COMBINED HIGH FREQUENCY AND CONVENTIONAL VENTILATION

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Since 1980, Siemens have been involved in development of equipment for high frequency ventilation (HFV) and research on the clinical application of HFV. Several prototypes have been developed. Most of these models have also been tested by experimental and clinical studies in institutes around the world.

At an early stage of development, we examined a technology where HFV was combined with other modes of ventilation (CHFV), as HFV alone did not appear to produce significant improvement in ventilatory status. Other reasons were that important functions such as safety, reliability, monitoring capability and means for controlled gas delivery were difficult to secure in the traditional type of open circuit HFV gas delivery system. Some of the advantages of using a combined ventilation technique were: access to monitoring, alarms and safety functions of the Servo Ventilator; immediate access to alternative modes of ventilation if HFV fails; the possibility of altering the proportion of gas delivered by HFV and conventional modes; the possibility of using the ventilator for clinical research without compromising safety.

The integration of HFV into a conventional ventilator also facilitates switching from one mode of ventilation to another if the patient’s condition changes.

The present version of the Siemens CHFV unit, Servo HFV 970, has been developed for supporting research and is not available as a commercial product. It can only be used with the Servo Ventilator, but may be adjusted so that all the ventilation is delivered as HFV. CHFV is provided by incorporating a high frequency gas delivery system in parallel with the conventional ventilator gas delivery system. Activation of the high frequency gas delivery system is generated by timing signals from the ventilator and control settings on the HFV control panel.

The pulsatile flow from the high frequency gas delivery system may be added during inspiration, expiration or both phases of the ventilator breathing cycle. The characteristics of the pulsatile flow are determined by control settings on the HFV control panel, the timing signals from the ventilator, and the properties of the connecting tubing.

When the high frequency pulses are generated during the inspiratory period of the ventilator, the pulse flow is delivered to a closed system. The sum of all the pulse volumes delivered during the Servo inspiratory cycle is added to the tidal volume as a positive pressure breath. When high frequency pulses are generated during the Servo Ventilator expiratory period, the pulse volume is delivered to an open or semi-open system depending on PEEP settings, and therefore modulates the expiratory flow. This major difference from the more "traditional" HFV delivery systems should be noted when making comparisons with other devices. Siemens is presently supporting several research projects exploring different HFV applications. One is a multicentre clinical study of CHFV v. volume controlled and pressure controlled ventilation. This study is being conducted in four major hospitals in the U.S.A. Results are expected to be available by the beginning of 1990.