

Oxygenation in Neonates with Hypoxemic Refractory Respiratory Failure (HRRF) After Switching from High-Frequency Oscillatory Ventilator (HFOV) to High-Frequency Jet Ventilator (HFJV)

Background

Extremely preterm infants often develop chronic lung disease (CLD) which may lead to hypoxemic refractory respiratory failure (HRRF). High-frequency oscillatory ventilation (HFOV) and high frequency jet ventilation (HFJV) has become the standard of care for supporting patients with respiratory failure in neonatal intensive care units. HFJV with high end-expiratory pressure may improve airway patency, lead to better gas distribution and improve gas exchange. This study will evaluate the response in infants with HRRF on HFOV, and evaluate whether there is an improvement in oxygenation by changing to HFJV.

Objective

To study the response of infants with hypoxemic refractory respiratory failure whose respiratory support was switched from high frequency oscillatory to jet ventilator.

Methods

An IRB approved prospective observation and retrospective data analysis of 15 infants from 1/2011 to 9/2013 was conducted for infants with HRRF who were started on HFJV. The data was collected while the patients were being switched from HFOV to HFJV and for 24 hours after the switch. Ventilator settings, oxygen saturations and oxygenation index (OI), were collected every 2 hours for 8 hours, then every 4 hours for 16 hours. Respiratory failure was defined as oxygenation index (OI) of > 20 with mean airway pressure (MAP) providing optimum lung expansion on HFOV. Oxygenation settings on the HFOV were compared to the settings on the HFJV initially and during the first 24 hours.

Results

Over 20 months, 15 neonates with mean gestation age of 25.1 weeks and birth weight of 723 grams qualified for the study. There was a significant decrease in the fraction of inspired oxygen (FiO_2) at 30 minutes (0.93 to 0.78, $p=0.01$), within initial 12 (0.64, $p<0.001$) and 24 hours (0.57, $p<0.001$) following the change to HFJV. There was, also, a decrease in the OI in the first 12 hours (37 to 19.6, $p=0.006$) and 24 hours (17.8, $p=0.005$) post change. MAP decreased within the first 24 hours (14.4 to 12.8, $p=0.06$). Median postnatal age at change to the HFJV was 15 days and patients remained on the Jet ventilator for an average of 12 days.

Conclusion

A tremendous decrease in FiO_2 necessary to maintain adequate oxygenation, and OI's was seen when patients with hypoxemic refractory respiratory failure were changed from HFOV to HFJV. This may lead to improved survival and decreased co-morbidities.