EIT-guided positive end-expiratory pressure in supine and prone positions in patients with acute respiratory distress syndrome

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Abstract: The objective of the study was to investigate the effect of prone position compared to supine position on the positive end-expiratory pressure (PEEP) guided by electrical impedance tomography (EIT). Nineteen patients with acute respiratory distress syndrome (ARDS) were studied retrospectively. PEEP titration was conducted firstly in supine and subsequently in prone positions. Patients were divided into: LOP and NLOP groups. For patients in the LOP, PEEP in prone position $PEEP_{PP}$ < $PEEP_{SP}$ (supine position). Otherwise, they were NLOP. Eleven patients were classified as LOP (12±5 vs. 9±1 cmH_2O; $PEEP_{PP}$ vs. $PEEP_{SP}$). $PEEP_{PP}$ was higher than $PEEP_{SP}$ in 4 patients in the NLOP and remained unchanged in the others four patients. Patients in the LOP group had a significantly higher body mass index (26±3 vs. 22±8 kg/m^2; LOP vs. NLOP, p = 0.009) and lower ICU mortality rate (0 vs. 50%; LOP vs. NLOP, p = 0.018). Besides, oxygenation improved significantly during prone positioning in the LOP group. Not all patients showed decreased $PEEP_{PP}$ compared to $PEEP_{SP}$. Wide variability in $PEEP_{SP}$ and $PEEP_{PP}$ was observed in ARDS patients. EIT has the potential to identify the phenotypes of the prone position response and determine an individual PEEP in supine and prone positions.

Table.1 Difference of ventilator parameters at supine position and prone position

	Group	SP	PP	P value
PaO_2/FiO_2 (mmHg)	Total(n=19)	186±77	238±138	0.023
	LOP(n=11)	186±54	238±121	0.042
	NLOP(n=8)	199±94	216±150	0.313
$PaCO_2$ (mmHg)	Total(n=19)	43.0±9	43.3±9	0.732
	LOP(n=11)	42±8	42±10	0.286

	NLOP(n=8)	47±5	45±6	0.575
Optimal PEEP (cmH_2O)	Total(n=19)	9±6	9±3	0.116
	LOP(n=11)	12±5	9±1	0.002
	NLOP(n=8)	5±5	6±3	0.089

PaO_2 = Partial Pressure of Oxygen in Arterial Blood; FiO_2 = fraction of inspired oxygen; $PaCO_2$ = Partial Pressure of carbon dioxide in Arterial Blood; PEEP = positive end-expiratory pressure; SP = supine position; PP = prone position.