Airway occlusion pressure: P0.1

Alain Mercat
Conflicts of interests

- Fundings for clinical researchs
  - Covidien (PAV+)
  - GE (EELV/PEEP/ARDS)
  - Maquet (NAVA)
  - Fisher-Paykel (Optiflow)
- Patent
  - GE (EELV/PEEP/recruitment)
- Fees for lectures
  - Covidien
  - Fisher Paykel
- Fees for consulting
  - Faron Pharmaceuticals
  - Air Liquide Medical Systems
• Negative airway pressure generated 0.1 sec after the onset of an inspiratory effort against an occluded airway

• No flow $\rightarrow$ Unaffected by resistance

• No change in volume $\rightarrow$ Unaffected by compliance

• $< 150$ ms $\rightarrow$ Unaffected by any reflex or cortical response to the occlusion
• Indicative of the output of respiratory centers: «respiratory drive»

• «normal value» (healthy subjects at rest) < 2 cmH₂O

• Available on all modern ventilators
P 0.1 : An indicator of respiratory drive

• 10 healthy volunteers
• Mouthpiece
• CO₂ inhalation

OCCLUSION PRESSURE AS A MEASURE OF RESPIRATORY CENTER OUTPUT IN CONSCIOUS MAN

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Department of Physiology, McGill University, Montreal, Quebec, Canada

Respiration Physiology (1975) 23, 181–199
P 0.1 and WOB during assisted breathing

Fig. 5  Relationship between changes in inspiratory work of breathing and P 0.1 at decreasing PSV levels. The regression line is drawn by means of the least-square method.

P 0.1 and WOB during assisted breathing

- 20 pts with COPD, on Pressure Support + PEEP 5

Mancebo et al. Anesthesiology 2000
P 0.1 in patients with intrinsic PEEP
P 0.1 in patients with intrinsic PEEP

Estimation of Occlusion Pressure During Assisted Ventilation in Patients with Intrinsic PEEP

GIORGIO CONTI, GILDA CINNELLA, ENRICO BARBONI, FRANÇOIS LEMAIRE, ALAIN HARF, and LAURENT BROCHARD

P 0.1 and titration of Pressure Support

P 0.1 is a useful parameter in setting the level of pressure support ventilation
Changes in occlusion pressure ($P_{0.1}$) and breathing pattern during pressure support ventilation

Pierre-François O Perrigault, Yvan H Pouzeratte, Samir Jaber, Xavier J Capdevila, Maurice Hayot, Gilles Bocca, Michele Ramonatxo, Pascal Colson

Thorax 1999;54:119–123
P 0.1 and WOB during assisted breathing

**Airway Occlusion Pressure to Titrate Positive End-expiratory Pressure in Patients with Dynamic Hyperinflation**

Jordi Mancebo, M.D.,* Pierre Albaladejo, M.D.,† Dominique Touchard,‡ Ela Bak, M.Sc.,§ Mireia Subirana, R.N.,‖ François Lemaire, M.D.,# Alain Harf, M.D.,** Laurent Brochard, M.D.#

- 20 pts with COPD
- On Pressure Support
- PEEP 0 - 5 - 10 cmH₂O

*Anesthesiology* 2000; 93:81-90
P 0.1 and weaning

Bellani et al. Anesthesiology 2010
Airway Occlusion Pressure and Breathing Pattern as Predictors of Weaning Outcome

Catherine S. H. Sassoon and C. Kees Mahutte

- 45 pts, recovering from ARF
- P0.1 and f/Vt after 5 min of CPAP 5

Respiratory failure in chronic obstructive pulmonary disease after extubation: value of expiratory flow limitation and airway occlusion pressure after 0.1 second (P0.1)

- 35 pts with COPD, extubated after a successful SBT
- Measurement of P0.1 one hour after extubation
- 14 pts reintubated for postextubation respiratory failure

![Graph showing measurement of P0.1](Journal of Critical Care (2008) 23, 577–584)
P 0.1 and hypoxic ventilatory drive

- 12 pts with mild or moderate ARDS (PO$_2$/FiO$_2$ : 112 to 270)
- Pressure Support (16 ± 3 cmH$_2$O) + PEEP (9 ± 3 cmH$_2$O)
- 3 levels of FiO$_2$:
  - High (SpO$_2$>95)
    - PaO$_2$ : 158 ± 68 mmHg
  - Intermediate (90<SpO$_2$<95)
    - PaO$_2$ : 75 ± 12 mmHg
  - Low (85<SpO$_2$<90)
    - PaO$_2$ : 55 ± 6 mmHg

Pesenti et al. Chest 1993
P 0.1 and hypoxic ventilatory drive

- 13 pts on PS (14 ± 2 cmH₂O) – PEEP (4 ± 1 cmH₂O)
- FiO₂: 20% – 40% - 60% - 80% (randomized order)

Volta et al. Intensive care Medicine 2006
P 0.1 and spontaneous breathing on ECMO

• 8 pts on ECMO since 28 ± 20 days for severe ARDS
• With spontaneous breathing activity
• Sedation for RASS -3 to -1
• Baseline sweep gas flow for: P0.1 < 2 cmH₂O, RR < 25/min and VT < 6 ml/kgPBW
• Progressive decrease of sweep gas flow

(ANESTHESIOLOGY 2016; 125:159-67)
P 0.1 and spontaneous breathing on ECMO

(Anesthesiology 2016; 125:159-67)
• Meaningful physiologic parameter

• Easy way to assess the impact of ventilator settings on respiratory drive and WOB in mechanically ventilated patients
Extubation failure: diagnostic value of occlusion pressure (P0.1) and P0.1-derived parameters

Fig. 1 Receiver operating characteristic (ROC) curves for the three diagnostic parameters in the total population of patients who tolerated the spontaneous breathing trial