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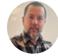

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LETTER

Critical Asthma in Infancy and Toddlers: How Can We Mechanically Discriminate From Critical Bronchiolitis?

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To the Editor
Asthma in infancy and toddlers has been increasingly recognized, referring to recurrent episodes of wheezing, also in mechanically ventilated children [1]. We analyzed the working pressures of the respiratory system under static conditions in a cohort of infants and toddlers with a discharge diagnosis of critical asthma. Also, we compare them with critical bronchiolitis cohort and anesthetized children without respiratory disease (normal physiology). Finally, we aimed to identify consistent thresholds in lung mechanics to discriminate between these conditions.

1 | Methods

Ethical approval for this case-control study was obtained from the Servicio de Salud Metropolitano Central Ethics Committee in Santiago, Chile (approval number 16/2022), waiving informed consent.

The inclusion criteria were: (1) Children younger than 2-year-old with discharge diagnosis of critical asthma. (2) Controlled mechanical ventilation (MV) and neuromuscular blocker agents (NMBA); and (3) Lung mechanics measured within 24 h after intubation. The treating physician was responsible for discharge diagnosis, and critical asthma was defined as at least two previous emergency room or primary care visits and beta-agonist prescriptions for acute symptoms [2].

We studied all consecutive patients who met the above criteria at Hospital El Carmen de Maipú between January 1, 2018, and December 31, 2022. We excluded patients that met fully Pediatric acute respiratory distress syndrome criteria [3], patients with endotracheal tube air leak > 20% of tidal volume (V_T), airway obstruction due to other diseases, and any pre-existing lung or airway disease other than asthma.

All patients were supported using the Volume-controlled ventilation (VCV), and we obtained the following parameters: peak inspiratory pressure (PIP), plateau pressure (P_{PLAT}), extrinsic PEEP (PEEP), total PEEP (tPEEP), driving pressure ($\Delta P = P_{PLAT}$–tPEEP), expiratory V_T (VT_E), inspiratory time (Ti), respiratory rate (RR), and peak inspiratory and expiratory airflow (Q_I and Q_E). We also recorded pH, PaO_2, and $PaCO_2$ from arterial blood gases.

We performed a 3-s inspiratory hold and a 3-s expiratory hold, calculated respiratory system compliance (C_{RS}, $ml{\cdot}cmH_2O^{-1}{\cdot}kg^{-1}$), inspiratory airway resistance (R_{AW}, $cmH_2O{\cdot}L^{-1}{\cdot}s^{-1}$) and inspiratory time constant (π, s) according to formulas previously described [4]. V_T, flow, and C_{RS} were normalized to ideal body weight (IBW). Next, we calculated the components of the working pressure as follows: resistive component, PIP–P_{PLAT}; elastic component, P_{PLAT}–tPEEP (or Driving pressure, ΔP); and threshold component, tPEEP–PEEP (or intrinsic PEEP, iPEEP).

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