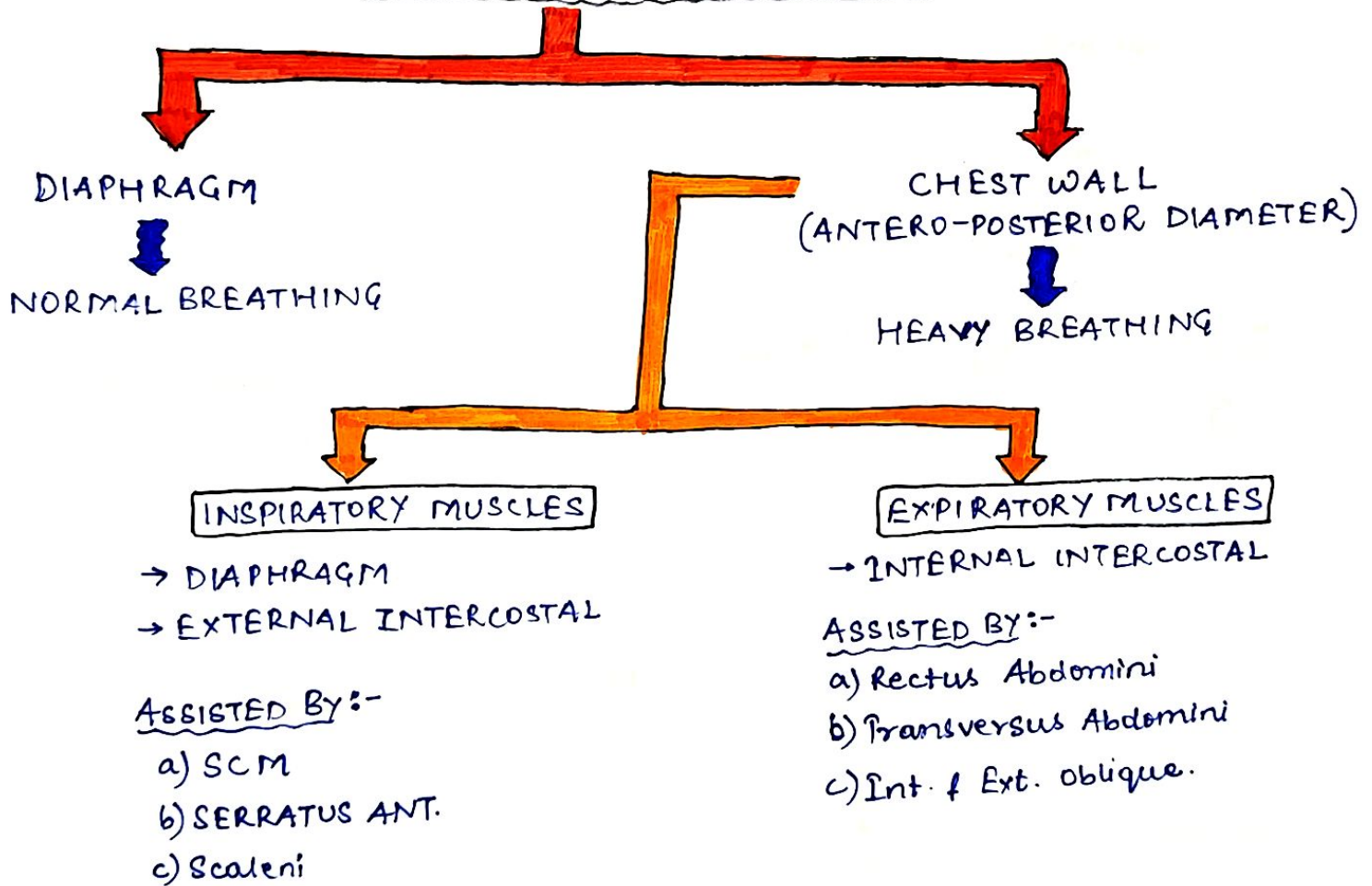


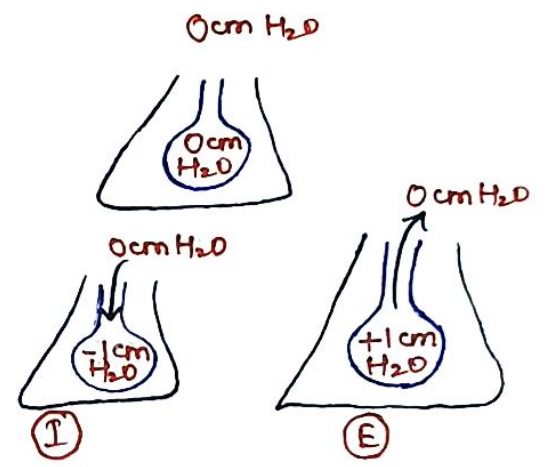
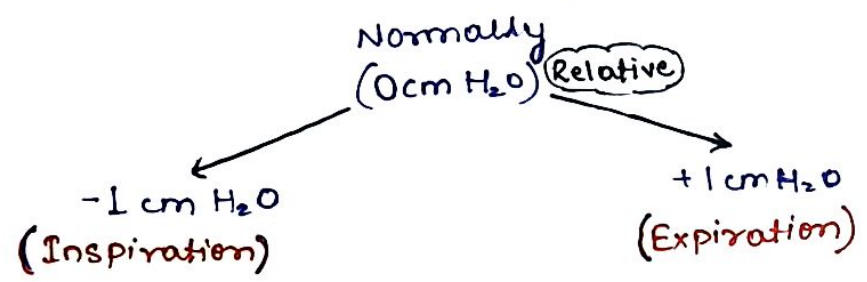
MECHANICS OF BREATHING



PRESSURES RELATED TO PULMONARY VENTILATION :-

→ Intra-Alveolar Pressure :-

