

Pulmonary Changes: Elderly

The ABA loves this stuff so make sure you know it well. Keep in mind that while everyone experiences some degree of physiologic changes associated with their accumulating revolutions around the sun, they may also pick up diseases related to their age (e.g. COPD, IPF) that can have separate or compounding physiologic effects which will not be discussed here.

Degenerative changes of the spine and costal joints result in **decreased compliance of the thorax**. Meanwhile, the **compliance of the lung parenchyma increases** due to changes in the spatial orientation of the elastic fiber network. The net result is an **unchanged total lung capacity (TLC)** but steadily **increasing functional residual capacity (FRC) and residual volume (RV)** with age. Therefore, by definition **vital capacity (VC) decreases**, as does **gas exchange capacity** (as shown by the increasing A-a gradient). This mechanical degradation combined with **decreased respiratory muscle strength** results in **increased work of breathing**. **Closing capacity increases** and eventually rises above FRC resulting in atelectasis at end exhalation during the resting respiratory cycle. There is also **increased V/Q mismatch**.

As patients age, their **ventilatory response to hypoxia and hypercapnia decreases**. In addition to weaker respiratory muscle strength, elderly patients have **weaker pharyngeal muscles**. This, combined with the **decreased mucociliary function, decreased esophageal motility, and less efficient coughing increases the risk of aspiration**. Additionally, the decreased pharyngeal tone results in an **increased propensity for apneic episodes at night**.

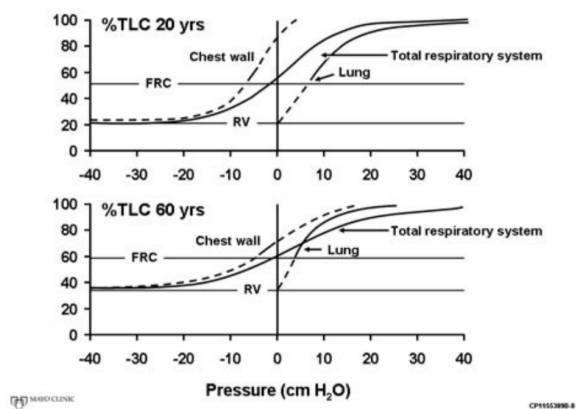


FIGURE 1 Pressure volume curves in a 20-yr-old (upper panel) and 60-yr-old (lower panel). Aging creates increases in lung compliance and decreases in chest wall compliance. The pressure-volume curve of the aged total respiratory system compliance (lung and thorax) is flatter and overall less compliant. TLC = total lung capacity; FRC = functional residual capacity; RV = residual volume. Reproduced with permission from J Appl Physiol 1968; 25: 664–71 (reference 5).

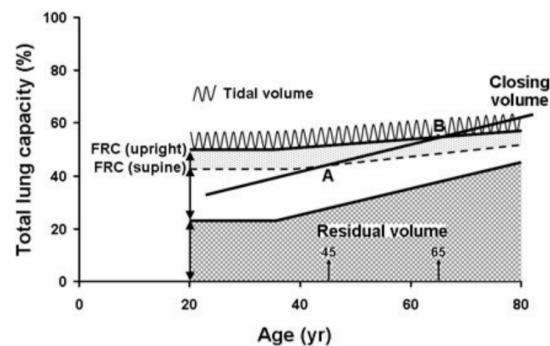


FIGURE 2 Lung volumes and aging. Residual volume and functional residual capacity (FRC) increase with aging while total lung capacity does not change. The closing volume increases with aging and exceeds FRC around age 65 in the upright position (B). However, because FRC is lower in supine body position, closing volume exceeds FRC at age 45 while supine (A). Modified with permission from Anesthesiol Clin North America 2000; 18: 47–58 (reference 4).

Further Reading: Sprung, J., Gajic, O. & Warner, D.O. Review article: Age related alterations in respiratory function — anesthetic considerations. Can J Anesth 53, 1244–1257 (2006).

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