Pleural Manometry Histroical Background, rationale for use and Methods of Measurement

## Physiology and pathophysiology of pleural pressure

* Inspiration of quiet breathing: Ppl varies between -6 and -10 cmH20
  + Up to -100 cmH2O at forced inspiration against airway resistance
* -3 to -5 cmH2O at expiratory phase
* Cardiopulmonary
  + Decreased Ppl increased RV preload
  + Excessive negative Ppl can result in Vena Cava collapse
  + Increased Ppl can result in RV and LV collapse, hence leading to decreased cardiac output
* Ppl is not uniform, and the gradient may be caused by gravity.
  + Ppl is decreased at upper part of pleural cavity
  + Ppl is increased at the basal, peridiaphragmatic regions
  + Thus, alveoli in upper part are larger than in peridiaphragmatic regions
* Measurement methods alter interpretation of Ppl
  + Liquid pressure measured with fluid-filled catheter has 1 cmH2O/cm vertical height gradient
  + Pleural surface pressure measured with surface balloon or suction cup has approx 0.3 cmH2O/cm vertical height gradient

A diagram of the lungs

Description automatically generated

## Development of pleural manometry-historical perspectice

* First pleural measurement performed by Heinrich Irenaeus Quincke in 1978
  + Quincke’s edema (1882) & needle lumbar technique (1891) are among Quincke’s other contributions.
* In the pre-antibiotic era, pleural manometry (PM) was essential in collapse therapy.
  + Commonly applied during creation and management of artificial pneumothorax
  + PM’s role was to calibrate needle position in pleural cavity, as well as validating nitrogen gas infusion
* After discovery of anti-tuberculous agents, collapse therapy was decommissioned, causing PM to be abandoned.
* During the 1980’s and 1990’s, PM reemerged, catalyzed by the study by Light et. Al. published in 1980.
  + PM has since then been used in studying thoracentesis, pleural fluid removal, identification of unexpandable lung, and delineation of trapped lung and lung entrapment.

## Methods of pleural pressure measurement

* Two main methods
  + Water manometers
  + Electronic systems
* Water manometers are simple, but fail to deliver a reliable Ppl
  + Allow for mean Ppl measurements
* Electronic systems consist of pressure transducer and a system to collect and display the data
  + Offer precise measurements and large scale data collection
* Electronic pleural pressure measurement procedure
  + Discuss informed consent with patient
  + Patient is put in upright sitting position
  + Ultrasound guides point of entry for pleural- needle or catheter
  + Disinfect the skin
  + Following local anaesthesia, pleural needle- or catheter is inserted into pleural cavity
  + Pressure transducer is attached to the base with a signal conditioner and data storage system
  + Intravenous tubing is attached to the transducer
    - Second end attached to puncture site