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Nutritional Status as a Risk Factor in COPD

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ABSTRACT

The third leading cause of death, chronic obstructive pulmonary disease COPD is gaining more and more attention in the literature and clinical practice. Precision medicine, already recognised as a right approach for COPD, requests a special attention to be allocated for nutritional status. Free fat mass index FFMI and visceral fat VFA area measurements should be added to body mass index (BMI) in order to have a complete perspective of the nutritional status and disease prognosis. Prospective medical nutrition therapy should consider caloric intake for achieving a BMI of 20-24 kg/m², nutritionally dense, small and frequent meals, choosing the moment for the most important meal when the level of energy is the highest for the patient. A resting period before mealtime is adviced. Obesity paradox in COPD means a lower mortality associated with BMI between 25 and 32. This benefit is mainly related to higher muscular mass, as it has been described by some authors. The main objective in nutritional intervention will be to maintain muscular mass, adviced protein intake should be 1.2 g/kg body weight/day, higher vs general population.

In the future, nutritional status evaluation should be included in pulmonary rehabilitation process, and a multidisciplinary team is expected to cooperate in order to achieve best pulmonary results.

Keywords: bioimpedance, malnutrition, nutritional status, obesity paradox, COPD.

INTRODUCTION

The third leading cause of death, chronic obstructive pulmonary disease COPD is gaining more and more attention in the literature and clinical practice (1).

Disease severity, genetic factors, nutritional status, environment and acute exacerbations are defined as prognostic factors for COPD (2).

Precision medicine is already recognised as the recommended approach for COPD (3). Adopting precision medicine in COPD requests a special attention for nutritional status as a first step in medical nutrition therapy, tailored for each patient, based on biomarkers, genetic characteristics, psychosocial and phenotypic characteristics.

Only body mass index (BMI) and weight measurements are not enough. In COPD prognosis

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will be important to measure lean mass through fat free mass index FFMI, visceral fat area VFA by bioimpedance and other body composition measurements. All these body measurements are in correlation with inflammatory parameters enhanced in COPD. It has to be mentioned that low FFMI in COPD is associated with low plasma levels of C reactive protein CRP and tumour necrosis factor TNF-R1 (4).

1. Malnutrition in COPD

Prevalence

Malnutrition in COPD is described by variable prevalence rates ranging between 30-60%.

Pathogenesis

Malnutrition is caused by a high metabolic rate and/or inapropriate nutritive intake. Decreased weight, which is seen in COPD patients, is an independent risk factor (5).

Normal breathing energy expenditure, around 36-72 kcal/day is increasing 10 times in COPD patients (6), meaning an important energy expenditure increase, which may not being replaced by proportional energy intake, leading to malnutrition. Higher mortality is associated with malnutrition in COPD patients (3). A study which assesed malnutrition prevalence, based on European Society for Clinical Nutrition and Metabolism (ESPEN) consensus, revealed that malnutrition had a significant impact on prognosis at two years. But more relevant in diagnosing malnutrition and COPD prognosis could be FFMI, still more prospective studies should confirm these findings (7).

Diagnosis criteria

Global Leadership Initiative on Malnutrition GLIM criteria for malnutrition diagnosis (8) include five criteria: three phenotypic (low BMI, unintentional weight loss, reduced food intake or reduced assimilation) and two etiologic (reduced muscle mass and disease burden/inflammation). One of each criterium is required for establishing malnutrition diagnosis.

Issues

The main issues described in COPD are the loss of apetite and inappropriate food intake. Managing hipermetabolism in COPD involves addressing two main goals: a) weight loss prevention and b) lean body mass loss prevention (2).

Prospective medical nutrition therapy

In COPD underweight patients, prospective medical nutrition therapy should consider:

- nutritionally dense, small and frequent meals;
- choosing the moment for the most important meal when the level of energy is the highest for the patient;
- recommend the right caloric intake for maintainance of BMI ~ 20-24 kg/m^2;
- Other recommendations include: to choose food that requires minimal cooking efforts;
- Additionally, alcohol limitation to less than 30 g/day should be considered;
- A resting period before mealtime is adviced.

2. Obesity and COPD

Definitions, prevalence

Obesity is defined as BMI >30 kg/m^2. Based on World Health Organisation (WHO) data, worldwide obesity prevalence has tripled since 1975, 650 million people being obese in 2016 (9).

