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Comorbidities and Modern Therapies of COPD

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Abstract:

Chronic obstructive pulmonary disease (COPD) is a chronic inflammatory lung disease that causes obstructed airflow from the lungs. Nowadays, COPD is the third leading cause of death globally. Although COPD primarily affects the patient's lungs, it is also considered a multicomponent disease marked by prolonged systemic inflammation and a high frequency of coexisting conditions with other diseases (i.e., comorbidities). comorbidities. Yet we still do not have a summary of all of the situations and treatments of COPD, in this paper, I review recent papers that may indicate some therapies that can effectively treat COPD and indicate some common comorbidities of COPD.

Keywords: chronic obstructive pulmonary disease (COPD), Cardiovascular comorbidities, Osteoporosis, Metabolic syndrome and diabetes Malnutrition Anemia lung volume reduction surgery (LVRS) obstructive sleep apnea (OSAS), Lung fibrosis endobronchial valve (EBV)

1. Introduction

Comorbidities are prevalent in COPD patients. In research that contains 213 COPD patients, about 97.7% of participants were noticed to have one comorbid disease or even more, and nearly 54% of them had more than four diseases. Additionally, 19 COPD patients had combinations of comorbidities that clustered more frequently together. Comorbidities can also impact the management of COPD. Clinical interventions that are recommended for COPD may have unknown beneficial or harmful effects on the regulation of these comorbid conditions. Besides, comorbidities are known to create problems in the effective management and assessment of COPD. For instance, obesity may obscure the diagnosis of COPD by avoiding an accurate assessment of hyperinflation and airflow restriction, which are common characteristics of COPD.

2. Comorbidities of COPD

2.1 Cardiovascular comorbidities

Heart disease and systemic and pulmonary vascular diseases in COPD. The systemic inflammation in COPD causes pulmonary and systemic endothelial dysfunction and induces a ''pro-coagulant'' state. Coagulopathy, venous stasis and systemic venous endothelial dysfunction due to inactivity in patients with COPD explains their susceptibility to venous thromboembolism (VTE). During the process of a COPD exacerbation, hospitalization increases by 4.4 days, and mortality rate in a year increases by 30%.

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Besides, Pulmonary artery remodeling occurs early during COPD and also causes pulmonary hypertension (PH). Such remodeling results from endothelial dysfunction and blood clotting issues, as well as lung-specific factors like low oxygen levels, emphysema damage, smoking-related inflammation, and changes in blood flow. Coronary heart disease and COPD have an unsurprising relationship since they have the same important danger factor, smoking. Lastly, COPD and heart failure are diseases that share risk factors that are similar, especially due to smoking, and they also share pathophysiological mechanisms like skeletal muscle alterations and inflammation. COPD also has an impact on patients with heart failure, which lowers their survival curves.

2.2 Lung cancer

Some studies proposed a relationship between lung cancer and COPD. The rifeness of COPD in lung cancer patients is between 40% to 70%. There are now two main hypotheses.

The first one is about shared genetic links that are predisposed to both diseases. In smokers, the 4q31 locus has two genetic variants that appear to prevent both COPD and lung cancer. In addition, epigenetic changes play a role in the development of both diseases.

The second one concerns the role of chronic inflammation. Bronchial inflammation itself promotes EMT. Alzheimer's disease and chronic obstructive pulmonary disease (COPD) share common factors, including activation of the receptor tyrosine kinase/RaS pathway and transforming growth factor-β. In addition, the transcription factor nuclear factor (NF)-κB plays a crucial role in the pathogenesis and progression of COPD by promoting the release of pro-inflammatory mediators. Smoking cessation is the central way to stop the success of COPD and to minimize chances of getting lung cancer. According to the research, pharmacological treatments and cognitive behavioral therapy could be effective for COPD patients in improving their possibilities of successful cessation.

2.3 Anxiety and depression disorders

A study has suggested that patients with anxiety and depression experience their first hospitalization for COPD sooner. One of many hypotheses is that these patients may perceive dyspnoea more strongly and earlier.

