

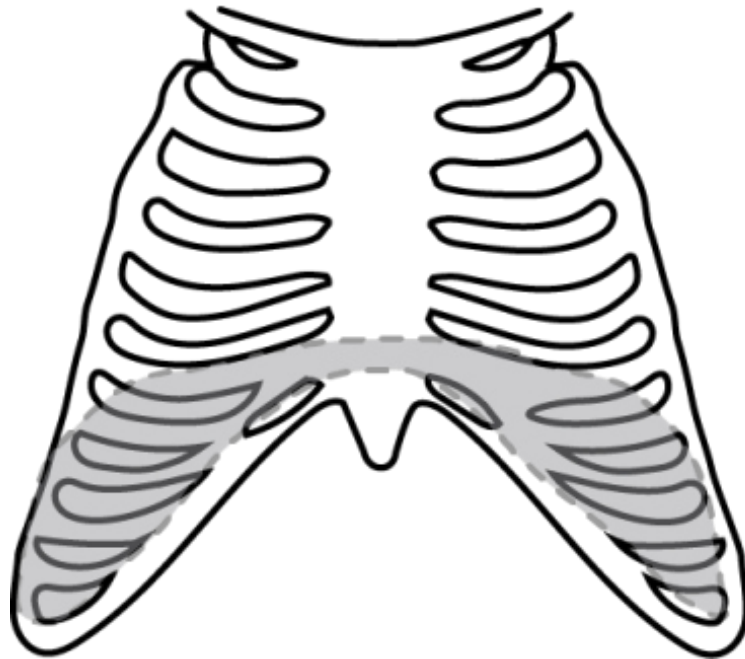
Chest wall mechanics in very preterm infants

Benjamin Stöcklin, Chiara Veneroni, Jane Choi, J. Jane Pillow, Raffaele Dellacà

Aarau, 14.05.2024

<https://doi.org/10.1152/japplphysiol.00561.2023>

Chest wall compliance & lung function



Post surfactant era ?

Bronchopulmonary
dysplasia (BPD) ?

Gerhardt et al. 1980; Heldt et al. 1988; Davis et al. 1988

Participants and Methods

- Very preterm infants



- King Edward Memorial Hospital, Perth, AUS

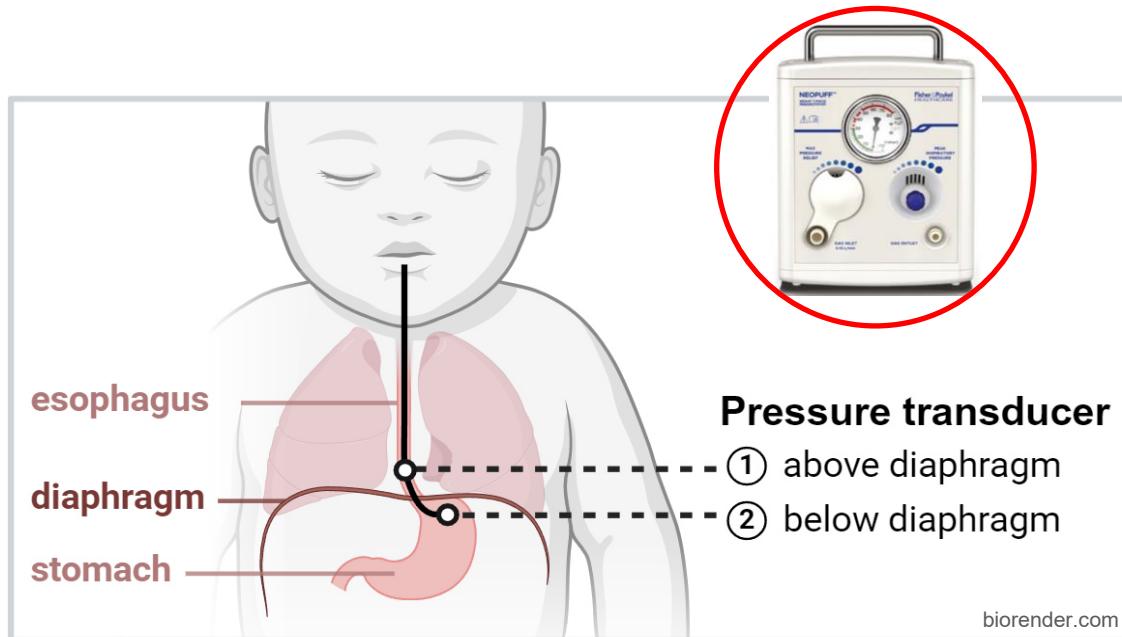
- 07/2017 – 05/2018



- With/without bronchopulmonary dysplasia (BPD)