Interaction between COPD and obesity is increasingly explored, with a variable prevalence rate among COPD patients. A lower prevalence is described in stages Global Initiative for Chronic Obstructive Lung Disease GOLD IV (6%) and a higher one in stages GOLD I-II (16-24%) (10, 11).

There is not enough evidence yet to develop guidelines for clinical practice.

The obesity paradox

Obesity is usually associated with increased morbidity in chronic diseases, but overweight and obese patients with COPD have a lower mortality rate compared to normal weight or underweight patients, which is a strange paradox. In terms of survival rate, this benefit is diminishing for higher BMI >32 kg/m^2 (12). The mechanism was not clearly elucidated, muscular mass could be considered a better predictor for survival rate compared to BMI. This „ protective" effect could be explained by higher muscle mass at overweight/obese people, not simply by BMI (13). Still, some gaps are delaying clinical guidelines

for obese COPD patients nutritional interventions.

Firstly, a short review of differences between pulmonary function parameters, exercise capacity, exacerbation risk and dyspneea in obesity has to be done.

There is no consensus about the role of obesity in dyspneea, but obesity is associated with relatively less lung hyperinflation, however other details are missing. Obesity could be beneficial regarding dyspneea, due to respiratory mechanisms advantages, on contrary, other findings are considering that increased work of breathing in obese patients will result in increased dyspneea. Exercise capacity is negatively influenced by obesity, however cycling (weight supported exercise) is not influenced by obesity. But, if the risk of exacerbations is reduced by obesity remains under debate.

In Spain, in a large retrospective study on 313 233 patients with COPD exacerbation hospital admissions, the assesment showed a lower in-hospital mortality risk (OR 0.52; 95% CI 0.49-0.55) and a lower early re-admission risk (OR 0.87; 95% CI 0.85-0.92) for obese patients (14). Risk of re-admission was 13% lower for obese patients and 29% higher for malnourished patients (15).

Why treating obesity? If a better survival rate and lower risk of early re-admission after hospitalisations due to exacerbations is described for obese patients? But, as mentioned by Guo *et al*, this „protective obesity effect" dissapears while BMI >32 kg/m^2 (12).

Then, also for obese COPD patients, a nutritional intervention plan should be carefully built.

Priority in obesity and COPD

In obesity and COPD, be muscle mass maintainance must become a priority, since muscle mass loss is the risk factor for mortality in COPD and obesity- with higher recommended protein intake of 1.2 g/kg body weight/day – compared to 0.75 g/kg body weight/day for general population – combined with physical exercises.

Lack of guidelines in obesity treatment in COPD is obvious. Nevertheless, nutritional intervention model, with hyperproteic diet shows improvement potential for diet quality and eating behavior (15).

Then, for obese COPD patient, energy intake has to be adapted to caloric needs. Macronutrients proportion of 15-20% proteins, 30-45% fats, 40-45% carbohydrates is recommended. Micronutrient intake has to be as follows: vitamin C ~ 75 mg/day (women) and 90 mg/day (men) with an additional intake of 35 mg/day for smokers; vitamin D 600 IU for adults and 800 IU for people aged over 70 and appropriate sun exposure can be recommended (3).

Mediteranean diet could be a good dietary model to be adapted in obesity and COPD (3, 16). This diet, rich in fruits, vegetables, with valuable proteins and monounsaturated fats will support antiinflammatory mechanisms, which is useful in COPD.

Special attention has to be paid for therapies/ food interractions. A low salted diet with limited refined sugars is indicated in order to counterbalance the secondary effects of corticosteroid therapy, even if these are not very high in inhalatory treatments (3). ❑

CONCLUSION

Nutritional status is influencing prognosis in COPD, and bioimpedance measurements should be performed in order to establish right nutritional intervention.

Muscle mass maintainance is a priority in both malnourished and obese COPD patients, and prospective medical nutrition therapy should adress the energy intake according to patient needs, the right macronutrients proportion and the BMI level maintained between 20-24 for underweight and normal weight patients and around 30 for obese or overweight patients in order to obtain better COPD parameters and prognosis of COPD.

In the future, nutritional status evaluation with body composition analysis should be included in pulmonary rehabilitation process, and a multidisciplinary team is expected to cooperate in order to achieve the best possible quality of life for these patients. ❑

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