Chronic Obstructive Pulmonary Disease (COPD)

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Highlights - Hoogtepunte

- Natural history of normal FEV_1
- What are the risk factors for COPD?
- The treatment of COPD

- Die natuurlike verloop van normale FEV_1
- Wat is die risikofaktore vir COLS?
- Die behandeling van COLS.

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INTRODUCTION:

COPD is the name of a heterogeneous group of diseases characterized by:

- Chronic and slowly progressive nature.
- Reduced maximal expiratory flow during forced expiration: most of the airflow obstruction is fixed.

COPD is currently viewed as a heterogeneous disorder (or group of disorders) with components of chronic asthma, chronic bronchitis, emphysema and airflow obstruction, all being part of the final disease process.

Pathogenesis:

COPD is characterized by a reduction of FEV_1 [Forced Expiratory Volume in 1 second] but also with an accelerated decline of FEV_1. Various factors contribute to this accelerated decline of FEV_1.

RISK FACTORS FOR COPD:

1. Genetic factors: Alpha-1-antitrypsin deficiency, absolute or relative, is the only known genetic abnormality.
2. Smoking: Some 90% of COPD patients are current or former smokers. Smoking impairs respiratory ciliary movement, inhibits alveolar macrophages, inhibits antiproteases (e.g. α1AT) and causes polymorphonuclear leucocytes to release proteolytic enzymes acutely.
3. Air pollution.
4. Occupation.
5. Infection.

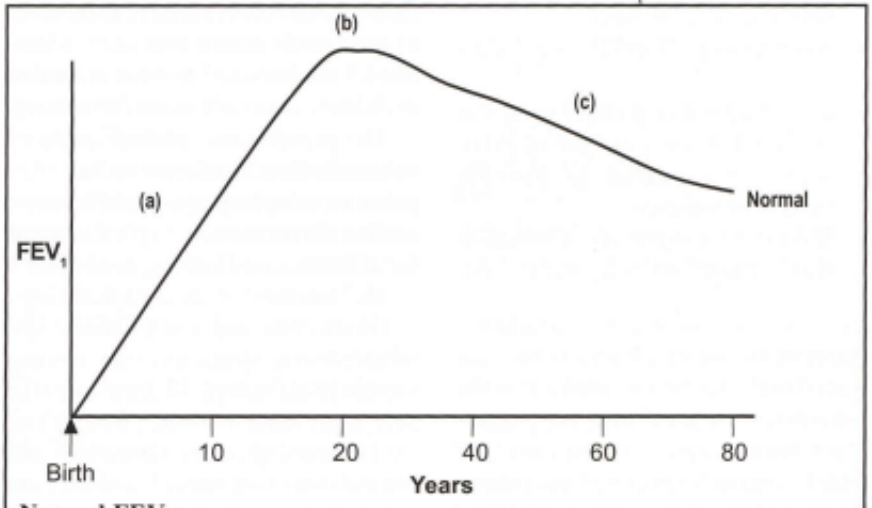
TREATMENT:

I. Retarding the progression of airflow limitation:

a. Smoking cessation:
Confers survival benefit with reduction of malignancy and cardiovascular disease. Smoking cessation is also associated with a significant increase in FEV_1 in the first year after smoking cessation and later the rate of decline of FEV_1 reverts to the normal loss of a non-smoker. How to induce smoking cessation in patients is another matter entirely.

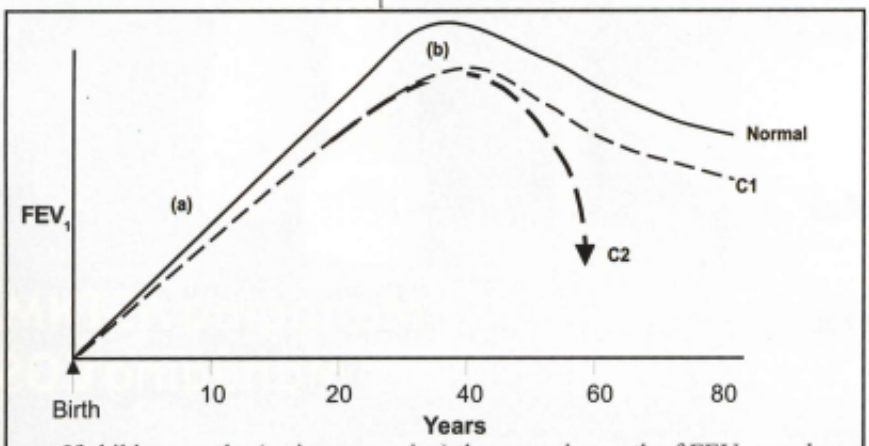
b. Glucocorticoids:
Results of clinical trials using steroids have shown response in that subgroup of COPD patients with asthmatic features. Only ± 10% of COPD patients show subjective benefit and increased FEV_1 by at least 20% compared to placebo.

Natural History of Normal FEV_1:



Normal FEV_1:
a From birth FEV_1 develops up to the age of ± 20 years.
b There is a short period ± from 20 – 30 years of age, where FEV_1 is maintained.
c Thereafter the FEV_1 gradually declines at the rate of ± 30 ml/year in all people.