- Pressure inside Lung Alveoli

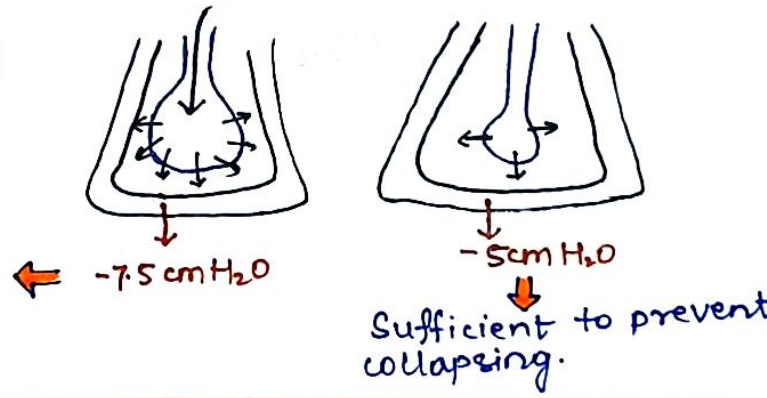


→ Intra-Pleural Pressure :-

- Pressure of Pleural fluid between lung pleura & chest wall pleura

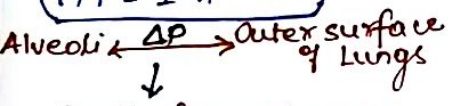


↪ Suction pressure.



