September 15th, 2021 15:00 - 17:00

PARALLEL SESSION 9 – CIRCULATION 1

ID 131. POSTNATAL CARDIAC MORPHOLOGY IN INTRAUTERINE GROWTH RESTRICTED NEONATES

Doctoral Research Fellow / Consultant Neonatologist Lisa Bjarkoe[1,2], Professor Drude M Fugelseth[1,2], Professor Torvid Kiserud[3,5], Consultant in Obstetrics and Gynecology Nina Harsem[4], Professor Guttorm Haugen[1,4], Associate Professor and Consultant in Paediatric Cardiology and Neonatology Eirik Nestaas[1,6]
[1]University of Oslo, Institute of Clinical Medicine, Oslo, Norway, [2]Oslo University Hospital, Department of Neonatal Intensive Care, Oslo, Norway, [3]University of Bergen, Department of Clinical Science, Bergen, Norway, [4]Oslo University Hospital, Department of Obstetrics and Gynecology, , Oslo, Norway, [5]Haukeland University Hospital, Department of Obstetrics and Gynecology, Bergen, Norway, [6]Akershus University Hospital, Clinic of Paediatrics and Adolescence, Loerenskog,

POSTNATAL CARDIAC MORPHOLOGY IN INTRAUTERINE GROWTH RESTRICTED NEONATES

Background: Intrauterine growth restriction (IUGR) following placenta insufficiency affects cardiac development. We hypothesized that IUGR influences early cardiac remodeling. Our aim was to assess the impact on cardiac morphology in premature and term neonates.

Methods: Sixty-two pregnant women and their 69 neonates with gestational age (GA) 30-42 weeks were included in a prospective, observational cohort study. IUGR (n=28) was documented with measurements of foetal growth and centralization of the foetal circulation. The non-IUGR group (n=41) had normal prenatal growth and circulation. We performed echocardiographic measurements of cardiac morphology on postnatal day one, two and three.

Results: IUGR GA (mean (SD)) were 34.8 (3.2) and non-IUGR 38.6 (2.5) weeks ($p<0.001$), and birth weight (BW) 1.9 (0.6) and 3.2 (0.7) kg ($p<0.001$). The table shows measurements of cardiac morphology, adjusted for GA, BW, sex and singleton/twin. The adjusted values are estimated marginal means by use of mean GA and BW (37 weeks and 2.7 kg). We also made indices to adjust for heart size by dividing by left ventricle (LV) septum length. The IUGR neonates had significantly smaller left atrium (LA) diameter and shorter LV septum length compared to the non-IUGR neonates. They also had significantly smaller end-diastolic left ventricle internal diameter (LVIDd) and right ventricle (RV) midwall diameter. The reduction in LA and RV diameters were more pronounced than the reduction in septum length. The reduction in LV diameter was similar to the reduction in septum length. IUGR neonates hence exhibited a symmetrical change in shape for the LV and an oblong change in shape for the RV.

Conclusion: We found impact of IUGR on heart morphology when adjusting for GA, BW, sex and singleton/twin. The IUGR group overall had smaller hearts. The LV dimensions exhibited a symmetrical change in shape and the RV dimensions exhibited an oblong change in shape.

Table: Adjusted echocardiographic morphological measurements (mean (SEM).

Measurements adjusted for GA, BW, sex and singleton/twin. Significance level p value <0.05			
	IUGR n = 28	Non-IUGR n = 41	p value
Left side measurements, mm			
Septum length	27.8 (0.4)	29.7 (0.3)	0.001
LA diameter	9.4 (0.2)	10.8 (0.2)	<0.001
LVIDd, mm	16.0 (0.3)	17.3 (0.2)	<0.001
Left sided indices			
	0.336 (0.008)	0.361 (0.006)	0.024
	0.569 (0.014)	0.590 (0.011)	0.275
Right sided measurements, mm			
RV cavity length, mm	23.5 (0.4)	24.4 (0.4)	0.111
RV mid-wall diameter, mm	8.3 (0.3)	9.9 (03)	0.001
Right sided indices			
	0.296 (0.012)	0.330 (0.010)	0.032
Ratios between corresponding right sided and left sided measurements			
	0.845 (0.018)	0.825 (0.014)	0.402
	0.519 (0.018)	0.565 (0.015)	0.056

Table: Adjusted echocardiographic morphological measurements (mean (SEM).
Table: Adjusted echocardiographic morphological measurements (mean (SEM).
None declared

ID 149. Effect of intrauterine growth restriction on regional perfusion and tissue oxygenation in term neonates after birth

Doctor Simona Puzone[1], Doctor Elisabetta Caredda[1], Doctor Umberto Pugliese[1], Doctor Anna Maietta[1], Mrs Giusy Di Paolo[1], Mrs Federica Formato[1], Mrs Iolanda Marcone[1], Mrs Mariateresa Riccardi[1], Mrs Maria Savarese[1], Mrs Roberta Spina[1], Professor Carlo Capristo[1], Phd Paolo Montaldo[1,2]

