# Weaning Strategies for HFOV

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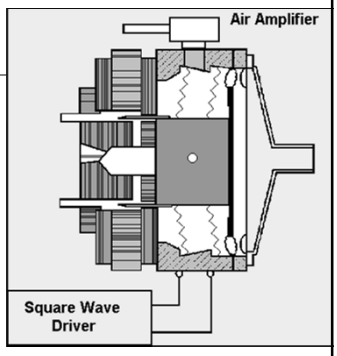
## Specification of HFOV

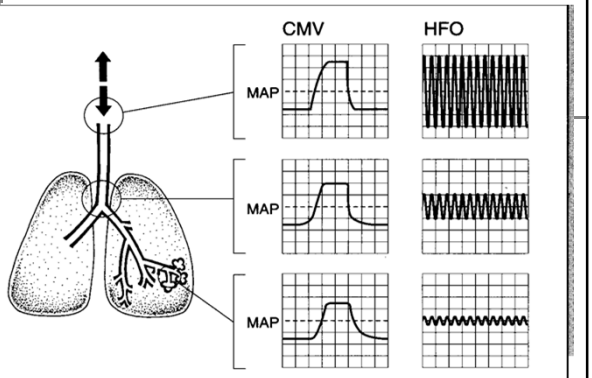
(Sensor Medics Model 3100 A)

- Amplitude range 0-100 $cmH_2O$
- Frequency 3-15 Hz
  (180-900 cycles/min)
- Ti 33-50 % of total cycle time
  (I : E of 1:2 to 1:1)
- MAP 3- 45 $cmH_2O$
- Bias gas flow 0-40 L/min

## SensorMedics 3100B

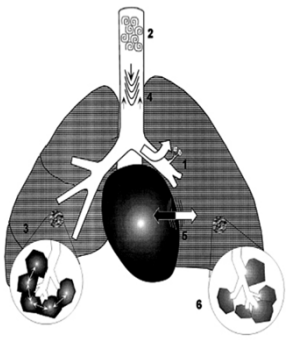
- Electrically powered, electronically controlled piston-diaphragm oscillator
- Paw of 5 - 55 cmH2O
- Pressure Amplitude from 8 - 130 cmH2O
- Frequency of 3 - 15 Hz
- % Inspiratory Time 30% - 50%
- Flow rates from 0 - 60 LPM






**HFOV : decreasing in pressure amplitude from trachea to alveoli**

## Mechanism of gas transport during HFV




1. **direct bulk flow (convection)**
2. **longitudinal (Taylor) dispersion**
3. **pendeluft**
4. **asymmetric velocity profiles**
5. **cardiogenic mixing**
6. **molecular diffusion**

## The benefit of HFOV in ARDS/ALS

- High volume strategy will recruit the atelectatic lungs
- Decreasing of tidal volume and pressure swing will reduce the lung injury and air leak syndrome
- The different flow pattern of HFOV will improve ventilation-perfusion matching

(New Horizons 1999;7:359)

## Ventilator Strategies - Goals

- Normalize lung volume
- Minimize peak ventilator pressures

Physiological targets included:

- Oxygen Saturation **>** 88%
- Delay weaning mPaw until FiO2 **<** 50%
- pH **>** 7.15
- PaCO2 in the range of 40 – 70 mmHg

## Initial HFOV setting in DAD/ARDS

- $FiO_2$ 1.0
- Frequency 5-15 Hz
- Inspiratory time (Ti) 33 % (1:2)
- Paw 5 $cmH_2O$ > in mode CMV
- Bias gas flow $\geq$ 20 L/min
- Pressure amplitude : adjust to provide adequate chest wall movement and/or $PaCO_2$ 40-70 (Start 10-15>PIP in CMV)

## Ventilation made easy

| Oxygenation | Ventilation |
|---|---|
| • *FiO2* | • *Amplitude* |
| • *MAP* | • *Frequency* |

