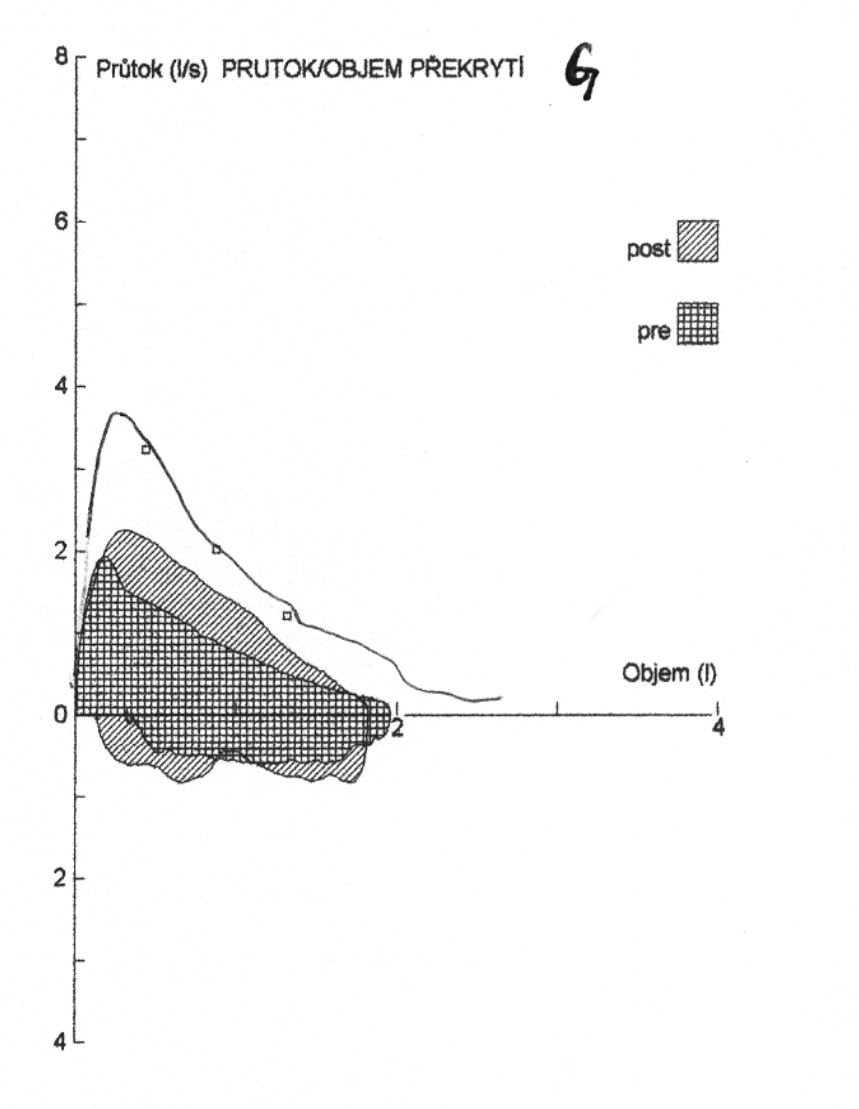
Symptoms score

- mild exacerbations of atopic dermatitis
- allergic perennial rhinitis with moderate allergic conjunctivitis during the pollen season (may-june)
- adenoidectomy in the age of 5 years

Examination

- partially reversible airflow obstruction
- normal chest x-ray
- **dg.: uncontrolled severe persistent asthma, perennial allergic rhinitis and atopic dermatitis (allergic march)**

Flow - volume loop



FEV_1 71% n.h.

PEF 49% n.h.

FEF_{50} 40% n.h.

