SYNCHRONIZING TIDAL PUMP DURING AIRWAY PRESSURE RELEASE VENTILATION IN A PEDIATRIC PATIENT
Keith R, Hintz RRT, Petertent RRT-NPS, David Hetz RRT-NPS, David A. Turner MD, Children’s Hospital Boston and Harvard Medical School, Boston, MA

Introduction: Airway pressure release ventilation (APRV) is a ventilator mode aimed at recruiting and maintaining lung volume, while preserving spontaneous ventilation. In our center, APRV is applied with the Acuva™ ventilator (Vianta Healthcare, Palm Springs, CA). We report the use of this mode and the its success in a 4 day period in a 3 year old male who developed ARDS. Background: The patient was a child with Bardet-Biedl Syndrome admitted for suspected aspiration during induction for an endoscopy. The patient subsequently developed ARDS, and required high frequency oscillatory ventilation (HFJV) and muscle relaxation due to worsening lung compliance and gas exchange. Over the next 3 days after HFJV course, airway exchange improved and the patient was transitioned to APRV in order to promote spontaneous ventilation. Initial APRV settings were Wp 30 cmH2O, PEEP of 8 cmH2O and V̇E of 10L/min. After 6 hours, PEEP was increased to 10 cmH2O. At hour 36 of APRV the patient developed a pneumothorax, a crackle was heard, and transition to PSV/PEEP of 108 cmH2O in order to minimize further barotrauma. Over the next few days, the patient’s gas exchange worsened and work of breathing increased. The mode was changed to SIMV-PCV + PS with no improvement. In an attempt to avoid HFJV and the need for paralysis, a second trial of APRV was employed with the settings, Fio2 0.7, PEEP/Paw 230 cmH2O and V̇E of 550L/min. After transition to APRV, the patient became hypertonic, tachycardic, hyperventilatory, diaphoretic, and agitated. Furosemide was started. The increase in work of breathing was presumed to be from under-recruited lungs and increased in Ppa was attenuated and were unresponsive. The APRV synchronisation features were added: 20% Td, Lo Flow for Ppa, Pao2, PtcO2 and Tidal Volume of 5.5L/min. After changes were made, work of breathing and RR subsequently decreased, and the patient appeared more comfortable. Blood pressure and heart rate returned to clinically acceptable levels, and there was no recurrence of air leak. Gas exchange improved over the next 9 days and the patient was transitioned from APRV settings of Fio2 0.45 PEEP/Paw 210 cmH2O and V̇E of 500L/min. After change to APRV, the patient became tachypneic, tachycardic, and hyperventilatory. After 9 days the patient was successfully extubated 2 days later. Discussion: The addition of Td, Lo Flow and Tidal Volume in this case improved the patient/ventilator interaction during APRV. The APRV advanced settings of Td, PEEP/Paw, Tidal Volume and V̇E are unique to the Acuva™. It is possible that the lack of improvement and the development of a pneumothorax was avoided if the synchronization features were used in the original APRV attempt. Prior to this patient, we had not used this feature as part of our APRV protocol, and we now routinely synchronize to improve patient/ventilator interactions. Clinical trials are warranted to validate the benefits of synchronization during APRV.


CARDIOPULMONARY INTERACTIONS DURING A VENTILATOR MODE CHANGE IN A PEDIATRIC PATIENT
Michelle Lilenfeld, RRT, Patricia Benjamin RRT, David A. Turner MD, Children’s Hospital Boston and Harvard Medical School, Boston, MA

Introduction: Airway pressure release ventilation (APRV) is a mode aimed at recruiting and maintaining lung volume, while preserving spontaneous ventilation. We report an episode of dramatic cardiopulmonary interaction involving a pediatric patient who was switched from APRV to PCV-PSV. Case Summary: A 3 y old girl with Kasabach-Merritt syndrome presented with hypoxemic respiratory failure. Initial APRV settings were Fio2 0.7, PEEP/Paw 240 cmH2O, Tidal Volume 700 mL, Fio2 0.6, Pw 22 cmH2O. After transition to APRV, the patient became tachypneic, tachycardic, diaphoretic, and agitated. The PEEP setting was adjusted to 40 cmH2O. After changes were made, work of breathing and RR subsequently decreased, and the patient appeared more comfortable. Blood pressure and heart rate returned to clinically acceptable levels, and there was no recurrence of air leak. Gas exchange improved over the next 9 days and the patient was transitioned from APRV settings of Fio2 0.45 PEEP/Paw 210 cmH2O and V̇E of 500L/min. After change to APRV, the patient became tachypneic, tachycardic, and hyperventilatory. After 9 days the patient was successfully extubated 2 days later. Discussion: The addition of Td, Lo Flow and Tidal Volume in this case improved the patient/ventilator interaction during APRV. The APRV advanced settings of Td, PEEP/Paw, Tidal Volume and V̇E are unique to the Acuva™. It is possible that the lack of improvement and the development of a pneumothorax was avoided if the synchronization features were used in the original APRV attempt. Prior to this patient, we had not used this feature as part of our APRV protocol, and we now routinely synchronize to improve patient/ventilator interactions. Clinical trials are warranted to validate the benefits of synchronization during APRV.