

High Frequency Jet Ventilation and High Frequency Flow Interruption Differences in Comparison to High Frequency Oscillatory Ventilation

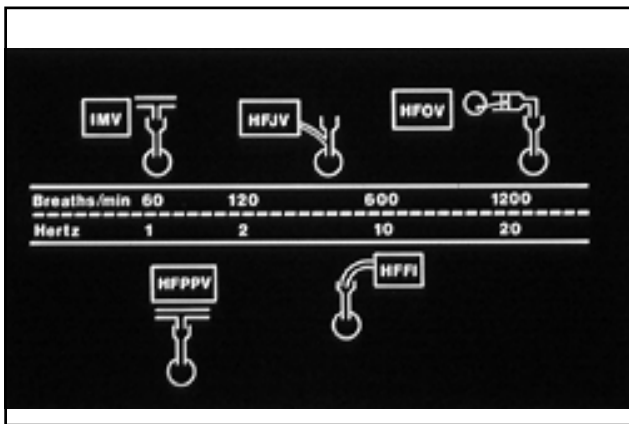
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Active Exhalation

- HFOV

Passive Exhalation

- Jet
- HFFI

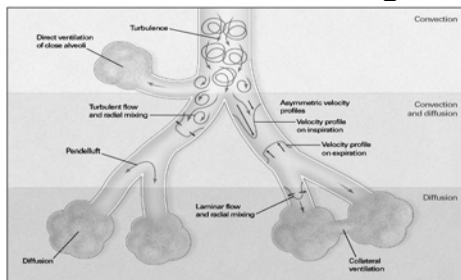


Adjustable Variables in HFV

Ventilator	Type	dP/Vol	Rate	I Time	Paw
SM 3100A	HFO	Yes Yes	Yes	Yes	
PVDR	HFFI	Yes	Yes	Yes	No*
Life Pulse	HFJ	Yes	Yes	Yes	No*

* via IMV PEEP

HFV and Gas Exchange



Slutsky & Drazen, NEJM 2002

Similarities and Differences between Ventilators

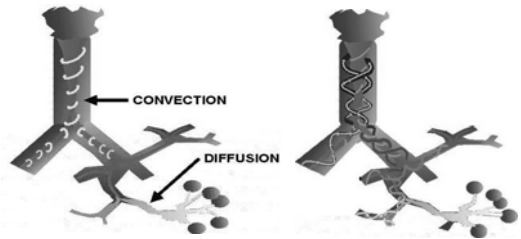
Bronchotron® I Patient Connector: Phasitron

- Used for both CMV & HFV
 - Sliding venturi
 - Peep valve
 - Entrainment port
 - Nitric Oxide ports



Jet

Gas entering the lungs travels centrally, while gas leaving the lungs swirls around it



Active versus Passive Exhalation

- A. Air trapping
- B. Choke Points
- C. Inspiratory to expiratory ratios

Wave Form Production

Jet
HFOV
HFFI

Tidal Volume

Oscillator

- Decrease frequency increases tidal volume
- Increase amplitude increases tidal volume

HFFI

- Frequency changes similar to HFOV but less significant

HFJV tidal volume
fixed not altered by
rate

Mean Airway Pressure

Oscillator

- Obstruct outflow
- Minimally effected by amplitude or frequency

Mean Airway Pressure

Jet

- Combination of PEEP from conventional ventilator and PIP and rate

Mean Airway Pressure

HFFI

- PEEP plus PIP and rate

Oxygenation

1. FiO_2 – same for all three
2. Mean Airway Pressure
 - A. Increasing Mean for inadequate lung expansion improves PaO_2 – same for all three

3. Amplitude – little effect on oxygenation unless
 - A. Inadequate lung expansion
 - B. Non-homogenous lung disease

Same for HFO + HFFI; Jet uses conventional breaths for recruitment as increased amplitude has little to no effect on PaO_2

4. Frequency – No effect unless too high and causes air trapping the PaO_2 decreases same for all three

Ventilation

1. Amplitude/Tidal Volume - Increasing will decrease $PaCO_2$ – same for all three
2. Mean Airway Pressure – No effect on Ventilation unless too low – same for all three
3. Frequency – Decreasing frequency increases $PaCO_2$ – same for HFJV, HFFI- $PaCO_2$ decreases with HFOV

Complications

Air Trapping

HFJV – Breath stacking when IMV breaths used

High rates typically lower than with HFOV or HFFI

HFOV and HFFI - High rates typically ≥ 10 Hz with airway disease

Choke point when mean airway pressure too low and amplitude too high > 3 to 1 Amp to PAW

