

Perioperative Monitoring in Children undergoing Open Heart Surgery

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Simplified Abstract

Perioperative monitoring of total body water by bio-electrical impedance in children undergoing open heart surgery

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Knowledge of the changes in total body water (TBW) following cardiac surgery (OHS) in children would be of value in fluid therapy and in researching the causes and management of capillary leak. We have validated a bioelectrical impedance technique (BEI) for non-invasive estimation of TBW in children after OHS. We report the use of this method in a longitudinal study. Twenty patients (mean age 4.7 years \pm 3.5 (SD), mean weight (WT) 16.2 kg \pm 1 kg) undergoing a variety of complex OHS procedures were studied from 1 day preoperatively to 4 days postoperatively. Anaesthetic and basic bypass (CPB) techniques were uniform. Six patients underwent CPB at less than 20°C, 10 at 20°–25°C and 4 at 26°–33°C. TBW (BEI), core (ctemp) and peripheral (ptemp) temperatures and fluid balance (TFB) were recorded at frequent intervals. TBW (by BEI) rose ($P < 0.001$) following CPB in all patients from 62% \pm 9% (SD) body weight preoperatively to 73% \pm 13% in the ICU (an increase of 11% \pm 5%). TBW remained significantly elevated until the 3rd postoperative day. Multivariate analysis (MVA) confirmed that TBW was significantly related to TFB, but not to ctemp or ptemp. MVA also revealed smaller patient size (height and weight), younger age and longer CPB time as incremental risk factors for the rise in TBW.

Conclusions

(1) BEI permits the non-invasive study of TBW in children after OHS, when TBW variation may be considerable. (2) The smaller the child and the longer the CPB, the greater the rise in TBW. (3) The technique should be a valuable tool in researching the major water fluxes associated with CPB in children.