A Simple Prediction Model of Hypoxemia During One-Lung Ventilation

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【Background and Aim】

- One-lung ventilation (OLV) may cause severe hypoxemia during thoracic surgery.
- No single factor independently accurately predicts hypoxemia during OLV.
- We tried to construct a simple prediction model of hypoxemia during OLV by combining several relevant factors.

【Methods】

This single center, retrospective, observational study was approved by the Institutional Ethics Board of Kurashiki Central Hospital.

Patient Randomization

Derivation group (75% of patients): to develop the most suitable model

Validation group (25% of patients): to evaluate the validity of the model

Definition of hypoxemia during OLV (either of the following)

- SpO₂ < 91% with 100% oxygen
- Apneic oxygen insufflation or continuous positive airway pressure was required to non-dependent lung
- Intermittent two lung ventilation was required

Factors Evaluated

Body mass index (BMI)¹⁾, Preoperative PaO₂ value²⁾, Previous lung resection on the dependent lung³⁾⁴⁾, Side of operation²⁾, Forced expiratory volume in one second (FEV 1.0 % prediction)²⁾

【Results】

Figure 1. Patient Enrollment

Figure 2. ROC curve for the two groups

Derivation group
C statistic 0.81

Validation group
C statistic 0.87

Table 1. Multivariable Model with All Factors

	Odds ratio	95% CI	P value
BMI	1.07	0.949-1.20	0.28
Low preoperative PaO ₂	0.939	0.906-0.974	<0.001
Previous lung resection	13.6	3.94-46.7	<0.001
Right-side operation	7.31	2.64-20.2	<0.001
FEV1.0 %prediction	0.99	0.959-1.02	0.53

Table 2. Prediction Score* for Hypoxemia

	Point	β coefficients	P value
Preoperative PaO ₂		1.163	<0.001
< 75 mmHg	2		
< 90 mmHg	1		
Previous lung resection	2	2.477	<0.001
Right-side operation	2	2.027	<0.001

Figure 3. Risk of Hypoxemia in each score

All patients were stratified according to scores.

【Conclusion】

The risk of hypoxemia during OLV was accurately predicted before surgery with this model constructed from preoperative low PaO₂ value, history of lung resection, and the side of operation.

1) Suemitsu R, et al. *Asian Cardiovasc Thorac Ann* 2008;16:463–7.
3) Tomita A, et al. *EJA* 2017;34:e-supplement 194.

2) Slinger P, et al. *Can J Anaesth* 1992;39:1030–5.
4) Campos JH, et al. *Anesth Analg* 1995;81:1095–6.