ASTHMA

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OUTLINE

- Definition
- Pathology
- Epidemiology
- Aetiology
- Precipitating factors
- Mediators
- History
- Examination
- Investigations
- Management

Plinius the Younger A.D. 76

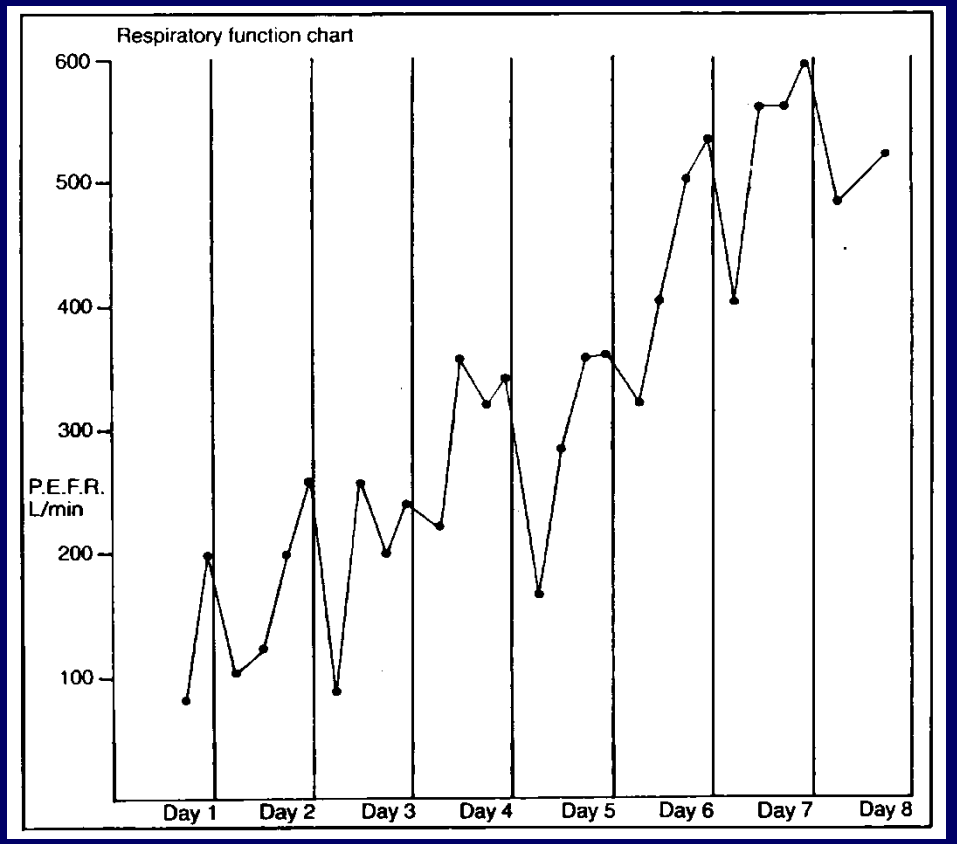
"Leaning on two servants, he brought himself upright and immediately collapsed again, I suppose because he was affected by the dense fog that obstructed his airways that were weak in nature, narrow and subject to inflammation"

DEFINITION (1/3) - CLINICAL

Clinical

- partial airflow limitation

- Varies over short periods of time and with treatment



Peak flow chart with treatment

DEFINITION (3/3) - PATHOLOGY

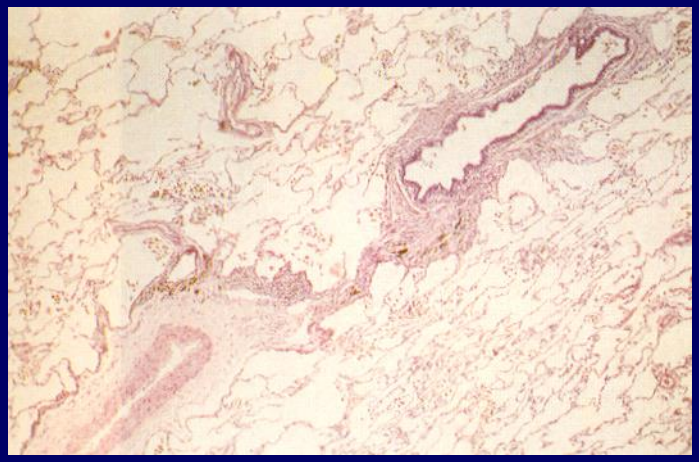
Site: smaller bronchi (& bronchiole)

Findings:

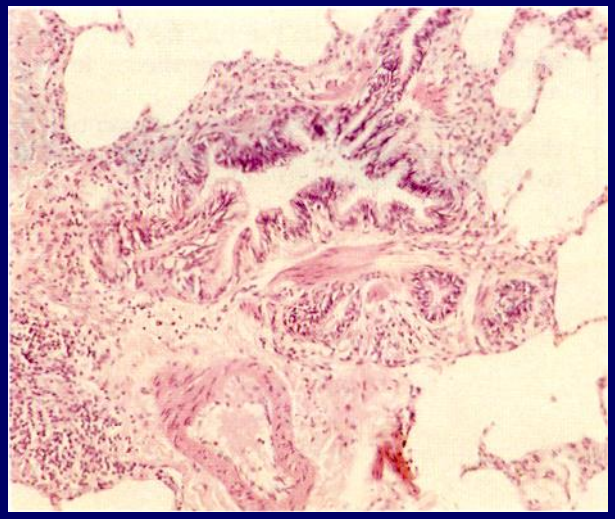
- smooth muscle hypertrophy
- submucous gland hypertrophy
- cellular infiltration (lympho + eosin's)

