

EFFECT OF PEEP AND TIDAL VOLUME ON AERATION OF THE PRETERM NEONATAL LUNG

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Previous studies suggest that positive end expiratory pressure (PEEP) promotes aeration of the preterm lung. The role of tidal volume has been less clear. We aimed to study the effects of different PEEPs (0, 5, 8 and 10 cm H₂O) and VTs (4, 8, and 12 mL/kg) on the establishment of functional residual capacity (FRC).

27d preterm rabbit pups (equivalent to a surfactant deficient extremely preterm infant) were anaesthetised and surgically intubated. Volume targeted intermittent positive pressure ventilation (IPPV) was provided at each permutations of the above PEEPs and VTs. The primary outcome was FRC after 160 inflations, measured by plethysmography. Secondary outcomes included static compliance and homogeneity of tidal ventilation assessed using synchrotron based techniques (Spring8, Japan).

Mean (SE) FRC and static compliance after 160 inflations are shown below:

	FRC				Compliance			
	PEEP 0 cm H ₂ O	PEEP 5 cm H ₂ O	PEEP 8 cm H ₂ O	PEEP 10 cm H ₂ O	PEEP 0 cm H ₂ O	PEEP 5 cm H ₂ O	PEEP 8 cm H ₂ O	PEEP 10 cm H ₂ O
VT 4 mL/kg	2.4 (1.1)	3.0 (0.4)	2.0 (0.4)	3.3 (0.6)	0.10 (0.01)	0.13 (0.01)	0.17 (0.01)	0.23 (0.02)
VT 8 mL/kg	0.7 (0.3)	2.9 (0.7)	5.4 (1.4)	4.8 (0.8)	0.18 (0.01)	0.24 (0.02)	0.31 (0.01)	0.36 (0.02)
VT 12 mL/kg	1.4 (0.5)	2.8 (0.9)	5.2 (0.9)	9.6 (2.1)	0.26 (0.01)	0.36 (0.03)	0.48 (0.02)	0.57 (0.01)

[Table]

Linear regression of both FRC and compliance was statistically significant against both VT and PEEP separately ($p \leq 0.01$). No pup developed a pneumothorax. Video imaging demonstrates more homogeneous tidal ventilation in pups with better established FRC.

PEEP and VT both played a role in the establishment of FRC in fully ventilated infants. Future studies should assess which strategies promote aeration at birth whilst minimising lung injury.