

EP15.57 Perinatal outcomes related to impaired umbilical vein flow is strongly modulated by pre-eclampsia in small-for-gestational-age infants

Ana Elizabeth Gomes de Melo Tavares Ferreira^{1, 2}, Kylie Crawford¹, Erika Cavanagh², Jennifer Hong², Samantha Hedges², Sailesh Kumar^{1, 3}

1. Mater Research Institute The University of Queensland, South Brisbane, QLD, Australia ; 2. MFM Centre, Mater Mothers' Hospital, Brisbane, QLD, Australia; 3. School of Medicine, The University of Queensland, Brisbane, QLD, Australia.

Introduction

The aim of this study was to determine the prevalence and association of low umbilical vein flow (UV-Q) with adverse placental and perinatal outcomes in small infants. We also ascertained the effect of pre-eclampsia (PE) on study outcomes.

Methods

This was a prospective cohort study of singleton pregnancies complicated with small for gestational age (SGA)/fetal growth restriction (FGR). Multivariable logistic regression was used to determine the effect of UV-Q<5th centile on three study outcomes: 1) severe fetal phenotype [estimated fetal weight (EFW)<3rd, umbilical artery (UA) pulsatility index (PI)>95th centile, middle cerebral artery (MCA) PI<5th centile, cerebroplacental ratio (CPR) PI<5th centile], 2) placental dysfunction [placental weight<3rd centile, placental growth factor (PIGF)<100ng/L, soluble fms-like tyrosine kinase-1 (sFlt-1)/PIGF ratio>38, sFlt-1/PIGF ratio>85], and 3) severe neonatal morbidity (composite of hypoxic-ischaemic encephalopathy, intracranial haemorrhage, sepsis, extensive resuscitation, respiratory distress syndrome, necrotising enterocolitis and hypoglycaemia). These outcomes were evaluated for the whole population and adjusted for PE.

Results

The study cohort comprised 634 women – 226 (35.6%) with early FGR, 226 (35.6%) late FGR, and 182 (28.7%) SGA. The prevalence of UV-Q<5th was 54.3%, 37.0% and 8.6%, in early FGR, late FGR and SGA respectively. Of the 115 cases with PE, only 29 (35.8%) had UV-Q<5th centile. UV-Q<5th centile was significantly associated with all study outcomes except placental weight<3rd centile. The odds of severe neonatal morbidity were >2.5 times higher in the PE cohort compared to the non-PE cohort (aOR 5.28, 95% CI 2.81-9.91 vs. 2.25, 95% CI 1.09-4.65).

Table 1. Logistic Regression models of the association between umbilical flow vein <5th and study outcomes, univariable and multivariable model adjusting for pre-eclampsia.

Outcomes	Univariable Model		Multivariable Model			
	Umbilical Vein Flow <5 th		Umbilical Vein Flow <5 th		Pre-eclampsia	
	Odds Ratio (95% CI)	p-value	Odds Ratio (95% CI)	p-value	Odds Ratio (95% CI)	p-value
EFW <3rd Centile	2.65 (1.63-4.31)	<0.0001	2.20 (1.33-3.63)	0.002	3.47 (2.23-5.39)	<0.0001
UAPI >95th Centile	4.48 (2.73-7.36)	<0.0001	3.69 (2.18-6.22)	<0.0001	5.21 (3.32-8.18)	<0.0001
MCA <5th Centile	5.04 (3.07-8.28)	<0.0001	4.14 (2.40-7.14)	<0.0001	5.61 (3.51-8.97)	<0.0001
CPR <5th Centile	4.55 (2.77-7.47)	<0.0001	3.72 (2.20-6.30)	<0.0001	6.98 (4.39-11.10)	<0.0001
Placenta weight <3rd Centile	1.48 (0.93-2.37)	0.10	1.38 (0.86-2.23)	0.19	1.43 (0.95-2.16)	0.09
PIGF <100ng/L	3.82 (2.29-6.38)	<0.0001	3.21 (1.86-5.54)	<0.0001	11.52 (6.64-20.00)	<0.0001
sFlt-1/PIGF Ratio >38	3.23 (1.97-5.28)	<0.0001	2.60 (1.52-4.46)	0.0005	14.83 (8.43-26.10)	<0.0001
sFlt-1/PIGF Ratio >85	3.51 (2.15-5.73)	<0.0001	2.82 (1.62-4.90)	0.0002	17.12 (10.46-28.02)	<0.0001
Severe Neonatal Survival Morbidity*	3.19 (1.63-6.25)	0.001	2.25 (1.09-4.65)	0.03	5.28 (2.81-9.91)	<0.0001
Perinatal Mortality	3.54 (1.04-12.04)	0.04	2.33 (0.65-8.31)	0.19	5.71 (1.72-18.91)	0.004

EFW – estimated fetal weight; UA – umbilical artery; PI – Pulsatility index; MCA – Middle cerebral artery; CPR – cerebroplacental ratio; PIGF - placental growth factor; sFlt-1 - soluble fms-like tyrosine kinase-1; () represents 95% Confidence Intervals.
* Composite of hypoxic-ischaemic encephalopathy, intracranial haemorrhage, sepsis, extensive resuscitation, respiratory distress syndrome, necrotising enterocolitis and hypoglycaemia.

Conclusion

UV-Q <5th was significantly associated with ultrasound features of suboptimal fetal growth and placental dysfunction as well as severe neonatal morbidity. The odds of all outcomes were greater in the PE cohort underlining the contribution of maternal disease to severe perinatal outcomes.