2.4 Osteoporosis

Osteoporosis, characterized by decreasing skeletal resistance due to the aggravation of bone tissue microarchitecture, which can lead to eliminated inferior mineral content and bone mass. This results in bone fragility with a developing risk of fractures. Recent studies indicate that the level of osteoporosis among COPD diseases has significantly proliferated. To reduce this situation, rehabilitation has been involved in exercise retraining programs to enhance the mineral density of bone. Vitamin D and calcium absorption have also been proved to be effective in decreasing the risk of fractures.

2.5 Malnutrition

Malnutrition is caused by the disbalance between energy input and consumption. There is also a positive correlation between malnutrition and mortality. In order to solve this problem, COPD patients should do more physical exercise and increase supplementation of polyunsaturated fatty acid, protein, caloric, and anabolic steroids.

2.6 Sleep disturbance

In people with severe COPD, damaged sleep quality seems to be easier to meet. However, organizations that studied patients with moderate COPD failed to find a significant decrease in sleep quality in the absence of OSAS. Such reduction of quality of sleep may cause by extension and elevating work of breathing.

2.7 Lung fibrosis

Research suggests that smoking is a common cause for lung fibrosis. Normal spirometry results are influenced by the obstruction in the bronchus and emphysema collapsing, as well as airway traction caused by the peribranchial fibrosis. Additionally, elimination of vascular surface area in emphysema and the thickening of the alveolar membrane thanks to fibrosis combine to decrease the rate of gas exchange.

3 modern therapies for COPD

3.1 Lung volume reduction surgery

Lung volume reduction surgery (LVRS) can help the diaphragm to return to its normal shape, allowing for patients' more efficient breathing. Essentially, by reducing the volume of the lungs, LVRS aims to improve lung function and relieve symptoms, while also reducing pressure on the diaphragm. LVRS consists of removing the most severely emphysematous portion of the target lung. The thoracic surgeon performs this procedure under general anesthesia, primarily using unilateral video-assisted thoracoscopic surgery or robotic-assisted surgery. If necessary, open-heart surgery is performed at the surgeon's discretion.

3.2 Bronchoscopic Lung Volume Reduction

Bronchoscopic Lung Volume Reduction (BLVR) is performed to occlude the target lung lobe by placing a Zephyr endobronchial valve (PulmonX). The procedure is performed bronchoscopically under conscious sedation or general anesthesia by an operator experienced in placing endobronchial valves. Chest radiographs were taken 1 hour after the procedure.

3.3 Pharmacologic treatment

Pharmacologic therapy for COPD aims to treat symptoms, reduce exacerbation severity, and enhance exercise tolerance and health status. Commonly used medication classes include long-acting β2-agonists (LABAs), long-acting muscarinic antagonists (LAMAs), and inhaled corticosteroids (ICS). The choice within each class depends on medication availability and individual patient preferences and responses.

4 Discussion

This paper mainly reviews some possible comorbidities of COPD and several existing treatment options. The current research problem is that some of COPD patients are very thin and weak, accompanied by malnutrition and unequal breathing, so lung volume reduction surgery is difficult to achieve on them. Future research directions can keep eyes on different treatment options for different definite comorbidities.

5 Conclusion

This paper highlights the significant prevalence and impact of comorbidities in patients with chronic obstructive pulmonary disease (COPD). Almost all patients with COPD suffer from at least one comorbidity, and a significant proportion of them also suffer from multiple comorbidities, making the complexity of COPD treatment self-evident. The presence of comorbidities not only complicates the diagnosis and treatment of COPD, but also affects the overall prognosis and quality of life of patients. For example, cardiovascular disease, lung cancer, anxiety and depression, osteoporosis, nutritional deficiencies, sleep disturbance, and pulmonary fibrosis are all common comorbidities that exacerbate the challenges faced by patients with COPD. The importance of this article lies in the comprehensive review of the various comorbidities associated with COPD and their impact on patient management. By emphasizing the intricate relationship between COPD and its comorbidities, this paper provides insights for healthcare providers to develop more comprehensive and effective treatment strategies. The paper emphasizes the need for a multidisciplinary approach to the management of COPD given the potential interactions between COPD treatment and comorbidities.

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