www.hamilton-medical.com/G5

Neonatal Ventilation

Support neonates non-invasively over nasal CPAP

The breathing pattern of very premature infant are frequently erratic and inadequate.The use of nasal CPAP with the HAMILTON-G5 effectively supports the breathing of preterm infants. It results in a decreased work of breathing, stabilized chest wall, improved asynchornous motion between chest and abdomen and improves tidal volumen and minute ventilation. nCPAP-PS mode enables you to perform CPAP and NIPPV, known for its positive effects on recruitment and airway stabilization .

Volume Targeted Ventilation

Inflammation caused by lung overdistension (volutrauma) is thought to be important in the pathogenesis of bronchopulmonary dysplasia (BPD). Preterm infants with variable lung compliance are particularly at risk. The HAMILTON-G5 with Volume targeted ventilation delivers consistent, appropriate tidal volumes as low as 2 ml with the goal of reducing lung damage. This lung protective type of ventilation can provide an effective, safer means of ventilating the neonatal patient.

Proximal Flow Sensor and CO_2 Monitoring

The HAMILTON-G5 with its proximal flow sensor provides responsive and accurate airway flow triggering and volume monitoring. Flow triggering at the proximal airway offers the sensitivity and response time that is required for tiny premature infants with rapid respiratory rates. This enhances ventilator-patient synchrony and reduces work of breathing in neonates. Also, continuous noninvasive monitoring of end-tidal and volumetric CO_2 reduces the need for arterial blood sampling. The sidestream CO_2 monitoring option is especially helpfull for neonates.

Heliox

Helium Oxygen gas mixtures facilitate ventilation with obstructive diseases. Heliox through the HAMILTON-G5 can decrease work of breathing (WOB) in tiny premature infants with obstructive lung disease such as BPD and reactive airway disease. Reducing the neonate's WOB can decrease calorie expenditure which is important in our tiny patients. Heliox has been demonstrated to reduce respiratory distress scores, reduce airway resistance and facilitate CO_2 removal.[5]

NEO

Neonatal Ventilation
The HAMILTON-G5 accurately achieves volumes as small as 2 ml in order to support the smallest patients.

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HAMILTON·G5

Intelligent Ventilation

Safe and Intuitive Neonatal Ventilation

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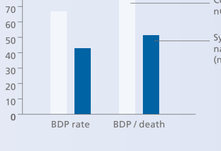

Reducing the risk of BPD
The use of synchronized nasal intermittent positive pressure ventilation (IPPV) as implemented in the HAMILTON-G5 with nCPAP-PS mode reduces the risk of BPD and BPD/death significantly in babies with very low birth weight.[8]

IntelliTrig
Changing breathing patterns or circuit leaks are a challenge in non-invasive ventilation.
With the innovative IntelliTrig technology, the HAMILTON-G5 automatically responds to varying leaks and adapts sensitivity thresholds for optimal response to the neonates breathing pattern.

Clinical benefits for infants

The neonatal option expands your ventilator's patient range down to the tiniest infants and premature babies. The HAMILTON-G5 proximal flow sensing meets the needs of your smallest patients by providing precise volume and leak monitoring with accurate responsive triggering with IntelliTrig. The excellent nCPAP qualities and sidestream capnography of this ventilator provides you with a very wide range of diagnostic and therapeutic options for treating your most sensitive patients. The integrated Heliox option allows Heliox-Therapie with accurate monitoring of tidal volumes.

Improve patient outcome

Use of protective tidal volumes, 4–6 ml/kg in preterm infants, has been shown to reduce ventilator length of stay, incidence of BPD and pneumothorax.[1,2] Stability of tidal volume is especially important in avoiding hypocarbia and volutrauma associated with rapid changes in compliance due to clearing of lung fluid and surfactant administration.[3] All monitored data and waveforms on the HAMILTON-G5 are based on proximal airway measurements.[3] Work of breathing (WOB) and synchrony are enhanced with flow and pressure trigger sensitivity reduced to 0.1 lpm / 0.1 cm H_2O respectively. Endtidal and volumetric CO_2 measurements not only reduce blood gas frequency, but provide measurement of dead space and CO_2 elimination. Precise spirometric displays of volumetric capnograms are provided.[4]

Reduce complexity in your hospital

The HAMILTON-G5 provides ergonomically advanced features to help the clinician assess complex situations into easy to understand information. Our Graphic User Interface simplifies the interaction between hospital caregivers and the ICU ventilator, thereby eliminating many of the chances of human error in the process of delivering respiratory care. This award winning user interface is scientifically proven to reduce workload and im prove safety.

[1] McCallion N et. al, Volume-targeted versus pressure-limited ventilation in the neonate. Cochrane review, Issue 3, 2005
[2] Martin Keszler, Volume-targeted ventilation. NeoReviews Vol.7 No.5 May 2006
[3] Cheifetz Ira M. et. al. Tidal Volumes For Ventilated Infants Should Be Determined with a Pneumotachometer Placed at the Endotracheal Tube. Am J Respir Crit Care Med Vol 162. 2000
[4] Bhat Y R, Abhishek N. Mainstream end-tidal carbon dioxide monitoring in ventilated neonates. Singapore Med J 2008; 49(3)
[5] Kneyber et. al, Mechanical ventilation with heliox decreases respiratory system resistance and facilitates CO_2 removal in obstructive airway disease. Intensive Care Med (2006) 32
[6] International Design Excellence Award. www.idsa.org
[7] Tassaux, D et.al. Evaluation of the user-friendliness of new generation ICU ventilators. Intensive Care Med 2008; 34: S140
[8] Bhandari V., et al. Pediatrics, 2009;124:517-526.

