**Table 1. Comparisons between control and ARDS groups**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables** | **Control (n = 11)** | **ARDS (n = 21)** | **p-value** |
| ICU stay (day) | 4 (2, 4) | 25 (14, 36) | **< 0.001\*** |
| Age (yr) | 61 ± 8 | 60 ± 17 | 0.687 |
| Gender (M/F) | 5/6 | 17/4 | 0.056 |
| BH (cm) | 158.5 ± 10.3 | 164.7 ± 6.9 | 0.050 |
| BW (kg) | 65.6 ± 9.4 | 65.1 ± 8.5 | 0.882 |
| BMI (kg/m2) | 26.3 ± 4.4 | 24.0 ± 2.8 | 0.138 |
| Endo size | 7 (7, 7.5) | 7.5 (7, 7.5) | 0.134 |
| PEEP (cmH2O) | 5.8 ± 1.8 | 10.4 ± 3.0 | **< 0.001\*** |
| PIP (cmH2O) | 20 (20, 20) | 20 (18, 22) | 0.983 |
| RI (sec) | 5.0 (4.6, 5.0) | 3.5 (2.3, 3.8) | **< 0.001\*** |
| Ti (sec) | 0.9 (0.9, 1.0) | 0.9 (0.8, 1.0) | 0.532 |
| Te (sec) | 3.8 ± 0.6 | 2.3 ± 0.9 | **< 0.001\*** |
| (mL/sec) | 574.8 ± 92.5 | 464.7 ± 119.1 | **0.012\*** |
| VT (mL) | 538.5 ± 93.8 | 427 ± 117.4 | **0.011\*** |
| RR (bpm) | 12 (12, 13) | 17 (16, 26) | **< 0.001\*** |
| MV (L/min) | 7.1 ± 2.0 | 8.6 ± 3.2 | 0.160 |
| Cdyn (mL/cmH2O) | 28.6 ± 6.2 | 22.9 ± 7.6 | **0.041\*** |
| R (cmH2O·sec/mL) | 0.034 ± 0.006 | 0.044 ± 0.012 | **0.020\*** |
| RSBIv (bpm/L) | 25.0 (20.3, 26.1) | 56.3 (37.7, 69.6) | **< 0.001\*** |
| RPPv (cmH2O\*bpm) | 240 (240, 260) | 340 (300, 540) | **0.010\*** |
| RPVI (cmH2O\*bpm/mL) | 0.48 (0.39, 0.52) | 0.98 (0.71, 1.35) | **0.001\*** |
| IER | 0.24 (0.22, 0.25) | 0.36 (0.32, 0.66) | **< 0.001\*** |
| MW (cmH2O\*L) | 10.3 ± 2.1 | 8.2 ± 2.6 | **0.030\*** |
| MW/IER (cmH2O\*L) | 41.1 (37.0, 43.7) | 18.7 (12.8, 27.3) | **< 0.001\*** |
| ***Outcome*** |  |  |  |
| Survivors | 11 (100%) | 16 (76.2%) | 0.138 |
| Non-survivors | 0 (0%) | 5 (23.8%) |  |

ARDS: acute respiratory distress syndrome; bpm: breath per min; PEEP: positive end-expiratory pressure; PIP: peak inspiratory pressure above PEEP; Ti: inspiration time; Te: expiratory time; VT: tidal volume; MV: minute ventilation; Cdyn: dynamic compliance; : flow rate; R: flow resistance; RSBIv: rapid shallow breathing index during mechanical ventilation; RPPv: rate pressure product of ventilation; RPVI: rate pressure volume index; MW: mechanical work; IER: inspiration to expiration time ratio. \**p* < 0.05

**Table 2. Comparisons between survivors and non-survivors of patients with ARDS**

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| --- | --- | --- | --- |
| **Variables** | **Survivors (n = 16)** | **Non-survivors (n = 5)** | **p-value** |
| ICU stay (day) | 20.5 (11, 40.5) | 25 (25, 36) | 0.509 |
| Age (yr) | 57 ± 17 | 69 ± 12 | 0.148 |
| Gender (M/F) | 14/2 | 3/2 | NS |
| BH (cm) | 165.3 ± 6.6 | 162.7 ± 8.3 | 0.493 |
| BW (kg) | 64.5 ± 7.6 | 67.2 ± 11.6 | 0.546 |
| BMI (kg/m2) | 23.62 ± 2.49 | 25.34 ± 3.49 | 0.235 |
| Endo size | 7.5 (7.0, 7.5) | 7.0 (7.0, 7.5) | 0.314 |
| PEEP (cmH2O) | 10.0 (9.0, 12.0) | 10.2 (10.0, 11.9) | 0.523 |
| PIP (cmH2O) | 18 (15.5, 20) | 22 (20, 22) | **0.035\*** |
| RI (sec) | 3.41 ± 0.94 | 2.58 ± 0.66 | 0.087 |
| Ti (sec) | 0.9 (0.8,1.0) | 0.9 (0.8,0.9) | 0.520 |
| Te (sec) | 2.48 ± 0.88 | 1.70 ± 0.70 | 0.088 |
| VT (mL) | 436.3 ± 119.5 | 397.2 ± 117.9 | 0.530 |
| RR (breath/min) | 17 (16, 22) | 26 (24, 27) | 0.145 |
| MV (L/min) | 8.19 ± 2.84 | 9.96 ± 4.08 | 0.285 |
| RSBIv (bpm/L) | 47.8 ± 20.0 | 62.9 ± 10.4 | **0.045\*** |
| RPPv (cmH2O\*bpm) | 359.5 ± 148.9 | 514.8 ± 92.7 | **0.042\*** |
| RPVI (cmH2O\*bpm/mL) | 0.88 ± 0.39 | 1.35 ± 0.24 | **0.023\*** |
| Cdyn (mL/cmH2O) | 21.6 (18.9, 30.7) | 19.0 (17.7, 21.3) | 0.215 |
| (mL/sec) | 470.3 ± 122.1 | 446.9 ± 120.3 | 0.712 |
| R (cmH2O·sec/mL) | 0.041 ± 0.010 | 0.051 ± 0.017 | 0.105 |
| MW (cmH2O\*L) | 8.11 ± 2.72 | 8.46 ± 2.54 | 0.801 |
| IER | 0.35 (0.32, 0.45) | 0.66 (0.60, 0.67) | 0.230 |
| MW/IER (cmH2O\*L) | 21.7 (12.2, 30.3) | 12.9 (12.8, 18.1) | 0.240 |

