Neurodevelopment at 3 years following IUGR relationship with brain sparing

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BACKGROUND

Intrauterine growth restriction (IUGR) due to placental insufficiency is associated with significant neurodevelopmental disabilities in cognitive function, attention capacity and school performance both in preterm and term babies. Neurostructural correlations with these disabilities in humans are not clear.

Animal studies have shown that chronic intrauterine hypoxia and protein restriction due to placental insufficiency have a negative impact on brain development.

The concept of 'brain sparing' as a 'protective' function persists in the interpretation of hemodynamic changes in IUGR fetuses even if it has been lately challenged by many reports showing increased prevalence of short-term and long-term neurological complications in IUGR children presenting brain vasodilatation.

AIM OF THE STUDY

To evaluate cerebral morphological maturation by Magnetic Resonance Images in preterm newborns to verify the hypothesis that IUGR interferes on human brain development

To assess the neurodevelopmental outcome at 3 years of age in our population of growth-restricted preterm babies, brain imaged at term corrected age and its relationship with arterial and venous Doppler

METHODS

<u>26 singleton IUGR</u> fetuses met the inclusion critera for this study

<u>34 singleton Preterm Appropriate for Gestational Age (AGA)</u> fetuses matched for gestational age at birth were identified.

within 48 h from delivery → Doppler ultrasound examinations: umbilical artery, middle cerebral artery and ductus venosus

at delivery → Perinatal outcomes

at term corrected age → MRI performed in order to asses Total Maturation Score

at 3 years of age → Neurodevelopmental outcome assessed by the Griffith's scale. Severe developmental delay was defined as General Quotient (GQ) ≤ 75

RESULTS

	Preterm AGA (n=34)	IUGR (n=26)
-	Preterm AGA (n=34)	IUGR (n=26)
Umbilical Artery pH	7.28 ± 0.2	7.23 ± 0.1
Umbilical Vein pH	7.34 ± 0.2	7.28 ± 0.1*
Umbilical Artery Cont O2 (mmol/L)	1.14 ± 0.2	0.48 ± 0.7**
Umbilical Vein Cont O2 (mmol/L)	3.17 ± 0.5	1.81 ± 0.2*
Umbilical Artery Lactate (mmol/L)	3.04 ± 0.4	3.86 ± 0.5
Umbilical Vein Lactate (mmol/L)	2.69 ± 0.3	3.81 ± 0.5

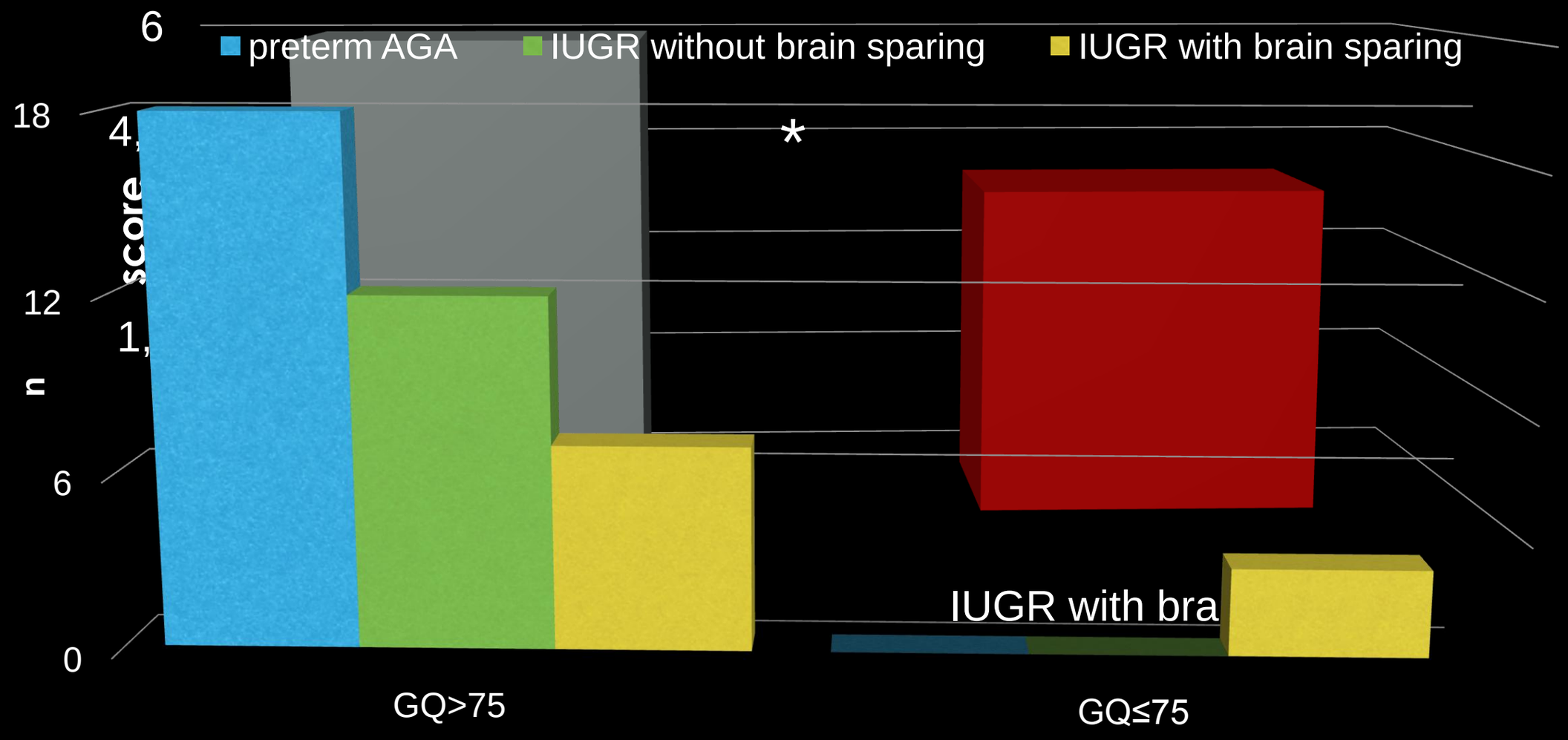
*p<0.05 t test vs preterm AGA, **p<0.01 t test vs preterm AGA

* P value obtained by unpaired Student's t test vs AGA p<0.001,° P value obtained by non-parametric Chi-squared test vs AGA p<0.001

RESULTS

Myelination at corrected age

Neurodevelopment at 3 years of age



test U of Mann-Whitney,*p<0.05

WHAT'S NEW?

Very well classified population

MRI and Doppler are here used together to evaluate relationship between IUGR and neurodevelopment

Need largest population

Controls are not really physiological

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HOW THIS DATA HELP PERINATOLOGY?

Timing of delivery?

PREMATURITY

COMPENSATORY AND DECOMPENSATORY CHANGES

ANY IDEAS FOR NEXT RESEARCHES?

Increase population number with <u>uniform diagnostic criteria</u>

Follow-up until scholar age