

Chronic Obstructive Pulmonary Disease

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Introduction

Before considering the impact of chronic obstructive pulmonary disease (COPD) in the elderly, the normal physiological changes that take place in the lungs with aging should be reviewed¹ (Table 1). In general terms, the lungs lose elastic recoil properties and alveolar surface area. This results in a mild decline in expiratory flow rates, and an increase in trapped air (residual volume) along with a decrease in resting arterial partial pressure of oxygen (PaO₂). Airway closure occurs progressively in dependent portions of the lung in the supine position beginning in the mid-40s, and the sitting position in the mid-60s. This airway obstruction results in some shunting and further hypoxemia. Muscle strength—particularly diaphragmatic—declines and the chest wall becomes stiffer, contributing to decreased exercise tolerance. Neural reflexes to hypoxia and hypercapnia as well as the perception of changes in lung stiffness and air flow obstruction are blunted in elderly patients, decreasing their awareness of acute problems. Despite all these changes, it is probably fair to say that lung aging is not limiting unless affected by disease. However, elderly patients also have a less effective cough, are prone to aspiration and have less effective lung defenses, thereby increasing the risk of infection.

Definition

A recent international consensus study defined COPD as a disease characterized by progressive airflow limitation that is only partially reversible and that is associated with an abnormal inflammatory response of the lungs to noxious particles or gases.² Research is currently focusing on the inflammatory features of COPD but has yet to produce definitive solutions.

It is important to recognize those at risk for developing COPD with the use of spirometry to document airflow obstruction (Table 2). Advice can then be given regarding smoking cessation and, less commonly, environmental changes that might halt the accelerated decline in lung function. Symptoms are a poor screening tool because elderly individuals may have poor perception of dyspnea (see above) or may assume that their reduced exercise tolerance is a normal manifestation of aging.

Epidemiology

Figures from Health Canada gathered in 1998/1999 suggest that 7.8% of Canadian men and 6.3% of Canadian women over age 75 suffer from physician-diagnosed COPD.³ COPD is primarily a disease of the elderly with a prevalence increasing from 1.6% in men age 35 to 54 to 4.0% in men age 55 to 74, and to 7.8% in those over age 75. Similar trends are seen in women. The gender differ-

ences are largely ascribed to different smoking patterns. Not surprisingly, these trends are changing due to societal changes in smoking behaviour as increasing numbers of women are taking up smoking.⁴

Hospitalization rates from COPD steadily rise with age after 55. For those older than 80 years, 2,765 men and 1,197 women per 100,000 were hospitalized in Canada with COPD as the primary diagnosis in 1998/1999.³ However, it is estimated that COPD hospitalization rates for women will surpass men in 2001 and will continue to rise over the next 15 years. COPD is currently the fourth leading cause of death (4.5%) in Canada after cancer (27.2%), heart disease (26.6%) and cerebrovascular disease (7.4%), but it is estimated that COPD will rise to third by 2020. Thus, we can expect an increase in the incidence, morbidity and mortality of COPD in elderly people, particularly women, over the next 15 to 20 years (Figure 1).

The classical symptoms of COPD are chronic cough, usually with sputum production, and progressive dyspnea on

Table 1
Normal Age-related Changes in Lung Function

| Cause | Result | Effect |
|---------------------------------------|---|--|
| Loss of lung elasticity | Decreased flow rates | Airway narrowing |
| Airway closure | Mild obstruction | Hypoxemia (especially supine) Breathing at higher lung volume |
| Loss of alveolar surface area | Less efficient gas exchange | Decline in PaO ₂ |
| Decreased respiratory muscle strength | Decreased diaphragm effectiveness | Decreased cough effectiveness |
| Increased chest wall stiffness | Work of breathing increased | Decreased exercise tolerance |
| Decreased neural reflexes | Unresponsive to small changes in blood gases and lung mechanics | Unable to perceive subtle changes in lung function |