Asthma = eosinophilic bronchitis

PATHOPHYSIOLOGY OF ASTHMA



Normal airway



Asthmatic airway

1) Smooth muscle constriction

2) Mucosal oedema

3) Chronic inflammatory cell infiltrate

KEY POINT

Asthma is an inflammatory condition, not just bronchoconstriction as a result of smooth muscle contraction

EPIDEMIOLOGY

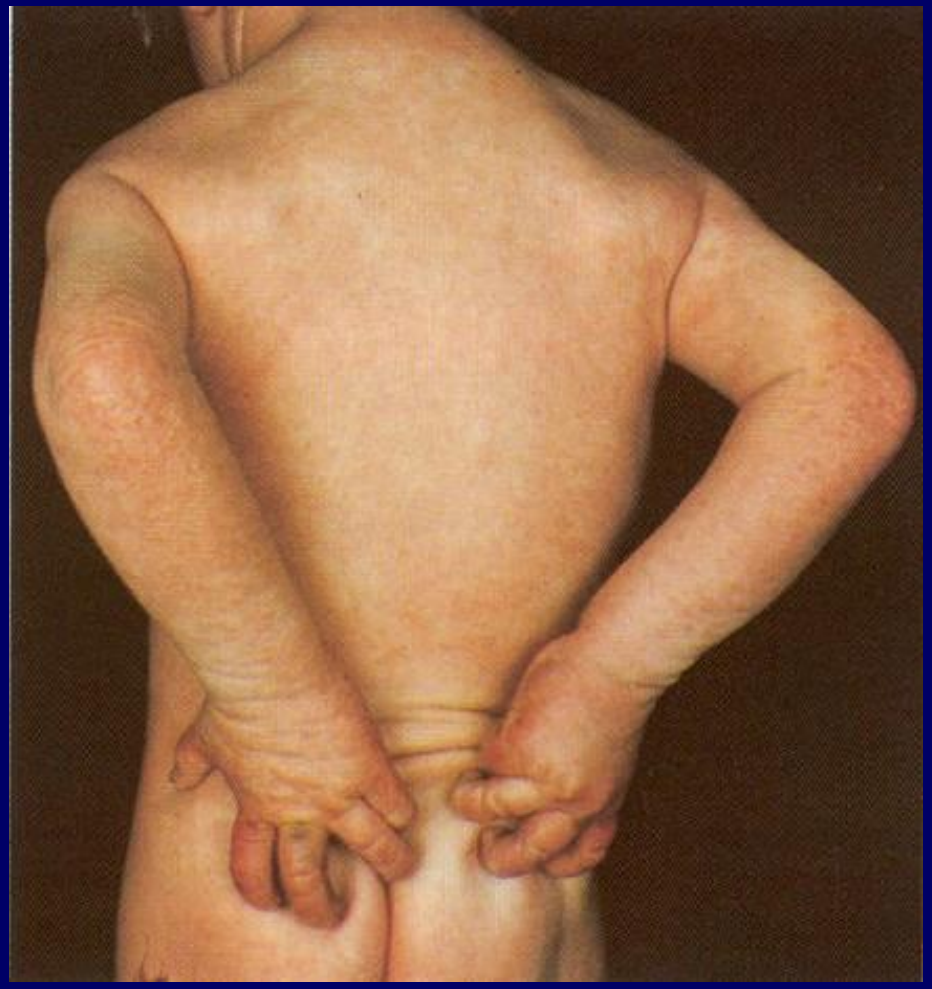
- Common, prevalence 5%
- Peak incidence in second decade (10-15%)
- (Probably) increasing, especially in developing counties
  - ? pollution
  - ? dietary
  - ? improved standards of living

AETIOLOGY

2 major factors:

1) Atopy
   - Type 1 IgE mediated inflammatory response to commonly encountered antigens, runs in families

CHILDHOOD ECZEMA



AETIOLOGY 2/2

2) Airway hyper-reactivity

- Early phase – within 1 hr of exposure, smooth muscle contraction: use bronchodilators
- Late phase – more prolonged, lasts 12 –24 hrs, inflammatory mucosal oedema: use corticosteroids
  - Bronchial provocation tests with methacholine