- Chest wall mechanics & lung function at 36 weeks' postmenstrual age (PMA)

Assessment 36 weeks' PMA



$$C_{CW} = \Delta V / \Delta P_{pl}$$

$$C_{RS} = \Delta V / \Delta P_{ao}$$

$$C_L = \Delta V / \Delta (P_{ao} - P_{pl})$$

Lung function: tidal breathing parameters

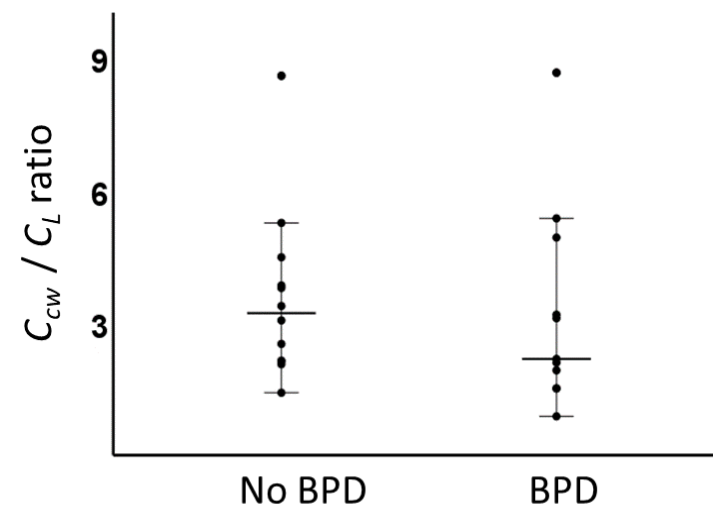
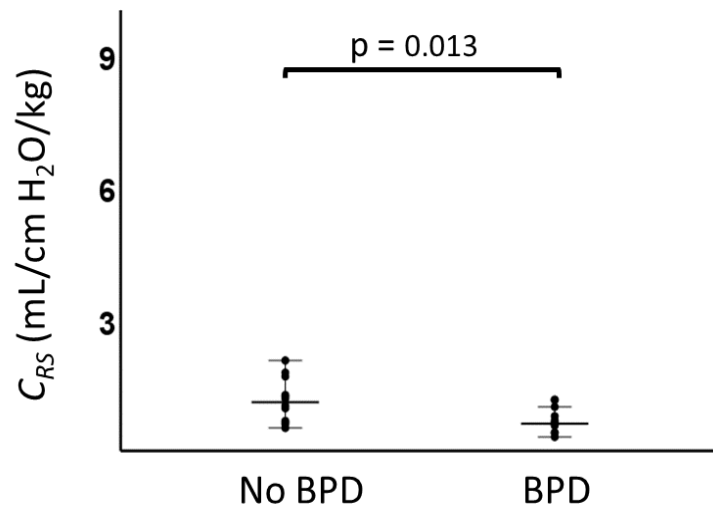
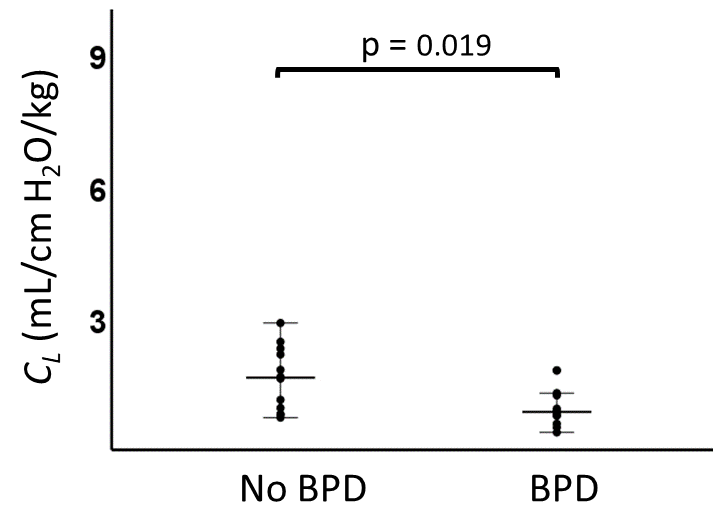
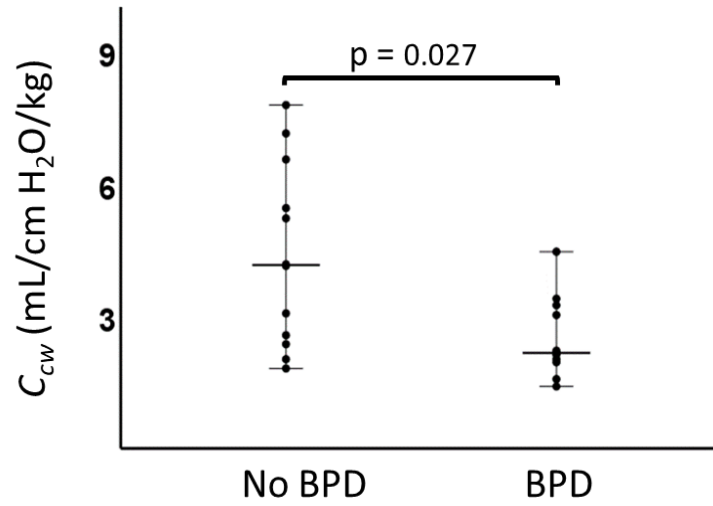
FRC by multiple breaths washout (mbw)

