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Editorial

Bronchopulmonary Dysplasia: The Importance of Physical Exercise☆

Displasia broncopulmonar: importancia del ejercicio físico

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Bronchopulmonary dysplasia (BPD), one of the sequelae of extremely premature birth (≤28 weeks gestational age), occurs in approximately 40% of cases.[1] This is now recognized as a consequence of the interruption of lung development resulting from premature delivery, which can later be aggravated by postnatal exposures such as barotrauma and supplemental oxygen.[2] This condition causes poor lung function from a very early age, even more so than in infants who were preterm but who did not develop BPD,[3] and this loss in lung function persists during childhood[4] and even into adulthood.[5] BPD can, therefore, be a risk factor for the development of chronic obstructive pulmonary disease (COPD) later in life. In fact, many of the clinical features of COPD are present in children with BPD, for example: worse lung function, dyspnea on exertion, respiratory failure, clinical exacerbations with viral respiratory infections, more hospital admissions for respiratory causes, etc. Although bronchial hyperreactivity, which is common in BPD,[6] has been considered for decades to be specific to asthma, it has also been described in COPD. Furthermore, this airway hyperreactivity is a risk factor for morbidity and mortality in COPD and, perhaps, a marker of asthma-COPD overlap syndrome.[7]

The benefits of exercise in COPD have been widely studied, and it has been seen to improve daily physical activity, quality of life, and lung function, even if only slightly.[8,9] The article by Morales Mestre et al.,[10] published in this issue of Archivos de Bronconeumologia, explores another of the similarities between BPD and COPD. The authors aimed to investigate the effectiveness of exercise on functional capacity, flexibility, and lung function in patients with BPD aged between 4 and 6 years. The study was a randomized open-label trial, in which the intervention group underwent a 4-week supervised training program and the control group received no training. As expected, the trained group increased their exercise tolerance, assessed through the 6-minute walk test and the incremental shuttle walk test, but there was also a significant increase in FEV_1, although this had little clinical relevance; once again, the results are very similar to those already known in COPD. These effects were achieved with a training program of only 4 weeks: it would be interesting to know what results might be obtained in patients who incorporate exercise into their daily life, and if this would have a greater effect on lung function.

Athletes are known to present significant quantitative differences in the lung function compared to the sedentary population (mean difference in predicted FEV_1 (%) (7.97; 95% CI: 6.83; 22.77).[11] However, these differences are not very significant from a clinical point of view. Moreover, in a healthy population (not athletes), physical activity is not associated with spirometric functional values.[12] However, recent studies in this same population cohort have shown that muscle strength measured by hand grip dynamometer is associated with lung function.[13] These studies, performed in a large cohort of adolescents, appear to suggest that if the aim is to improve lung function, a more interesting strategy would be to promote exercises that strengthen trunk and arm muscles, rather than exercises targeting the cardiovascular reserve. It is possible that the small but significant improvement in lung function found by Morales Mestre et al.[10] is due to the type of muscle-strengthening exercises that were used. On the other hand, we do not know the effect of these exercises in healthy individuals. The 3 studies cited[11–13] compared groups that did exercise and those that did not, but the effect of exercise on lung function in healthy individuals who start a training program is not clear. Nor is it clear if exercise or sport is the most appropriate approach when the aim is to improve lung function.

The benefit obtained from exercise in respiratory diseases has been studied in asthma and cystic fibrosis. In asthmatics, swimming improves FEV_1 discretely, with mean differences in predicted FEV_1 (%) (8.07; 95% CI: 3.59; 12.54), FVC, and FEF_{25-75}.[14] It is interesting to note that swimming strengthens the trunk and arms. In patients with cystic fibrosis, exercise significantly improves the annual increase in predicted FVC (%) (2.17; 95% CI: 0.47; 3.87), while FEV_1 remains within the limit of statistical significance (2.01; 95% CI: −0.06; 23.6).[15] However, the meta-analysis from which these data were retrieved does not discriminate between different exercise programs.