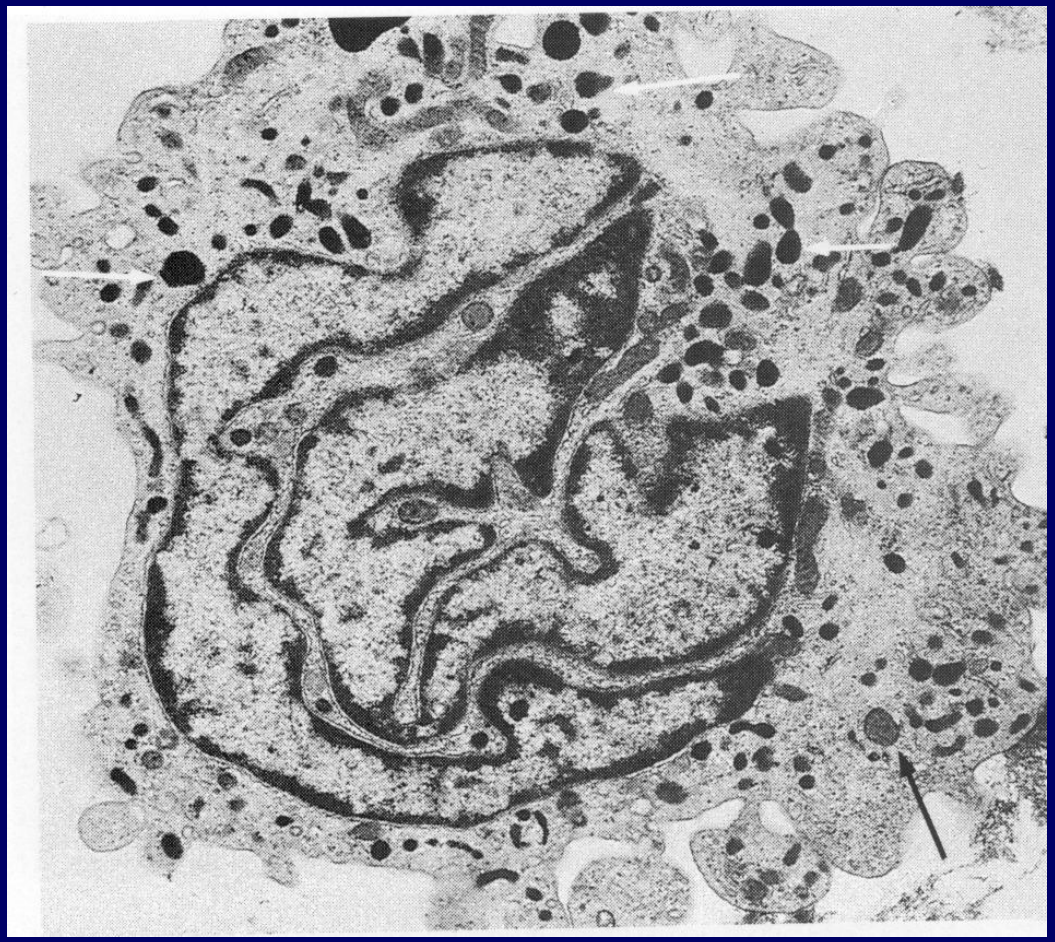
PRECIPITANTS

- Exercise / cold air
- Resp tract infection
- Inhaled allergens
  - Pollens
  - House dust mite
  - Pets
- Drugs
  - Beta-blockers
  - NSAID's
  - Histamine releasers
- Foods
- Menstruation & pregnancy

OCCUPATIONAL ASTHMA

- Materials encountered in the work place that cause or worsen asthma
- Allergens (over 200) from flour & grain, soldering fumes, paint spraying etc..
- 50% are cured if they are permanently removed from exposure
- Use face masks, respirators
- Drug control can be difficult

MAST CELL



MAST CELL DERIVED MEDIATORS

Preformed

- Histamine
- Eosinophil chemotactic factor
- Neutrophil chemotactic factor
- Neutral proteases
- Acid hydrolases
- Heparin proteoglycans

Membrane derived

- Leukotrienes
- Prostaglandins
- Thromboxanes
- Platelet activating factor

HISTORY

- Known precipitating factors

- Nocturnal cough
- Shortness of breath
- Wheeze

KEY POINT

Nocturnal cough is the earliest feature of developing new asthma or deterioration of well-controlled of asthma

EXAMINATION (1/2)

- Nil in between attacks

- No finger clubbing
- Abnormal chest wall shape (severe childhood asthma)
- Reduced chest wall movement
- Central mediastinum

EXAMINATION (2/2)

- Normal tactile vocal resonance
- Normal percussion note
- Normal vesicular breath sounds, prolonged expiratory phase
- Added breath sounds: bilateral, expiratory polyphonic wheeze
  - N.B. localized monophonic wheeze

INVESTIGATIONS (1/2)

Clinical diagnosis

- CXR: normal (or signs of hyperinflation)
- Eosinophils in blood or sputum

Lung function tests:

