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The effects of the ventilation condition on respiratory and cardiovascular functions during one-lung ventilation in dogs

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One-lung ventilation (OLV), which is a very safe and useful technique of anesthesia for human thoracic surgery, has not been applied to small animal practice. The objectives of the present study were to select the most suitable technique of intubation of double lumen endobronchial tube (DLET) and ventilation condition, and to evaluate respiratory and cardiovascular effects of OLV in dogs.

OLV was induced under closed-chest condition using DLET with 20 cmH₂O airway pressure for 60 min. OLV under open-chest condition was then done using the same manner for 90 min. Four types of combination of DLET position and ventilation were used as follows; 1) left bronchus lumen ventilation with 10 breaths/min, 2) left bronchus lumen ventilation with 16 breaths/min, 3) left tracheal lumen ventilation with 10 breaths/min, and 4) right tracheal lumen ventilation with 10 breaths/min. Two-lung ventilation with 20 cmH₂O airway pressure and 10 breaths/min was done as control. Each ventilation group was consisting of 5 beagles. The entire procedure was done under general anesthesia with Isoflurane-oxygen and artificial ventilation using vecuronium bromide.

After the induction of OLV in bronchus lumen ventilation dogs (groups 1 & 2), a sig-

nificant decrease (50%) of arterial O₂ tension (PaO₂), as well as a remarkable increase of pulmonary vascular resistance (PVR), was seen. Main reasons of decreased PaO₂ and increased PVR would be the reduction of ventilatory lung by half in its volume, and be presumably due to auto-positive end-expiratory pressure (auto-PEEP). In left bronchus lumen ventilation with 16 breaths/min group, a significant increase of PaO₂ was not seen in comparison with group 1. In two groups of tracheal lumen ventilation (groups 3 & 4), a decrease of PaO₂ was more gradual (39%) than in bronchus lumen ventilation groups. No significant changes of cardiovascular and blood gas values were found in tracheal lumen ventilation groups.

In the present study, the tracheal lumen ventilation was less problematic on the decrease of PaO₂ values during OLV with DLET than the bronchus lumen ventilation. No significant positive effect was seen on PaO₂ in appreciation of the increased respiration rate (10 to 16 breaths/min) in bronchus lumen OLV. Further improvement of ventilation, which may be applicable methods for canine OLV, would be of value to diminish the disadvantage of OLV in dogs.