[1]University Of Campania Luigi Vanvitelli, Naples, Italy, [2]Division of Brain Sciences, Centre for Perinatal Neuroscience, Imperial College London, London, UK

Background:
Intrauterine Growth Restriction (IUGR) is mainly due to placental insufficiency, which can lead to chronic intrauterine hypoxia and prenatal hemodynamics disturbances, thus causing structural and functional changes of cerebral and renal circulation.
Near infrared spectroscopy (NIRS) is a non-invasive tool to study organ hemodynamic processes by measuring oxygenation and hemoglobin concentration changes.
Methods.
In this prospective case-control study 105 IUGR term infants and 105 age/gender-matched controls were recruited.
Regional cerebral and renal oxygenations (rSO2) were studied by NIRS for the first 12 hours after birth. Fractional tissue oxygen extraction (FTOE) was calculated.
Resistance index (RI) in renal and anterior cerebral arteries (ACA) were assessed by doppler at 6 and 24 hours.
Results
NIRS monitoring was starting at a mean time of 68 min ± 22 min
There were higher cerebral rSO2 values (main effect group: p = 0.04; interaction time × group: p = 0.72) and lower FTOE in the IUGR versus control group (main effect group: p = 0.03; interaction time × group: p = 0.463).
Renal FTOE was lower in IUGR (main effect group: p = 0.04; interaction time × group: p = 0.39) whereas renal rSO2 was higher in IUGR versus control neonates (main effect group: p = 0.003; interaction time × group: p = 0.44).
RI in ACA was lower in the IUGR group (0.66±0.11 versus 0.76±0.14 at 6 hours p=0.007; 0.65±0.08 versus 0.73±0.13 at 24 hours p=0.04).
There was no significant difference in the renal blood flow between two groups.
Conclusion
IUGR has a direct impact on the cerebral and renal oxygenation and perfusion after birth. IUGR infants have an increased cerebral oxygenation and perfusion during the first day after birth as indicated by a higher cerebral rSO2 and lower RI in ACA, reflecting a preferential redistribution of blood flow to the brain. The lower cerebral FTOE in IUGR may indicate the persistence of an adaptive phenomenon to reduced substrate delivery in case of foetal chronic hypoxia.
Higher rSO2 and lower FTOE in the kidney without any significant difference in the renal blood flow may indicate an impaired renal maturation with reduced oxygen consumption.

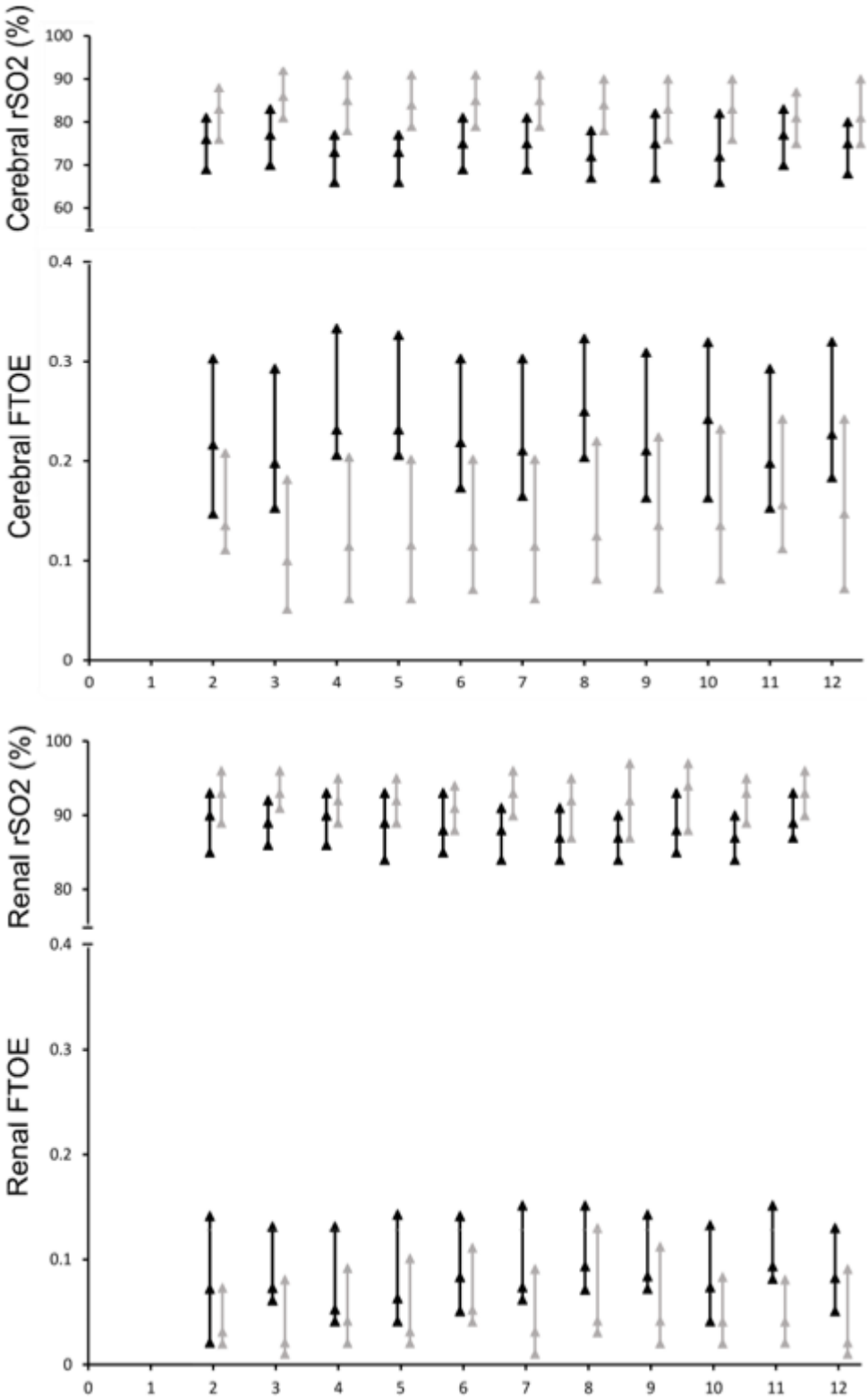
Cerebral rSO2 (%)
100
90
80
70
60
Cerebral FTOE
0.4
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10 11 12
Renal rSO2 (%)
100
90
80
Renal FTOE
0.4
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10 11 12