Table 2**Risk Factors for Chronic Obstructive Pulmonary Disease**

| |
|--------------------------------------|
| Smoking: Primary Second-hand |
| Airway hyper-responsiveness (asthma) |
| Childhood respiratory infections |
| Air pollution |
| Occupational hazards |
| Genetic |

exertion, both of which are often exacerbated by respiratory infections. The increased frequency of comorbid illness in the elderly makes it extremely important to rule out other diseases—particularly cardiovascular disease—before attributing symptoms to the lungs. Asthma does occur in the elderly and is differentiated by the intermittent nature of the symptoms and the presence of triggers that can be identified by careful history. Patients with both COPD and asthma frequently note worsening of their symptoms when exposed to climatic extremes.

Physicians must be wary of the patient's expectation of decreased exercise tolerance with aging and should specifically question the activities undertaken and how the patient's tolerance compares with that of others of similar age. It is also important to take into consideration the patient's usual level of function and exercise tolerance, because a change in these domains may be the initial presentation of disease exacerbations in frail seniors. Airflow obstruction should be confirmed using spirometry.

Management Approaches

Smoking Cessation

The first responsibility of a physician when faced with an elderly patient with COPD is to attempt to slow disease progression. Currently, the only approach that has been conclusively shown to achieve this goal is removal of envi-

ronmental pollutants. In elderly patients, ongoing exposure to cigarette smoke is almost always the major contributing factor to COPD development. Accordingly, the employed strategy is smoking cessation. The original observation by Fletcher and Peto in 1977,⁵ recently confirmed by the Lung Health Study,⁶ was that the accelerated decline in respiratory function can be returned to non-smoking levels by smoking cessation alone. Strategies for smoking cessation are beyond the scope of this article (see article, page 8), but the success of any technique is enhanced by ongoing physician support and encouragement.

Exercise

Significant COPD can have a large impact on the quality of life of the elderly patient. Symptomatic COPD seldom occurs in isolation and usually develops in the context of other life changes and physical infirmities that tend to undermine self-esteem and confidence. It is therefore important that we, as physicians, approach this problem realistically but positively by encouraging our

patients to make the best of their lung capacity by remaining as active as possible. A golfer who can play nine holes with a cart is far happier than one who gives up altogether.

Daily exercise improves cardiorespiratory fitness, confidence, self-esteem and feeling of well-being. A regular program of exercise should be strongly encouraged to patients, and personal observations have been consistent with the dictum "the more you do, the more you are able to do".

Vaccination

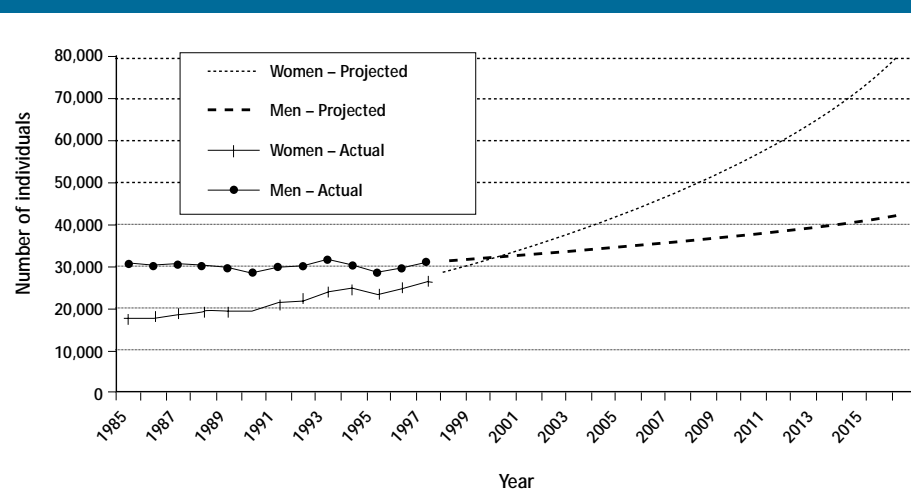
Annual influenza vaccination can reduce hospitalization and mortality in patients with COPD,^{7,8} but presently there is insufficient evidence to recommend routine vaccination against pneumococcus. It is important to promote vaccination of health care providers in long-term care facilities and hospital staff as a means to reduce the transmission of influenza to frail seniors.