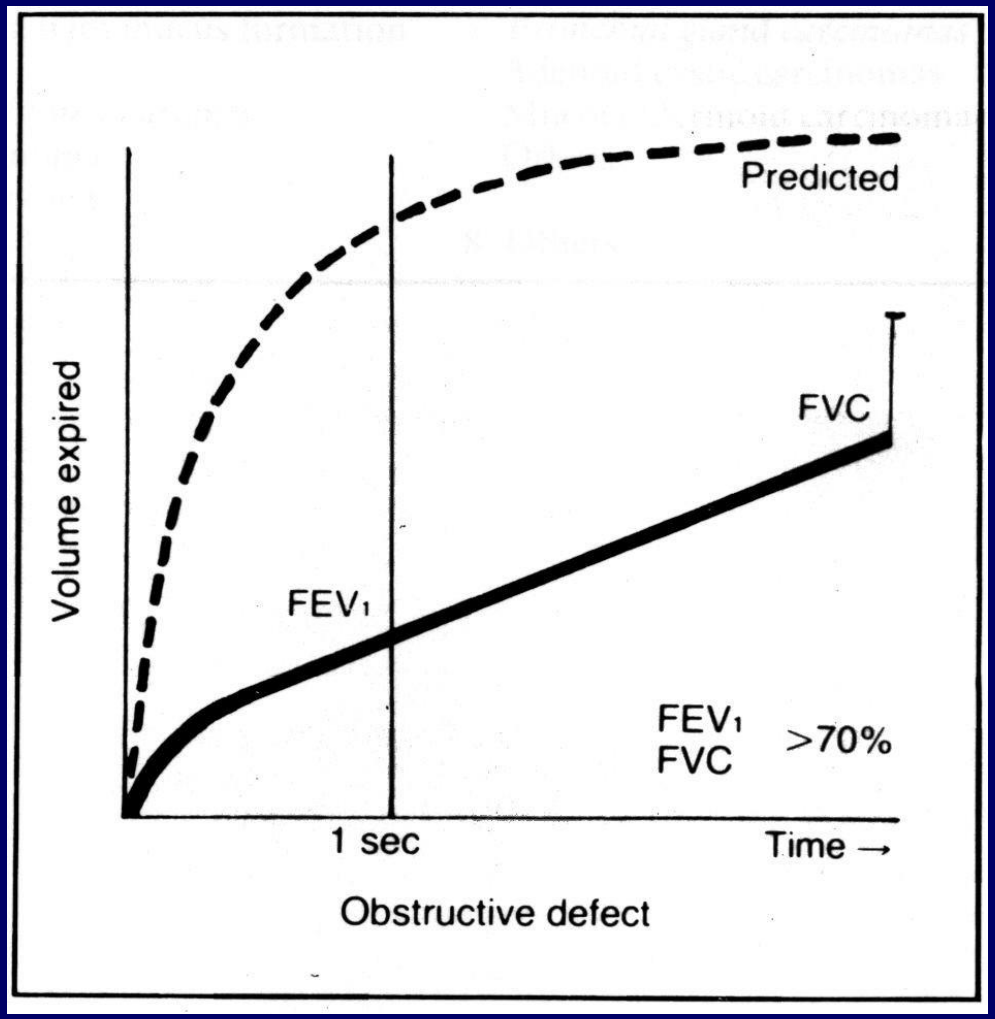
- Bronchial provocation tests
- Diurnal variation of peak flow

INVESTIGATIONS (2/2)

- Skin prick tests
- Spirometry
  - Obstructive ventilatory defect: ↓↓ FEV1/↓ FVC
  - With >15% improvement in FEV1 and 200 ml absolute rise with bronchodilator
- Trial of corticosteroids (30mg prednisolone o.d. for 2 weeks)

SKIN PRICK TESTS

SPIROMETRY: CHRONIC AIRFLOW LIMITATION



KEY POINT

Asthma is a clinical diagnosis; there is no one diagnostic test to confirm clinical impression

MANAGEMENT

Aim: To allow the patient to live a normal active life

Requires patient motivation and education

- Non-drug treatment
- Drug treatment
  - Chronic outpatient asthma
  - Acute severe asthma

NON-DRUG TREATMENT

- Education and reassurance
- Rapid identification of allergen
- Avoidance is difficult e.g. house dust mite
  - Reduce soft furnishings
  - Synthetic fillings for pillows and mattresses
  - Regular dusting

MECHANISMS FOR ASTHMA DRUG THERAPY

- Preventing mediator formation
- Preventing mediator release
- Preventing mediators reaching targets
- Physiological antagonism of mediators

DRUGS

Relievers

- SALBUTAMOL
- terbutaline
- salmeterol
- IPATROPIUM
- THEOPHYLLINE

Preventers

- GLUCOCORTICOIDS
  - beclomethasone
  - budesonide
  - fluticasone
- Na cromoglycate

- Montelukast
- Zafirlukast
- Zileuton

RELIEVERS

Drugs that reverse acute bronchoconstriction:

