Pulmonary hyperinflation: Dx

Hyperinflation exists when the end-expiratory lung volume is increased, usually due to an airflow limitation. Hyperinflation acts as a compensatory mechanism. Hyperinflation comes in 2 flavors: **static and dynamic**

Static hyperinflation exists at rest and is predominantly due to decreased elastic recoil

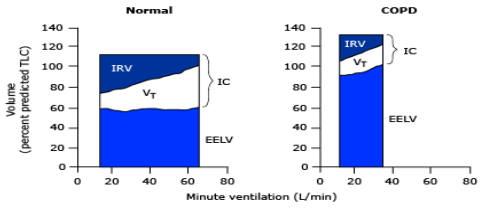
Dynamic hyperinflation is induced by exercise and is primarily due to impaired expiratory flow

Pearl: Chronic obstructive pulmonary disease (COPD) is the most common disease in which hyperinflation occurs

Presentation: The cardinal symptom of dynamic hyperinflation is dyspnea on exertion. Although hyperinflation is a compensatory mechanism that increases expiratory flow, it has several disadvantages including: it increases the work of breathing; it places the inspiratory muscles at a mechanical disadvantage due to length-tension effects; and it produces a positive alveolar pressure that must be overcome to initiate a breath. The net effect is a marked disparity between the level of inspiratory effort (approaches maximum) and the actual mechanical response of the respiratory system (greatly diminished tidal volume), which manifests as dyspnea, initially with exertion and later at rest

Definitive diagnosis of dynamic hyperinflation requires lung volume measurements during exercise. This is time consuming, labor intensive, and technically difficult. Therefore, indirect measures using spirometry are more common. There are two methods of indirect measurement: measurement of **inspiratory capacity** and comparison of **flow-volume loops**.

Dynamic changes in lung volumes during exercise in normal lungs and COPD



Dynamic changes in lung volumes during exercise in normal lungs and COPD. Note that end-expiratory lung volume (EELV) remains relatively constant in normal lungs as minute ventilation increases. Tidal volume (VT) is able to expand, since inspiratory volume (IC) remains constant. In COPD, increases in EELV force VT closer to the total lung capacity (TLC) and IC is reduced even at rest. Dynamic hyperinflation further increases EELV and reduces IC as minute ventilation increases. VT is unable to expand and patients cannot achieve high minute ventilations before breathing becomes so restricted that patients have to stop activity.
EELV: end-expiratory lung volume; VT: tidal volume; IC: inspiratory volume; TLC: total lung capacity; IRV: inspiratory reserve volume.
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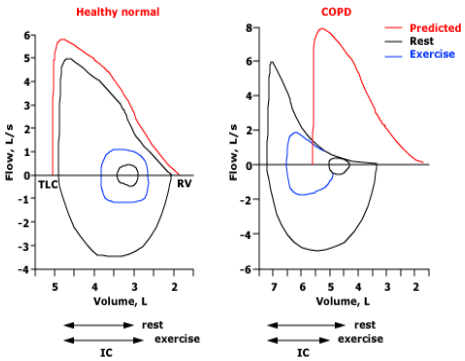
Rest and peak exercise flow volume (FV) responses in a healthy, average fit adult plotted within a maximal FV curve



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Question:

During dynamic hyperinflation the following is expected:

a. Increased tidal volume
b. Reduced inspiratory capacity
c. Increased inspiratory capacity
d. Reduced End Expiratory lung volume

Answer: B - an increase of the EELV must be accompanied by a decrease of the IC since the sum of the two measures is the total lung capacity (EELV + IC = TLC)