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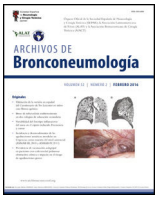

Editorial

# Aging, Sarcopenia, and Frailty in Chronic Respiratory Diseases☆

## Envejecimiento, sarcopenia y fragilidad en el contexto de las enfermedades crónicas respiratorias

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Lung diseases are among the most prevalent diseases in the elderly population.[1] Chronic obstructive pulmonary disease (COPD) is a prime example of a chronic disease, and elderly patients typically present many features of this disease: the associated functional decline, the very high burden of comorbidity (involving particularly other chronic diseases such as diabetes or cardiovascular diseases) and polypharmacy, and the need for complex therapeutic strategies that range from lifestyle changes (physical activity and nutrition) to continuity of care, adjusted to the patient's changing needs over the course of the disease.

Perhaps one of the most important features of this comorbidity is its impact on the autonomy of elderly patients.[2] Autonomy has been shown to be a fundamental factor in the health of these patients, since functional status has been shown to be the main predictor of significant clinical events, including death, permanent institutionalization, quality of life, risk of hospitalization, and use of other health resources.[3] Indeed, numerous studies have found that functional status predicts much of the impact of the disease on many of these outcomes.[4] This predominance of function over the specific disease, whether alone or in association with other comorbidities, has prompted the World Health Organization to define healthy aging in terms of function, rather than disease, as "the process of developing and maintaining the functional ability that enables wellbeing in older age".[5] The same document goes on to state that the impact of multimorbidity on function and quality of life is greater than the sum of the effects of each of the separate diseases, underlining the need for global and integrated management approaches.[5]

Having established this paradigm, we must now act accordingly. However, it might first be useful to briefly review how functional capacity declines during the aging process. Functional decline that occurs as we age depends basically on 2 conditions, the first being aging itself: after the age of 25–30 years, maximum oxygen consumption declines by around 1% yearly ($VO_{2max}$/year).[6] This generates a series of deleterious effects, which also involve the respiratory system, and lead to a series of chronic diseases and conditions which accelerate the aging process, one of the most important of which is COPD. When functional decline advances far enough, the individual loses their reserve capacity, to the extent that low-intensity stressors are capable of triggering abrupt declines in function from which it is difficult to recover due to the individual's depleted functional reserve. This situation, in which the subject is basically independent, but at high risk of developing disability and other adverse events (death, hospitalization, institutionalization, falls) in situations of low-intensity stress, has been called frailty.[3] The detection of frailty is simple and can be done in any clinical setting,[7] and helps identify individuals who are at greater risk of developing hard-to-reverse functional decline, and who will benefit from a series of interventions.

The pathophysiology of frailty is characterized by the simultaneous involvement of multiple systems, that include the inflammatory/immune system, some hormonal axes (testosterone, estrogen, insulin, growth hormone), the musculoskeletal system, and the cardiovascular system.[8] All these changes converge in many cases in the generation of sarcopenia, the main underlying pathophysiological mechanism of frailty that determines functional decline (decreased daily activity, decreased walking speed, decreased grip strength, etc.).

Both sarcopenia and low-grade inflammation are common findings in patients with COPD. About 25% of patients with COPD have sarcopenia; this prevalence is even higher in older patients and indicates a worse prognosis.[9] It is not surprising, then, that COPD patients often present frailty. In fact, frailty has been reported in subjects with COPD at rates varying between 10% in a European cohort[10] and 57.8% in the NHANES cohort[11]; furthermore, frail subjects had a worse prognosis. Not only do COPD patients have an increased risk of frailty, the functional progress of patients with frailty is worse.[12] In addition to this generally worse functional prognosis, frail patients with COPD are at increased risk of complications not directly related to their lung function. Patients with COPD and sarcopenia have a lower bone mineral density, a higher

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prevalence of osteopenia and osteoporosis and, consequently, a higher risk of fractures,[13] conferring a worse functional prognosis and higher mortality.[14]

What can we do? A series of practical steps emerge from the aspects discussed so far. The first of these is screening for frailty in all elderly patients with any chronic lung disease, and with COPD in particular. Secondly, we already know that interventions can be performed, even in elderly patients with COPD. In a recent study in COPD patients with an average age of 70 years, frail patients who completed the rehabilitation program experienced a marked improvement in functional parameters, and almost two thirds of the cohort could reverse their condition of frailty.[15] Finally, we will have to get used to managing elderly patients globally, in the understanding that the different comorbidities interact with one another, finally affecting patients' ability to function and compromising their autonomy. Geriatrics departments and geriatricians are always available to assist in this approach.

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