C_{CW} , compliance chest wall; C_{RS} , compliance respiratory system; C_L , compliance lung;
 ΔV , difference in lung volume 20 versus 5 cmH₂O; P_{pl} , pleural pressure; ΔP_{ao} , airway opening pressure

Demographics

	no BPD (n = 12)	BPD* (n = 11)	p
Male, n (%)	7 (53.8)	6 (46.2)	0.85
GA (w)	28.4 (5.7)	25.7 (4.3)	< 0.001
Weight at birth (kg)	1.1 ±0.2	0.7 ±0.1	0.001
Weight z-score at birth	-0.2 ±0.7	-0.2 ±1.2	0.83
Any surfactant, n (%)	7 (58.3)	11 (100)	0.016
Mechanical ventilation (d)	0.8 (4.7)	11.8 (42.1)	< 0.001
Supplemental oxygen (d)	10.2 (15.3)	84.7 (81.3)	< 0.001
Weight at test (kg)	2.5 (1.2)	2.7 (1.5)	1.00
Weight z-score at test	-0.6 ±1.1	-0.9 ±1.2	0.72
Length at test (cm)	45.2 (2.8)	44.8 (2.6)	0.70
Chest circumference (cm)	30.9 ±1.7	31.2 ±1.9	0.71

*BPD, NICHD definition 2001, Jobe 2001



Lung function

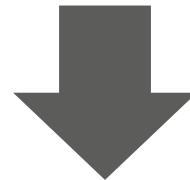
	no BPD (n = 12)	BPD (n = 11)	p
Minute ventilation (mL/kg/min)	357 (109)	329 (132)	0.190
FRC _{mbw} / weight (mL/kg)	22.6 ±2.5	20 ±3.3	0.044
Inspiratory capacity (mL/kg)	8.8 ±2.4	6.1 ±1.7	0.005

mL, millilitre; kg, kilograms; FRC_{mbw}, functional residual capacity measured by multiple breaths washout

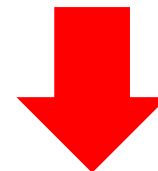
Conclusion

FRC = total lung capacity – inspiratory capacity

**Trapped gas
infants with BPD**



Static compliance
chest wall (C_{cw})



Acknowledgments

J. Jane Pillow

Chiara Veneroni

Raffaele Dellacà

Jane Choi

Amanda Woods

Nurses at KEMH

Families & babies



	no BPD* (n = 12)	BPD (n = 11)	p
Male, n (%)	7 (53.8)	6 (46.2)	0.85
GA (w)	28.4 (5.7)	25.7 (4.3)	< 0.001
Weight at birth (kg)	1.1 ± 0.2	0.7 ± 0.1	0.001
Chorioamnionitis, n (%)	6 (50.0)	4 (36.3)	0.51
Antenatal steroids, n (%)	11 (91.6)	11 (100)	0.33
Postnatal steroids, n (%)	0 (0.0)	3 (27.2)	0.052
Any surfactant, n (%)	7 (58.3)	11 (100)	0.016
Mechanical ventilation. (d)	0.8 (4.7)	11.8 (42.1)	< 0.001
Non-invasive ventilation. (d)	34.4 (49)	64.3 (19.0)	0.06
Supplemental oxygen (d)	10.2 (15.3)	84.7 (81.3)	< 0.001
Weight at test (kg)	2.5 (1.2)	2.7 (1.5)	1.00
Length at test (cm)	45.2 (2.8)	44.8 (2.6)	0.70
Chest circumference (cm)	30.9 ± 1.7	31.2 ± 1.9	0.71

*BPD, NICHD definition 2001, Jobe 2001