Predictors of the incidence of acute kidney injury in neonates treated with peritoneal dialysis after surgery for congenital heart disease

Ko Yoshizumi, MD, Shingo Kasahara, MD, Yasuhiro Kotani, MD, Takuya Kawabata, MD, Yosuke Kuroko, MD, Sadahiko Arai, MD Shunji Sano, MD
Department of Cardiovascular Surgery, Okayama University Graduate School of Medicine, Dentistry and pharmaceutical Sciences, Okayama, Japan

Background: Acute kidney injury (AKI) is one of the most common complications of cardiopulmonary bypass surgery in children with congenital heart disease. The purpose of this study was to investigate the risk factors associated with peritoneal dialysis (PD) in a neonatal patient who developed acute renal failure (ARF) in the perioperative period after open heart surgery.

Methods: We performed a retrospective chart analysis of 259 neonates that underwent complex cardiac repair under cardiopulmonary bypass between January 2006 and September 2014. AKI was defined based on the Acute Dialysis Quality Initiative’s modified for children RIFLE (pRIFLE) definitions for acute kidney risk or injury (AKI-RI) and based on the requirement of PD.

Results: AKI occurred in 132 patients (51%), and 43 patients (17%) required renal replacement therapy within three days postoperatively. Based on a univariate analysis, the body weight, age, an Adjustment in Congenital Heart Surgery (RACHS-1) score of 4 or higher, the surgical procedure (palliative or collective), use of lower body circulatory arrest and the vasoactive-inotropic score (IVS) were associated with post-operative AKI. In a regression analysis, the use of lower body circulatory arrest, a RACHS-1 score ≥4 and the preoperative serum creatinine (SCr) levels (odds ratio: 3.003, 0.271 and 2679.525; 95% confidence interval: 1.103 to 8.176, 0.087 to 0.848 and 96.110 to 74704.416; p = 0.30, 0.027 and 0.000) remained predictive of a subsequent need for PD. Age at the time of surgery and required PD (odds ratio: 1.184 and 4.835; 95% confidence interval: 1.027 to 1.365 and 1.124 to 20.806; p = 0.20 and 0.034) were associated with mortality.

Conclusions: We conclude that the use of lower body circulatory arrest, a RACHS-1 score ≥4 and the preoperative SCr levels were associated with a high incidence of postoperative AKI and the use of PD in neonates who underwent cardiac surgery under cardiopulmonary bypass. In this study, requiring PD and younger age at the time of surgery were associated with mortality.