S. B. K. S. Medical Institute & Research Center

Subject: Pharmacology

Topic:

Respiratory System: Drugs used in Bronchial Asthma - PART TWO

II MBBS Batch 2021

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COMPETENCY:

Describe the mechanism of action, types, side effects, indication and contraindication of the drugs used in Bronchial Asthma.

Respiratory System

Integration Teaching:

Respiratory Medicine

Disorders of Respiratory Function

1. Bronchial asthma

2. Cough

3. Allergic rhinitis

4. Chronic obstructive pulmonary disease

(COPD, also called emphysema)

CHOICE OF TREATMENT

(K. D. Tripathi Textbook)

A stepwise guideline to the treatment of asthma as per needs of the patient has been recommended:

1. **Mild episodic asthma**: (symptoms less than once daily, normal in between attacks): Inhaled short-acting β2 agonist at onset of each episode. No regular prophylactic therapy (Step-1).
2. **Seasonal asthma**: Start regular inhaled cromoglycate/low-dose inhaled steroid (200-400 μg/day) 3-4 weeks before anticipated seasonal attacks and continue till 3-4 weeks after the season is over. Treat individual episodes with inhaled short-acting β2 agonist.

3. **Mild chronic asthma with occasional exacerbations:** (symptoms once daily or so) Regular inhaled low-dose steroid (Step-2). Alternatively, inhaled cromoglycate. Episode treatment with inhaled short-acting β2 agonist.

4. **Moderate asthma with frequent exacerbations** (attacks affect activity, occur > 1 per day or mild baseline symptoms) Increasing doses of inhaled steroid (up to 800 μg/day) + inhaled long-acting β2 agonist (Step-3).

Leukotriene antagonists may be tried in patients not accepting inhaled steroids and in those not well controlled.
Theophylline may be used as alternative additional drug. Episode treatment with inhaled short-acting β2 agonist.

5. **Severe asthma (continuous symptoms; activity limitation; frequent exacerbations/hospitalization):** Regular high dose inhaled steroid (800-2000 μg/day) through a large volume spacer device + inhaled long-acting β2 agonist (salmeterol) twice daily.

Additional treatment with one or more of the following (Step-4):

Leukotriene antagonist/sustained release oral theophylline/oral β2 agonist/inhaled ipratropium bromide.

Rescue treatment with short-acting inhaled β2 agonist.

In patients not adequately controlled or those needing frequent emergency care-institute oral steroid therapy (Step-5).

Attempt withdrawing oral steroid periodically.

Lung function assessment

The diagnosis and severity assessment of asthma is based mainly on parameters of lung function. The most important of them are:

Forced Expiratory Volume in 1 second (FEV1) &

Peak Expiratory Flow (PEF), which are measured during spirometry at forced breathing-out.

PEF also can be measured with the help of individual devices – peak flow meters

STATUS ASTHMATICUS

• **Severe acute asthma (Status asthmaticus)** is a serious medical emergency, requiring urgent hospitalisation and vigorous therapy.

• It is often precipitated by:

1. An acute respiratory infection.
2. Abrupt cessation of glucocorticoid therapy.
3. Drugs (aspirin or NSAID) or inhaled allergens; or
4. Acute emotional stress.

Status Asthmaticus is a life threatening form of asthma **defined** as “a condition in which a progressively worsening attack is unresponsive to the usual appropriate therapy with adrenergic drugs and that leads to pulmonary insufficiency.

- History: Previous history of wheezing, known asthmatic, non Compliant Previous hospitalizations or intubations history.

- Presence of hypoxia, bilateral wheeze or silent chest and mental confusion with impending collapse.

- CBC : elevation in WBC may indicate infection specially bacterial ,signs of viral infection such as leucopenia and thrombocytopenia.

- ABG might help in the presence of normal or elevated CO2 that indicate severe presentation.

- Chest x-ray to exclude reversible pathology such as pneumothorax.