ß$_2$ agonists

Methylxanthines

Anti-muscarinics

Anti-leukotriene agents

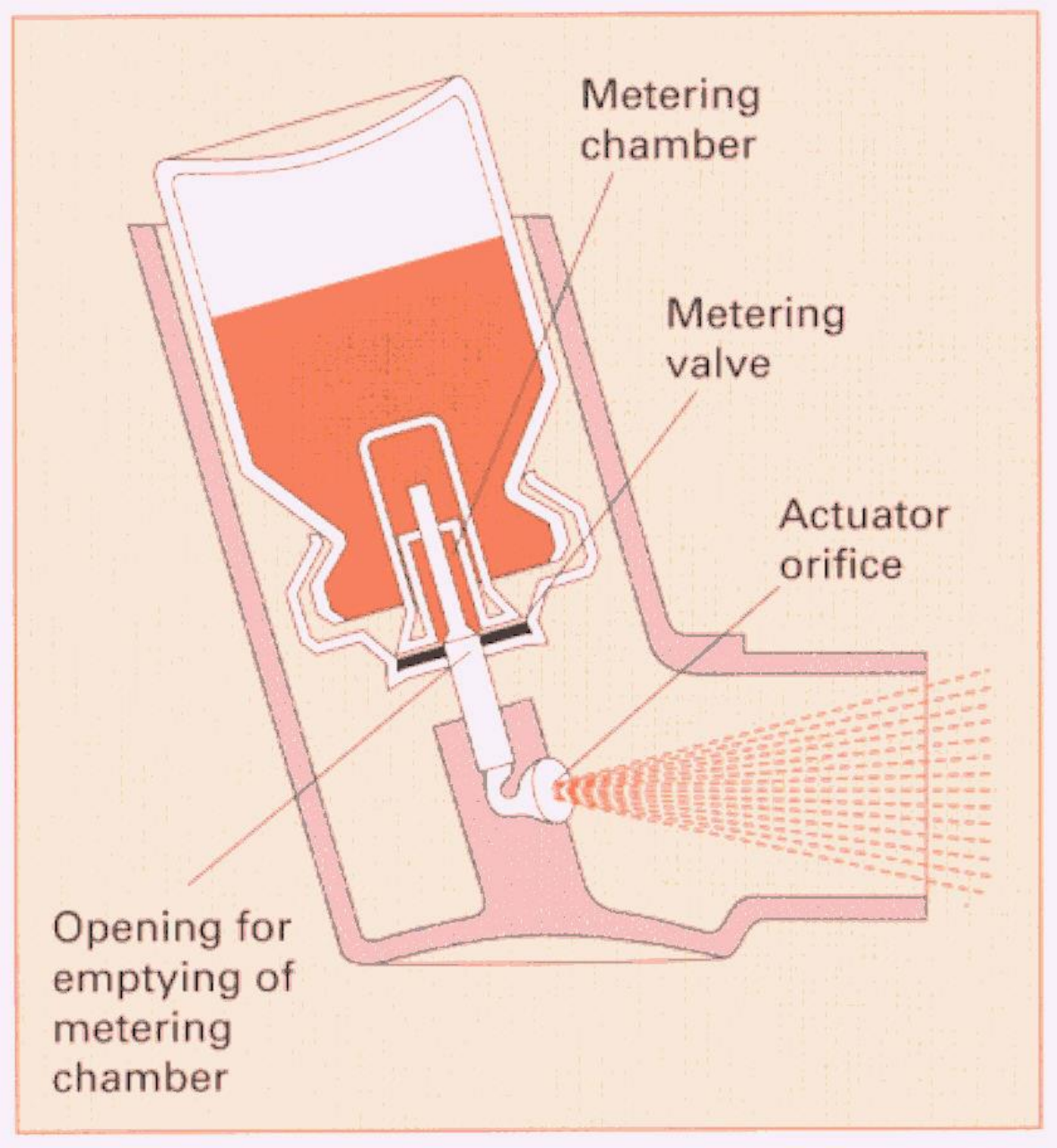
PREVENTERS

Do not cause acute bronchodilatation:

no use for acute treatment

‘Anti-inflammatory action’

- reduce bronchial hyper-reactivity
  - reduce entry of inflammatory cells
  - inhibit release of mediators from cells
  - reduce formation of mucosal oedema by mediators


Metering chamber
Metering valve
Actuator orifice
Opening for emptying of metering chamber

INHALER TECHNIQUE

- Shake canister
- Exhale to FRC i.e. end of tidal breathing, not RV
- Simultaneously activate inhaler and inhale to TLC
- Hold breathe for 10 seconds
- Maximally 15% reaches bronchial tree

SPACER DEVICES

MANAGEMENT OF OUTPATIENT ASTHMA

Principles of Management

- Educate patients on deteriorating control
- Aim to gain control of symptoms rapidly
  - Use *short courses* of oral steroids as required
- Monitor compliance & inhaler technique
- Once well controlled, reduce doses progressively until symptoms reappear

