

Rapid Shallow Breathing Index as a Predictor of Extubation Outcomes After Pediatric Cardiac Surgeries

Jihane Moukhaiber

Assistant Professor, American University of Beirut Medical Center (AUBMC), Beirut, Lebanon

Abstract:

Background/Objectives: Determining the optimal timing for the discontinuation of mechanical ventilation (MV) in pediatric patients following cardiac surgery remains challenging. Both delayed and premature extubation increase the risk of complications. The rapid shallow breathing index (RSBI) is widely used, but its role and optimal cutoff in pediatric cardiac populations remain uncertain. This study aimed to determine a clinically useful RSBI cutoff for predicting extubation readiness in children after cardiac surgery.

Methods: We conducted a prospective single-center observational cohort study including children younger than 18 years who required postoperative MV after cardiac surgery and were admitted to the Pediatric Intensive Care Unit (PICU) between July 2020 and June 2024. The RSBI was measured one minute prior to extubation during a spontaneous breathing trial (SBT). Extubation failure was defined as the need for reintubation within 48 h.

Results: A total of 247 patients were enrolled, with 13 (5.3%) experiencing extubation failure. Patients who failed extubation had significantly higher RSBI values compared with those successfully extubated (median 4.97 vs. 3.76; $p < 0.001$). An RSBI cutoff ≥ 4.62 breaths/min/mL/kg provided a sensitivity of 84.6%, specificity of 94.0%, positive predictive value (PPV) of 44%, and negative predictive value (NPV) of 99.1%. The RSBI was the only independent predictor of extubation failure in multivariable analysis ($p = 0.014$).

Conclusions: The RSBI is a simple and reliable physiological marker for assessing extubation readiness in pediatric patients after cardiac surgery. An RSBI threshold of ≥ 4.62 breaths/min/mL/kg identifies patients at increased risk of extubation failure. Larger, multicenter studies will be important to validate our results.

Keywords:

RSBI, cardiac surgery, pediatric, extubation failure.