Effects on neurodevelopmental outcome using a mixed lipid emulsion containing fish oil versus a lipid emulsion based on soy bean oil in preterm infants

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Background

A mixed lipid emulsion (soybean, olive, fish oil and medium chain triglycerides, SMOFLipid, SMOF) contains higher amounts of omega-3 fatty acids and lower amounts of omega-6 fatty acids compared to 100% soybean-based lipid emulsions (Intralipid, IL). The omega-3 fatty acid DHA is critical for brain development. Using SMOFLipid for parenteral nutrition during the first weeks of life might be beneficial for the neurodevelopmental outcome in preterm infants.

Figure 1 & 2. Intralipid vs. SMOFLipid

Patients & Methods

This study is a secondary outcome analysis of a double-blind randomized trial which was performed at a single center between 06/2012 and 06/2015. Preterm infants with a birth weight <1000g received either SMOF or IL for parenteral nutrition. Neurodevelopmental outcome (Bayley-III) was assessed as a predefined secondary outcome at 1 and 2 years corrected age (08/2013-10/2017).

Results

86.6% (n=174/201) of discharged patients were available at one year corrected age and 84.1% (n=169/201) at two years. At one year corrected age, cognitive composite score was 95 (=median, IQR SMOF 85-102.5, IL 85-100, p=0.865) and motor composite score 88 (=median, IQR SMOF 76-94, IL 79-94, p=0.878) in both groups, respectively. Language composite score was 86 (=median, IQR 77-94) in the SMOF group and 89 (=median, IQR 77.5-94) in the IL group (p=0.569). At two years corrected age, cognitive composite score was 95 (=median, IQR SMOF 80-105, IL 90-105, p=0.229), motor composite score 94 (=median, IQR SMOF 82-100, IL 88-103, p=0.422) and language composite score 89 (=median, IQR SMOF 71-97, IL 77-100, p=0.467) in both groups.

Table 1. Demographic Data

	Intralipid (n = 101)	SMOFLipid (n = 105)	P
Male	66%	58%	n.s.
Cesarean Section	92%	93%	n.s.
Prenatal steroids (completed)	62%	64%	n.s.
PROM	38%	35%	n.s.
Surfactant	87%	88%	n.s.
Gestational age	26+2 (23+1 - 32+0)	26+0 (23+1 - 33+4)	n.s.
Birth weight, g	780 (430 - 997)	790 (420 - 998)	n.s.
Birth weight <10th percentile	31%	21%	n.s.
APGAR (5 minutes)	8 (4-9)	8 (5-10)	n.s.
Umbilical artery pH	7.3 (7.03 – 7.42)	7.3 (6.8 – 7.48)	n.s.

Table 2. Neonatal Outcome

	Intralipid (n = 101)	SMOFLipid (n = 105)	P
PNAC	16%	10%	n.s.
Sepsis (culture proven)	25%	23%	n.s.
NEC (≥ Bell II)	6.9%	6.7%	n.s.
Focal intestinal perforation	3%	2.9%	n.s.
IVH III/IV	5.9%	9.5%	n.s.
Days on mechanical ventilation	1 (0 - 27)	0 (0 - 29)	n.s.
BPD (O2 > 36 weeks of gestation)	19%	18%	n.s.
Pharmacological treatment for PDA	63%	52%	n.s.
PHT (verified by cardiac ultrasound)	24%	19%	n.s.
ROP	55%	58%	n.s.
ROP requiring treatment	9.3%	8.8%	n.s.

Figure 3. Bayley-III at 1 year corrected age

Figure 4. Bayley-III at 2 years corrected age

Conclusion

The type of parenteral lipid emulsion administered during neonatal period did not affect neurodevelopmental outcome of extremely preterm infants at one and two years corrected age, demonstrating safety, but no neurodevelopmental long-term benefit.