

Second National Update on Chronic Obstructive Pulmonary Disease (COPD) Oman Respiratory Society and Sultan Qaboos University

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التحديث الوطني الثاني
في مرض الانسداد الرئوي المزمن
الجمعية العمانية للأمراض التنفسية وجامعة السلطان قابوس

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Introduction

The Oman Respiratory Society, in collaboration with College of Medicine & Health Sciences, Sultan Qaboos University, held its 2nd National Chronic Obstructive Pulmonary Disease (COPD) Symposium on 14th October 2010, which was celebrated as World Spirometry Day by the European Respiratory Society and the European Lung Foundation. The Oman Respiratory Society supported this event by conducting a workshop on spirometry in the afternoon. Primary care physicians and the other health care workers got hands-on experience in performing and interpreting spirometry. A workshop on non-invasive ventilation was also organised on the same day. The symposium was held under the auspices of His Excellency Dr. Abdullah Al-Futaisi, Executive President of the Oman Medical Specialty Board.

SELECTED ABSTRACTS

COPD: Definition and pathophysiology

Issa Al-Jahdhami

Department of Medicine, Armed Forces Hospital, Muscat, Oman. Email: essajah111@yahoo.co.uk.

Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease characterised by irreversible airway obstruction. It is usually progressive and associated with an abnormal inflammatory response of the lung to noxious particles or gases. Though common, COPD often remains under diagnosed. The exact prevalence worldwide is unknown, but varies from 7–19% in different studies. The prevalence increases with age and is variable between different countries. In the United States more than 12.7 million patients were diagnosed with COPD in 2005. The exact incidence in Oman is unknown. In women, COPD is most commonly misdiagnosed as asthma. Smoking is the main risk factor for COPD. In healthy non-smokers, lung function normally declines by around 20 ml per year. This decline is accelerated in smokers. Other risk factors include exposure to smoke from biomass fuels used for cooking in rural areas, organic dust in crops and animal farming and also to chemicals in the plastics and textile industries. Outdoor air pollution, long standing asthma and bronchiectasis can also lead to irreversible airway obstruction. Exposure to smoke and various noxious agents starts a cascade of inflammatory processes that lead to small airway remodelling and loss of alveolar attachments with decrease of elastic recoil. This inflammation is mainly driven by neutrophils with the release of various cytokines. COPD leads to disabling symptoms and substantial mortality.

Functional Assessment in COPD

Omar Al-Rawas

Department of Medicine, College of Medicine & Health Sciences, Sultan Qaboos University, Muscat, Oman. Email: orawas@squ.edu.om.

Functional assessment, a major component of COPD management, helps in the differential diagnosis, the classification of COPD and in treatment decisions. Assessment consists of several components and steps including history taking, clinical examination and investigations. The focus of this presentation is on the objective physiological investigations such as spirometry, extended lung function testing, cardiopulmonary exercise testing, and respiratory muscle strength estimation. Spirometry is the main investigation and should be done in all patients suspected of having COPD. This has to be made available at all the levels of health care facility providing care for COPD patients. In the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines, spirometric values are used for the definition and classification of COPD severity. The presence of airway obstruction is confirmed by a post bronchodilator forced expiratory volume 1 (FEV1)/forced vital capacity (FVC) value of less than 70% and is then further classified based on FEV1 values (Stage

I: Mild - FEV1 \geq 80%; Stage II: Moderate - FEV1 -50 to <80%; Stage III: Severe - FEV1 -30 to <50%, and Stage IV: Very Severe - FEV1 <30% predicted). Spirometry before and after bronchodilator administration identifies reversibility of airway obstruction and helps to distinguish COPD from asthma. Lung volume measurements identify air trapping and hyperinflation which are characteristics of emphysema. This is considered when there is an uncertainty about the diagnosis and should be available in all secondary care hospitals. The pulmonary diffusing capacity (lung transfer factor), a non-invasive index of gas exchange, is reduced in emphysema, but remains normal in pure chronic bronchitis and asthma. Cardiopulmonary exercise testing helps in the differential diagnosis of patients with exertional dyspnoea and objectively quantifies the severity of exercise limitation. The other useful functional tests include arterial blood gases, respiratory muscle strength testing and the six-minute walk test.

