

ICU

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PLUS

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Country Focus: Denmark





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LUNG PROTECTIVE VENTILATION

TWINSTREAM® PULSATILE BI-LEVEL VENTILATION (P-BLV)

The Twinstream® ventilator (Carl Reiner GMBH, Vienna, Austria) is an electric-driven microprocessor-controlled jet ventilator, which allows simultaneous application of two different jet streams (low frequency and high frequency), resulting in a pulsatile Bi-Level Ventilation (p-BLV) mode. ICU Management & Practice spoke to Prof. Dr. Gerfried Zobel about his experiences with the system in the Paediatric ICU at the Children's Hospital in Graz, Austria.

Which patient groups could potentially benefit from pulsatile Bi-Level Ventilation (p-BLV)?

In the Paediatric ICU infants and children with ARDS, SARS, SARS-like disease with occluded airways, plastic bronchitis, pulmonary barovolotrauma, thoracic trauma, and burn inhalation injury.

How would you summarise your experience with this technology?

Pulsatile-BLV using the Twinstream ventilator significantly increased the clearance of airway debris and secretions associated with improved gas exchange in infants and children with different forms of acute hypoxic acute respiratory insufficiency.

Hypoxaemia is a common finding in the paediatric intensive care unit and may result from paediatric acute lung injury/paediatric acute respiratory distress syndrome (P-ALI, P-ARDS), infection, sepsis and postoperative complications. In addition, these infants and children may have problems with airway secretions. These patients frequently do not respond to standard ventilatory techniques and additional therapies such as inhaled nitric oxide, inhalation, prone positioning and recruitment manoeuvres. Hence our decision to use a jet ventilation system.

How does this technology differ from conventional mechanical ventilation approaches and what are its advantages?

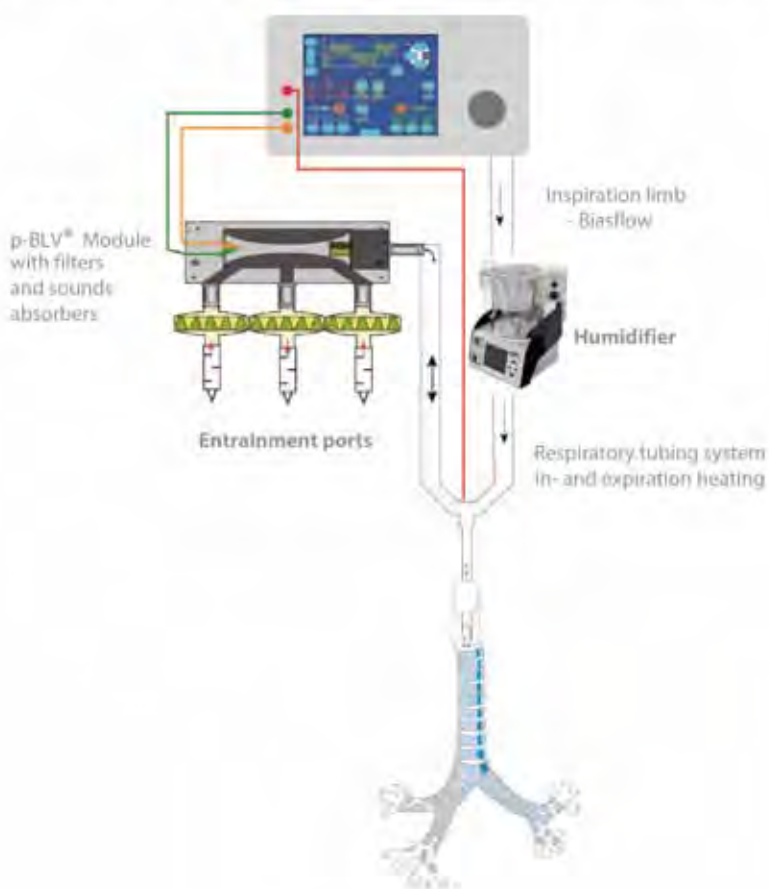
A variable bias flow warmed and humidified in the inspiratory limb of the breathing circuit

reaches the y-piece connected to the endotracheal tube. The expiratory limb of the breathing circuit is connected with the p-BLV module® and the inspiratory bias flow is modified by two jet streams, resulting in an oscillating gas column to the patients' airways. In addition the p-BLV module® acts as a pneumatic-driven PEEP generator (See image).

Would you recommend using this technology as an alternative / supportive therapy to ECMO?

Use of Pulsatile BLV might avoid the need for ECMO support and it might improve mobilisation of airway secretions on ECMO, eventually resulting in shorter periods on ECMO.

TwinStream™ with Pulsatile Bilevel Ventilation Module



Would you share with us a patient case where pulsatile Bi-Level Ventilation (p-BLV) has made a difference?

Case Report

Down syndrome with congenital heart defect
Ventricular Septal Defect closure 2002

Actual history

13-year old girl, fever, coughing, wheezing, increasing fatigue, tachypnea

Chest x-ray:

overinflation, signs of bronchitis and peribronchitis

Inflammatory parameters: Leukocytes: 35.87 G/L, CRP: 113 mg/L

Therapy

Bronchodilators
Intravenous steroid application
Oxygen application

Transfer to PICU

Silent lung in flat position
Massive wheezing in sitting position
Oxygen therapy 8L/min → SpO₂: 85-90%
Agitation
Exhaustion despite noninvasive ventilation (NIV) support
Sedation-Analgesia → Endoscopic intubation (6.5 mm+cuff) and invasive mechanical ventilation

Antibiotic strategy: Cefuroxime, clarithromycin

Mechanical ventilation

Noninvasive mechanical ventilation (NIV)

NIV 6 hours

Invasive mechanical ventilation 14 days

Conventional mechanical ventilation - 281 hours

Pulsatile bilevel lung ventilation - 37 hours

Weaning - 25 hours

Extubation

Postextubation period

NIV - 4 hours

High flow nasal cannula (HFNC) - 12 hours

Adjuvant therapy-Inhalation

Initially salbutamol inhalation – side effects: tachycardia, hypotension

Mucoclear 3 and 6% inhalation: every 3 to 4 hours

Deoxyribonuclease (Dnase) nebulisation every 12 hours

Inhaled r-tPA every 6 hours

Endoscopic lavage 3x

Systemic steroid medication

Diagnosis

Mycoplasma pneumonia with acute hypoxic respiratory failure

Tenacious secretions

Inflammatory bronchial casts

Multiple atelectasis and regional overinflation

Ventilation/perfusion imbalance

Intrapulmonary right to left shunts

Diffusion limitation

Pulsatile BiLevel Ventilation-pBLV

Improved mobilisation of tracheo-bronchial mucous casts

Reopening of atelectasis

Improvement of V/Q mismatch

Improved oxygenation

Adequate CO₂-elimination



TwinStream ICU® p-BLV®

*TwinStream® ICU provides:
Lung Protective Ventilation
Strategy for Infant, Paediatric and
Adult patients with:*

- RDS (Respiratory Distress Syndrome) and ARDS (Acute Respiratory Distress Syndrome)
- Any kind of oxygenation problems in ICU
- Atelectasis after conventional long term ventilation
- Bronchial Fistula

For more details, please contact us at office@carlreiner.at
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CARL REINER
Medical Technology for Diagnosis and
Therapy Manufacture of Surgical
Instrument

TwinStream[®] ICU

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