Improved safety valve tested in vitro.
he characteristics of an intelligent ventilator safety valve

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Aim of the study

First goal of the study was to measure the characteristics of an intelligent ventilator safety valve (VSV) when connected in a ventilator breathing circuit when using the manual mode.

Second goal was to search what type of mechanical ventilation mode, lung compliance and resistance did incorrectly activate the VSV

Methods and Analysis

- The VSV is inserted in the breathing circuit. An American breathing bag of 2 litres is connected for the manual ventilation. Blease, an artificially lung with a variable compliance and resistance, is connected to the ventilator.
- In the first test the characteristics of the safety valve are analyzed in the manual mode. Fresh gas flow is set at 12 litres per minute. The airway alarm and the APL valve are set at their maximum level. Resistance is set at zero and compliance at 23 ml/cmH20. At time zero the ventilator is switched to a manual ventilation mode without compression of the balloon. The airway pressure is monitored.
- In the second test the ventilator is changed to its largest I/E ratio and its lowest ventilation frequency in the controlled volume ventilation mode till the VSV opens. Tidal volume is set at 750 ml. Compliance is set at 11 ml/cmH20 and resistance at the maximum level. The airway pressure is monitored during ventilation frequencies.
- No approval from the hospital ethical committee was needed as no patients or animals were involved.

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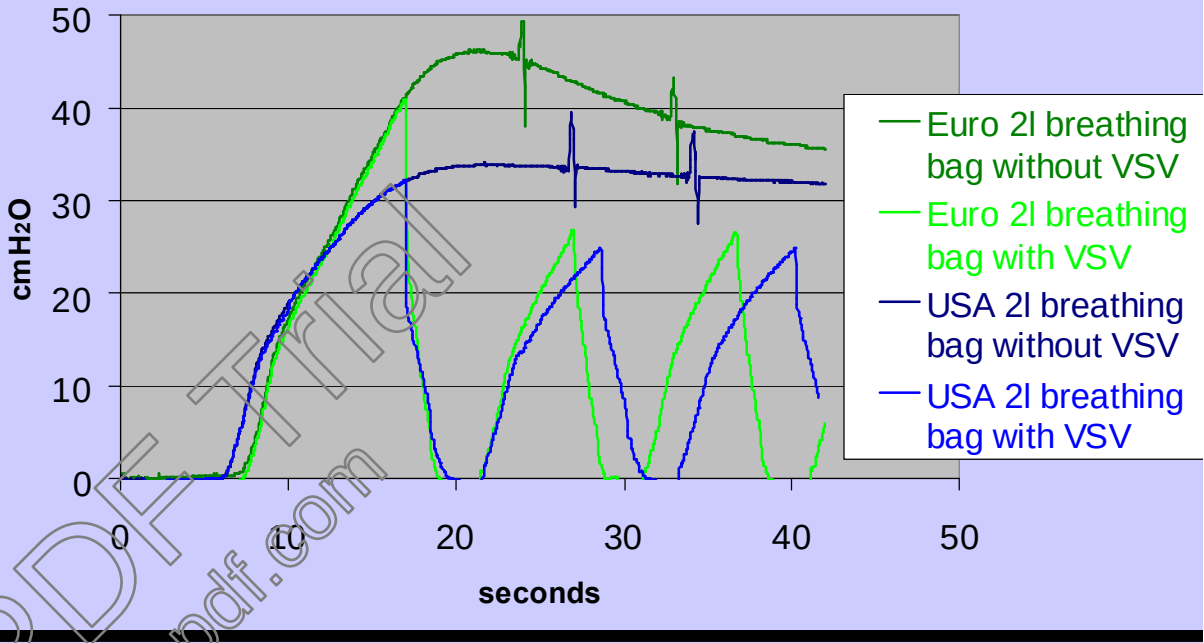
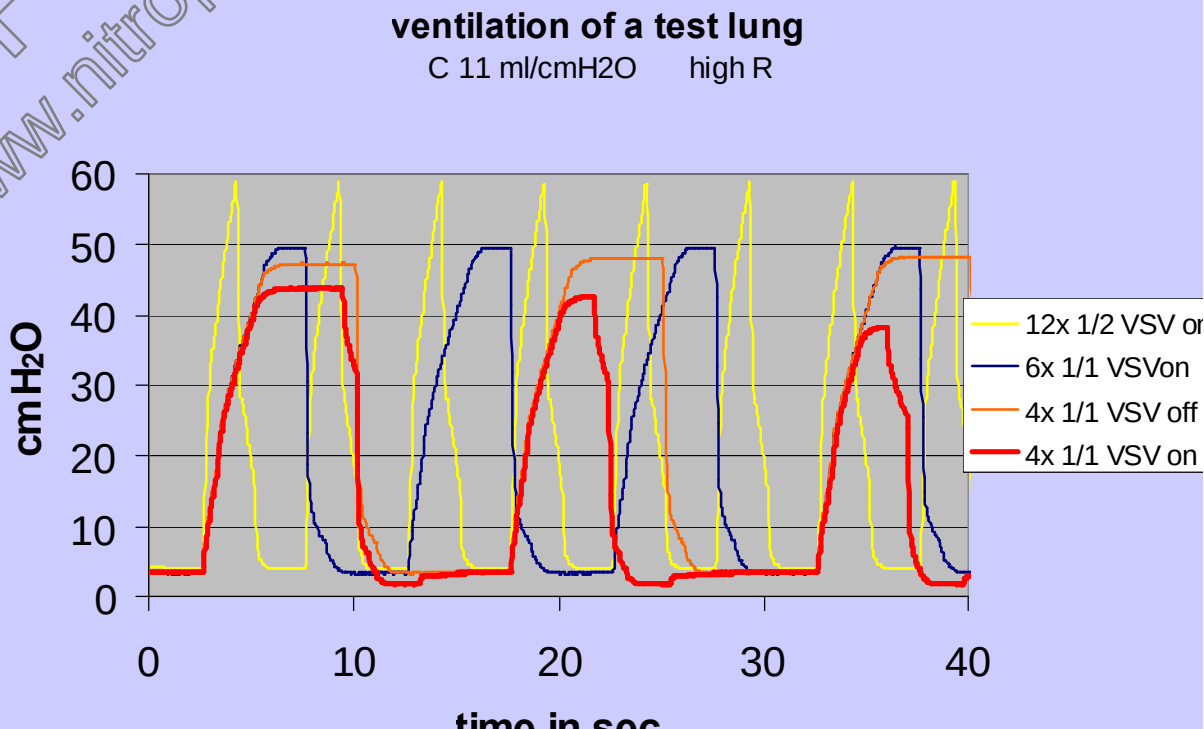
Results

- The airway pressure is shown over time.
- In the first test VSV on is compared with VSV off with an european or a usa breathing bag. The VSV device releases air when a pressure of 20 cmH2O is sensed longer than 6 sec.
- In the second test the VSV opened only when inspiratory - expiratory ratio was 1:1 or 2:1 and ventilation rate was less than 5 cycles per minute.





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Conclusion

- The pressure in the manual system always dropped after a period of 6 seconds at 20 cmH2O when VSV was active.
- A setting of a respiratory rate of 4 and I/E of 1/1 in a high resistance and low compliant lung is never used.
- Besides these unrealistic conditions the device does not disturb the ventilation when inserted into the breathing circuit.

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