Management of Chronic Stable COPD

Jayakrishnan B

Department of Medicine, Sultan Qaboos University Hospital, Muscat, Oman. Email: drjayakrish@hotmail.com.

The goals of treatment in COPD are to relieve, improve and reduce symptoms and also to reduce the frequency and severity of exacerbations. A stepwise, comprehensive approach combining pharmacotherapy and non-pharmacotherapeutic interventions is needed to achieve this. Annual influenza vaccination reduces the mortality, morbidity and also the frequency of hospitalisations. Periodic pneumococcal vaccination is recommended in patients over 65 years, or in patients with a forced expiratory volume 1 (FEV1) of <40%. Education about the chronic nature of the disease, the purpose and dosing of medications and the inhaler technique is needed. Bronchodilators form the mainstay of pharmacological therapy for COPD. They decrease airway smooth muscle tone, improve the expiratory flow rates and reduce hyperinflation. Short acting bronchodilators, both β 2-agonists (salbutamol, terbutaline) and anticholinergics (ipratropium bromide) improve pulmonary function, dyspnoea and exercise performance. Long-acting β 2-agonists (LABA) produce sustained improvements in pulmonary function and dyspnoea, but the effects of LABA on exercise performance have been inconsistent. Long acting anticholinergics (LAAC) provide sustained improvement and also improves exercise endurance. There is evidence that the combination of LAAC (tiotropium bromide) and LABA (salmeterol, formoterol) produce additive improvement in pulmonary function. Patients with mild COPD should be provided with a short acting bronchodilator, to be taken on an 'as and when needed' basis. Short-acting β 2-agonists and anticholinergics can be used alone or in combination. If the disease severity increases from mild to moderate, it is quite logical to add a long acting bronchodilator, either LABA or LAAC. Theophylline clearly has a bronchodilatory effect, but given the risk of side effects it should not be considered as a first line drug. In patients with stage II-IV COPD whose symptoms are not well controlled with a single long-acting bronchodilator, the combination of both an anticholinergic and a β 2-agonist long-acting bronchodilator may provide better symptom relief. For repeated exacerbations, or for patients with stage III disease, long-term inhaled corticosteroids (ICS) are indicated. Inhaled steroids decrease exacerbations and modestly slow the progression of respiratory symptoms, but have little impact on lung function and mortality. Regular treatment with ICS is advised for symptomatic COPD patients with an FEV1 <50% predicted and repeated exacerbations. In patients with severe disease triple therapy with LABA, ICS and LAAC are often preferred. Thick tenacious secretions could cause a major problem, but there is no evidence that thinning or increasing the clearance of secretions can bring about clinical improvement. Supplemental therapies, such as oxygen, pulmonary rehabilitation, and smoking cessation also play an important role in treatment. In patients not responding to treatment, comorbid conditions like continued smoking, coronary heart disease, heart failure, pulmonary hypertension and thromboembolic disease should be considered. New therapeutic options include phosphodiesterase-4 inhibitors (Roflumilast) and Indacaterol, a novel once daily ultra long-acting β 2-agonist.

Management of Acute Exacerbation of COPD

Nabil M Al-Lawati

Department of Medicine, Royal Hospital, Muscat, Oman. Email: nabil.allawati@gmail.com.

