Clinical Description and Treatment Protocol for Hypernatremic Neonates with Na > 170

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Introduction

At AIC Kijabe Hospital, we have noted an increasing trend in significant hypernatremic dehydration in neonates. Neonatal hypernatremic dehydration is a serious condition with significant morbidity and failure caused by failure to establish lactation.

Methods

In an effort to improve mortality in neonates with Na > 170 mmol/l, we conducted a literature review and a thorough chart review of patients presenting to AIC Kijabe hospital. The pediatric team developed a protocol for rehydration and treatment of sepsis that included initial resuscitation, monitoring parameters, fluid sodium concentration and rate, antibiotic choice, imaging, and introduction of feeds. We performed chart review in 2016 after initiation of protocol and refining of all parameters through quarterly audits.

Results

In 2012, from April to December, we admitted 27 babies with sodium >170 mmol/l with 12 deaths, 1 transfer, and 14 babies discharged home (Mortality rate of 46%). Protocol was written and implemented in 2014. In 2016, we admitted 40 babies with sodium >170 and had 2 deaths (Mortality rate of 4%).

In 2016, sodiums ranged from 170-235mmol/l (Mean 183). Initial creatinine ranged from 0.36-8.6 mg/dl. Culture positive sepsis, disseminated intravascular coagulation, presence of significant IVH and initial creatinine >7mg/dl were present in both patients with mortality after initiation of protocol.

Current Kijabe Hypernatremic Dehydration Protocol

- Neonatal Hypernatremic Dehydration
  - Frequently there are presentations to Kijabe Hospital of term babies with over 20% weight loss, severe dehydration and shock. Severe hypernatremia carries a significant risk of central edema if levels drop more than 20 mmol/l per 24 hours, and such babies must have consultant oversight.
  - Initial evaluation and management of such babies should include the following:
    - Head to toe examination for signs of infection, dehydration, conjunctival anemia, and shock.
    - Start iv. If poor skin turgor and delayed capillary refill, 10mg/kg 0.9% NS bolus.
    - Immediate consultant or CT notification for signs of shock and weight loss over 15%.
    - Consider a second IV 0.9% NS bolus if signs of shock have not improved, but do not give more than 2 boluses in total.
  - Nongaseous tube as @100 for measurement of UOP.
  - Initial fluids: CBC, Na, E, C, Blood Cs, Bi, PIC, VSGO.
  - Estimated Na based on Percentage Weight Loss:
    - 7%-12%: 150-160
    - 12%-15%: 160-170
    - 16%-20%: 170-180
    - >20%: 180

- Antibiotics
  - Commence IV ampicillin and ceftriaxone until creatinine is known.
  - If Pyelitis +0.001, start piperacillin tazobactam.
  - Initial fluid rehydration (before lab back)
    - % Weight loss should be calculated
    - Birth weight - Current weight = deficit.
    - Deficit / Birth weight = % weight loss
    - If birth weight is unknown, a clinical estimate of dehydration should be used to estimate % loss.
    - %<20%, total fluids should be calculated to replace deficit up to 20% over 96 hours + daily maintenance fluids.
    - If no blood aspiration on NG insertion, the first 20 ml/kg/day should be given as NS fluids/ESM (if available), and this should be rapidly increased daily as tolerated to full fluids.
    - The remainder of fluid deficit / in mass should be given as IVF with ONS until the initial sodium level is known to avoid central edema, then adjusted per the following table.

- Management when Sodium Resulted < (last consult <160)
  - Once sodium level is back, IV fluids should be adjusted accordingly:
    - Na <120
      - 0.9% NS
      - 150-170
      - 1/2/2/4/2 NS
      - 4/2 NS
    - Na >180
      - Check Na every 12 hours
      - Babies with sodium levels over 180 should have strong consideration given to management in HOU/HU.
    - No greater than 170 mmol/l.
    - Total fluid rate = (sodium - 140) + daily maintenance fluid rate.
      - For patients with oliguria, daily fluid intake should be tailored on the basis of daily urine output.
    - Hypokalemia, if present, should be treated according to standard protocols found in the Harriet Lane Handbook.
    - In acute kidney injury (S x 15), start Aminophylline 1mg/kg IV bid to improve renal afferent circulation.
    - Additional Options:
      - Crural ultrasound if any suspicion/lethargy

Patient with initial Na of 193, Cr of 8.6, and DIC on day of discharge.

Conclusion

Severe hypernatremic dehydration is a survivable condition in Kenya with appropriate adherence to strict protocols. Initial lab and imaging findings including Na, Cr, and CBC can help guide the treatment course and family expectations.

References
