TITLE: PREDICTING HYPOXEMIA DURING ONE-LUNG VENTILATION

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Hypoxemia is a recognized complication of one-lung ventilation (OLV) for thoracic surgery. The aim of this study was to see if independent covariates for arterial oxygenation (PaO₂) during OLV could be identified and then used to construct a predictive equation for PaO₂ during OLV.

With Ethics Committee approval and informed consent eighty patients having thoracotomies were studied. All patients were intubated with a left-sided double lumen tube. OLV was abandoned if the patient became hypoxemic (pulse oximeter saturation <85% or arterial blood eas PaO. <70mmHe

saturation <85% or arterial blood gas PaO₂ <70mmHg).

The data from the first fifty patients (Group A) were studied for correlations with PaO₂ during OLV. Multiple linear regression was used to identify the most explanatory variables and to construct a predictive equation for PaO₂ during OLV. The subsequent thirty patients (Group B) were studied prospectively using both the observed and predicted PaO₂.

The most explanatory independent covariates for PaO₂ during OLV were: FEV₁%, initial intra-operative PaO₂ during two-lung ventilation (2L-PaO₂) and side of operation. The resultant predictive equation for PaO₂ after 10 min of OLV was:

TITLE: EFFECT OF ISOFLURANE & CARDIAC OUTPUT ON HYPOXIC PULMONARY VASOCONSTRICTION

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Isoflurane's effect on HPV is controversial1-2 because of its effects on variables such as Q_T and $P_{\overline{\nu}02}.$ Computer simulation $^{3-4}$ allows blood flow distribution to be predicted. The model requires input of PAP, Qr, LAP, $P_{\overline{\nu}02}$, $\Re Q_L$, P_{AO2-R} , P_{AO2-L} , P_{alv-R} and P_{alv-L} (5cmH₂0) and estimates $P_{p_1}(0$ cmH₂0). The iteratively derived constriction ratio(CR) 0.6 corresponds to maximal hypoxic constriction and 1.0 to no constriction. During left lung hypoxia and right lung hyperoxia, the P/Q curves with no-isoflurane to the left lung are obtained at 3 levels of Qr(low[A], normal[nl,O], high[hi, []])(Fig 1). With no isoflurane during hypoxic ventilation, the left lung vasoconstricts most when relative blood flow (RQ) was nl>hi>low (CR 0.61<0.69<0.70). Isoflurane's effect on HPV is more clearly demonstrated at comparable $Q_{\text{\tiny T}}.$ At low RQ with 0 MAC-low and 2.5 MAC-nl, the hypoxic left lung essentially vasodilates the same amount (CR 0.70 vs 0.69). Vasodilatation at medium RQ is greater at 2.5 MAC-hi than at 1 MAC-nl (CR 0.78 vs 0.68) and at high RQ is greater at 1.0 MAC-hi than at 0 MAC-hi (CR 0.77 vs 0.69), All plots assume that isoflurane minimally affects baseline pulmonary vascular tone in the hyperoxic right lung. Computer simulation demonstrates that when the effects of Q_T are controlled for, the mechanism of inhibition of HPV by isoflurane is due to vasodilation in the hypoxic lung. 1) Domino KB, Anesthesiol 64:423, 1986.

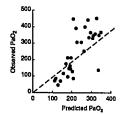
PaO₂ = 100-72(side)* -1.86(FEV₁%) +0.75(2L-PaO₂)
(*2 for side insert: 1 for right-sided thoracotomy
0 for left-sided thoracotomy)

There was a significant correlation by linear regression between observed and predicted PaO₂ values for Group B (see figure). 4/30 patients had a predicted PaO₂ <150mmHg; of these 4/4 had an observed PaO₂ <80 and in 2/4 OLV was abandoned. 19/30 patients had a predicted PaO₂ 150-300; of these 0/19 had an observed PaO₂ < 80 and 3/19 had an observed PaO₂ < 80-100. 7/30² patients had a predicted PaO₂ >300; of these 0/7 had an observed PaO₂ <100.

Using data which are routinely available, it is possible to predict intra-operative hypoxemia during OLV. These findings concur with previous studies that have found correlations between PaO₂ during OLV and 2L-PaO₂ or pulmonary function tests. In patients at high risk of hypoxemia during OLV prophyllactic measures, such as non-dependent lung CPAP, can be employed.

References

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Observed versus predicted PaO₂ values for Group B (30 patients) after 10 min. of one-lung ventilation (r = .73, p < .01) (--line of identity)

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2) Benumof JL, Anesthesiol 67:910, 1987. 3) Zhuang F, JAP 55:1341, 1983. 4) Marshall BE, JAP 64:68, 1984.