An acute exacerbation of COPD (AECOPD) is defined as an acute change in patient's dyspnoea, cough and/or sputum volume or purulence. AECOPD is the most frequent cause of medical visits, hospital admissions and death among patients with COPD. These events are an important determinant of quality of life and each attack further accelerates lung function decline. Short-term mortality from AECOPD in patients with mild to moderate COPD can be as high as 24% for those needing intensive care. Infections, both viral and bacterial, account for 60% of the precipitating factors. Risk factors include advanced age, chronic mucous hypersecretion, admission with an exacerbation in the previous year and the presence of comorbidities such as diabetes or heart failure. General indicators for hospital admission include acute respiratory acidosis, worsening hypoxemia, marked dyspnoea, altered sensorium and inability to care for oneself. The immediate measure is to give controlled oxygen therapy to alleviate hypoxaemia and improve tissue oxygenation. Venturi masks are the preferred interface for such therapy. Short acting bronchodilators namely salbutamol and ipratropium bromide given via a nebuliser work synergistically to improve airflow. Systemic corticosteroids are indicated for moderate to severe attacks and in particular if the forced expiratory volume 1 (FEV1) is less than 50% predicted. Corticosteroids have been shown to shorten recovery time, improve lung function in terms of FEV1 and arterial oxygenation and reduce the risk of early relapse. Unlike asthma, antibiotics have a major role in management of moderate to severe AECOPD. They can reduce the short term mortality by 77%. Aminophylline is not recommended routinely in the acute setting as they lack efficacy and can contribute to the development of serious side effects. One of the major recent advances in management of an acute exacerbation is the use of non-invasive positive pressure ventilation (NIV). This should be started for every patient with a respiratory rate of more than 25, arterial pH of < 7.35 and a PaCO₂ of >45mmHg without any delay. NIV reduces the work of breathing by 60%; moreover, it obviates the need for mechanical ventilation, decreases treatment failure and short-term mortality by as much as 50%. Finally mechanical ventilation may be needed in very sick and unstable patients, or in those who either fail or are thought to be unsuitable candidates for NIV.

Systemic Effects and Mortality in COPD

Yacoub Al-Mahrooqi

Department of Medicine, Royal Hospital, Muscat, Oman. Email: yaqpal@yahoo.com.

COPD is a systemic disease. In addition to causing pulmonary abnormalities, COPD is associated with systemic consequences outside the lungs. The comorbidities associated with this disease include skeletal muscle dysfunction, cardiovascular disease, osteoporosis, anaemia, metabolic abnormalities, depression and gastrointestinal diseases. Higher rates of hospitalisation are common among COPD patients who have comorbidities. Because these consequences can seriously affect quality of life and worsen prognosis, preventing and treating the systemic effects is important in COPD management. Persistent local and systemic inflammation and oxidative stress may contribute to these changes. Several studies had shown the elevation of various inflammatory markers in COPD like C reactive protein, tumor necrosis factor alpha, fibrinogen, leucocytes and vascular endothelial growth factor. Fat free mass is often low in COPD. Risk of developing ischaemic heart disease or stroke is higher among COPD patients. They are also at risk of developing osteoporosis. The prevalence of diabetes and metabolic syndromes is also higher among COPD patients. Respiratory failure is the leading cause of mortality followed by cardiovascular disease and lung cancer. Validated indices are often used to classify the severity of disease and predict the outcome or mortality. When, forced expiratory volume 1 (FEV1), the widely used prognostic indicator, is low it is associated with an increased risk of all-cause mortality. In summary, in COPD one should look for comorbidities, and in smokers with the above problems look for COPD as well.

Non-Pharmacological Management of COPD

Dimitrije Ponomarev

Department of Medicine, Royal Hospital, Muscat, Oman. Email: dponomarevster@gmail.com.

