

Plateau airway pressure and Driving Pressure

Plateau pressure is the pressure that is applied by the mechanical ventilator to the small airways and alveoli. The plateau pressure is measured at end-inspiration with an inspiratory hold maneuver on the mechanical ventilator that is 0.5 to 1 second. Meta-analysis demonstrated a significant correlation between plateau pressures greater than 35 cm H₂O and the risk of [barotrauma](#).³⁰ In the [ARDS](#) Network trial, lower [tidal volume](#) ventilation with plateau pressures less than 30 cm H₂O was associated with a lower mortality rate than that found for conventional tidal volume using plateau pressures less than 50 cm H₂O.¹²

Static compliance is measured in the absence of gas flow, and is based on **plateau pressure**:

$$C_{stat} = V_t / (P_{plat} - PEEP)$$

Dynamic compliance is measured in the presence of gas flow, and is based on **peak pressure**:

$$C_{dyn} = V_t / (P_{peak} - PEEP)$$

Remember these three scenarios to understand how compliance curves will change:

- Pulmonary emboli do not change resistance or compliance, so both compliance curves are unchanged.
- Plugging or bronchospasm increases airway resistance (Raw) and peak pressure, so dynamic compliance curve shifts to the right and flattens resulting in increase in the peak pressure. Plateau pressure and static compliance are unchanged.
- Tension pneumothorax, atelectasis, pulmonary edema, pneumonia, bronchial intubation cause reduced lung compliance which increases both peak pressure and plateau pressure, so both static and dynamic compliance fall. High PEEP, high inspiratory flow and high tidal volumes also increase Plateau and PIP.

Ideally, all patients should be managed with a plateau pressure less than 30 cm H₂O unless there is a marked decrease in chest wall compliance. If the chest wall compliance is decreased, the

Transpulmonary pressure (PTP) is decreased and the risk of overdistention of the alveolus is reduced.

In patients with stiff chest walls and abdomens because of sepsis, abdominal distention, fluid resuscitation, obese patients, and so forth, a plateau pressure higher than 30 cm H₂O may be necessary and not associated with an increased risk of Ventilator associated lung injury(VILI). Alternatively, some have advocated the use of an esophageal balloon to estimate pleural pressure and guide mechanical ventilation strategies to limit PTP.

Driving Pressure

The difference between plateau pressure and PEEP during tidal inflation is known as the driving pressure. At present, based on available data, it is recommended to limit driving pressure in passively inflated individuals to 15 cm of water in the ICU settings.

Rearrangement of the standard respiratory system compliance (C_{RS}) equation leads to driving pressure as equal to the tidal volume (divided by

$$DP = V_T / C_{RS}$$

Sources

1. Eskaros SM, Papadakos PJ, Lachmann B. Respiratory Monitoring. Chapter 44, Section "Pulmonary and Chest Wall Monitoring." In: *Miller Anesthesia*. 7th edition. Saunders; 2009