Clinical Trial of Fluid Infusion Rates for Pediatric Diabetic Ketoacidosis

Article in New England Journal of Medicine · June 2018
DOI: 10.1056/NEJMoa1716816

Background: DKA related cerebral edema typically occurs 4–12 hours after treatment is initiated. It is believed that improper fluid administration is the major reason for development of cerebral edema.

Overview of study: The PECARN FLUID study is a 2×2 factorial design RCT comparing four fluid treatment protocols for children with DKA conducted at 13 Emergency departments across USA, part of Pediatric Emergency Care Applied Research Network (PECARN). All patients received a 10 cc/kg fluid bolus at admission. Two **rates** of rehydration were compared –

FAST (faster reperfusion)	SLOW (more gradual reperfusion)
ADDITIONAL 10ML/KG BOLUS 10% DEFICIT CORRECTION OVER 24 HOURS	NO ADDITIONAL BOLUS 5% DEFICIT CORRECTION EVENLY OVER 48 HOURS

Within each of these, two **sodium concentrations** were compared – 0.45% NaCl or 0.9% NaCl

ACADEMIC P.E.A.R.L.S

Pediatric Evidence And Research Learning Snippet

FLUID STUDY: FLuid therapies Under Investigation in DKA

Results: A total of 1,389 episodes of DKA occurred in 1,255 patients who underwent randomization and 1,361 episodes were included in the primary analysis

- There were 48 episodes of GCS decline to <14 (3.5%) [Primary outcome]
- There was no statistically significant difference in the frequency, magnitude, or duration of GCS decline between the groups. There was also no statistically significant difference between the treatment arms in regards to secondary outcomes of clinically apparent brain injury and memory/neurocognitive function

Authors' Conclusion: Neither the rate nor the sodium content significantly influenced the neurological outcome of children during treatment or at post-recovery follow up. Time to resolution of DKA and length of hospitalization were similar among treatment arms.

EXPERT COMMENT

"Children with significant electrolyte issues and those with a GCS < 12 who are more likely to have CNS injury and develop cerebral edema were excluded from study. Moreover only 3.5% of study children had the primary outcome (GCS decline <14) which might have brought down the power of the study to detect any significant difference. The belief that the tonicity and rate of administration of intravenous fluids, as well as the theory that osmotic shifts are the cause of cerebral edema in DKA are not well supported by evidence. Cerebral edema could be just a manifestation of the CNS injury caused by severe DKA (disease process) itself rather than resulting from improper fluid administration. CNS damage resulting from significant derangements in homeostasis (extreme dehydration, hyperosmolarity, severe acidosis etc) seen in DKA could be the predominant contributor to the development of cerebral edema."

Dr Narayanan P.
Professor
Department of Paediatrics, JIPMER.

DR MANINDER S DHALIWAL
Editor –
Academic Pearls
pedpearls@gmail.com

With warm regards,

Reference

Kuppermann N, Ghetti S, Schunk JE, Stoner MJ, Rewers A, McManemy JK, Myers SR, Nigrovic LE, Garro A, Brown KM, Quayle KS, Trainor JL, Tzimenatos L, Bennett JE, DePiero AD, Kwok MY, Perry CS 3rd, Olsen CS, Casper TC, Dean JM, Glaser NS; PECARN DKA FLUID Study Group. Clinical Trial of Fluid Infusion Rates for Pediatric Diabetic Ketoacidosis. N Engl J Med. 2018 Jun 14;378(24):2275-2287. doi: 10.1056/NEJMoa1716816.