The components of non-pharmacological management of COPD are: 1) Rehabilitation; 2) Oxygen therapy; 3) Ventilatory support, and 4) Surgical management. The goals of rehabilitation include the reduction of symptoms, improvement of quality of life, increasing physical and emotional participation in everyday activities and reducing health care costs by stabilising or reversing the systemic manifestations of the disease. Non-pulmonary problems that cannot be treated by medicines are de-conditioning, relative social isolation, depression, muscle wasting, and weight loss. Rehabilitation programs can contribute to the improvement of exercise capacity, reduction of the perceived intensity of breathlessness, reduction of anxiety and depression, improvement of health-related quality of life, and reduction in the number of hospital admissions and length of hospital stay. Comprehensive pulmonary rehabilitation should involve a team of various medical specialists involved in exercise training, nutrition counselling, education and psychological support. The primary goal of oxygen therapy is to increase the baseline oxygen level to at least 8 kPa (60 mmHg) or to produce a SpO₂ of at least 90% in the waking state. In the long term this brings a beneficial effect to haemodynamics, haematological characteristics, exercise capacity, lung mechanics and mental state. The benefits of non-invasive ventilatory support include the improvement of inspiratory flow rate, correction of hypoventilation, rest to respiratory muscles and resetting central respiratory drive. Non-invasive nocturnal positive pressure ventilation is indicated in hypercapnic patients with COPD who have recurrent oxygen desaturation during sleep despite the use of supplemental oxygen; moreover, it is useful in patients recovering from an acute exacerbation that required the use of mechanical ventilation. Surgical management of COPD includes bullectomy and lung volume reduction surgery. Bullectomy is indicated if the bulla occupies $\geq 50\%$ of the hemithorax and produces definite displacement of the adjacent lung. Lung volume reduction is a recent surgical technique where parts of the lung are removed to reduce hyperinflation which in turn improves the mechanical efficiency of respiratory muscles leading to an improvement in the overall gas exchange. Lung transplantation can be considered in selected patients when forced expiratory volume 1 (FEV1) is less than 25% of the predicted value with features of respiratory failure

Smoking Cessation

Zahir A. M. Al-Anqoudi

Control of Non-Communicable Diseases Section, Directorate General of Health Services - Dakhilyah Region, Nizwa, Oman. Email: alanqoudi@gmail.com.

Statistics indicate that it will not be possible to reduce tobacco-related deaths over the next 50 years, unless adult smokers are encouraged to quit. The World Health Organization (WHO) emphasises the need to have a multiple approach strategy including taxation, legislation, a ban on pro-tobacco advocacy and encouraging tobacco cessation programmes. The addiction starts with nicotine use for pleasure, enhanced performance and mood regulation and slowly tolerance and physical dependence develop. The process of addiction has three main aspects: physiological, due to nicotine; behavioural, where it is linked to different day-to-day behaviours and psychological, which is seen mostly in patients with depression or anxiety. Unfortunately, although a good percentage of smokers are considering cessation, the medical team somehow fails to reach them. Physicians, especially the primary care providers, have a role in all aspects of care. The "5A" intervention approach serves as a guide: Ask about tobacco use on every visit—this could easily be practised by including this questions in the vital signs chart; Advice patients to quit; Assess willingness to make a quit attempt; Assist by helping the patient formulate a quit plan, and Arrange follow-up contact to prevent relapses. The main step at the level of primary care team is the (Ask) screening. The management of tobacco cessation is a behavioural approach for those with a low Fagerström addiction score and the use of pharmacological therapy in selected cases. The "5R's" in the behavioural approach are: Relevance, motivational information being more effective if it is relevant to a patient's circumstances; Risks, emphasising the acute and long-term risks of smoking; Rewards, identifying potential benefits of smoking cessation; Roadblocks, detection of the barriers, and Repetition, repeating the motivational interventions at each visit. Drug therapy doubles the chance of long term cessation. This includes several forms of nicotine replacement therapy and Bupropion. The selective serotonin re-uptake inhibitors, Nortriptyline and Naltrexone, are not that effective. The Nizwa Healthy Lifestyle Project, a community based initiative with technical support from the Ministry of Health and the WHO, is running a tobacco cessation clinic staffed by family physicians, nurses, dietitians and dentists. Behavioural and motivational approaches, drug therapy and follow-up telephone calls are the tools employed. The preliminary data on a 5-month abstinence is encouraging, reaching an impressive 62%. We recommend extending our local experience so that tobacco cessation clinics are established throughout Oman with an initial focus on regions of high prevalence.