Strategies for Clinical Management

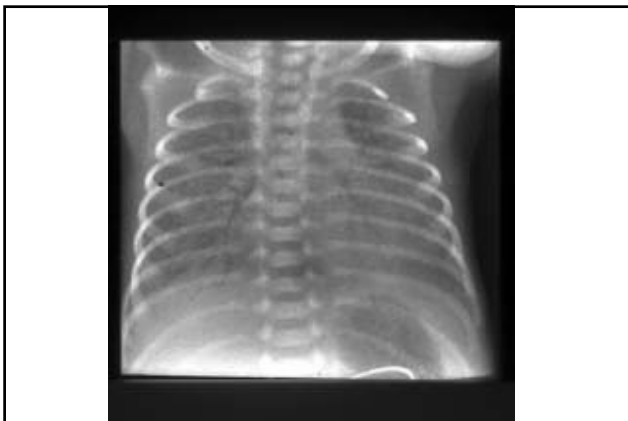
Diffuse Alveolar Disease

- Premature
- Mean airway pressure 1-2 cm H₂O > CV
- Frequency 10-15 Hz HFOV HFFI
- 8-10 Hz Jet
- Delta pressure - chest wall movement



Term/Near Term

- Mean airway pressure 2-4 cm H₂O > CV
- Frequency 8-10 Hz Jet 6-8 Hz
- Delta pressure - chest wall movement



Air Leak

Premature:

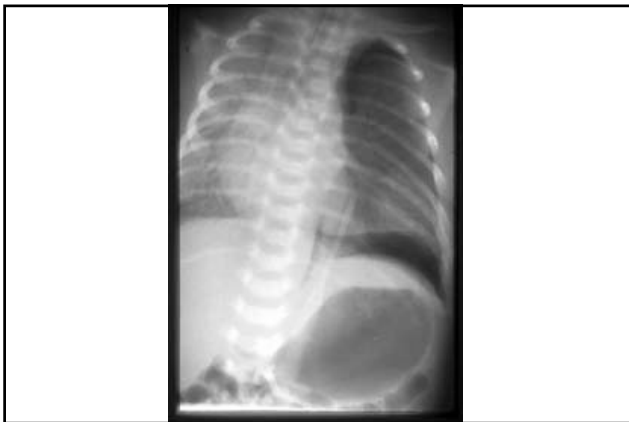
- PIE
 - Mean airway pressure 1 cm H₂O < CV
 - Frequency 10-15 Hz, 8-10 Hz Jet
 - Delta pressure - minimal chest wall movement



Premature

Gross air leak

- Mean airway pressure = or 1 cm H₂O > CV
- Frequency 10-15 Hz, 8-10 Hz Jet
- Delta pressure - chest wall movement



Term/Near Term

- Gross air leak generally poor inflation
- Mean airway pressure 1-2 cm H₂O > CV
- Frequency 8-10 Hz, same all 3
- Delta pressure - chest wall movement



Term/Near Term

- Gross air leak adequate inflation
- Mean airway pressure = or 1 cm H₂O < CV
- Frequency 8-10 Hz, same all 3
- Delta pressure - chest wall movement



Non-Homogeneous Lung Disease

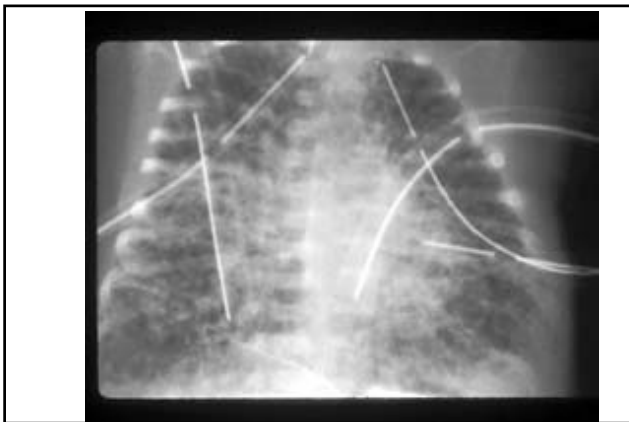
- Meconium aspiration with air trapping

Mean airway pressure = to CV

Frequency 6 - 8 Hz, same for HFFI

HFJV typically uses addition of conventional breaths, rate 5-6 Hz

Delta pressure - good chest wall movement



Non-Homogeneous Lung Disease

- Meconium aspiration diffusely hazy

Mean airway pressure 2-5 cm H₂O > CV

Frequency 6-10 Hz, same HFJV and HFFI

Delta pressure - good chest wall movement