FEV_1 for smokers



a If children smoke (active or passive) the normal growth of FEV_1 may be impaired.
b The maximal attained FEV_1 may be lower in young adults who smoked in childhood.
C1 FEV_1 decline in all smokers is ± double that of normal non-smokers.
C2 Only 15-20% of smokers will develop an accelerated decline in FEV_1. [They are the COPD patients.]
Why only 15-20% of smokers will develop COPD is not known.

Therefore, the benefit of a trial of steroids (10-14 days) on oral therapy 30mg-40mg/day with measurement of FEV_1 before and after therapy is an option. With no demonstrable effect on FEV_1, steroids should be stopped. In the majority of COPD patients, the use of inhaled steroids does not decrease the number or frequency of COPD exacerbations, but it may decrease the severity of an exacerbation and it may reduce the need for hospitalization of acute exacerbations. Symptoms and effort tolerance may improve.

II. Minimizing airflow limitation:

Bronchodilators

Bronchodilators may improve dyspnoea and exercise tolerance by improving airflow due to some degree of bronchodilator response. Three classes of bronchodilators are commonly used.

a. Beta-2-adrenergic-agonists:

i. Short-acting beta-2-agonists: they are commonly used as symptom rescue.
ii. Long-acting beta-2-agonists: Both salmeterol and formeterol have been shown to produce bronchodilatation in COPD.

b. Anticholinergics:

They inhibit the effects of acetylcholine on bronchial smooth muscle and in that way cause bronchodilatation.

i. Ipratropium bromide used 4-6 hourly is effective. Combining a beta-2-agonist and an anticholinergic can also be used to good effect in some cases.
ii. Long-acting anticholinergic: Tiotropium bromide is effective and is a new type of selective muscarine (M_3) receptor antagonist, blocking the effect of acetylcholine. The effect lasts up to 24 hours. Spiriva® is currently available in South Africa.

c. Theophylline derivatives:

Theophylline is a weak bronchodilator with a narrow therapeutic window easily causing toxicity and much of the benefit derives from other effects such as enhanced diaphragmatic contractility, increased cardiac output and an increase in ventilatory drive.

d. Increased eliminations of secretions:

No proven benefit is consistently seen with mucolytic agents.

III. Correcting secondary physiologic abnormalities:

a. Rehabilitation:

Severe deconditioning with muscle loss compromise cardiopulmonary fitness and contribute to severely constrained daily life and poor quality of life. A rehabilitation program consisting of proper dietary measures, exercise training, patient education and other measures is available.

b. Lung volume reduction surgery:

This is designed to relieve dyspnoea and to improve exercise function in severely disabled patients. Severely emphysematous lung tissue is resected which leads to a decrease in hyperinflation and improvement of airflow. This is currently an experimental procedure and needs more study. In selected patients bullectomy can be considered as well.

c. Oxygen for Hypoxaemia:

Resting PaO_2 levels of < 55mmHg or saturation of < 88% measured during a period free of exacerbation on optimal therapy provide the indication for 15 – 18 hours of O_2 therapy at low flow. This may prolong life.

IV. Reduction of acute exacerbations:

After an acute exacerbation, most patients experience a transitory or permanent decrease in quality of life and nearly 50% of them will experience another acute exacerbation in the following 6 months.

Clinical features:

i. Worsening dyspnoea.
ii. Increased sputum volume.
iii. Increased sputum purulence.

A severity scale is used from these 3 features: severe exacerbation (all three features), moderate (two features) and mild (one feature). Acute exacerbations can be triggered by tracheobronchial infections or environmental exposures. Associated clinical conditions can worsen the COPD e.g. heart failure and pulmonary embolism.

Management of acute exacerbation:

1. Bronchodilators:

Anticholinergics plus or minus short-acting beta-2-agonists by wet nebulization or dry aerosol delivery are clinically equivalent.

2. Steroids:

Systemic steroids are given for 2 weeks. Inhaled steroids are not appropriate.

3. Antibiotics:

Antibiotics are given for severe and moderately severe acute exacerbations.

4. O_2-therapy:

Proper care needs to be taken not to worsen respiratory failure, but hypoxaemia needs to be relieved.

5. Non-invasive Positive-Pressure Ventilation (NPPV):

NPPV might improve the survival of patients with acute exacerbations of COPD. The following treatment options are not recommended and some may be harmful in the treatment of acute exacerbations:

i. Mucolytic medications.
ii. Chest physiotherapy.
iii. Methylxanthines.

V. Alpha-1-Antitrypsin deficiency replacement:

Exogenous α-1-AT derived from pooled human plasma administered intravenously weekly is an option for severe deficiency, but it is inconvenient and expensive.

SUMMARY

Relentless dyspnoea is a constant feature of COPD and these measures are currently available to relieve dyspnoea. The mainstay of current treatment is described with cessation of smoking of paramount importance.❐

Please refer to CPD Questionnaire on pg 51

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