Postoperative systemic inflammatory response is an important determinant for adverse two-year neurodevelopmental outcomes after the Norwood procedure

Li X. (1), Robertson C. (2), Yu X. (2), Cheypesh A.(2), Dinu I.(2), Li J.(1)
(1) Capital Institute of Pediatrics, Beijing, China
(2) University of Alberta, Edmonton, AB, Canada

Objectives. Neonatal cardiopulmonary surgery, particularly the Norwood procedure, carries a significant risk factor for adverse neurodevelopmental outcomes, which may be related to early postoperative systemic inflammatory response. We examined the relationship between postoperative C-reactive protein level (CRP), a marker of systemic inflammatory response, and two-year neurodevelopmental outcomes among the survivors after the Norwood procedure.

Methods. Charts of 53 neonates undergoing the Norwood procedure from 2003-2009 were reviewed. CRP was measured in 43 neonates twice weekly within postoperative day 20. Peak CRP levels were recorded, with peak total and differential white blood cell counts (lowest level of lymphocytes), glucose and lactate. Demographic data included age at surgery; gender; durations of CPB, aortic cross clamp, deep hypothermic circulatory arrest, and ICU stay; and socioeconomic status of the families. Two-year neurodevelopment of cognition, motor and language were prospectively assessed with The Bayley Scales of Infant and Toddler Development-III in 26 patients (9 deaths, 2 lost, 6 assessed with Bayley Scales of Infant Development-II).

Results: Mean±SD scores were: cognitive, 91±13; language, 86±13; and motor, 85±17. The peak CRP was 79±37 mg/L. Univariate regression showed that cognitive scores significantly and negatively correlated with peak CRP (p=0.004), and trended to a negative correlation with age (p=0.097). Language scores significantly and negatively correlated with peak CRP (p<0.0001) and age (p=0.005). Motor scores trended to a negative correlation with age (p=0.08). Multivariate regression showed that both cognitive and language scores significantly and negatively correlated only with peak CRP (p<0.01 for both), but not with other clinical variables.

Conclusions: The magnitude of systemic inflammatory response, among the perioperative risk factors examined, is the most important determinant for adverse two-year neurodevelopmental outcomes of cognition and language after the Norwood procedure.