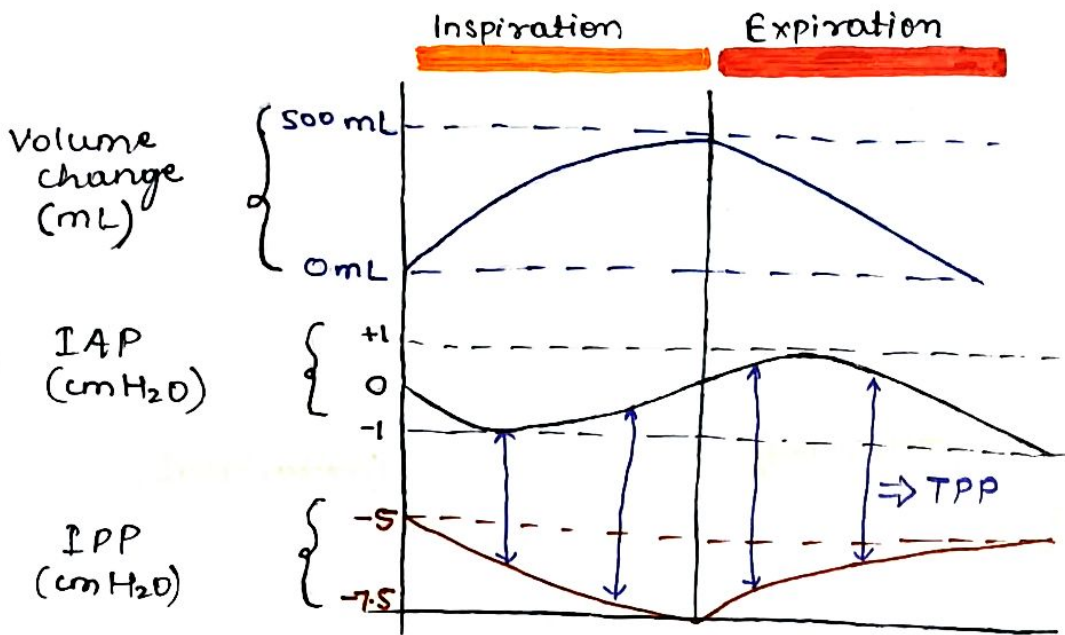
→ Transpulmonary P.

$$TPP = IAP - IPP$$



↓
Elastic force of lungs that tends to collapse

Expands alveoli to promote inspiration.

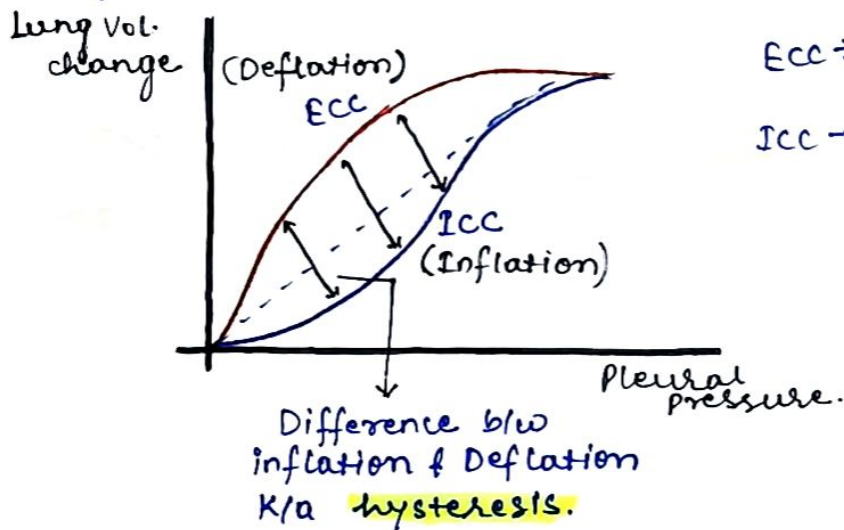


COMPLIANCE :-

⇒ Extent of lung expansion by unit change in TPP is known as compliance of lung

⇒ For Both lungs; $c = \frac{200\text{ml}}{1\text{cm H}_2\text{O}} (\Delta\text{TPP})$

⇒ Compliance diagram



ECC → Expiratory Compliance curve

ICC → Inspiratory compliance curve.

Compliance diagram depends on

2 forces → opposing inflation

Elastic forces of Lung tissue (1/3)



Elastin + collagen

Elastic force by S. Tension of fluid lining alveoli (2/3)

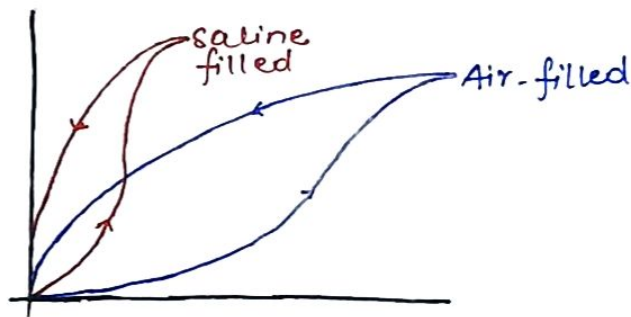
→ Deflated lungs

↓
fibres ⇒ contracted & kinked state.