Figure 1. Changes in the mean cerebral and renal rSO2 and FTOE for the IUGR (grey) and the AGA (black) group during the first 12 hours after birth.

Figure 1. Changes in the mean cerebral and renal rSO2 and FTOE for the IUGR (grey) and the AGA (black) group during the first 12 hours after birth.

None declared

ID 410. RESVERATROL REVERSED ENDOTHELIAL COLONY FORMING CELLS DYSFUNCTION AT ADULTHOOD IN A RAT MODEL OF DEVELOPMENTAL PROGRAMMING OF ARTERIAL HYPERTENSION RELATED TO INTRAUTERINE GROWTH RESTRICTION

Miss Estelle Guillot[1], Doctor Hanna Coppola[1], Doctor Stéphanie Simoncini[2], Miss Kathiusca Zamora[1], Doctor Anne Christine Peyter[3], Professor Umberto Simeoni[1], Doctor Catherine Yzydorczyk[1]

[1]Centre Hospitalier Universitaire Vaudois- DFME- DOHaD Laboratory, Lausanne, Switzerland, [2]Aix-Marseille University, INSERM, INRA, C2VN UMR_S1263, UFR de Pharmacie, Marseille, France, [3]Centre Hospitalier Universitaire Vaudois-DFME-Neonatal Research Laboratory, Clinic of Neonatology, Lausanne, Switzerland

Background: Infants born after intrauterine growth restriction (IUGR) are at risk to develop arterial hypertension thereafter. The endothelium plays a role in the pathogenesis of hypertension. The endothelial colony forming cells (ECFCs), circulating components of the endothelium, regulate the vasculo- and angiogenesis. In a rat model of IUGR, we observed in 6-month-old males a decreased number and impaired functionality of ECFCs, associated with arterial hypertension and microvascular rarefaction, related to oxidative stress and stress-induced premature senescence. Resveratrol, a polyphenol compound with antioxidant properties, was found to improve cardiovascular functions. However, whether resveratrol could reverse the ECFCs dysfunction observed at adulthood following IUGR is still unknown.

Method: IUGR has been induced in rats by administration of a maternal low protein diet during gestation vs. a control (CTRL) diet. ECFCs from males have been isolated from bone marrow and treated or not with resveratrol (1µM, 48 h) before investigation of their number (flow cytometry), proliferation (BrdU incorporation), capillary-like outgrowth sprout formation (Matrigel) and NO production (immunofluorescence and western blot). Oxidative stress has been investigated by evaluation of superoxide anion level (chemiluminescence) and antioxidant proteins expression (western blot), and senescence by beta-galactosidase activity and related-factors expression (western blot). Data were analyzed using a nonparametric Mann-Whitney U test. The significance level was set at $p < 0.05$.

