2007 -2-13 Briefly describe the factors that affect lung compliance

Lung compliance
- Change in lung volume per unit change in transmural pressure
- Normal lung compliance ~150ml/cmH₂O
- Static compliance
  ➢ Compliance of lung measured when lung held at constant lung volume
- Dynamic compliance
  ➢ Compliance of lung measured during cycles of inspiration and expiration
- Specific compliance
  ➢ Complaince/FRC

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**Fig. 3.8** Static pressure/volume relations for the intact thorax for the conscious subject in the upright position. The transmural pressure gradient bears the same relationship to lung volume during both intermittent positive pressure ventilation and spontaneous breathing. The intrathoracic-to-ambient pressure difference, however, differs in the two types of ventilation due to muscle action during spontaneous respiration. At all times: alveolar/ambient pressure difference = alveolar/intrathoracic pressure difference + intrathoracic/ambient pressure difference (due attention being paid to the sign of the pressure difference).
Factors affecting compliance

- **Surfactant**
  - Decreases surface tension at lower lung volumes

- **Lung volume**
  - Compliance decreases at higher lung volumes
  - Specific compliance (Compliance/FRC) remains constant
    ♦ Elephants have greater lung compliance than mice

- **Pulmonary blood volume**
  - Increased PBV decreased compliance
  - Pulmonary venous congestion from left heart failure or mitral regurgitation decreases lung compliance

- **Bronchial smooth muscle tone**
  - Increased bronchial smooth muscle tone decreases compliance
  - Decreased dynamic compliance by 50% in animal models of methacoline challenge

- **Disease**
  - ARDS, pulmonary fibrosis, pneumonia decreases compliance

Examiners Comments:

**Question 1:** Briefly describe the factors that affect lung compliance.

Main points/concepts expected in answer.

- **Surfactant** • increases lung compliance • decreases surface tension at alveolar air-water interface • prevents small alveoli from collapsing • accounts for most of hysteresis in intact lung
- **Lung elastic recoil** • lung compliance changes in disease states
- **Lung volume** • lung compliance greatest around FRC • lung compliance reduced at low and high lung volumes • gravitational effects on regional lung compliance
- **Pulmonary blood volume** • pulmonary venous congestion reduces lung compliance
- **Lung size** • specific compliance = lung compliance / FRC
- **Dynamic lung compliance** • influenced by airways resistance • lung compliance measured during normal breathing • less than static lung compliance • frequency dependence

1 candidate (14%) passed this question.