5 STEPS OF ASTHMA MANAGEMENT

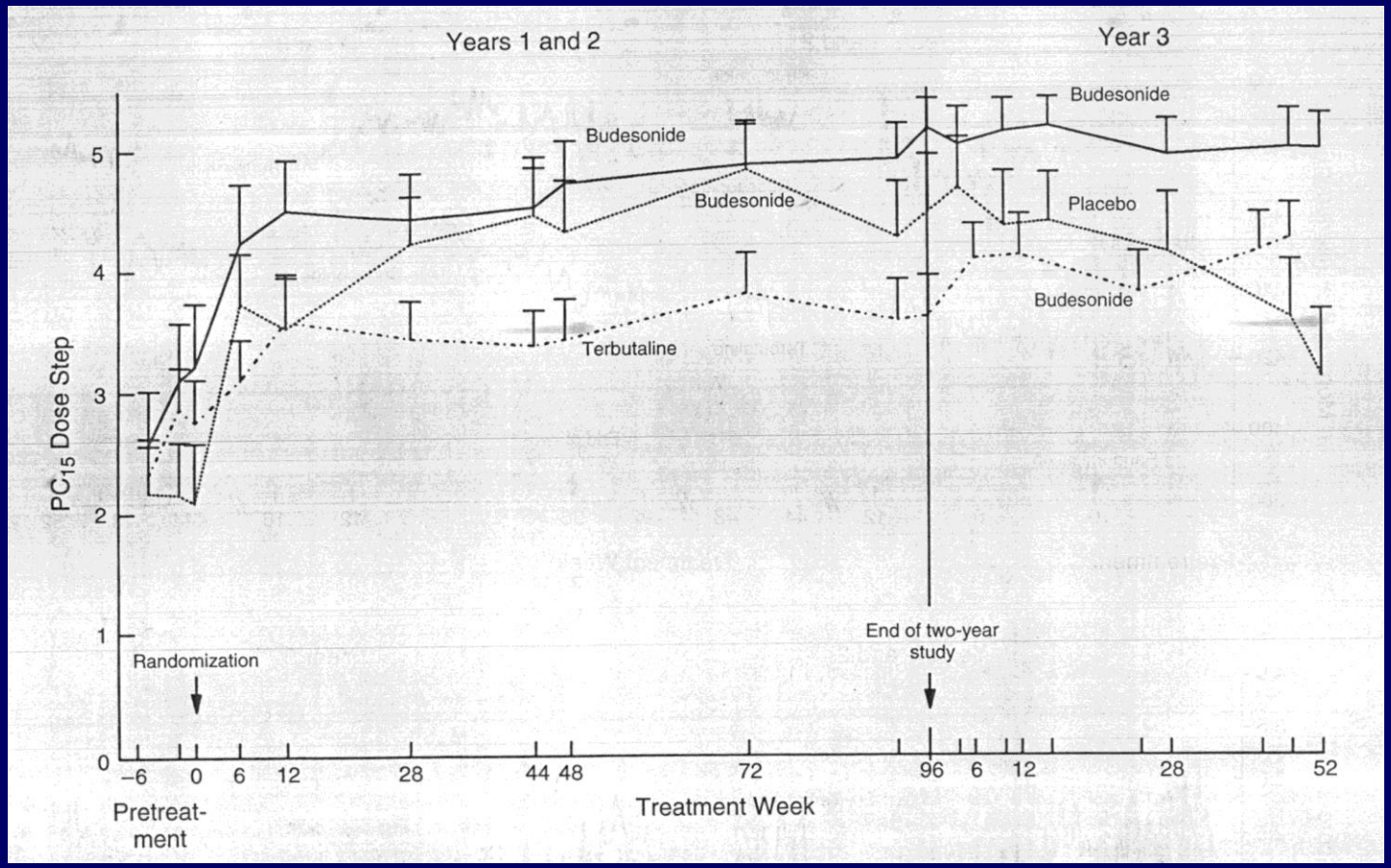
SA $ß_2$ agonist

Step 1 + Low dose ICS

Step 1

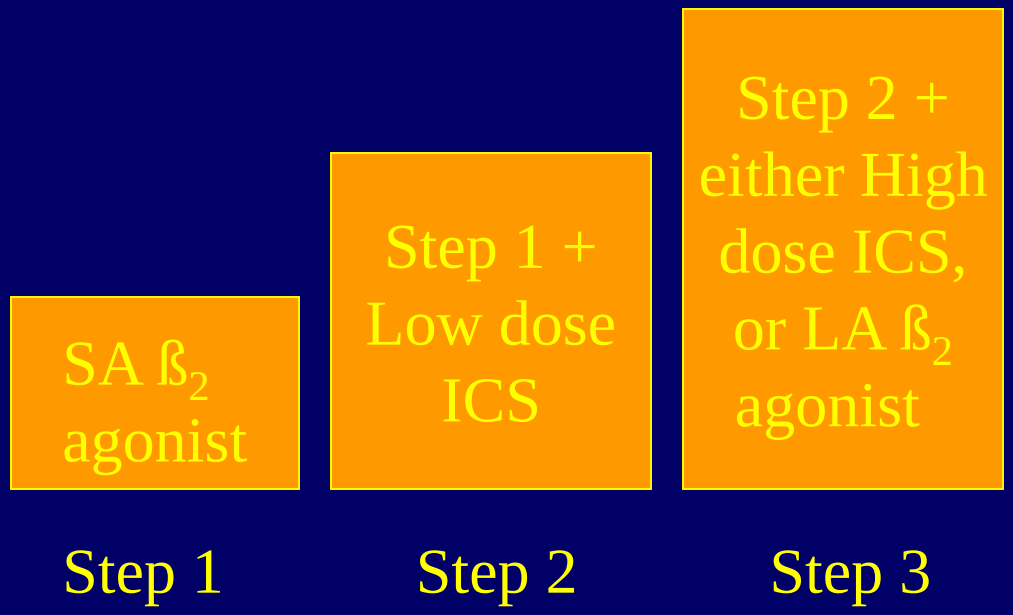
Step 2

VALUE OF ICS AT STEP 2

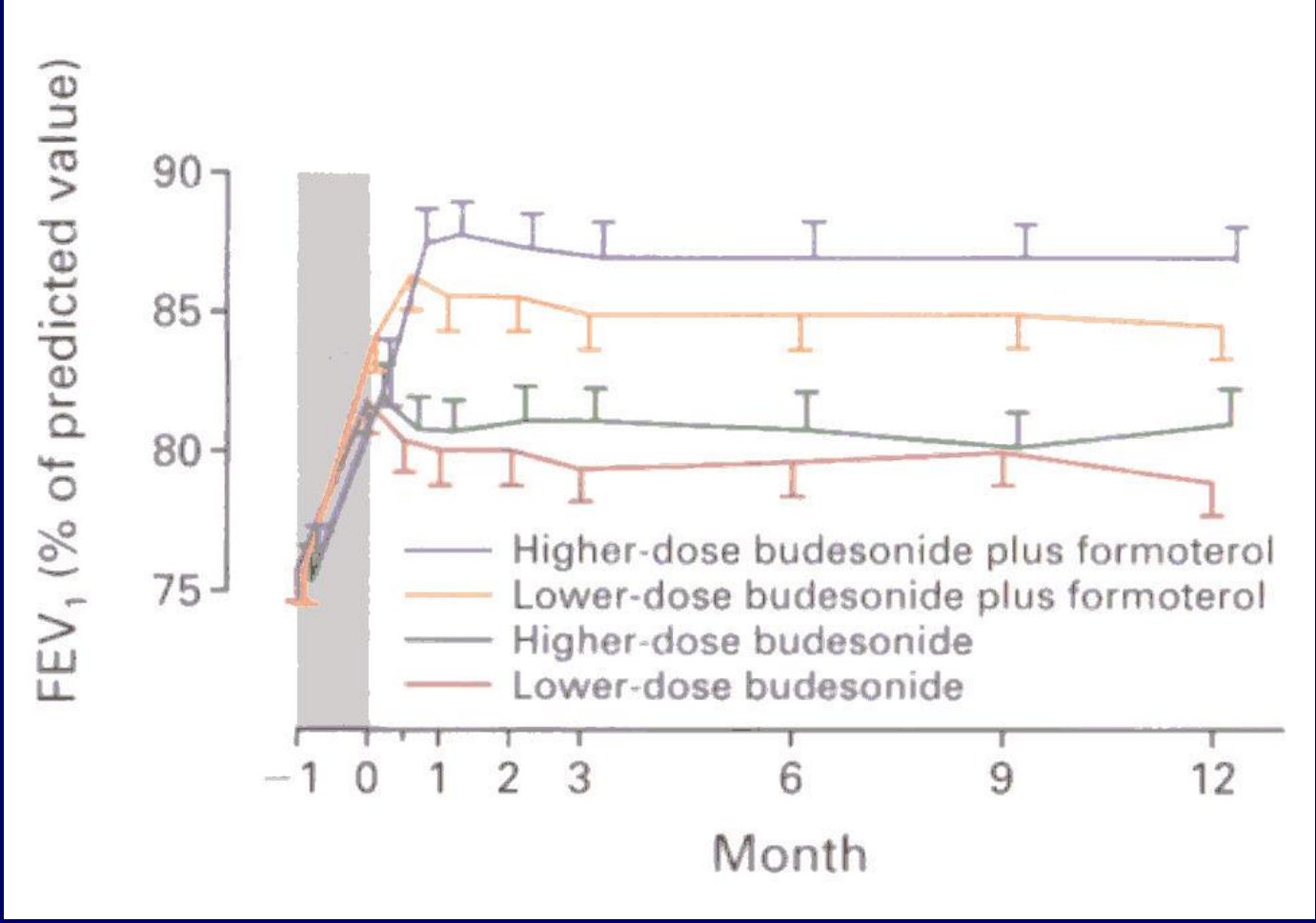


