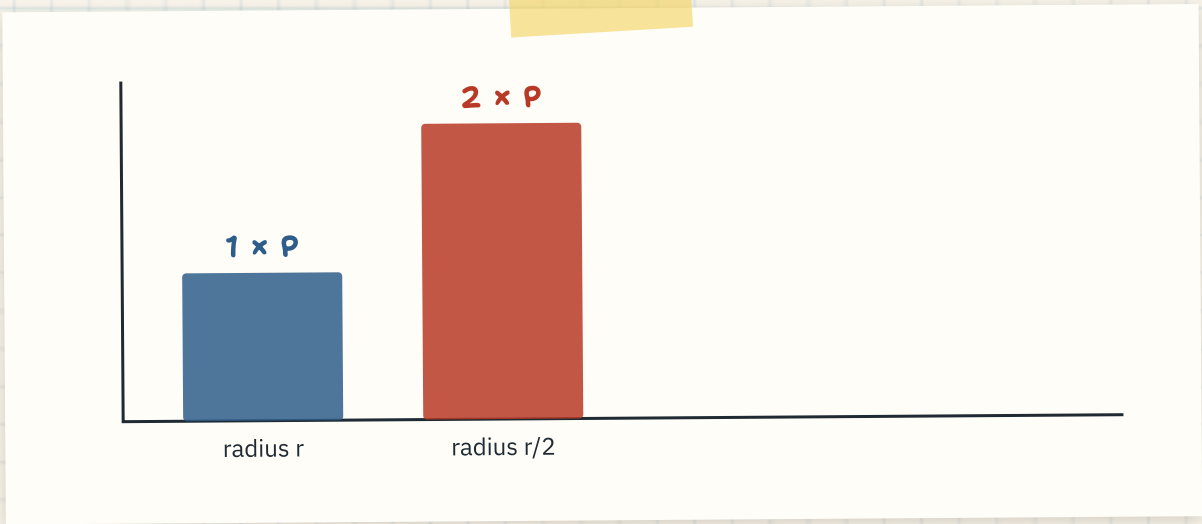
Compliance, Laplace and surfactant

Why alveoli stay open



Step by step

1. Compliance = slope of the volume–pressure curve
2. Recoil: elastic tissue plus surface tension
3. Laplace: small alveolus, higher pressure
4. Surfactant (type II cells, DPPC) lowers tension
5. L/S ratio about 2 or more: mature lungs

Lung	Compliance
Emphysema (elastic fibres lost)	High
Fibrosis (collagen replaces elastin)	Low
Surfactant-deficient (premature)	Low, stiff

Compliance and recoil

LAW OF LAPLACE (ALVEOLUS)

$$P = 2T / r$$

P = pressure; T = surface tension; r = radius. Halve r at the same T and P doubles.

Rule of thumb

Halve the radius, double the pressure

Emphysema floppy, surfactant lack stiff

Surfactant: tension down, compliance up

Exam traps

- High compliance is the emphysema pattern, not the surfactant-deficient one.
- Lower surface tension reduces collapse; it never increases it.
- Laplace is an approximation: real alveoli are connected polygons.

Lung compliance, Laplace and surfactant: why alveoli stay open

Video, written lesson, practice question and sources: medservatory.com/usmle-step-1/respiratory-physiology/compliance-surface-tension-surfactant

For exam study only, not medical advice. Follow local guidelines and your lab's ranges.
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