QUICK REFERENCE CARD EVONE®

! This Quick Reference Card does not replace the Instructions for Use of Evone® or Tritube® !

Introduction on Evone

Mechanical ventilator Evone is intended to be used in sedated / anesthetized patients (>40 kg ibw), who require FCV® or Jet ventilation.

FCV® MODE:

FCV® ventilates a patient with a controlled and stable insufflation and exhalation flow (by suctioning), between a set minimum tracheal pressure ((P)EEP) and maximum tracheal pressure (Peak). FCV® aims to create linear increases and decreases of intratracheal pressure. FCV® is used in elective situations and requires a cuffed airway and tubes with ~2 – 10 mm ID.
Compatible with: Tritube, single / double lumen endotracheal tubes (size 5 /CH35 or higher).

JET MODE:

Single and double lumen jet ventilation (60-150 bpm) is used in elective procedures or to liberate a patient from ventilation and requires an open airway.
Compatible with: Tritube (with deflated cuff), Jet catheter or rigid bronchoscope.

Materials

- Evone Control Unit
- Evone Cartridge (1)
- Evone Airway Adapter (2)
- Humid-Vent Filter Pedi straight (HME Filter) (3)
- Evone Breathing Tubing (4) OR Conventional Tube Adapter (CTA) (6)
- Tritube, jet catheter or rigid bronchoscope (5) OR a conventional adult endotracheal tube (single lumen at least 5 mm ID or double-lumen at least CH35) (7)
- Empty syringe (20mL) to check cuff
- Syringe with 2-5 mL saline and ~15 mL air to purge lumens
- Manometer
- Lubricant spray (e.g. silicone)

Materials for alternative ventilation Tritube:

- Ventrain® and manometer

OR

All tubes:

- Conventional tube/(laryngeal) mask (in parallel with Tritube)
- Conventional (balloon) ventilation equipment

Assembly with Tritube

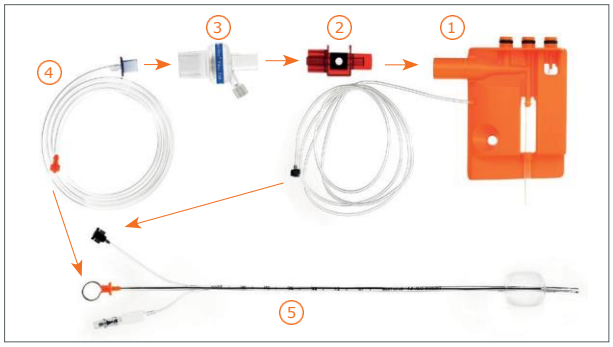

Fig. 1 Assembly of the Evone Breathing System and Tritube

Assembly with conventional tubes

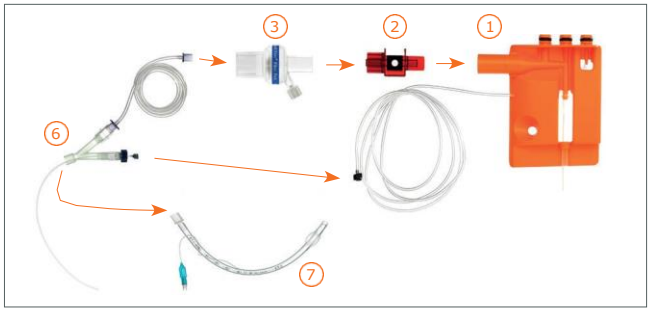

Fig. 2 Assembly of the Evone Breathing System and conventional adult endotracheal tube

Installation and set up

1 Switch on Evone.
2 Perform Startup checks successfully.
3 Patient set up menu: select gender and fill out length. Accept default settings or start with last used.
4 Check and, if required, adapt alarm limits.

Note that default settings are:

- FiO_2 50%
- Inspiratory Flow 12 L/min
- I:E ratio 1:1.0
- Peak 15 mbar
- EEP 5 mbar

Intubation with tritube

1 Inflate cuff of Tritube - check for leakage - deflate and wrap cuff around Tritube.
2 Patient with increased risk on secretions: ask to clear the throat by coughing and swallowing any secretions.
3 Induce anesthesia (TIVA).
4 Visually assess larynx and remove secretions if present.
5 Take out stylet Tritube, spray with lubricant and put stylet back.
6 Bend Tritube in curve required for intubation.
7 Remove stylet after the tip has passed the vocal cords.
8 Advance Tritube while turning to facilitate insertion.
9 Pull back to the position aimed for to avoid tracheal contact with the tip.
10 Inflate the cuff to be sure Tritube's tip is free from the tracheal wall.
11 Flush both lumen with air by syringe.
12 Fixate Tritube.

