

Hyperkalemia in a Pediatric Patient with Anuric Hydronephrosis

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Introduction: The incidence of death in neonates with acute renal failure has been reported as high as 90% mostly from septicemia.¹ If hyperkalemia from medications, Munchausen-by-proxy syndrome, blood administration, erroneous values and lysis are excluded, we are left with impaired distribution or impaired renal excretion are the only pathologies left. Risks of hyperkalemia under anesthesia have been associated with muscular and associated dystrophies, multiple syndromes, pyloric stenosis, head injuries, and malignant hyperthermia. Weisberg discussed the life threatening risk of preoperative hyperkalemia and is the only one to state that a value of 6.0-6.2 mEq/L is acceptable prior to surgery.² After an extensive literature search, no report of pediatric patients undergoing anesthesia with hyperkalemia was found. We report the first pediatric patient undergoing anesthesia with a potassium level greater than 8 mEq/L.

Case Report: Prenatal ultrasound showed abnormal kidneys. Born at 36 weeks, the VCUg showed no vesicoureteral reflux and the patient was discharged. At 10 days old, the patient presented to the emergency room lethargic and anuric. His electrolytes levels were as follows: potassium 12 mEq/L, sodium 122 mEq/L, BUN 22 mg/dL and creatinine 2.9 mg/dL. The electrocardiogram showed wide QRS with peaked T waves and the patient was transferred to the PICU for stabilization with normal saline, calcium gluconate, glucose and insulin drip, sodium bicarbonate, albuterol inhaler, furosemide, steroids, and Kayexalate. Despite aggressive therapy, the potassium remained high and the sodium low. The wide QRS did narrow but the T waves remained peaked. On day 11 with a diagnosis of left sided multicystic dysplastic kidney and grade II hydronephrosis the patient presented for hemodialysis catheter insertion and ureteral stent placement. The potassium was 7.9 mEq/L. After further discussion, the patient was sent back to the PICU for another trial of Kayexalate, albuterol, glucose and insulin in an attempt to lower the potassium further prior to surgery. After over an hour of therapy, the repeated potassium was higher at 8.1 mEq/L. Alternative therapy such as placing the peritoneal catheter under local and / or ketamine were discussed with plans to dialyze the patient prior to a general anesthetic. Because hyperkalemia is a life threatening emergency requiring immediate attention, the decision was made to proceed forward with general anesthesia and be prepared for any hyperkalemia induced conduction anomalies visible on electrocardiogram. Calcium, glucose, insulin, beta-2-inhalers, Kayexalate and bicarbonate were prepared prior to induction. The patient was induced with lidocaine 6 mg, fentanyl 14 mcg, and propofol 7 mg, paralyzed with cis-atracurium 0.5 mg and the trachea was intubated. Maintenance therapy included a glucose and insulin drip throughout the case, oxygen and Sevoflurane. The blood pressure was within normal range and the heart rate fluctuated between 180 – 200 bpm. The surgery was performed without complications and the patient was transferred with the trachea intubated to the PICU and where it was extubated thereafter.

Discussion: The administration of anesthesia for patients with hyperkalemia carries a high risk. In this patient, the aggressive preoperative treatment was disappointing and the potassium continued to climb prior to surgery. Weisberg suggests that in ESRD with chronic hyperkalemia, the body adapts.² We report on the first safe anesthetic for a newborn with possibly acute / chronic hyperkalemia now presenting with a potassium level greater than 8 mEq/L and the avoidance of hyperkalemia inducing drugs.

References:

1. Meeks, ACG and Sims, DG. Treatment of renal failure in neonates. *Archives Diseases of Childhood*. 1988, 63, 1372-76.
2. Weisberg LS. *Seminars in Dialysis*. 2003. 16(1), 78-79.