Bronchodilators

To date, there is no convincing evidence of a significant long-term beneficial effect

Figure 1

Number of Individuals Hospitalized with Chronic Obstructive Pulmonary Disease—Actual and Projected Number in Canada Excluding Territories, 1985–2016



Reproduced with permission from Canadian Institute for Health Information, Canadian Lung Association, Health Canada, Statistics Canada, Respiratory Diseases in Canada, Ottawa, September 2001 (Figure 5-5, page 49).

with any form of pharmacotherapy on the rate of decline of lung function in COPD. The goals of drug therapy are therefore to control symptoms, to reduce the frequency and severity of exacerbations and to improve overall health status and exercise tolerance.

All categories of bronchodilators have been shown to increase exercise capability without necessarily producing significant improvements in FEV1 (forced expired volume in one second). Bronchodilatation allows for a decrease in gas trapping, allowing the patient to breathe at a lower functional lung volume. The lower volume results in less chest wall distention and lower work of breathing; however, because there are less elastic forces keeping the airways open, the expiratory flow rates are unchanged. Thus, a therapeutic trial of bronchodilators is warranted in all symptomatic patients with COPD regardless of spirometric reversibility testing results.

Although inhaled therapy is more effective than oral medication, it may create challenges for some elderly patients, particularly in the presence of neuromuscular disease and cognitive impairment with associated apraxia. Various devices such as aerochambers and dry powder inhalers reduce the need for hand-eye coordination. However, the institution of inhaled medication requires patient instruction on the use of the device with review on follow-up visits. Repetition of instructions and information sharing with a reliable informant or caregiver is particularly important when a patient demonstrates any cognitive impairment.

Long-acting beta-2 agonists, such as formoterol and salmeterol, are effective and more convenient but more expensive than the short-acting drugs such as salbutamol.⁹⁻¹¹ Anticholinergic drugs such as ipratropium have also been shown to be effective with minimal side effects, but require administration four times daily.⁶ A long-acting anticholinergic drug tiotropium will be released shortly, and studies to date suggest that it is effective in this patient population.^{12,13} Due to the different mechanisms of action, combin-

ing beta-agonists and anticholinergic drugs provides additional benefit while avoiding potential side effects by keeping the individual doses modest.¹⁴ Side effects from anticholinergic inhalers are rare, but cases of hypokalemia, palpitations and arrhythmias, shakiness and insomnia should be watched for with beta agonist usage.

Steroids

The role of corticosteroids in COPD has been and remains controversial. Long-term systemic corticosteroids have not been evaluated in the treatment of stable COPD. However, dramatic results would be necessary to outweigh the potential for serious side effects in elderly COPD patients, including weakness, cataracts, bruising, candidiasis, hyperglycemia and osteoporosis.¹⁵ Elderly COPD patients have the additional risk factors for osteoporosis of inactivity and smoking history. Overall, it seems prudent to minimize the total steroid exposure in these patients. This notwithstanding, there is evidence that short-term systemic steroids (two weeks) reduce treatment failures and shorten the duration of illness, and their use is probably justified in patients with severe disease.¹⁶

Inhaled Steroids

To date, there is no evidence to support the use of inhaled steroids in acute COPD exacerbations. In chronic stable COPD, inhaled steroids have not been shown to have a significant effect on the rate of decline of lung function.¹⁷ However, there is evidence that inhaled steroids result in a small one-time increase in FEV1, of 50-200mL, within weeks of initiating therapy in this patient population.¹⁸⁻²⁰ In addition, there is evidence that inhaled steroids reduce the frequency and/or severity of exacerbations and modestly improve symptoms and quality of life as measured by the St. George's Respiratory Questionnaire.^{18,21,22} Indirect evidence has shown that inhaled steroids might decrease relapse rate and mortality after discharge from hospital with COPD.²³

