

# High Frequency Jet Ventilation (HFJV) In Mature Infants With Non-Homogeneous Lung Disease And Severe Gas Trapping

Loughnan, Peter M. Dept of Neonatology, Royal Children's Hospital, Melbourne 3052, Vic. Australia.

Infants with gas trapping are difficult to manage with conventional ventilation (CMV). HFJV has been used successfully in infants with severe gas trapping. The techniques used during HFJV in this situation are often described as a "low volume strategy". However, there is little published data to indicate optimal ventilator settings, both Jet and conventional, to achieve these aims.

During HFJV the following parameters must be set: CMV: Rate per min (R) Insp. time (TI), Peak insp. pressure (PIP) and PEEP. Jet: R, TI (on time), PIP. This presentation will report details of blood gas, oximetry (SaO<sub>2</sub>), and transcutaneous partial pressure of carbon dioxide (TcPCO<sub>2</sub>), which occurred in response to abrupt changes in one of the above parameters. The observations were made in three patients with non-homogeneous lung disease and obvious gas trapping on x-ray. The Jet TI was .02 secs throughout. All ventilator pressures are in cmH<sub>2</sub>O. Ventilators used were the VIP Bird and Bunnell Life Pulse ventilators.

**Change in Jet rate.** In a patient with meconium aspiration syndrome, a change in Jet rate from 540 to 360 resulted in a decrease in TcPCO<sub>2</sub> from 120 to 60 over 15 mins. Jet ventilator settings were R 540, PIP 38, and CMV settings were PIP 40, R 10, PEEP 10, TI 0.8 sec. Monitored PEEP was 13. CV PEEP was 9.

**Change in Jet PIP.** In a patient with diaphragmatic hernia, a change in Jet PIP from 37 to 34 resulted in a decrease in TcPCO<sub>2</sub> from 120 to 60, and SaO<sub>2</sub> increased from 87 to 99 within 15 mins. Jet settings were R 420, PIP 37, and CMV settings were R4, PIP 35, PEEP 8, TI 1.0 sec. Monitored PEEP was not documented. Prior to the reduction in Jet PIP, the Jet was not being interrupted during conventional breaths.

In a patient with complex upper airways obstruction a reduction in Jet PIP from 45 to 33 resulted in a similar decrease in TcPCO<sub>2</sub>. The TcPCO<sub>2</sub> rapidly increased when Jet PIP was again increased to 45. Since the CMV PIP was 35, the reduction in Jet PIP from 45 to 33 caused interruption of the Jet during CMV breaths.

**Change in conventional ventilator rate.** The same infant the following day had another episode of CO<sub>2</sub> retention. Although a CMV PIP of 35 produced an adequate tidal volume and chest wall movement, a Jet PIP of 45 or more was required for CO<sub>2</sub> removal. With these settings there was no interruption of the Jet during conventional breaths. CMV R was 4. Severe CO<sub>2</sub> retention occurred, reaching 220. Monitored PEEP was 15, CV PEEP was 12. Turning the CV rate to zero resulted in an abrupt decrease in TcPCO<sub>2</sub> which reached 55 within 20 mins. Monitored PEEP fell to 12.5 within 2 mins.

**Conclusion:** During HFJV in patients with severe gas trapping: 1) The Jet rate should

be kept as low as possible. 2) The Jet PIP should be below the CMV PIP to avoid "breath stacking". 3) If this is not possible, a CMV rate of zero should be considered, even if this requires a higher PEEP. 4) A significant difference (> 2 cm H<sub>2</sub>O) between the monitored PEEP and the delivered PEEP indicates likely acute gas trapping using the new jet adaptor.