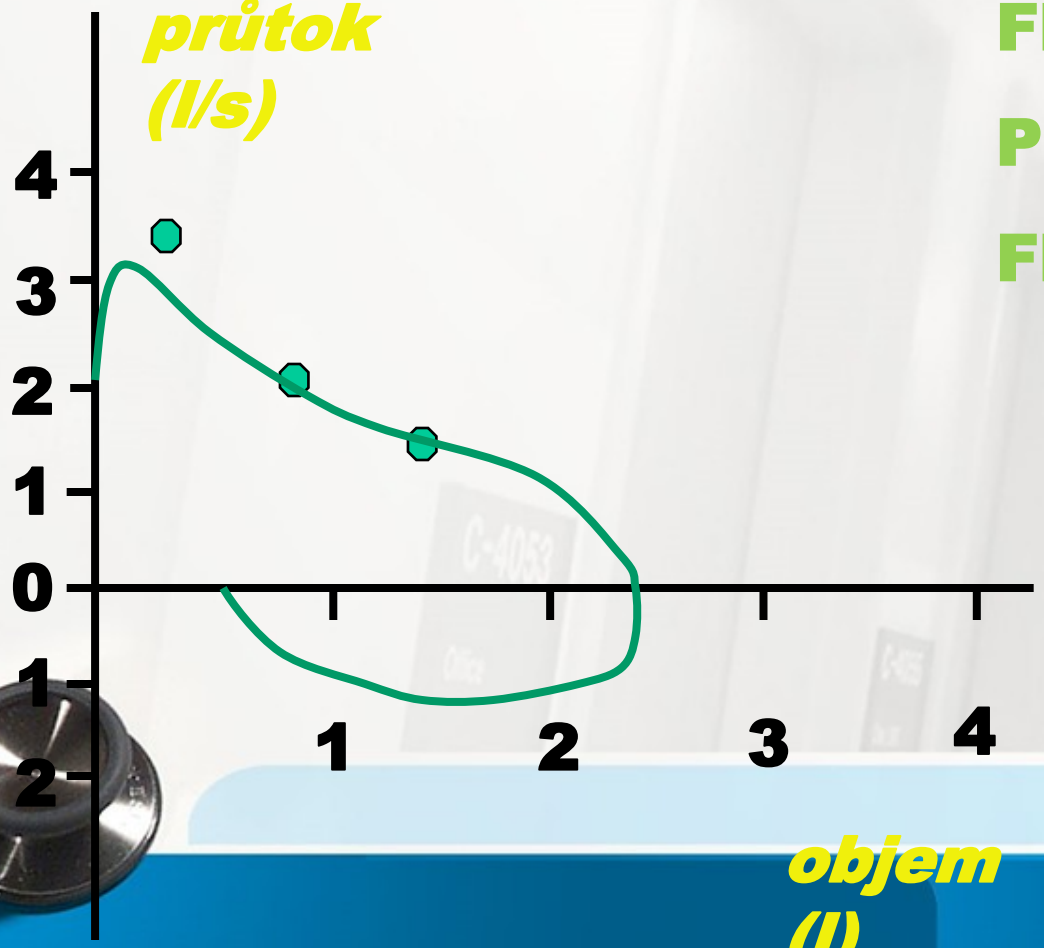
Therapy

- **Written asthma management plan**
- Seretide with 750 ug ICS daily
- Ventolin p.p. + spacer
- Locoid lipocream, Excipial U Lip.
- Zyrtec 1x1 tbl., Flixonase nas. spr. 1x1
- avoidance of indoor allergens
- environmental control measures

Outcome

- no asthma symptoms after one month treatment
- normal lung function
- no exacerbations of atopic dermatitis
- no symptoms of allergic rhinitis
- after 3 months: Seretide D. 50/250 mg 2x1
- after 9 months: Seretide D. 50/100 mg 2x1
- after 1,5 year: Seretide D. 50/100 mg 1x1

Flow - volume loop



FEV_1 107 % n.h.

PEF 70 % n.h.

FEF_{50} 80 % n.h.

