

Airway resistance and its measurement

Principle

Airflow between the nose/mouth and the alveoli is driven by a pressure difference. The airways in between form a resistance

$$R = \Delta P / Q$$

where R is resistance, ΔP is the pressure gradient and Q is airflow

Resistance itself is described by the Poiseuille law

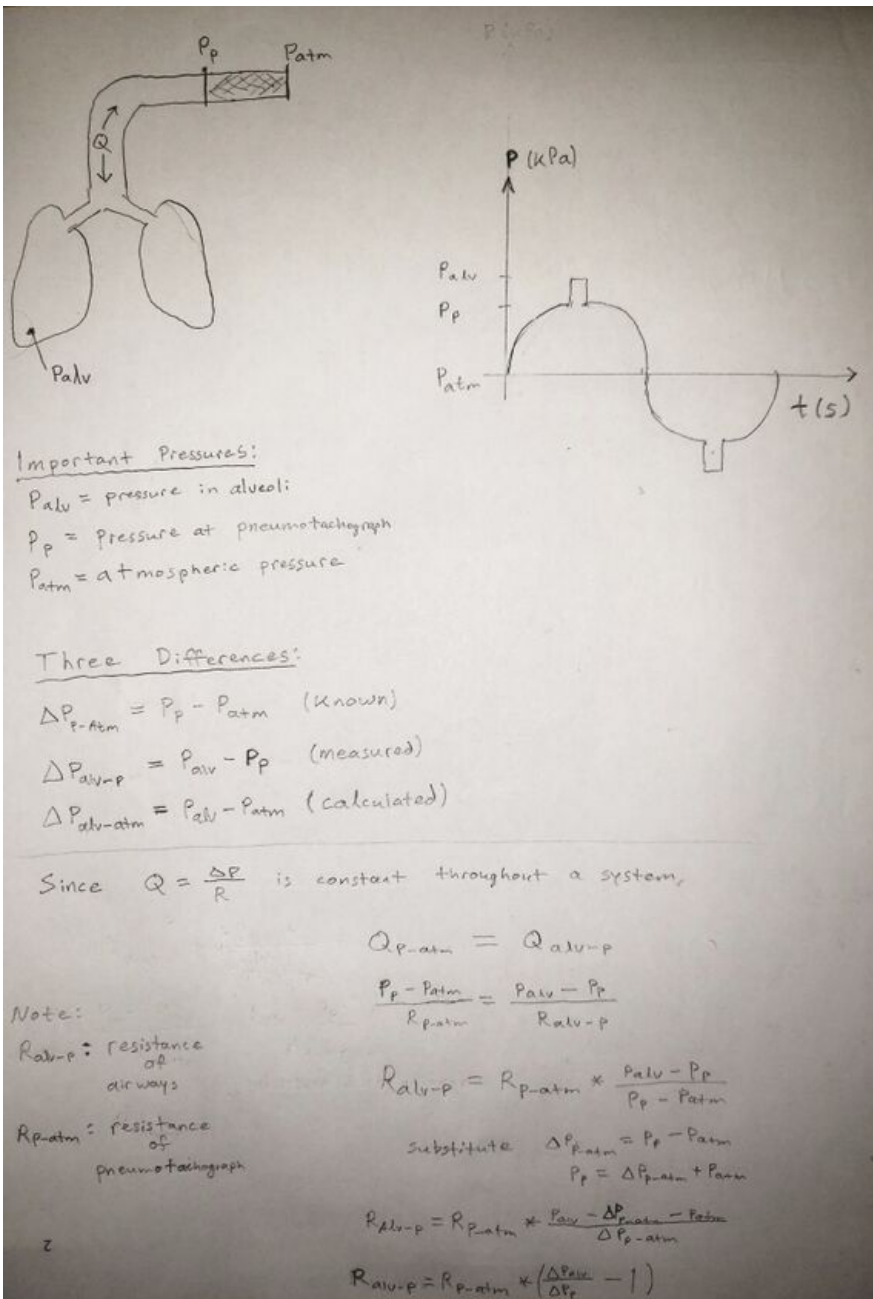
$R = 8\eta l / (\pi r^4)$ - use to explain why during exhalation there is more resistance, because we take all the alveoli all together, compare with their radius and the tracheal radius

Where η is the viscosity of the inspired gas, l and r are the length and radius of the airway

Evidently, contraction of bronchi results in decreased airflow.

Measurement

Airway resistance is measured via **pneumotachography** (*pneumo=lung, tacho=fast, graph=write*), which compares pressure differences at two ends of a tube through which the subject breathes. Since the airflow Q is the same everywhere, one can derive an equation to find airway resistance:



Increased airway resistance indicates obstruction of the airways.

Links

- Respiratory insufficiency

References

Costanzo, L., 2019. *Physiology - Board Review Series*. 7th ed. Philadelphia: Wolters Kluwer, p.122.