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Mortality and severe neurological morbidity of extremely preterm intrauterine growth restricted infants

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Objective

To construct a predictive model for neonatal mortality or severe neurological morbidity in extremely preterm (<28 weeks) antenatally detected growth restricted infants.

Methods

A multicenter cohort was constructed of all singleton pregnancies attended in the referral hospitals of the area of Barcelona between January 2010 and January 2020, meeting the following inclusion criteria: antenatal suspicion of fetal growth restriction, livebirth between 24.0 and 27.6 weeks (according to first-trimester crown-rump length) and a birthweight< 10th percentile according to international reference tables (http: //intergrowth21. ndog. ox. ac. uk/es). Exclusion criteria were severe/major congenital anomalies, genetic abnormalities with clinical significance and congenital infections. A composite serious adverse outcome was defined as mortality (neonatal death or infant death during the infant follow-up) or severe neurological morbidity, defined as: cognitive impairment [Bayley Scales of Infant and Toddler Development third edition (Bayley-III) below 85]; cerebral palsy; hearing loss (evaluated by evoked otoacoustic emissions (<2 years of age), play audiometry (2-4 years of age) or conventional audiometry (>4 years of age); visual loss [6 months to 2 years of age: failure to fix and follow; 3-4 years of age: visual acuity <0.4; 4-5 years of age: visual acuity <0.5; and >5 years of age: visual acuity <0.66].

Results

A total of 109 cases were included (7 of 24 weeks, 15 of 25 weeks, 36 of 26 weeks and 51 of 27 weeks). There were 40/109 (36.7%) cases of neonatal mortality, and, among the survivors, 20/69 (29%) cases of neurological morbidity. The multivariate analysis retained as significant predictors of mortality: magnesium sulfate neuroprotection (OR 0.35 (0.12-1.05)), gestational age at birth (OR 0.54 (0.27-1.12)), being a boy (OR 2.81 (1.01-7.85)), fetal weight (x100g) (OR 0.58 (0.31-1.06)) and Doppler stage (umbilical artery positive diastolic flow [reference]; absent umbilical artery diastolic flow [OR 1.54 (95%CI 0.21-11.2)]; reversed umbilical artery diastolic flow or pulsatile DV [OR 3.9 (95%CI 1.2-13.2)]; and, absent or reversed ductus venosus diastolic flow [OR 6.4 (95%CI 1.5-27.4)]). This model showed and area under the curve significantly better than a model including only gestational age at birth (AUC 79% vs. 68%; p=0.021). For the prediction of the composite adverse outcome (mortality or neurological morbidity), the predictive model included: gestational age at birth (OR 0.43 (0.26-0.7)), being a boy (OR 2.88 (1.11-7.26)) and Doppler stage (umbilical artery positive diastolic flow [reference]; absent umbilical artery diastolic flow [OR 1.93 (95%CI 0.4-9.2)]; reversed umbilical artery diastolic flow or pulsatile DV [OR 5.1 (95%CI 1.6-16.8)]; and, absent or reversed ductus venosus diastolic flow [OR 9.5 (95%CI 2.4-38)]). This model showed and area under the curve significantly better than a model including only gestational age at birth (AUC 79% vs. 68%; p=0.026).

Conclusion

A model including gestational age, magnesium sulfate administration before delivery, birthweight, sex and fetal Doppler status improves the prediction of mortality or severe morbidity in extremely preterm and antenatally diagnosed growth restricted infants. This should be considered in the counselling of parents.