→ Expanded lungs

↓
fibres ⇒ stretched & unkinked state

⇓
More elastic force.



saline-filled ⇒ No air-fluid interface

⇓
ST = 0

Role of surfactant :-

- ⇒ ↓ S. tension of alveoli
- ⇒ stabilise alveoli (prevents from collapsing)
- ⇒ Contains ⇒ DPPC (Dipalmitoylphosphatidylcholine), Apoproteins, Ions (Ca^{++}).
- ⇒ Produced by Type II alveolar epithelial cells.

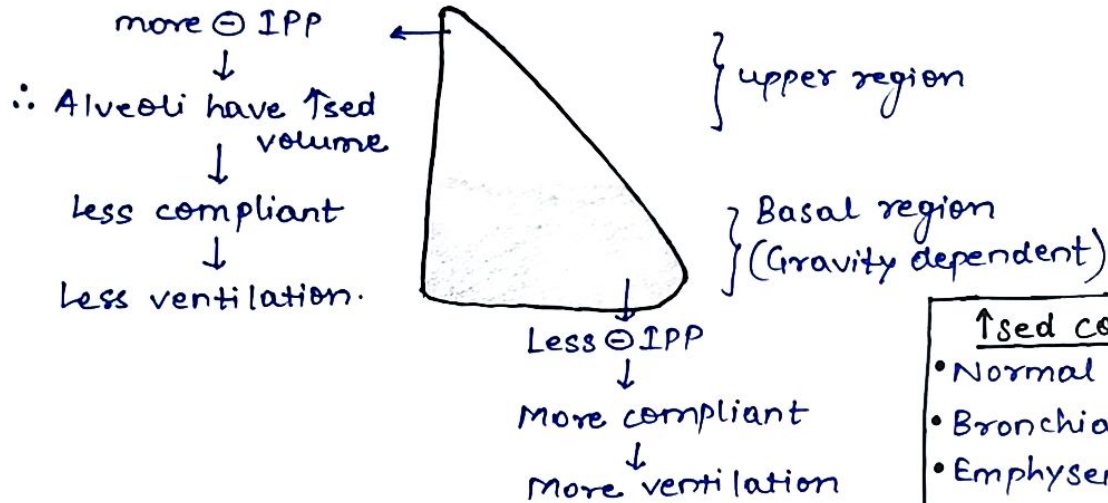
S. Tension $\left\{ \begin{array}{l} \rightarrow \text{Normal fluid w/o surfactant} \Rightarrow 50 \text{ dyne/cm} \\ \rightarrow \text{Normal fluid } \bar{c} \text{ surfactant} \Rightarrow 5-30 \text{ dyne/cm.} \end{array} \right.$

Respiratory distress syndrome of Newborn :-

$$\text{Laplace Law :- } P = \frac{2T}{r}$$

Premature baby $\left\{ \begin{array}{l} \rightarrow \text{small radius} \Rightarrow \text{promotes collapsing} \\ \rightarrow \text{Absence/↓sed surfactant} \rightarrow \text{S. Tension} \uparrow \Rightarrow \text{promotes collapsing.} \end{array} \right.$

Gravity causing Regional variation in compliance.



COMPLIANCE of Thorax & Lungs together.

$$C = \frac{1}{2} \text{ of lung alone} \approx 110 \text{ mL/cm of H}_2\text{O}$$

"WORK" of breathing \approx inspiration

- ① Required to expand lungs against lung & chest elastic forces \rightarrow Compliance/Elastic work
- ② Required to overcome viscosity of lung & chest wall structures \rightarrow Tissue Resistance work
- ③ Required to overcome airway resistance \rightarrow Airway Resistance work.

↑ sed compliance

- Normal Aging
- Bronchial Asthma
- Emphysema

↓ sed compliance

- Fibrosis
- Reduced surfactant
↳ Premature Infants
- Pulmonary Hypertension
- Alveolar Atelectasis.