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Neonatology

HEMODYNAMIC EFFECTS OF MECHANICAL VENTILATION Using normal, spontaneously delivered or prematurely delivered lambs with respiratory distress, the authors studied the effects of positive- and negative-pressure ventilation on hemodynamic function. Determinations included cardiac output, shunt pattern through the foramen ovale and ductus arteriosus, and systemic and pulmonary arterial pressures. Seven lambs with "respiratory distress" were treated with periods of spontaneous breathing or mechanical ventilation using either a positive-pressure (Engstrom) or a negative-pressure (Air-Shields) ventilator. Lambs with respiratory distress had significantly lower cardiac outputs and higher pulmonary arterial pressures, with increased right-to-left shunts at the foramen ovale level, compared with the control, full-term animals. The effects of mechanical ventilation were similar in both groups and included significant decreases in cardiac output without significant change in shunt pattern or systemic arterial blood pressure. No difference between the effects of positive- and negative-pressure ventilation on cardiac output or vascular pressures at comparable levels of ventilation was demonstrable. There was no evidence of a progressive decrease in cardiac output as tidal volume was increased to as high as 108 ml/kg body weight.

No correlation between cardiac output and P_{aCO_2} , as had been suggested in other experiments, was found. Similarly, no correlation between arterial pH and cardiac output could be shown to exist in either normal or distressed lambs.

A previous study in newborn humans in which the magnitude of right-to-left shunting during periods of spontaneous breathing and with mechanical ventilation were compared showed a marked reduction in right-to-left shunt when a negative-pressure phase was added to the ventilation pattern. The present study could not confirm this finding. The authors suggest that diminution of the right-to-left shunt through the ductus arteriosus and foramen ovale secondary to mechanical ventilation is caused by a change in hydrogen-ion concentration and oxygenation. (Shepard, F. M., and others: *Hemodynamic Effects of Mechanical Ventilation in Normal and Distressed Newborn Lambs—A Comparison of Negative Pressure and Positive Pressure Respirators*, *Biol. Neonate* 19: 83-100, 1971.)