

**S100 a potential biomarker for cerebral injury in neonates and infants undergoing surgery for congenital heart disease - association to perioperative cerebral tissue oxygenation**

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**Objectives:** Neurodevelopmental impairment including fine and gross motor deficits or speech and language problems are common in children with congenital heart defects (CHD) requiring palliative or corrective surgery as neonates or infants. Identification of risk factors, monitoring techniques and specific and sensitive markers for perioperative neurologic injury are of special interest. We analyzed serum levels of S100, a protein expressed primarily by astrocytes, in children undergoing surgery for CHD within the first year of life. The association between serum levels of S100 and perioperative cerebral tissue oxygenation was evaluated.

**Methods:** Serum levels of S100 were measured preoperatively and 0, 12, 24 and 48 hours postoperatively using electrochemoluminometric immunoassay (ELECSYS, Roche®). Cerebral tissue oxygenation (cSO<sub>2</sub>) was derived by near infrared spectroscopy (INVOS, Covidien®) for 12 hours preoperatively, intraoperative and for 48 hours postoperatively.

**Results:** S100 and cSO<sub>2</sub> were obtained in 32 cases (Repair of Tetralogy of Fallot, n=6; Arterial switch operation, n=7; Norwood procedure, n=5; Hemifontan procedure, n=5; Aortic arch repair, n=2; others, n=7). Median age at surgery was 82 (1-295) days, median weight 5.2 (2.8-9.2) kg. The median duration of cardiopulmonary bypass was 129 (49-208) minutes. None of the patients showed neurologic symptoms during the perioperative course. Preoperative S100 was 0.20 ±0.10 µg/l. Highest S100 levels were measured directly after surgery (0.88 ±1.22 µg/l). Overall, S100 declined to preoperative levels in the postoperative period (S100 48 hours post OP: 0.22 ±0.11 µg/l). However, 48 hours after surgery, S100 was >0.2 µg/l in 17 cases. In those, mean cSO<sub>2</sub> values were significantly lower in the early postoperative course (first 4 postoperative hours: 54 ±13% vs. 68 ±14%, p=0.007) and within the first 12 hours (58 ±14% vs. 71 ±10%, p=0.005). Preoperative and intraoperative cSO<sub>2</sub> were not different (59 ±11 vs. 62 ±11%, p=0.435 and 70 ±14% vs. 63 ±10%, p=0.157).

**Conclusion:** Infants younger than 1 years of age undergoing surgery for CHD who did not show a decline of serum S100 levels to preoperative levels had lower early perioperative cerebral tissue oxygen saturations. Neurocognitive outcome still needs to be determined, but S100 may serve as a surrogate for subtle cerebral injury.