Ventilation with Tritube

1 Connect Tritube to Evone (ventilation lumen and pressure lumen).
2 Optional: start ventilation with the cuff deflated to allow deepening of anesthesia (Jet mode).
Note that the airway is open (risk on aspiration).
3 Start ventilation with the cuff inflated (25-30 mbar) in FCV® mode when anesthesia is optimized. A triangular pressure curve appears on the screen (Fig. 3).

Fig. 3 FCV® mode active

4 If needed adapt ventilation settings:
- FiO_2 as preferred
- EEP as preferred
- Peak to adjust Tidal Volume
- Inspiratory Flow to adjust Minute Volume

Ventilation with conventional tubes

1 Induce anesthesia (TIVA).
2 Intubate patient as usual with tube of choice.
3 Oxygenate patient as preferred to allow deepening of anesthesia.
4 Connect tube to CTA of Evone when anesthesia is optimized.
5 Start ventilation in FCV® mode. A triangular pressure curve appears on the screen (Fig. 3).
6 If needed adapt ventilation settings:
- FiO_2 as preferred
- EEP as preferred
- Peak to adjust Tidal Volume
- Inspiratory Flow to adjust Minute Volume

Handling obstructions

1 Stop ventilation.
2 Fiercely flush the pressure lumen and/or ventilation lumen with 2-5 mL saline followed by ~15 mL air.
3 In case secretions are still present in ventilation lumen, remove secretions using a suction catheter.
Note that the airway needs to be open.
4 **Optionally:** slightly turn Tritube to avoid any tracheal wall contact and inflate cuff.
5 Purge lumen again with 2 mL saline followed by air.
6 Re-start ventilation.

Sedation and relaxation

Because of the small lumen (high resistance) of the breathing circuit, coughing may result in tube dislocation and spontaneous breathing is not possible. In case of light anesthesia (indicated by e.g. irregular pressure curves, coughing, BIS>60, TOF>90%):

Optimize anesthesia

- Optionally deflate cuff of Tritube temporarily, to reduce trachea stimuli and allow breathing/coughing. Optionally disconnect CTA temporarily to allow breathing / coughing

Individual optimization of FCV® ventilation based on lung compliance (optional)

1 Find 'Best EEP'
- Change both EEP and Peak stepwise by 1-2 mbar; keeping driving pressure (Peak – EEP) constant.
- Monitor tidal volume (V_T): Increased V_T indicates increased respiratory system compliance (C_{RS}) and improved ventilation.
- Choose EEP setting resulting in highest V_T; for similar V_T choose lowest EEP for circulatory reasons.

Note: Do not change settings too rapidly. Adequate application of the following steps requires equilibration periods of at least 1 minutes.

2 Find 'Best driving pressure'
- Change Peak pressure stepwise by 1-2 mbar.
- Monitor V_T
  - Per mbar increase of driving pressure, V_T is expected to increase with value of C_{RS};
  - If V_T increases over-proportionally, C_{RS} will increase -> improved ventilation;
  - If V_T increases under-proportionally, C_{RS} will decrease -> ventilation not further improved.
- Chose Peak setting resulting in highest C_{RS}.

Note: This step might lead to the application of higher tidal volumes than generally advised by common guidelines.

3 Find 'Best flow'
- Adjust flow depending on measured $etCO_2$ and/or $PaCO_2$.
- To reduce $etCO_2$ and/or $PaCO_2$: increase inspiratory flow
  - Results in higher frequency with same V_T and higher minute volume.
- To increase $etCO_2$ and/or $PaCO_2$: decrease inspiratory flow
  - Results in lower frequency with same V_T and lower minute volume.

Wakening the patient

1 Set FiO_2 as preferred.

Tritube

Wake patient using one of the two ventilation options:

2 With inflated cuff (e.g. in case of aspiration risk) in FCV® mode.
3 Gently wake patient (no shaking).
Deflate cuff and extubate when patient awakes.

OR

2 With deflated cuff in Jet mode (risk on aspiration).
3 Open airway required.
4 Adapt settings if required (e.g. lower driving pressure with higher frequency may reduce tracheal stimuli).

Conventional tubes

Wake the patient:

2 Disconnect CTA from tube allow waking up using preferred method of oxygenation.

Note that spontaneous breathing is not possible when the CTA is connected to the conventional adult endotracheal tube.

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