Technical Specifications

Controls	
Ventilation modes	nCPAP-PS, SPONT, APVcmv, APVsimv, P-SIMV, DuoPAP, APRV, P-CMV
Special functions	Manual breath, O_2 enrichment standby, sigh, apnea backup ventilation, fully compensated heliox application in all modes
APVcmv and P-CMV rate	1 to 150 b/min
APVsimv, P-SIMV, DuoPAP rate	1 to 80 b/min
Target tidal volume	2 to 200 ml
PEEP/CPAP (P low)	0 to 25 cmH_2O (DuoPAP and APRV)
Oxygen	21 to 100%
Inspiratory time (Ti)	0.1 to 10s (10 to 80% of cycle time)
T low (APRV)	0.1 to 30 s
T high (DuoPAP and APRV)	0.1 to 30 s
Pressure trigger	0.1 to 10 cmH_2O below PEEP/CPAP
Flow trigger	0.1 to 5 l/min
Time	I:E
Automatic base flow	4 to 10 l/min, depending on flow trigger
Pressure control	3 to 100 cmH_2O, added to PEEP/CPAP
Pressure support	0 to 100 cmH_2O, added to PEEP/CPAP
P high (DuoPAP and APRV)	0 to 50 cmH_2O
Pressure ramp	25 to 200 ms
Expiratory trigger sensitivity (ETS)	5 to 70 % of inspiratory peak flow

Alarms	
Operator-adjustable	Low/high minute volume, low/high pressure, low/high tidal volume, low/high rate, apnea time, low/high $PetCO_2$, %leak
Special alarms	Oxygen concentration, disconnection, loss of PEEP, exhalation obstruction, check settings, Flow Sensor alarms, APV, CO_2, power supply, batteries, gas supplies
Loudness	Adjustable (1–10)

Ventilation Cockpit	
Numeric monitoring	50 monitoring parameters can be displayed (see monitoring parameters)
Real-time waveforms and loops	Simultaneous display of up to 8 waveforms or up to 4 loops based on: volume, flow, airway pressure, auxiliary pressure, CO_2 or reference loops
Trending	Simultaneous display of up to 17 parameter trends, selected from all 50 monitoring parameters for 1, 12, or 24 hours
Others	Graphic freeze and cursor function, inspiratory/expiratory hold user configurable default graphics layout

Monitoring parameters	
Pressure (cmH_2O / mbar)	Airway pressure (Paw)*, auxilary pressure (Paux)*, peak airway pressure (Ppeak), mean airway pressure (Pmean), minimum airway pressure (Pminimum), plateau airway pressure (Pplateau) PEEP/CPAP
Flow (l/min)	Real time inspiratory flow*, inspiratory peak flow (Insp Flow), expiratory peak flow (Exp Flow)
Volume (ml)	Real time tidal volume*, expiratory tidal volume / spont. VTE (VTE / VTEspont), expiratory minute volume / spont. minute vol. (ExpMinVol / MVspont), leakage volume at the airway (Vleak)
Time	I:E ratio, total breathing frequency (fTotal), spontaneous breathing frequency (fSpont), inspiratory time (TI), expiratory time (TE),
Lung mechanics	Static compliance (Cstat), airway occlusion pressure (P0.1) intrinsic PEEP (AutoPEEP), pressure time product (PTP), expiratory time constant (RCexp), inspiratory time constant (RCinsp), expiratory flow resistance (Rexp), inspiratory flow resistance (Rinsp), rapid shallow breathing index (RSB), Imposed work of breathing (WOB)
Oxygen	Airway oxygen concentration (FiO_2)
CO_2 (option)	Real time CO_2 measurement (FCO_2 / PCO_2), end-tidal CO_2 ($PetCO_2$ / $FetCO_2$), V/Q status of the lung ($slopeCO_2$), alveolar tidal ventilation (Vtalv), alveolar minute ventilation (V'alv), CO_2 elimination (V'CO_2) airway dead space (VDaw), Dead space fraction (VDaw/VTE), exhaled volume of CO_2 ($VeCO_2$), inspired volume of CO_2 ($ViCO_2$)
SpO_2 (option)	Pulse oximetry (SpO_2 sensor)

* real time values displayed as waveforms

CO_2 sidestream capnography
This option enabels monitoring the sampling of the expiratory gases of non-intubated neonates, receiving simultaneous oxygen administration using nCPAP. The sensor can easily be attached at the HAMILTON-G5 hand rail.

Heliox
The HAMILTON-G5 takes the risk out of heliox administration by correcting automatically the ventilator's gas delivery and volume monitoring. The blue 360° visible alarm lamp indicates heliox application and gas supply management.