Allergic rhinitis

Allergic rhinitis

- prevalence is increasing
- 5% of school-age children have AR
- 40% children with grass pollinosis have asthma
- 80% of patients with asthma have allergic rhinitis

Allergic rhinitis

- clinical presentation: rhinitis, nasal blockage, itching, sneezing and eyes symptoms
- diagnosis:
  - history
  - skin prick testing
  - ENT examination

Allergic rhinitis

- seasonal x perennial rhinitis
- mild rhinitis
- moderate rhinitis
- severe rhinitis

Allergic rhinitis-treatment

- specific immunotherapy
- oral antihistamines: *cetirizine, levocetirizine, loratadine, desloratadine*
- local antihistamines: *levocarbastine*
- intranasal CS: *fluticasone, mometasone, budesonide*

Anaphylaxis

Anaphylaxis

- Acute generalized allergic reactin mediated by IgE
- causes: hypersensitivity to **food** (nuts, egg, fish, milk), insects stings and drugs
- **clinical manifestations: urticaria, dyspnoe and hypotension**
- other symptoms may involve **the skin** (flushing, angioedema, pruritus)

Anaphylaxis

- **respiratory tract** (stridor, hoarseness, cough, wheezing, chest tightness, tachypnea, rhinitis)
- **cardiovascular system** (tachycardia, shock, cardiac atthytmias)
- **GIT** (dysphagia, nausea, vomiting, diarrhea, abdominal pain)
- **in fatal reaction, death may occur within minutes**

Anaphylaxis

- risk of severe dyspnoe mainly in patients with uncontrolled persistent asthma
- **life-threatening event from laryngeal oedema, bronchoconstriction and shock**
- **diff. dg.vasovagal collapse X** bradycardia, nausea and the absence of respiratory and cutaneous symptoms

Anaphylaxis - treatment

- evaluate airway, breathing, circulation
- remove allergen
- drugs
- prompt treatment is extremely important

Anaphylaxis - home treatment

- **Epipen or Emerade (0,15 - 0,3 – 0,5 mg)**
  - **10 ug/kg/dose i.m. !!!**
- antihistamine (Dithiaden 1 tbl.)
- corticosteroid (Prednison 2 tbl. á 20 mg)
- salbutamol + spacer
- contact the physician

Anaphylaxis - treatment

- epinephrine in patients with dyspnoe and/or hypotension **ALWAYS**
- by **intramuscular route**, in children

  in a dose 10 mcg (0,01 ml)/kg (maximal dose 500 mcg)
- Epipen jr. 0,15 mg (in children with body weight 10-27 kg)
  Epipen 0,3 mg

Anaphylaxis - treatment

- **antihistamine i.m.** - Dithiaden
- in children < 6 yrs: 0,5 mg (1 ml)
- in children > 6 let: 1 mg (2ml)
- **glucocorticosteroid i.m.:** prednisone 1-2 mg/kg
- **beta $_2$- agonist** (salbutamol, Ventolin) in acute asthma attack in a dose 2-4 puffs using a spacer (4 times in the first hour)

Anaphylaxis - treatment

- volume replacement (normal saline): in children 30 ml/kg
- transport of the child to the ICU

Anaphylaxis - prevention

- in patients known to be sensitive to a particular drug, premedication with antihistamines and steroids is beneficial

Food allergy to fish-history

- 16yrs old girl was admitted ho hospital for acute allergic reaction
- food allergy to carp and mackerel (dysphagia, nausea and abdominal pain)
- atopy (grass pollens and house dust mites allergenes)
- untreated and uncontrolled moderate persistent asthma and perennial allergic rhinitis

Food allergy to fish-history

- after ingestion of „mackerel á la salmon“ within 15 minutes swelling of the lips, hands, and tongue, dysphagia, urticaria and malaise occured
- home treatment: Zyrtec 1 tbl.
- she went **by bus** **to the GP**
  Dexona 8 mg + Dithiaden 1 mg i.v.
  Calcium 10 ml i.v. BP unknown
- admission to hospital

Food allergy to fish examination

- food allergy to fish (anaphylaxis)
- moderate persistent bronchial asthma (symptom score), allergic perennial rhinitis, atopic dermatitis
- lung function test: normal results (after treatment with CS)

Food allergy to fish-treatment

- Symbicort 6/200 2x1
- asthma written plan
- Xyzal 1x1 tbl.
- Flixonase nas. spr. 1x1 puff
- Locoid cream, Excipial U Lip.
- **anaphylaxis home treatment plan**
- Strict elimination diet (fish)

The End