HIGH -FREQUENCY OSCILLATORY VENTILATION

BY
MELISA KWENDO
AND
JANE GICHURU
OUTLINE

• INTRODUCTION
• THEORY AND PRINCIPLES
• HOW DOES HFOV WORKS
• SUMMARY
ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS) is one of the critical diseases in pediatric intensive care units (PICUs) and is associated with high mortality. A recent report indicated that the mortality due to ARDS had significantly reduced over the past two decades but continued to be high at 20%–40% and was even higher in severe patients, classified based on the severity stratification of the Berlin.
Since its introduction in neonatology in 1981, including 8 new-born with ARDS, various studies have been carried out to evaluate efficacy and safety of HFOV in relation to CMV in prematures. These studies present highly variable results. Since the onset it was well established that, just as in adults and in older children, MAP applied during HFOV had a direct correlation with oxygenation, therefore the high values of MAP permitted ventilation with low FiO2 and no major hemodynamic aftermaths were observed. It was noted that in prematures a given MAP needed to achieve and sustain alveolar expansions, could be maintained.
• As lung pathology evolves we need to increase pressure and volume on already compromised lung leading to ventilator induced lung injury (vili)

• To prevent VILI, HFOV has been introduced as a lung protective strategy.

HFOV IS A FORM OF VENTILATION WITH SUPRA PHYSIOLOGICAL RATES ABOVE 150B/MIN AND TIDAL VOLUMES LESS THAN DEAD SPACE.
• The two primarily variables that control ventilation are:

  • Tidal volume (ΔP or amplitude)
    • Controlled by the force with which the oscillatory piston moves. (represented as stroke volume or ΔP)

  • Frequency (λ)
    • Referenced in Hertz (1 Hz = 60 breaths/second)
    • Range: 3 - 15 Hz
HOW DOES HFOV WORKS

• A CPAP system with piston displacement of gas

• Active exhalation

• Tidal volume less than anatomic dead space (1 to 3 ml/kg) to prevent alveolar overdistension and volutrauma

• Rates of 180 – 900 breaths per minute

• Lower peak inspiratory pressures for a given mean airway pressure as compared to CMV to reduce baratruma

• Decoupling of oxygenation & ventilation
Indication of hfov

• Inadequate oxygenation that cannot safely be treated without potentially toxic ventilator settings and, thus, increased risk of VALI.

• Objectively defined by:
  • Peak inspiratory pressure (PIP) > 30-35 cm H₂O
  • F₁O₂ > 0.60 or the inability to wean
  • Mean airway pressure (Paw) > 15 cm H₂O
  • Peak end expiratory pressure (PEEP) > 10 cm H₂O
  • Oxygenation index > 13-15

• AND OTHERS
Potential Complications of HFOV

• The higher intrathoracic pressures with HFOV may decrease RV preload and require volume administration ± inotropic support.

• Pneumothorax

• Migration/displacement of ETT

• Bronchospasm

• Acute airway obstruction from mucus plugging, secretions, hemorrhage or clot.


Duke Ventilator Management Protocol
“Thanks for being my friend, Wayne.”