

Marked Reduction in Mean Airway Pressure and Oxygenation Index Using High Frequency Jet Ventilation in Neonates with Refractory Hypoxemic Respiratory Failure

P. Friedlich; N. Subramanian; M. Garg. Children's Hospital Los Angeles, Division of Neonatology. Keck School of Medicine, University of Southern California, Los Angeles, CA.

Infants are often referred to tertiary medical centers for severe hypoxemic respiratory failure unresponsive to optimal management with commonly used modes of ventilation. Infants with hypoxemic respiratory failure unresponsive to conventional and high frequency oscillatory ventilation (HFOV), not eligible for extracorporeal membrane oxygenation (ECMO), were placed on high frequency jet ventilation (HFJV). Ventilator management goals were to maintain SPO₂ 88-92% and PCO₂ 45-55 torr using the lowest permissive mean airway pressure (MAP) and FiO₂.

Methods: We recorded demographics, ventilator settings, blood gas analysis, and calculated oxygenation index (OI) prior to and during HFJV in eight consecutive infants placed on HFJV over a 12 month period between 1999-2000 were reviewed.

Results: Eight patients with mean birth weight 1063 g [650-2700 g], gestational age range 23-40 weeks, admitted on day of life (DOL) 32 ± 30 days were placed on HFJV on mean DOL 41 ± 35 days. All infants had heterogeneous lung disease with x-ray findings of overinflation. Six infants had BPD with acute pneumonia. One infant born at 28 weeks of gestation had hypoplastic lungs from oligohydramnios. One infant was term with streptococcal sepsis. Prior to HFJV, ventilatory MAP = 14.3 ± 3.7 cm H₂O, FiO₂ = 0.97 ± 0.06 and OI = 28.4 ± 13 . After 3 hours of HFJV, there was a statistically significant reduction in both MAP (10.9 ± 3.7 cm H₂O; $p < 0.001$) and OI (18 ± 11 ; $p < 0.02$). This statistically significant improvement was sustained at 6, 12, 24, 48 and 72 hours as well as one week. No significant changes in pH, PCO₂, or PO₂ before or during HFJV were noted. Significant decrease in FiO₂ from baseline were noted at 12 hours (0.62 ± 0.24 ; $p < 0.03$) and persisted at 24, 48 and 72 hours as well as one week of HFJV. One of the eight patients expired from septic shock.

Conclusion: In this population of neonates with severe lung injury, HFJV, allows the achievement of lower OI using lower MAP. We speculate that the successful management of these patients with HFJV is due to passive exhalation and the avoidance of "choke points". Passive exhalation in HFJV avoids airway collapse and avoids lung hyperinflation, a potential complication common with HFOV when airway resistance is high. Management with HFJV may be life-saving in this selected group of critically ill infants, especially if they are not candidates for advanced life support options such as ECMO.