Haahtela et al NEJM 1994; 331:700-5

5 STEPS OF ASTHMA MANAGEMENT



USE OF LAß$_2$ AGONISTS AT STEP 3



Pauwels et al NEJM (1997); 337:1405-11

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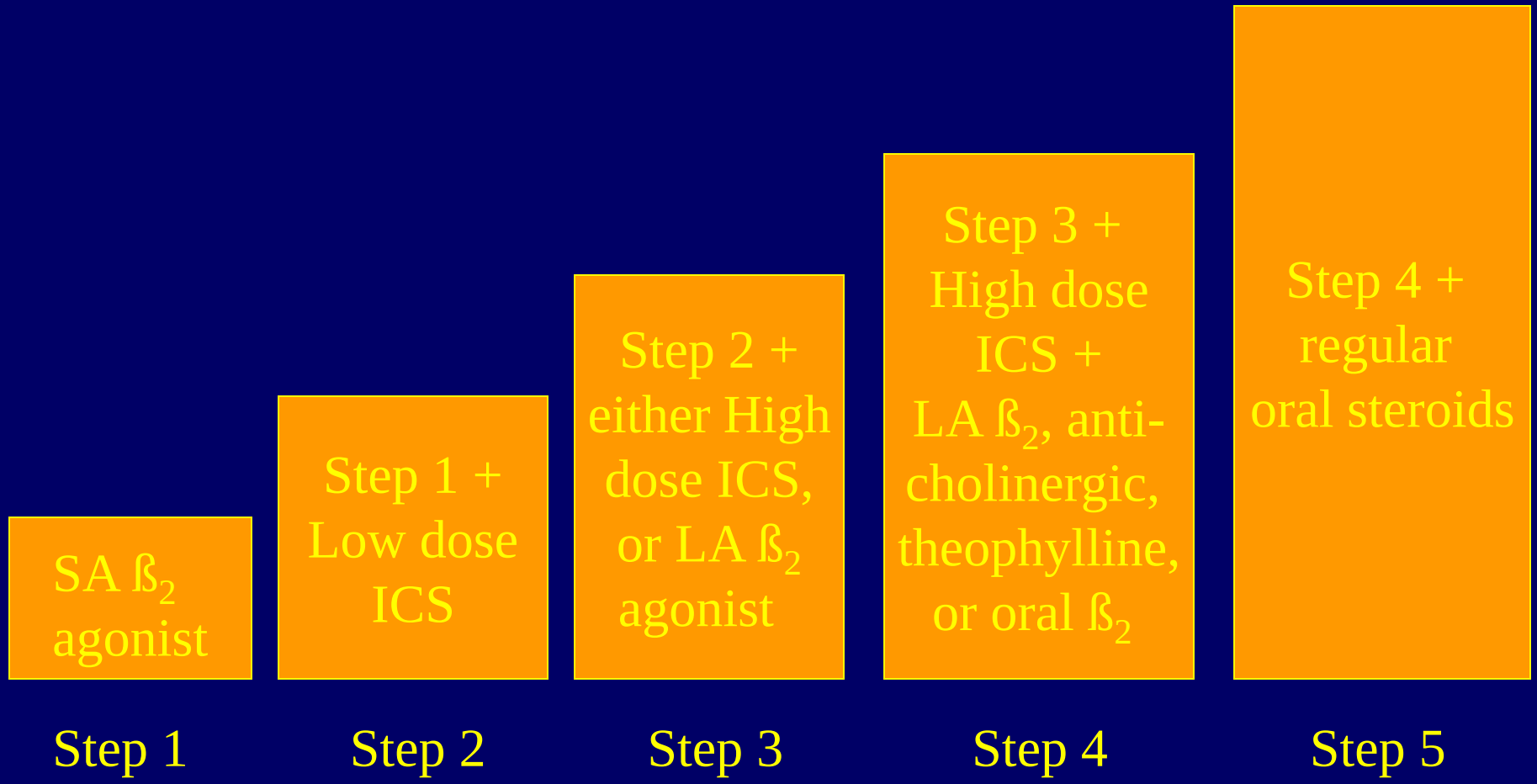


