Ventilatory management

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Ventilator support after coronary artery bypass surgery has been widely applied. Controlled ventilation for 12 to 24 hours following open heart surgery is believed to have reduced the incidence of postoperative pulmonary complications. Patients with obvious pulmonary insufficiency may require prolonged mechanical ventilator support.

Ventilator support can be provided with either pressure- or volume-controlled ventilators. Pressure-regulated respirators are used when "effective" compliance in high (ratio of tidal volume [ml]) to peak inspiratory pressure (cm H_2O) is higher than 40, arterial PO_2 in excess of 150 mm Hg (in Fl O_2 = 0.5), and the chest film is clear. The volume-controlled ventilator is mandatory when lung compliance deteriorates and peak airway pressure in excess of 35 cm H_2O is required. Furthermore, volume-controlled ventilator is indicated in patients with preexisting ventilatory abnormalities and intraoperative pulmonary insufficiency.

The oxygen-air mixture of the respirator is determined by serial blood gas analysis. The inspired oxygen concentration should be adjusted to produce an arterial oxygen tension between 120 and 150 mm Hg. The use of 100%

O_2 should be avoided because of the danger of producing damage to the lungs. Neurologic signs and symptoms may appear also. We generally administer oxygen concentration between 40% and 50%. A tidal volume of 15 ml/kg body weight is used and respiratory rate is set to maintain arterial PCO_2 within normal limits, adding mechanical dead space as required (8 to 12 breaths/min). Hyperventilation should be avoided because the resulting hypocapnic alkalosis has been shown to interfere with myocardial oxygen supply by causing coronary vasoconstriction and increased O_2 affinity of blood. Proper humidification of the air-oxygen mixture is mandatory because ventilation with dry gases will decrease lung compliance and increase airway resistance. Frequent blood gas determination and chest films are indicated to determine the adequacy of mechanical ventilation and to recognize early pulmonary insufficiency. When arterial PO_2 cannot be maintained above 100 mm Hg with less than 70% inspired O_2, mechanical ventilation with positive end-expiratory pressure (PEEP) is indicated. The initial amount of PEEP is usually 6 to 8 cm H_2O.

Ventilator support is discontinued early in most patients. Weaning is achieved by allowing the patient to breathe spontaneously through the endotracheal tube via a T-piece arrangement with added oxygen (FIO_2 = 1.0). Arterial blood gases are determined 20 to 30 minutes later. The oxygen concentration is gradually reduced. Stable arterial blood gases (PO_2 over 150 mm Hg with Fl O_2 = 0.5), a forced expired vital capacity of 10 ml/kg body weight, lack of agitation, and clear sensorium are signs that favor removal of the endotracheal tube. The patient should not be intubated if he is hemodynamically unstable.

Certain poor risk patients may require prolonged mechanical ventilation. Weaning these patients from the ventilator should be made gradually over several hours or days.