ARDS: acute respiratory distress syndrome; NS: not significant; bpm: breath per min; PEEP: positive end-expiratory pressure; PIP: peak inspiratory pressure above PEEP; Ti: inspiration time; Te: expiratory time; VT: tidal volume; MV: minute ventilation; Cdyn: dynamic compliance; flow rate; R: flow resistance; RSBIv: rapid shallow breathing index during mechanical ventilation; RPPv: rate pressure product of ventilation; RPVI: ate pressure volume index; MW: mechanical work; IER: inspiration to expiration time ratio. \**p* < 0.05

**Table 3. The areas under the ROC curves (AUC) of mechanical ventilator parameters and variable coefficient in principal components analysis for the development of ARDS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables** | **AUC analysis** | **Principal components analysis** | |
| **Component 1** | **Component 2** |
| PEEP (cmH2O) | 0.931 | **0.760** | 0.327 |
| RSBIv (bpm/L) | 0.885 | **0.992** | 0.041 |
| RPVI (cmH2O\*bpm/mL) | 0.857 | **0.949** | -0.091 |
| MW/IER (cmH2O\*L) | 0.944 | **0.877** | -0.025 |
| RR (breath/min) | 0.881 | **0.828** | -0.554 |
| RI (sec) | 0.881 | **0.828** | -0.554 |
| Te (sec) | 0.907 | **0.808** | -0.577 |
| IER (per 0.1 increment) | 0.905 | **0.759** | -0.578 |
| RPPv (cmH2O\*bpm) | 0.779 | **0.743** | -0.587 |
| R (cmH2O·sec/mL)(per 0.01 increment) | 0.788 | **0.695** | 0.576 |
| Cdyn (mL/cmH2O) | 0.784 | **0.686** | 0.511 |
| (mL/sec) | 0.801 | 0.603 | **0.755** |
| MW (cmH2O\*L) | 0.639 | 0.504 | **0.753** |
| VT (mL) | 0.816 | 0.677 | **0.729** |

ARDS: acute respiratory distress syndrome; bpm: breath per min; PEEP: positive end-expiratory pressure; Te: expiratory time; VT: tidal volume; Cdyn: dynamic compliance; : flow rate; R: flow resistance; RSBIv: rapid shallow breathing index during mechanical ventilation; RPPv: rate pressure product of ventilation; RPVI: rate pressure volume index; MW: mechanical work; IER: inspiration to expiration time ratio.

Notes: Variables in the same column of bold font are included in the same component.

**Table 4. Firth logistic regression analyses with stepwise elimination procedure for predicting the development of ARDS and mortality in patients with ARDS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Significant Predictors for The Development of ARDS*** | | | | | | |
| **Variables** | **Model 1a** | | **Model 2a** | | **Model 3a** | |
| **Adj. OR** | ***p*** | **Adj. OR** | ***p*** | **Adj. OR** | ***p*** |
| MW/IER | 0.82 (0.71, 0.94) | **0.004**\* |  |  | 0.81 (0.70, 0.95) | **0.008\*** |
| VT |  |  | 0.99 (0.98, 1.00) | **0.033\*** | 1.00 (0.99, 1.01) | 0.651 |
| ***Predictors for Mortality in Patients with ARDS*** | | | | | | |
| **Variables** | **Model 1b** | | **Model 2b** | | **Model 3b** | |
| **Adj. OR** | ***p*** | **Adj. OR** | ***p*** | **Adj. OR** | ***p*** |
| PIP | 1.35(0.90,2.02) | 0.150 |  |  |  |  |
| RSBIv | 1.05(0.98,1.13) | 0.190 |  |  |  |  |
| RPPv |  |  | 1.01(1.00,1.02) | 0.090 |  |  |
| RPVI |  |  |  |  | 28.4 (0.8,1034.8) | 0.068 |

ARDS: acute respiratory distress syndrome; Adj. OR: Adjusted Odds ratio; VT: tidal volume; MV: minute ventilation; : flow rate; RSBI: rapid shallow breathing index during mechanical ventilation; RPPv: rate pressure product of ventilation; RPVI: rate pressure volume index; MW: mechanical work. \**p* < 0.05

Adjusted OR was calculated by multivariate logistic regression with stepwise eliminated procedure.

The first step of model 1a adjusted for RSBIv, RPVI, and MW/IER.

The first step of model 2a adjusted for , MW and VT.

Model 3a adjusted for MW/IER and VT.

Model 1b adjusted for PIP and RSBIv.

Model 2b adjusted for RPPv.

Model 3b adjusted for RPVI.