

# High-frequency artificial lung ventilation/SŠ (nurse)

Template:High school

We classify high-frequency ventilation (HFO) as an unconventional type of artificial lung ventilation. Ventilation of the patient's/client's lungs takes place with small respiratory volumes at a high frequency. Small tidal volumes combined with high frequency will ensure minimal fluctuations in airway pressures and volumes, leading to a reduced risk of lung damage.

- In classic artificial lung ventilation, we calculate the minute volume (MV) by multiplying the frequency of breaths by the respiratory volume, from which we must subtract the volume of the dead space found in the airways.  
→  $MV = f \times (V_t - V_d)$ .
- For HFO, MV is calculated by multiplying the frequency by the tidal volume squared →  $MV = f \times V_t^2$ .

## Indication

- ARDS (Acute Respiratory Distress Syndrome).
- Contusion lungs.
- Newborns.

## Contraindications

- Chronic obstructive pulmonary disease (COPD).
- Status asthmaticus.
- Pulmonary emphysema.
- Intracranial hypertension.

## HFO Modes

- HFPPV = high frequency positive pressure ventilation;  $f=60-100$  cycles/min.
  - this frequency can also be achieved on a conventional fan.
- HFJV = high frequency jet ventilation;  $f=80-600$  cycles/min.
  - the respiratory mixture is blown by a nozzle under high energy into the patient's airways.
- HFALV = high frequency alternating pressure ventilation;  $f= 120-400$  cycles/min.
- HFOV = high frequency oscillatory ventilation;  $f=180-900$  cycles/min.

## HFO parameters

- Frequency of breaths given in Hz (1Hz = 60 breaths).
- Amplitude (7–130 cmH<sub>2</sub>O).
- Inspiratory time (30-50% of the cycle).
- mPaw (5–55 cm H<sub>2</sub>O).

## Execution of HFO

- Ensuring DC patency – oro- or naso-tracheal intubation, tracheostomy.
- Deep sedation and relaxation of the patient/client.
- We do not suction the patient/client.
- Regular X-ray checks.
- HF fan requirements:

High reliability and durability.

Possibility to administer the given breathing mixture, FiO<sub>2</sub> 21–100%.

Provision of DC humidification.

Monitoring the pressure in DC, at critical pressure alarm activation and ventilation stop.

## Patient/Client Monitoring

High frequency fan

- We monitor physiological functions (BP, P, SpO<sub>2</sub>, CVP, TT, GCS, etc.).

- Just before the start of HFO, we perform arterial ASTRUP, then 10 minutes after the start and then every 1 hour according to the doctor's office and the following days at least 3 times a day.
- Monitor and record values on ventilator.
- We observe the symmetry of vibrations from the sprouts to the thighs.

## Disadvantages of HFO

- Noise, deterioration of climatic conditions around the bed.
- Difficult physical examination pac.
- More difficult patient positioning.
- Weaning cannot be provided.
- It is difficult to provide HFO when transporting a patient.
- Negative perception by the family.

## Side effects of HFO

- Drop in blood pressure.
- Formation of a mucus plug.
- Increasing intracranial pressure.
- Barotrauma.

## Fan care

- The ventilation circuit is for single use, but can be sterilized in plasma.
- Do not use alcohol or solvents on external surfaces.
- Do not place anything on the top surface of the fan.
- The temperature sensor is disinfected with alcohol disinfection.

## Links

## References

- HE GOT THROUGH, Paul. *Fundamentals of artificial pulmonary ventilation*. 2nd, expanded edition. Maxdorf Jessenius, 2005. ISBN 80-7345-059-3.
- interpretation by MUDr. Lukáš Pokorný