

Vascular Haemodynamics In Young Adults Born Extremely Preterm

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Objectives: Adverse cardiovascular outcomes following preterm birth have been described in the literature, but few studies have described these in detail in children and adults born extremely preterm (EP). The EPICure study previously reported on vascular haemodynamics in 11-year-olds born <26 weeks gestation,¹ and this cohort has now been reassessed to determine outcomes in young adulthood.

Methods: Young adults born EP (n=130) and controls (n=64) were evaluated for detailed haemodynamic evaluations, including direct and indirect measurements for blood pressure (BP), augmentation index (AIx), aortic pulse wave velocity (aPWV), cardiac output (CO), stroke volume (SV) and total peripheral pressure (TPR). Outcomes were compared between EP subjects with and without neonatal bronchopulmonary dysplasia (BPD) and term-born controls.

Results: At 19 years, there were no differences in seated systolic and diastolic BP between groups, but EP subjects had higher supine brachial diastolic BP and mean arterial pressure (MAP). Similar to findings at 11 years, AIx remained significantly higher in EP subjects, and likewise there was no difference in aPWV between groups. Cardiac index was similar between groups, but with faster heart rate and lower stroke volume index, TPR was significantly higher in the EP group. There were no differences between EP subjects with and without BPD, and differences between EP and control groups persisted on adjustment for confounders, including socioeconomic status. (Table 1)

Table 1: Baseline demographic and haemodynamic characteristics of EP and Control groups

	EP n=130	Controls n=64	EP-C Difference in means (95% CI)	P value
Gestational age (weeks)	24.9	≥ 37		
Male, n (%)	60 (45)	25 (38)		
Age (years)	19.3	19.2		
Height (m)	1.64	1.68	-0.04 (-0.07, -0.01)	0.004
Weight (kg)	62.6	69.7	-7.0 (-11.6, -2.5)	0.003
Body Mass Index	23.3	24.7	-1.4 (-2.8, 0.1)	0.063
Waist : Hip ratio	0.85	0.81	0.04 (0.02, 0.06)	<0.001
Seated brachial SBP (mmHg)	119	118	1.4 (-1.7, 4.6)	0.360
Seated brachial DBP (mmHg)	73	72	1.6 (-0.8, 3.7)	0.172
Supine central SBP (mmHg)	101	97	4.2 (1.8, 6.6)	0.001
Non-augmented central SBP (mmHg)	28	30	-1.1 (-2.9, 0.7)	0.225
Supine central DBP (mmHg)	70	67	3.4 (1.2, 5.5)	0.002
Central pulse pressure (mmHg)	31	30	0.8 (-1.1, 1.9)	0.379
MAP (mmHg)	85	81	3.7 (1.5, 5.9)	0.001
AIx, %	6.5	0.4	6.1 (3.4, 8.7)	<0.001
Adjusted AIx ^b	6.6	0.3	6.4 (3.8, 8.9)	<0.001
aPWV (m/s)	5.1	4.9	0.1 (-0.1, 0.3)	0.181
Adjusted aPWV ^c	5.0	5.0	-0.04 (-0.2, 0.1)	0.664
Heart Rate (b.p.m.)	71	67	4.3 (1.0, 7.7)	0.011
Adjusted Heart Rate ^a	71	67	4.7 (1.5, 7.9)	0.004
Cardiac Index (L/min/m ²)	4.3	4.3	0.02 (-0.2, 0.3)	0.849
Adjusted Cardiac Index ^a	4.3	4.3	0.02 (-0.2, 0.3)	0.854
TPR (dyne cm ⁻⁵)	972	875	97 (27, 166)	0.007
Adjusted TPR ^a	972	875	100 (31, 169)	0.005

Data are means. AIx, augmentation index; aPWV, aortic pulse wave velocity; b.p.m., beats per minute; BMI, body mass index; DBP, diastolic blood pressure; MAP, mean arterial pressure; SBP, systolic blood pressure; SD, standard deviation; TPR, total peripheral resistance. ^aData adjusted for sex, height and heart rate. ^bData adjusted for sex and MAP. ^cData adjusted for sex.

Conclusion: Vascular haemodynamics remain persistently altered in young adulthood following extremely preterm birth, as shown by increase in AIx but not aPWV. Our findings suggest abnormalities in the resistance vasculature, although it is unclear whether this is structural or functional in origin. Long-term monitoring of cardiovascular risk would be highly recommended in this population.

References: McEniery, C. M. *et al.* Cardiovascular consequences of extreme prematurity: the EPICure study. *J Hypertens* **29**, 1367–1373 (2011).