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BIPHASIC CUIRASS VENTILATION FOR RESPIRATORY DISTRESS DUE TO ASTHMA OR BRONCHIOLITIS

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Learning Objectives: Biphase cuirass ventilation (BCV) provides non-invasive respiration through negative pressure and cough assistance. The objectives were to describe the impact of BCV therapy on infants and children in respiratory distress due to asthma or bronchiolitis on the need for intubation and on vital signs.

Methods: A retrospective chart review was completed to evaluate the use of BCV in asthmatics and bronchiolitics aged 0–18 years in the PICU between February 2014 and May 2016. Patients with underlying congenital heart disease, sickle cell disease, neuromuscular disease and/or chronic lung disease were excluded. Data collection included demographics, intubation rates, vital signs, length of stay and medications. Effective treatment was characterized by decreases in heart rate and respiratory rate, accompanied by an increase in oxygen saturation. Data was first reviewed overall then stratified to bronchiolitic patients (< 2 years) and asthmatic patients (2–18 years) when analyzed.

Results: Twenty-six patients with bronchiolitis and 29 patients with asthma were included. The median duration of BCV therapy was 41 hours, (47 hours for bronchiolitics and 36 hours for asthmatics). Heart rate and oxygenation greater than 92% improved in both groups, while the respiratory rate decreased only in patients with bronchiolitis after the initiation of BCV therapy. The overall rate of intubation was 18.2% with more bronchiolitic patients requiring intubation.

Conclusions: Heart rate, respiratory rate (in bronchiolitics only) and oxygenation improved in patients who received BCV therapy indicating the benefit of BCV on work of breathing in asthmatics and bronchiolitics. Before the advent of BCV, some of these patients would have certainly required intubation. Therefore, the use of BCV therapy can assist in avoiding the costs and potentially injurious effects of mechanical ventilation in these patients.

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OXYGENATION PARAMETERS AS PREDICTORS OF MORTALITY IN PEDIATRIC VENTILATOR-ASSOCIATED EVENTS (VAES)

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Learning Objectives: Pediatric ventilator-associated events (VAEs) are associated with high mortality. While the definition of VAE includes increases in either FiO₂ and/or mean airway pressure (MAP), characterization of the widely used noninvasively obtained parameters of oxygenation such as oxygen saturation index (OSI) and SaO₂/FiO₂ (S/F) ratio in patients with VAE has not been previously described. We hypothesized that OSI and S/F ratio at onset of VAE would be predictive of mortality in children with VAE.

Methods: This is a single-institution, retrospective cohort study of children in the PICU, NICU, and CICU between 2011 and 2013 who met criteria for VAE (increase in either daily minimum FiO₂ by ≥25% or daily minimum MAP by ≥4 cm H₂O for ≥2 days following ≥2 days of stability or improvement in these parameters). Univariate logistic regression modeling and ROC analysis were used to estimate the association between 90-day mortality after diagnosis of VAE and the worst or average values of either OSI or S/F ratio at day -2 (prior to diagnosis of VAE) or at the day of onset (index date). Transient desaturation episodes were excluded from the calculations. We also analyzed oxygenation index (OI) and PaO₂/FiO₂ (P/F) ratios in the subset of patients who had those parameters available.

Results: We analyzed oxygenation parameters on days -2 and the index date of VAE in 55 children without cyanotic congenital heart disease. Among these 55 patients, 22 (40%) experienced 90-day mortality. We found both average and lowest S/F ratio on day -2 to discriminate and predict 90-day mortality, with area under the ROC curve of 0.656 ($p = 0.049$) and 0.672 ($p = 0.025$), respectively. The cutoff of average S/F ratio on day -2 of ≤247 provided 73% sensitivity and 52% specificity for discriminating 90-day mortality. Notably, the 90-day mortality rate among patients with average S/F ratio on day -2 ≤247 was 50%, as compared to a rate of 26% among patients with average S/F ratio on day -2 > 247. OSI and change in OSI or S/F ratio between day -2 and the index date were not found to predict 90-day mortality. There was no predictive accuracy of OI among the 29 patients who had OIs available.

Conclusions: Average and worst S/F ratio on day -2 can be used as predictors of 90-day mortality among children with VAE.

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