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The study performed by Mestre Morales et al.[10] is the first to examine the benefits of exercise in children with BPD. However, in view of the short training period and small number of patients, the authors themselves suggest that more studies with a longer training program are needed. Nevertheless, it is clear that recommending exercise in children with BPD will improve their physical condition. With regard to improvement in lung function, the results are less significant. However, we must not forget that, in chronic respiratory diseases, any intervention targeted at preventing a loss of lung function is of great clinical relevance.

References

1. Stoll BJ, Hansen NI, Bell EF, Walsh MC, Carlo WA, Shankaran S, et al. Trends in care practices, morbidity, and mortality of extremely preterm neonates, 1993–2012. JAMA. 2015;314:1039–51.
2. Jobe AH. Mechanisms of lung injury and bronchopulmonary dysplasia. Am J Perinatol. 2016;33:1076–8.
3. Sánchez-Solis M, García-Marcos L, Bosch-Giménez V, Pérez-Fernández V, Pastor-Vivero MD, Mondéjar-López P. Lung function among infants born preterm, with or without bronchopulmonary dysplasia. Pediatr Pulmonol. 2012;47:674–81.
4. Sanchez-Solis M, Perez-Fernandez V, Bosch-Gimenez V, Quesada JJ, Garcia-Marcos L. Lung function gain in preterm infants with and without bronchopulmonary dysplasia. Pediatr Pulmonol. 2016;51:936–42.
5. Kotecha SJ, Edwards MO, Watkins WJ, Henderson AJ, Paranjothy S, Dunstan FD, et al. Effect of preterm birth on later FEV_1: a systematic review and meta-analysis. Thorax. 2013;68:760–6.
6. Kim DK, Choi SH, Yu J, Yoo Y, Kim B, Koh YY. Bronchial responsiveness to methacholine and adenosine 5′-monophosphate in preschool children with bronchopulmonary dysplasia. Pediatr Pulmonol. 2006;41:538–43.
7. Tkacova R, Dai DLY, Vonk JM, Leung JM, Hiemstra PS, van den Berge M, et al. Airway hyperresponsiveness in chronic obstructive pulmonary disease: a marker of asthma-chronic obstructive pulmonary disease overlap syndrome? J Allergy Clin Immunol. 2016;138:1571–9.
8. Liao WH, Chen JW, Chen X, Lin L, Yan HY, Zhou YQ, et al. Impact of resistance training in subjects with COPD: a systematic review and meta-analysis. Respir Care. 2015;60:1130–45.
9. Lahham A, McDonald CF, Holland AE. Exercise training alone or with the addition of activity counseling improves physical activity levels in COPD: a systematic review and meta-analysis of randomized controlled trials. Int J Chron Obstruct Pulmon Dis. 2016;11:3121–36.
10. Morales Mestre N, Papaleo A, Morales Hidalgo V, Caty G, Reychler G. Physical activity program improves functional exercise capacity and flexibility in extremely preterm children with bronchopulmonary dysplasia aged 4–6 years: a randomized controlled trial [Article in English, Spanish]. Arch Bronconeumol. 2018;54:607–13.
11. Vedala S, Paul N, Mane AB. Differences in pulmonary function test among the athletic and sedentary population. Natl J Physiol Pharm Pharmacol. 2013;3:118–23.
12. Smith MP, von Berg A, Berdel D, Bauer CP, Hoffmann B. Physical activity is not associated with spirometric indices in lung-healthy German youth. Eur Respir J. 2016;48:428–40.
13. Smith MP, Standl M, Berdel D, von Berg A, Bauer CP, Schikowski T, et al. Handgrip strength is associated with improved spirometry in adolescents. PLOS ONE. 2018;13:e0194560.
14. Beggs S, Foong YC, Le HC, Noor D, Wood-Baker R, Walters JA. Swimming training for asthma in children and adolescents aged 18 years and under. Cochrane Database Syst Rev. 2013, http://dx.doi.org/10.1002/14651858.CD009607.pub2. CD009607.
15. Radtke T, Nevitt SJ, Hebestreit H, Kriemler S. Physical exercise training for cystic fibrosis. Cochrane Database Syst Rev. 2017;11:CD002768. doi:10.1002/14651858.CD002768.pub4.