The prolonged use of inhaled steroids may cause bruising, oral candidiasis and increased cataract risk.^{18,19,24} Increased rate of bone loss has been observed, although studies have not demonstrated increased fracture risk, perhaps due to insufficient duration of treatment.¹⁷ At the present time, it is difficult to recommend the widespread use of inhaled steroids in COPD, particularly in elderly patients in which benefit is modest and comorbid illness combined with normal physiological changes of aging increase the potential for side effects. I suggest limiting their use to those with severe disease (FEV1 < 50% predicted) resulting in significant physical disability and frequent exacerbations. Further studies may help identify a subset of patients with greater potential benefit.

Antibiotics

Antibiotics are useful in the treatment of acute exacerbations of COPD, especially in the presence of dyspnea and an increase in sputum quantity and purulence.²⁵ A number of factors will influence the choice of antibiotic, including the severity of lung disease, the presence of comorbid illness, a history of recent hospitalization and whether the patient lives at home or in a nursing facility.²⁶ An updated review of this subject is scheduled to be published shortly as a guideline from the Canadian Thoracic Society.

Long-term Oxygen Therapy

Hypoxemia and hypercapnia may occur in the absence of an acute exacerbation. Long-term oxygen therapy (greater than 15 hours a day) has been shown to increase survival.^{27,28} Benefit has been demonstrated in pulmonary hypertension and right heart failure, exercise capacity, polycythemia and cognitive function.²⁹ Patients assessed for long-term oxygen must be ex-smokers as well as stable and exacerbation-free (usually for three months). They also must have a waking PaO₂ less than 55 mmHg on room air, an oxygen saturation less than 88% or a PaO₂ ranging from 55-59mmHg with

evidence of polycythemia or cor pulmonale despite receiving optimal medical therapy.²

The decision to start an elderly patient on oxygen is a big one. The survival benefit must be weighed against the inconvenience and psychological impact of being seen in public with oxygen. Some facilities do not allow portable oxygen. Depending on the system used, technical skills have to be mastered by the patient or the caregiver. Although benefits generally outweigh the disadvantages, one should not underestimate the impact of the decision to start domiciliary oxygen.

Surgery

Lung volume reduction surgery has been shown to provide short-lived improvement in lung function and quality of life in some patients.³⁰ However, operative mortality is high and appropriate patient selection is difficult.³¹ At the present time, this approach should still be considered experimental and is not generally recommended.

Rehabilitation

The principal goals of pulmonary rehabilitation are to reduce symptoms, improve quality of life and increase physical and emotional participation in everyday activities.² At all stages of the disease, COPD patients benefit from exercise training programs by improving exercise tolerance as well as symptoms of dyspnea and fatigue.³² For motivated patients who are otherwise well, the results can be dramatic. However, limited facilities are available and, for the best results, an inpatient commitment of four to six weeks is generally required. With elderly patients, this option may not be possible because of care needs of the partner. Geriatric rehabilitation program inpatient units and day hospitals may be more suitable for this population, as they can provide a multidisciplinary approach to patient care which can address the physical and psychological needs of both client and spouse.

Summary

COPD may have a significant impact on the quality of life of an elderly patient. The diagnosis of COPD has been approached by some physicians with pessimism and therapeutic nihilism. However, there are effective treatments that must be undertaken with the primary aim to improve quality of life. The caring physician can be a great help in allaying some of the inevitable anxiety that accompanies breathing limitations and restricted physical activity. Unfortunately, it is also necessary to be realistic, and end-of-life issues should be openly discussed in those with severe COPD.³³ ♦

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