Assessment of pulmonary mechanics is crucial to monitoring pulmonary function during artificial ventilation.

- It requires the measurement of VT, peak inspiratory flow rate, peak airway pressure, end-inspiratory plateau pressure, end-expiratory pressure in the circuit, and any occult end-expiratory pressure measured during an end-expiratory pause maneuver.

- From these variables, the compliance and resistance of the respiratory system are determined.

**Compliance & Resistance**

**Compliance**

- In mechanically ventilated, normal patients, compliance is 57 to 85 mL/cm H2O, and resistance is 1 to 8 cm H2O/L per second.

- Patients with ARDS or cardiogenic pulmonary edema tend to have low compliance (35 or 44 mL/cm H2O, respectively) and an elevated resistance (12 or 15 cm H2O/L per second, respectively).

- In contrast, patients with chronic obstructive lung diseases have a higher compliance (66 mL/cm H2O) and a higher resistance (26 cm H2O/L per second).

**Resistance**

- Intrinsic PEEP is common in mechanically ventilated patients with various lung diseases. Patients with ARDS or cardiogenic pulmonary edema tend to have markedly lower levels of intrinsic PEEP (3 to 4 cm H2O) compared with patients with chronic obstructive lung diseases (14 cm H2O).

- Under conditions of passive mechanical ventilation, peak airway pressure denotes the total force necessary to overcome the resistive and elastic recoil properties of the respiratory system (i.e., both lungs and chest wall).

- Distinguishing the resistive from the elastic recoil-related pressures requires introduction of an end-inspiratory circuit occlusion after VT delivery. During the end-inspiratory pause, peak airway pressure dissipates down to a stable plateau pressure. After a 3-second pause-hold, “quasi-static” conditions usually exist, so that the corresponding plateau pressure represents the elastic recoil pressure. Dividing the VT by the plateau pressure (Pplat) minus the PEEP yields the “quasi-static” compliance of the respiratory system (Crs-stat).

- During patient-triggered ventilation, the assessment of pulmonary mechanics becomes uncertain. Clinically, the pause time is decreased to 0.5 to 1 second, to limit any potential artifact from spontaneous breathing efforts that may falsely raise or lower the plateau pressure.

- Respiratory system resistance (Rrs) is the ratio of driving pressure to flow and is calculated as the difference between the peak airway pressure (Paw) and the end-inspiratory plateau pressure (Pplat) divided by the preocclusion peak inspiratory flow rate (Vdot) I expressed as cm H2O/L per second:

\[ R_{rs} = \frac{\text{Paw} - \text{Pplat}}{V_{\text{dot} I}} \]

- Resistance is flow dependent, because the driving pressure necessary to overcome resistance increases disproportionally to changes in VdotI (due to increased turbulence). Therefore, respiratory system resistance can be accurately determined only with a constant inspiratory flow (square wave) pattern. Because resistance is expressed as cm H2O/L per second, a [Vdot]I of 60 L/min (1 L/sec) is a convenient setting to measure resistance, and it also happens to be a standard setting for patient comfort.