

the longest duration of respiratory support. Nasal injury is usually mild and resolves with cessation of NCPAP. It can however lead to permanent disfigurement with long term functional sequelae. High flow nasal cannulae (HFNC) offer an alternative modality of respiratory support and may allow for decreased infant handling and less nasal trauma than NCPAP.

**Methods** 132 ventilated infants < 32 weeks of gestation were randomised to receive either HFNC (N=67) or NCPAP (N=65) following primary extubation. A nasal trauma score was adapted from Kaufman [EPAS 2007:61390] and validated. Nasal trauma scores were recorded for 7 days post-extubation (Figure 1). Each episode of prong repositioning was recorded for 72 hours post-extubation.

### Results

#### Abstract 397 Table 1

	HFNC N=67	NCPAP N=65
Mean Nasal Trauma Score (SD)	3.12 (7.16)	11.81 (10.71)*p<0.001
Mean Prong repositions (SD)	8.25 (3.25)	16.69 (6.29) *p<0.001

**Conclusions** HFNC results in significantly less nasal trauma and fewer prong repositions than NCPAP. These are important benefits that should be considered especially if HFNC and NCPAP are demonstrated to be equally efficacious for post-extubation respiratory support in preterm infants.

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#### SEVEN VENTILATORS DELIVERING NASAL CPAP CHALLENGED WITH LEAKAGE: AN EXPERIMENTAL PILOT STUDY

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**Introduction** Nasal Continuous Positive Airway Pressure (nCPAP) is an established treatment for respiratory distress in neonates. Most modern ventilators are able to provide nCPAP. Compared to traditional nCPAP delivery systems ventilators are more complex and allow correction for leakage. There have been no large studies examining the response to leakage for nCPAP delivered by ventilators. The aim of this pilot study was to compare pressure stability for nCPAP delivered by ventilators using simulated neonatal breathing and constant leakage.

**Methods** Neonatal breathing was simulated by using a mechanical lung simulator. Seven ventilators were tested with recommended prongs, humidifier and tubing. Tests were performed with a breath profile from a 3.4 kg infant and nCPAP of 4 cm H<sub>2</sub>O. Constant leakage at 1-2-3-4 l/min was introduced after 30 breaths. Pressure stability was measured as pressure increase and decrease from mean pressure. Leakage stability was measured as change in mean pressure. Calculations were performed for each breath.

**Results** The pressure stability of the tested ventilators showed large variations before introducing leakage. Fabian, Evita XL and SERVO-i were the most pressure stable systems (with and without leakage). Changes in mean pressure with leakage also showed large variations. Four of the ventilators had leakage compensation.

**Conclusion** The tested ventilators showed large variations in pressure stability and ability to maintain pressure when exposed to leakage. Ability to maintain mean pressure and provide pressure stable nCPAP are different aspects of nCPAP systems. Being able to compensate for leakage does not necessarily give more pressure stable nCPAP.

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#### AUTOMATIC CONTROL OF THE INSPIRED OXYGEN FRACTION IN PRETERM INFANTS. PRELIMINARY RESULTS OF A MULTICENTER RANDOMIZED CROSS-OVER TRIAL

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**Background and Aims** In preterm infants receiving supplemental oxygen, manual control of the inspired oxygen fraction is often time-consuming and inappropriate. We developed a system for automatic oxygen control (FiO<sub>2</sub>-Controller) and hypothesized that this system is more effective than routine manual oxygen control in maintaining target arterial oxygen saturation levels.

**Methods** We performed a multicenter randomized controlled cross-over clinical trial in preterm infants receiving mechanical ventilation or nasal continuous positive airway pressure and supplemental oxygen. Periods with routine manual oxygen control (period 1) were compared to periods of routine manual oxygen control supported by the FiO<sub>2</sub>-Controller (period 2).

**Results** Preliminary results including 18 patients are presented. The median (range) percentage of time with arterial oxygen saturation levels within target range (90–95%) was 59.3% (37.9–99.5) for period 1, and 69.4% (43.8–95.4) for period 2. Final analysis including significance testing is pending.

**Conclusions** Automatic oxygen control may improve oxygen administration to preterm infants receiving mechanical ventilation or nasal continuous positive airway pressure.

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#### OSCILLATION TRANSMISSION AND VENTILATION DURING FACE MASK-DELIVERED HIGH FREQUENCY OSCILLATORY VENTILATION IN INFANTS: A BENCH STUDY WITH ACTIVE LUNG SIMULATOR

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**Background** Noninvasive high frequency oscillatory ventilation (nHFOV) has been applied through nasal prongs as a new respiratory technique in preterm neonates and has been found to reduce CO<sub>2</sub>, but it has never been studied in bigger infants. Its mechanical properties when applied through a face mask are not known.

**Methods** We modeled the application of face mask-nHFOV in infants using a pediatric mannequin connected to an active lung simulator (ASL5000). This was set mimicking the mechanical properties of a normal lung (Cr<sub>s</sub> 1 mL/cmH<sub>2</sub>O/Kg; Raw: 40 cmH<sub>2</sub>O/L/sec; P<sub>mus</sub> 6 cmH<sub>2</sub>O; rate: 40 breaths/min) in a male infant at 1 year, 8 Kg, 3<sup>rd</sup> percentile for age. nHFOV parameters were sequentially changed. Spontaneous tidal volume (sTv), oscillatory stroke volume (oTv) and oscillation amplitude (DeltaPdist) at the lung simulator were recorded. Oscillatory pressure ratio (OPR: DeltaPdist/DeltaP) and the theoretical ventilation during HFOV (DCO<sub>2</sub>=frequency x oTv<sup>2</sup>) were also calculated.

**Results** Mean oTv, OPR and DCO<sub>2</sub> were 1.9±0.7 mL/Kg, 0.05±0.02 and 221±136 Hz x mL<sup>2</sup>/Kg, respectively. Significant correlations were found between OPR and oTv (r=0.48; p<0.001) and OPR and DCO<sub>2</sub> (r= 0.47; p<0.001). oTv significantly correlates with sTv (r=0.885; p<0,001). At a multivariate regression OPR was the factor more strongly associated with oTv (st.β=0.88) and DCO<sub>2</sub> (st. β=0.96; p<0.001).

**Discussion** nHFOV through face mask is feasible. Oscillation amplitude is dampened by the interface and may reach in the lung 11% of the set value. Nonetheless, in this model adequate Tv and DCO<sub>2</sub> are reached and OPR was the factor more strongly influencing ventilation.