Results: In IUGR-ECFCs (n=5), the resveratrol treatment improved proliferation (+80%, $p<0.01$), restored capillary-like outgrowth sprout formation, increased NO production (+40%, $p<0.05$) with increased eNOS expression (+50%, $p<0.05$). Resveratrol also decreased superoxide anion production (-60%, $p<0.01$), restored superoxide dismutase protein expression (+20%; $p<0.05$), decreased beta-galactosidase activity and increased the expression of sirtuin-1 (+60%, $p<0.01$), an anti-aging protein. Resveratrol treatment had no effect on CTRL-ECFCs.

Conclusions: IUGR-ECFCs treatment with resveratrol was able to improve their functionality by decreasing oxidative stress and reversing stress-induced premature senescence. It would be interesting to test whether resveratrol administration during gestation could restore the number of ECFCs and so decrease cardiovascular disorders related to IUGR.

None declared.

ID 355. Glomerular and tubular function in intrauterine growth restricted term newborns

Doctor Maeva De Lucia[1], Doctor Simona Puzone[1], Doctor Elisabetta Caredda[1], Doctor Umberto Pugliese[1], Doctor Francesca Galdo[1], Doctor Francesca Gicchino[1], Doctor Giuseppina Campana[1], Doctor Davide Ursi[1], Doctor Emanuela Inserra[1], Doctor Pierluigi Marzuillo[1], Professor Carlo Capristo[1], Phd Paolo Montaldo[1,2]
[1]Department of Neonatal Intensive Care, Università della Campania Luigi Vanvitelli, Naples, Italy, [2]Division of Brain Sciences, Centre for Perinatal Neuroscience, Imperial College London, London, England

Background
In the hostile environment linked to intrauterine growth restriction (IUGR), kidneys are extremely sensitive organs to damage. IUGR newborns are more likely to have a congenital reduction in nephron which in turn can lead to a compensatory hyperfiltration by the remaining nephrons and impaired nephrogenesis.
A prompt identification of the neonates with IUGR who have impaired glomerular or tubular function can help to improve their future outcome and management soon after birth.

The aim of this study was to assess whether IUGR affects the glomerular or tubular function soon after birth in term IUGR neonates.

Methods
We studied 105 small for gestational age (SGA) IUGR infants and 105 age/gender-matched controls . SGA was defined as birth weight < 10th centile for gestational age and adequate for gestational age as a birth weight between the 10th and the 90th percentile for gestational age. IUGR was defined according to the following criteria: estimated fetal birth weight below the 3rd percentile or below the 10th percentile in combination with one or more abnormal Doppler measurements prior to delivery.

A blood sample was collected for serum creatinine, urea between 48 and 72 hours after birth and a paired urine sample was collected for microalbumin and neutrophil gelatinase-associated lipocalin (NGAL) measurement (ELISA). Renal function was estimated by using the Schwartz formula for the term babies. A renal ultrasound of both the kidneys was performed to measure renal length.

Results
One-hundred-fifty-nine urine and 141 blood samples were available for analysis. Renal function was not significantly different between IUGR and control neonates (36.5±11.52 versus 40.6±9.14 mL/min/1.73 m2, p=0.28). Urine microalbumin (48 [25-62] versus 26 [21-35] mg/L) and NGAL (29.16 [12.10–49.01] versus 13.36 [7.04–24.45]) were significantly higher in IUGR infants compared with controls (p=0.01 and p= 0.04 respectively). No difference was found in kidney length between the two different groups (Table 1).

Conclusion
IUGR term infants have a higher risk of a subclinical kidney damage even though they are apparently clinically well. These data confirm that every IUGR term neonate should be considered at high risk for later kidney disease and should be closely followed-up.

Variables	IUGR group (n= 105)	Control group (n= 105)	P value
Gestational age	39(1.6)	39 (1.5)	0.49
Female	55(52)	55(52)	-
Birth weight, g	2640 [2400-2780]	3180 [3000-3400]	0.001†
Birth length	48 [47-49]	51 [50-53]	0.001†
Birth head circumference	33 [32-34]	34.7 [33.8-35]	0.001†
Right kidney length mm	40 [38-43]	42 [40-44]	0.13
Left kidney length mm	40.5 [37-43]	45 [42-47]	0.24
eGFR, mL/min/1.73 m^2	36.5 (11.52)	40.6 (9.14)	0.28
Serum Cr, mg/dL	0.69 (0.10)	0.57 (0.11)	0.13
Serum Urea, mg/dL	17.1 (2.0)	16.2 (7.7)	0.71
Urine NGAL, ng/mL	29.16 [12.10–49.01]	13.36 [7.04–24.45]	0.04†
Urine NGAL/Cr ratio, ng/mg Cr	33.2 [15.61–58.26]	17.69 [11.24-27.16]	0.04†
Urine microalbumin, mg/L	48 [25-62]	26 [21-35]	0.01†

Table 1. Clinical features, ultrasound and laboratoristic data in the two groups
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None declared