VALIDATION OF CONTINUOUS NEONATAL VENTILATOR RESPIRATORY MECHANICS AND TIDAL VOLUME BY SELECTED OPTIMAL RESPIRATORY CYCLES

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Aim: To assess on-line ventilator respiratory mechanics (RM) parameters, including tidal volume (V_T).

Methods: Ten recordings of ventilated newborns (10 minutes, synchronized intermittent mandatory ventilation (SIMV) and assist/control (AC)) were analyzed. Ventilator provided RM data (VRC, ventilator respiratory cycles) every ten seconds. Continuous pressure (P) and flow (V') recordings were used to reconstruct P, V' and volume (V) waves, and PV, PV' and V'V loops. Visual assessment determined assisted leak-free optimal respiratory cycles (SRC, selected respiratory cycles) used to calculate RM values. We compared mean values and their variability according to ventilatory mode and type of cycles.

Results: In AC, V_T decrease from 5.6 ± 1.8 mL/kg (VRC) to 4.8 ± 1.0 mL/kg (SRC). In SIMV, V_T tend to be lower for VRC (4.4 ± 1.1 mL/kg) than for SRC (5.6 ± 1.2 mL/kg). Also, assisted breaths V_T differ according to ventilatory mode. Averaged RM mean values are similar apart for C20/C, that drops from 1.8 (VRC) to 1.2 (SRC). Ventilator C20/C are often out of classical range. Coefficients of variation for dynamic resistance, compliance, V_T and C20/C improve from 36, 35, 40, and 33% for VRC to 27, 26, 18 and 24% for SRC respectively.

Conclusion: Ventilator reports V_T 16% above those effectively provided in AC assisted breaths, decreasing V_T validity to assess ventilator settings adequacy. SIMV V_T values don't reflect inspiratory pressure influence either. Careful selection of respiratory cycles to calculate RM values improves accuracy and decreases their high variability to clinically acceptable levels.