EVALUATION OF A NEW VALVELESS ALL PURPOSE VENTILATOR: EFFECT OF VENTILATING FREQUENCY PEEP, PACO₂ AND PAO₂ ON PHRENIC NERVE ACTIVITY

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1. INTRODUCTION

In recent years there has been considerable interest in the use of ventilation with low tidal volumes at high frequency in patients with low pulmonary compliance and the subject has been reviewed by Sjostrand (1980).

One claim by Jonzon (1977) is that high frequency ventilation (HFV) will abolish efferent phrenic nerve activity, (PNA). This has important implications for controlling the respiratory activity of patients on ventilators. This author describes the development of a PEEP of 2 cm H₂O during HFV but makes no reference to changes in blood gas tensions induced by changes in ventilation other than to state that these were normal. In the clinical reports where beneficial effects have been described on central respiratory control as a result of introducing HFV (eg, Davey and Leigh, 1982; Carlon et al, 1981; Bland et al, 1980) there has been a reduction in PaCO₂ and an improvement in PaO₂.

The present study was undertaken to determine the contribution of ventilation frequency per se on central respiratory activity, and was made possible by the development of a new ventilator.

2. METHODS

2.1. New Ventilator

The principle underlying this ventilator is to use a single breathing tube in which the respiratory gas is introduced near the airway while a jet in a more distal part of the tube drives the respiratory gas into the lungs. The jet driving gas is independent of the respiratory fresh gas used for patient ventilation. The distance between the respiratory gas inlet and the jet is sufficient to prevent the driving gas taking part in gas exchange in the lungs. There are no valves, or other obstructions in the breathing circuit which remains open to atmosphere.
FIG. 1. Ventilator Circuit.