

CONTROL OF BREATHING USING AN EXTRACORPOREAL MEMBRANE LUNG

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ANESTHESIOLOGY 46 (1977):138-141

CE1-52

Objective

To analyze the effect of extracorporeal CO₂ removal on spontaneous ventilation.

Study Design

Animal study.

Study Population

Seven lambs.

Methods

The animals received pumpless extracorporeal circulation with a membrane lung and also tracheostomy. Spontaneous ventilation and gas transfer were measured while blood flow and sweep gas flow were varied. The experiments lasted two to three days during which the lambs were connected to the AVCO₂R device. During this time they were neither sedated nor anesthetized.

Results

The decrease in spontaneous alveolar ventilation was proportional to the fraction of total carbon dioxide removed by the membrane lung. When extracorporeal CO₂ removal neared 100 percent of production alveolar ventilation ceased. Apnoeic oxygenation was possible in these phases.

Commentary

The authors describe fundamental aspects of extracorporeal CO₂ removal: Pumpless use because only low blood flow is necessary, the high effectiveness of extracorporeal ventilation and the increased CO₂ removal at higher paCO₂ levels.

They also describe a phenomenon that is not yet routinely used in patient treatment but that is very promising: Extracorporeal CO₂ removal controls the ventilatory drive. This can be used to increase or decrease the ventilatory effort of spontaneously breathing patients, thus combining phases of ventilatory rest with training phases. This could be a new treatment option for patients who suffer from exhaustion. Usually we want to avoid connection to mechanical ventilators because this may further deteriorate muscle function.