MANAGEMENT

- If the patient does not respond to appropriate therapy in the emergency department, if the frequency of required aerosol treatments is greater than can be administered on the ward, or if the patient is deteriorating significantly despite appropriate therapy, he/she should be transferred/admitted to the ICU.
- **Oxygen therapy should be started immediately to correct hypoxemia.**

• Any patient of asthma has the potential to develop acute severe asthma which may be life-threatening.

•Upper respiratory tract infection is the most common precipitant.

(i) Hydrocortisone hemisuccinate 100 mg (or equivalent dose of another glucocorticoid) i.v. stat, followed by 100-200 mg 4-8 hourly infusion; may take upto 6 hours to act.

(ii) Nebulized salbutamol (2.5–5 mg) + ipratropium bromide (0.5 mg) intermittent inhalations driven by O2.

(iii) High flow humidified oxygen inhalation.

(iv) Salbutamol/terbutaline 0.4 mg i.m./s.c. may be added, since inhaled drug may not reach smaller bronchi due to severe narrowing/plugging.

(v) Intubation and mechanical ventilation, if needed.

(vi) Treat chest infection with intensive antibiotic therapy.

(vii) Correct dehydration and acidosis with saline + sod. bicarbonate/lactate infusion

- **Magnesium sulfate Intravenous** magnesium sulfate 2 gm infused over 20 min has **bronchodilator activity** in acute asthma, possibly due to inhibition of calcium influx into airway smooth muscle cells.

Prophylaxis

Preservation of the environment, healthy life-style (smoking cessation, physical training) – are the basis of primary asthma prophylaxis. These measures in combination with adequate drug therapy are effective for secondary prophylaxis.

Chronic Obstructive Pulmonary Disease

Chronic Obstructive Pulmonary Disease

- COPD is characterized by airflow limitation caused by chronic bronchitis or emphysema often associated with long term tobacco smoking.

- This is usually a slowly progressive and largely irreversible process, which consists of increased resistance to airflow, loss of elastic recoil, decreased expiratory flow rate, and overinflation of the lung.

- COPD is clinically defined by a low FEV1 value that fails to respond acutely to bronchodilators, a characteristic that differentiates it from asthma.

• **Chronic Obstructive Pulmonary Disease (COPD)** is characterized by “air flow resistance that is not reversible”. It includes:

(1) **Emphysema** an anatomically defined entity associated with enlarged and distorted lung alveoli, and

(2) **Chronic bronchitis**, a clinical entity associated with disease of small brochioles with chronic airflow obstruction, chronic cough and marked expectoration.

• **Chronic bronchitis without airflow obstruction is not COPD**.

CURRENT THERAPY OF COPD

- **Inhaled bronchodilators**
- **Inhaled glucocorticoids**
- **Oxygen inhalation**
- **Prophylactic antibiotics**
- **Preventation of dehydration; and**
- **Physiotherapy, pulmonary rehabilitation and education.**

REFERENCE TEXT BOOKS

- **K. D. Tripathi M.D., Essentials of Medical Pharmacology.**

- **Satoskar & Bhandarkar, Pharmacology and Pharmacotherapeutics.**

- **EVIDENCE**

Satoskar & Bhandarkar, Pharmacology and Pharmacotherapeutics , Revised 24th Edition , 2015, pg . 572 to 588

Source of Information	Chapter	Author	Information	Level of evidence
Pharmacology and Pharmacotherapeutics – R. S. Satoskar, S. D. Bhandarkar, Nirmala N. Rege POPULAR PRAKASHAN, Mumbai.	Chapter 27 Pharmacotherapy of Bronchial Asthma	Satoskar & Bhandarkar	*On completion of this chapter, the student will:* Discuss drugs used in the treatment of bronchial asthma. They will describe the mechanism of action ,types ,side effects, indication and contraindication of the drugs. They will be	Level of evidence - Grade one

Zdanowicz M. M. (2007). Pharmacotherapy of asthma. American journal of pharmaceutical education, 71(5), 98. https://doi.org/10.5688/aj710598

Source of Information	Chapter	Author	Information	Level of evidence
American journal of pharmaceutical education	**Pharmacotherapy of asthma.**	**Zdanowicz M. M.**	**provides an overview of pharmacotherapy of asthma.**	Level of evidence - Grade two