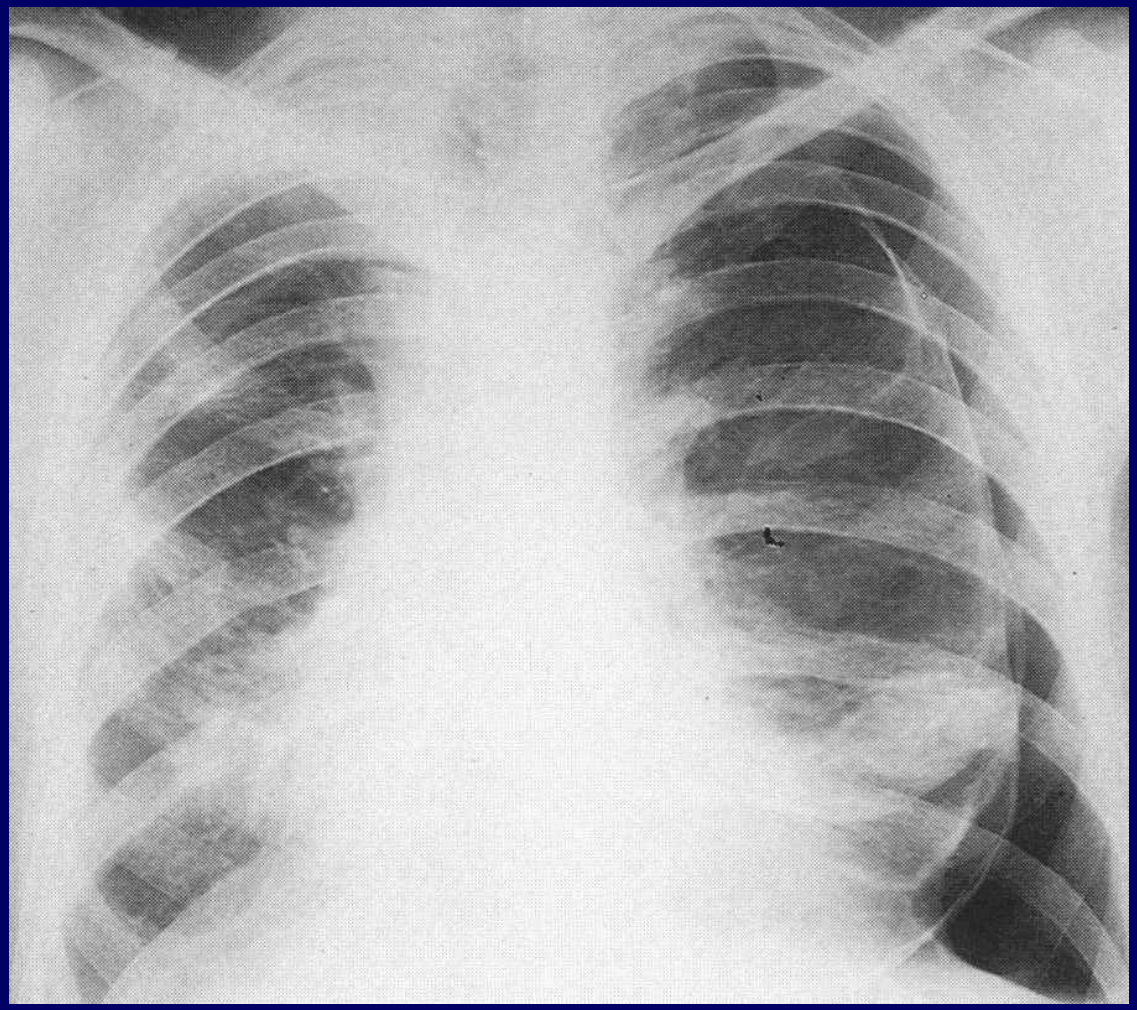
KEY POINT

Nocturnal cough is the earliest feature of developing new asthma or deterioration of well-controlled of asthma

COMPLICATIONS

- Pneumothorax
- Allergic bronchopulmonary aspergillosis and bronchiectasis
- Chronicity: irreversible airway obstruction
- Cor Pulmonale

PNEUMOTHORAX



CHRONICITY

Distinguishing Asthma from COPD

- Cigarette exposure
- Symptoms in earlier life (?atopy)
- Variability of symptoms

Why bother?

SUMMARY

- Definition
- Pathology
- Epidemiology
- Aetiology
- Precipitating factors
- Clinical features
- Investigations
- Management
  - Non drug
  - Drug

GUIDELINES

ON THE

MANAGEMENT OF ASTHMA

SRI LANKA MEDICAL ASSOCIATION

COLOMBO

2000