Quantitative Diffusion-Weighted MRI Predicts Outcomes In Neurologically-Impaired Survivors of Pediatric Cardiac Arrest

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Learning Objectives: The prognostic value of quantitative diffusion-weighted MRI (DWI MRI) in predicting neurologic outcomes after pediatric cardiopulmonary arrest (CPA) has not been determined. The aim of this study was to identify an optimal DWI MRI threshold for predicting neurologic outcomes in patients with neurologic deficits immediately after return of spontaneous circulation from in-hospital or out-of-hospital CPA.

Methods: This single-center retrospective study analyzed DWI MRIs of pediatric patients following CPA. Any MRI obtained within 2 weeks after CPA was analyzed. Poor neurologic outcome was defined as death during hospitalization or Pediatric Cerebral Performance Category (PCPC) score of 3-5 at 3-6 months after CPA. The mean apparent diffusion coefficient (ADC) value of each brain voxel was determined. Brain volumes below each ADC threshold between 300-1200 $\times 10^{-6}$ mm^2/sec with a step of 50 were studied for their correlation with outcome. ROC analysis was used to assess the performance of each ADC threshold and mean ADC of brain volumes to predict poor outcome.

Results: 19 patients were included in this study [median time from CPA to MRI 3 days (2-6)]. The median age was 9 years (3-15) and 12 patients were males. 4 had CPA in hospital. 12 survived and 11 had favorable outcomes. An ADC threshold of less than 650×10^{-6} mm^2/s in $\geq 11\%$ of brain volume demonstrated a sensitivity of 0.75 (0.36-0.96, 95% CI) and

specificity of 1.0 (0.68-1, 95% CI) for predicting poor outcome, with a negative predictive value of 0.85 (0.54-0.97, 95% CI).

Conclusions: In pediatric patients with neurologic deficits after CPA, quantitative DWI MRI correlates with functional neurologic outcome. A threshold **of** 650×10^{-6} mm2/s in $\geq$ 11% of brain volume may be used to predict poor outcome.