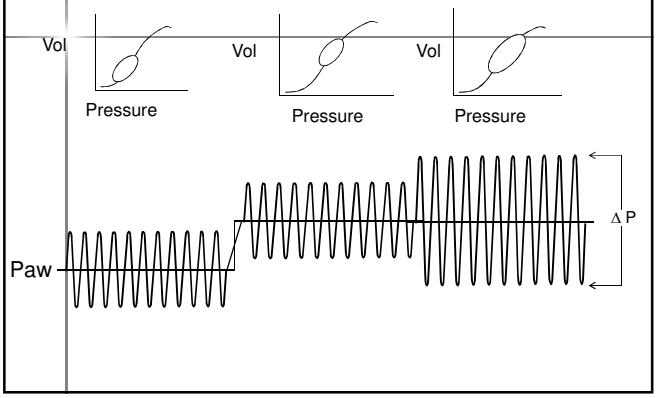
## HFOV - Oxygenation Strategy

- Open lung strategy
- Initial mPaw + 5, increase in 2-3 cmH2O increments Q 20 - 30 mins if FiO2 > 60% until max 45 cmH2O
- %IT 33
- Goal: FiO2 < 60% with SpO2 > 88%

## HFOV - Ventilation Strategy

- Δ P: “chest wall vibration” - increase 10 cm H2O increments if rising PaCO2 to max ΔP of approximately 90 – 100 cmH2O
- Hz 5-15 (could decrease to 3 Hz)
- ET cuff leak if rising PaCO2
- Goal: pH > 7.15 and PaCO2 40 - 70 mmHg

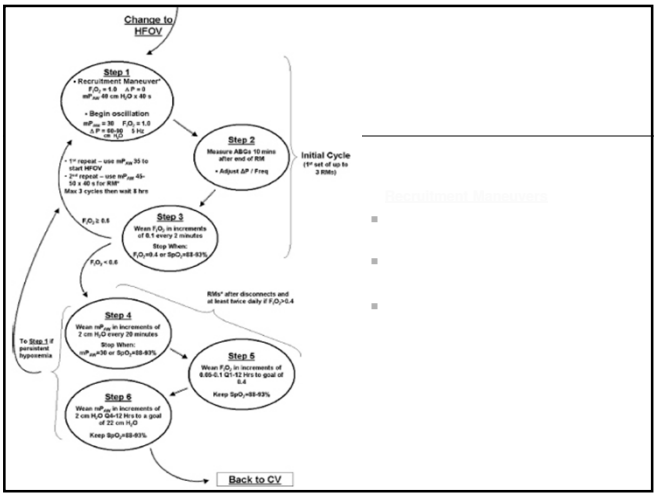
## HFOV Effectively Decouples Oxygenation from Ventilation



**Combining HFOV and recruitment maneuvers (RMs) in adults c ARDS**

- High MAP : to avoid atelectrauma and limiting volutrauma
- avoiding both lung over-distention and under recruitment
- RMs : sustained inflation c pressure 30 - 40 $cmH_2O$ for 30 - 40 sec.

(Crit Care Med 2005; 33: 479-86)




Recruitment Maneuvers

**Algorithms for HFOV setting in adult**

**Weaning** –

- **Goal** is $FiO_2$ of 0.4, $SpO_2$ of > 88%, mPaw 20-24 cm $H_2O$ before CV transition
- If required mPaw > 35 cm H2O, give equal priority to reducing mPaw and $FiO_2$.
- Reduce mPaw 2-3 cm H2O every 4-6 hrs
- When mPaw approaches 20 cm H2O, transition to CV (e.g., TV 6 mL/kg; PEEP 10 cm H2O; Pplat < 30 cm H2O; I:E 1:1; rate 15-25 breaths/min or to APRV (e.g., Phi 20 cm H2O; Plo 0 cm H2O; Thi 4 secs, Tlo 0.8 sec)
- Conventional weaning; Progressing to spontaneous breathing trials