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PERSPECTIVE

Reversibility of Airway Obstruction vs Bronchodilatation: Do We Speak the Same Language?

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Abstract

Airway reversibility test (or bronchodilatation test) is performed routinely in the diagnosis of obstructive lung diseases. The results of this test may be helpful in the diagnosis and differential diagnosis of asthma and chronic obstructive pulmonary disease (COPD), but sometimes bring confusion. Unfortunately, the nomenclature used for test result is not uniform, which also leads to confusion. Next the reader will find an attempt to order the state of affairs and the introduction of a uniform nomenclature, which would be consistent with the logic and allow for unambiguous classification of reversibility test results to facilitate future decisions based on the differential diagnosis.

reversible/rɪvɜːr-sə-bəl/adj > able to be changed to the opposite direction, order, position, or state: a reversible condition

According to recommendations of ATS/ERS, airway obstruction is defined if the value of FEV_1/FVC index is below the lower limit of normal (1). A commonly used simple criterion of airway obstruction is the FEV_1/FVC ratio of 0.70, which is recommended by practical guidelines to simplify the diagnosis of COPD, although it raises concerns of “overdiagnosis” (2,3).

Variability of lung function measurements is either spontaneous or in response to bronchodilators, occurring in both healthy persons and those with lung disease (4–7). In clinical practice bronchodilators (usually β_2 -agonists) are used between two lung function measurements resulting in a pre- and post-bronchodilator measurement. “Significant” improvement (positive bronchodilatation test) is defined as an increase in the FEV_1 or FVC of more than 200 mL and 12% predicted (8,9); however, another methods of assessment (200 mL and 12% of baseline) are also mentioned and may be used (1).

Bronchodilators may result in a greater improvement in the FEV_1 than the FVC, which increases the FEV_1/FVC ratio. It is worth noting that the magnitude of change in FEV_1/FVC ratio is not considered in reversibility test assessment. The FEV_1/FVC ratio can, paradoxically, decrease when the increase in the FVC is greater than the increase (or decrease) in the FEV_1 . This finding of “inverse”-reversibility, where a person develops obstruction after the administration of a bronchodilator, has been seen in a small proportion of subjects in population-based studies (10,11).

Thus, when using both the definition of obstruction ($FEV_1/FVC < LLN$) and significant improvement after BD ($>200\text{mL}$, $>12\%$), there are possible

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Table 1. Classification of the reversibility test results.

post BD FEV ₁ /FVC ΔFEV ₁ , ΔFVC	> LLN	< LLN
>200 mL and >12%	reversible AO, positive BD test	irreversible AO, positive BD test
<200 mL or <12%	reversible AO, negative BD test	irreversible AO, negative BD test

LLN – lower limit of normal, AO – airway obstruction, BD – bronchodilator, Δ – change of parameter after BD.

4 scenarios in patients who are obstructed prior to the administration of a bronchodilator (Table 1):

1. Substantial improvement in FEV₁ or FVC and the normalization of the FEV₁/FVC ratio (positive bronchodilation test with reversible airway obstruction).
2. Substantial improvement in FEV₁ or FVC, but the value FEV₁/FVC is still abnormal (positive bronchodilation test but irreversible airway obstruction).
3. The improvement FEV₁ and FVC after bronchodilator did not reach the threshold (200 mL or 12%pred.), but the normalization of the FEV₁/FVC ratio occurred (negative bronchodilation test with reversible airway obstruction).
4. The improvement FEV₁ and FVC after bronchodilator did not reach the threshold (200 mL or 12%), and the value FEV₁/FVC is still abnormal (negative bronchodilation test with irreversible airway obstruction).

The challenge is that “reversibility testing” using thresholds of the FEV₁/FVC may find “reversibility” in the presence of very small changes in the component measurements (i.e., a person’s FEV₁/FVC can improve from 0.69 to 0.70 with a minor change in their FVC). Using the classification noted above, categories 1 and 3 (as noted above) would be “reversible,” whereas category 2 demonstrates significant improvement (positive bronchodilation), yet remains obstructed.

Reversibility testing is performed in the diagnosis of obstructive diseases like asthma and COPD. Results of this test can be helpful in defining factors increasing or decreasing probability of disease. Unfortunately, the practical nomenclature in relation to the result of this test is not standardized, which leads to misunderstandings.

For example, we find in the literature the term “not fully reversible airway obstruction” or equivalents like: “partially reversible obstruction” and “poorly reversible obstruction” (10,12). We might assume that in most cases this term describes irreversible airway obstruction (post-BD FEV₁/FVC < LLN) with or without a significant improvement in FEV₁ or FVC after bronchodilators. This feature is characteristic and frequently observed in COPD, however it can appear also in the bronchial asthma (categories 2 and

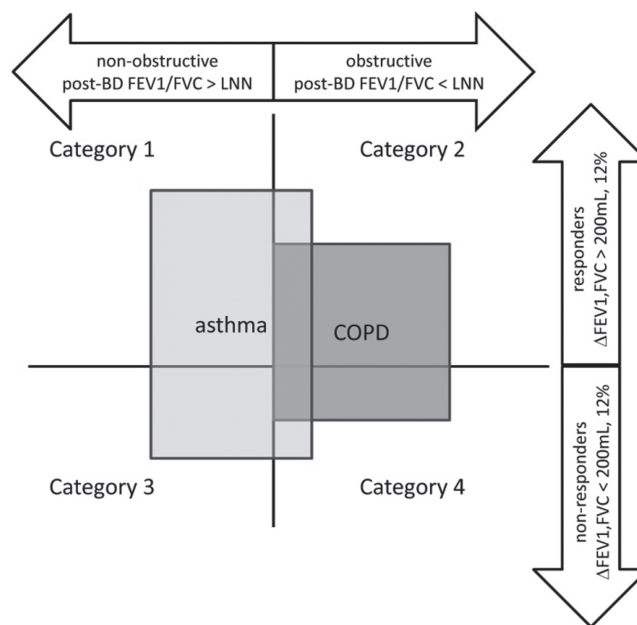


Figure 1. Possible relations between results of bronchodilation test and the diagnosis of asthma and COPD (LLN – lower limit of normal, BD – bronchodilator, Δ – change of parameter after BD).

4) (13,14). Reversible airway obstruction (post-BD FEV₁/FVC > LLN) is described in the literature as “fully reversible obstruction” with the normalization of FEV₁/FVC ratio (categories 1 and 3), excluding a diagnosis of COPD. This category suggests asthma (category 1), and does not exclude asthma if the improvement is insignificant (category 3) (14). In summary, every potential scenario is possible in asthma, but only categories 2 and 4 are found in COPD.

Thus, we propose that future clinical and research reporting of response to a bronchodilator be better standardized and include both components of the presence or absence of “reversibility” and the presence or absence of “bronchodilator responsiveness.” We believe this would be a better means of conveying important information than the currently used “not fully reversible” and other similarly confusing terms.

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Declaration of interests

The authors have no conflict of interest related to the subject matter. The authors are responsible for the writing and content of this article.

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