Hypokalemia, digoxin, and perioperative ventricular fibrillation arrest in a premature neonate with presumed congestive heart failure

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Introduction:
Congenital cardiac lesions resulting in left-to-right shunting produce varying degrees of congestive heart failure pathophysiology. In neonates, as in adults, medical therapy occasionally includes digoxin, in addition to diuretics and neuro-hormonal drugs. Hypokalemia secondary to multiple etiologies is a concern in this setting, despite judicious dosing of digoxin, which can precipitate unexpected malignant arrhythmias.

Case Report:
We report the case of a 3.64 kg ex-32 week premature infant who presented for closure of VSD and ligation of PDA at 40 weeks post-conceptual age. His echocardiogram showed Tetrology of Fallot morphology and a large VSD with left-to-right shunting. Leading up to surgery his symptoms of congestive heart failure had been worsening, presumably due to increased left-to-right shunting. He was being managed with digoxin, furosemide, and high flow nasal cannula (FiO2 21%). On the morning of surgery his serum potassium was 4.3 mEq/L. Following intravenous induction of anesthesia the patient was extremely difficult to ventilate and rapidly desaturated while the heart rate dropped precipitously. Over the next few minutes he exhibited profound bradycardia, then improvement, followed by two episodes of ventricular fibrillation separated by an asystolic period, then return of spontaneous circulation. During each episode he was managed immediately with appropriate PALS standards. A point-of-care blood gas revealed a potassium level of 2.5. His digoxin level after the event was 2.1 ng/ml (normal 0.5-2.0). Surgery was canceled and he regained hemodynamic stability in about 12 hours, however his respiratory status did not improve for several days.

Discussion:
VF/VT is rarely seen in neonates, and extremely unusual in association with a respiratory arrest as experienced by this patient. Although pre-operative serum potassium level was “normal,” hemolization of the specimen, relative hyperventilation, and possibly albuterol and epinephrine side effects may all have contributed to a dangerously low potassium level in a patient with an acceptable digoxin level. The patient’s two episodes of ventricular fibrillation are likely a result of this perfect storm. Digoxin toxicity in the setting of hypokalemia should be considered anytime unusual arrhythmias are encountered, even if digoxin blood levels are relatively normal.

References:


