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# Genetics Corner: Persistent Hypoglycemia in a Malnourished Infant with Hypertrophic Pyloric Stenosis

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**Case History:**

A term male infant was admitted at 40 days of age with non-bloody, non-bilious vomiting, severe dehydration, malnutrition, and hypoglycemia. A genetics consultation was requested because of hypoglycemia that persisted after surgical repair of his hypertrophic pyloric stenosis.

*"A term male infant was admitted at 40 days of age with non-bloody, non-bilious vomiting, severe dehydration, malnutrition, and hypoglycemia. A genetics consultation was requested because of hypoglycemia that persisted after surgical repair of his hypertrophic pyloric stenosis."*

When examined the day after his pylorotomy, he was a pale, lethargic, and cachectic infant whose buttocks hung in folds. His abdomen was mildly distended, without organomegaly, and with clean surgical wounds. He could not latch onto the nipple while feeding from a bottle. He made minimal eye contact with his mother, who held and fed him. Although irritable, he was calmed by a pacifier. He had mildly increased tone in his lower extremities and crossed his ankles. He had no dysmorphic features.

He was born vaginally at 40 weeks 2 day's gestation to a 30-year-old GBS+ primigravida mother, who was treated with five doses of penicillin prior to delivery. Vaginal delivery was induced for oligohydramnios, detected at 40 weeks gestation. The fetal US at 32 weeks showed an enlarged kidney. Birth weight was 6 lbs. 13 oz. (3.09 kg). Apgar scores were 7 and 9 at 1 and 5 minutes, respectively. He was discharged with his mother. He was followed by his pediatrician for poor weight gain. Mother had stopped breastfeeding and started formula. He had not regained his birth weight.

Four days before admission, he started vomiting with one daily episode of non-bloody, non-bilious emesis. On the day of admission, he had three episodes of emesis, one of which was projectile. On that day, when his grandmother attempted to feed him, he was unresponsive and limp, his eyes were closed, and his color was gray. He was taken to the emergency department of a nearby community hospital, where he was hypothermic (93 degrees F) and bradycardic to 80. He was intubated and resuscitated with a normal saline bolus and continuous 0.45% NaCl IV fluid. A workup for sepsis was initiated, and he was started on gentamicin and ceftriaxone. A lumbar puncture was performed. CSF parameters for glucose, protein, and nucleated cells were normal. Initial glucose was low, 68 mg/dL, and liver function tests elevated—AST and ALT were 126. He was transferred to this tertiary care facility's pediatric intensive care unit.

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On admission, his weight was 2.67 kg (0.19 %ile, Z score -2.89), and his weight-for-height percentile was 0.04 %ile (2.76 kg/52 cm, Z score -3.36), consistent with severe acute protein-calorie malnutrition. An abdominal US showed echogenic debris within the left renal pelvis, left proximal ureter, and bladder suggesting a urinary tract infection, central calyceal dilatation of the left kidney, and associated proximal ureterectasis, UTD P2 (Urinary Tract Dilatation intermediate risk). Urinalysis on admission was cloudy with moderate leukocytosis (30 WBCs). All cultures (urine, blood, CSF) were negative, as was a urine drug screen. Herpes simplex PCR was negative. He completed a 7-day course of ceftriaxone for a suspected urinary tract infection as urine culture was collected after initiating antibiotic therapy. An echocardiogram was normal.

*"He had persistent hypoglycemia before and for two days following surgery (see Figure). He required IV glucose maintenance with D10 (11 mL/hr) on the second hospital day, rising to D12.5 on hospital day 3. He also received multiple D10 bolus treatments for persistent hypoglycemia. Beta-hydroxybutyrate and lactate values were normal during an episode of hypoglycemia to 46. There was no evidence of ketosis."*

He had persistent hypoglycemia before and for two days following surgery (see Figure). He required IV glucose maintenance with D10 (11 mL/hr) on the second hospital day, rising to D12.5 on hospital day 3. He also received multiple D10 bolus treatments for persistent hypoglycemia. Beta-hydroxybutyrate and lactate values were normal during an episode of hypoglycemia to 46. There was no evidence of ketosis. An abdominal ultrasound exam identified pyloric stenosis (15 mm x 4 mm). He had a laparoscopic pylorotomy on his fourth hospital day, after which he was extubated. Intravenous glucose was discontinued on the day after his pylorotomy but was restarted 24 hours later with D12.5 (8 mL/hr) for persistent hypoglycemia. By the second postoperative day, he had resumed full oral feeds without emesis, and his GIR (Glucose Infusion Rate) was 6.17. He was weaned off continuous IV D10 infusion on postoperative day 5. He also had sinus bradycardia (HR 100) with sinus arrhythmia, right axis deviation on ECG, and an elevated Pro-BNP (B-type natriuretic peptide) of 1163. He was discharged on hospital day 9.

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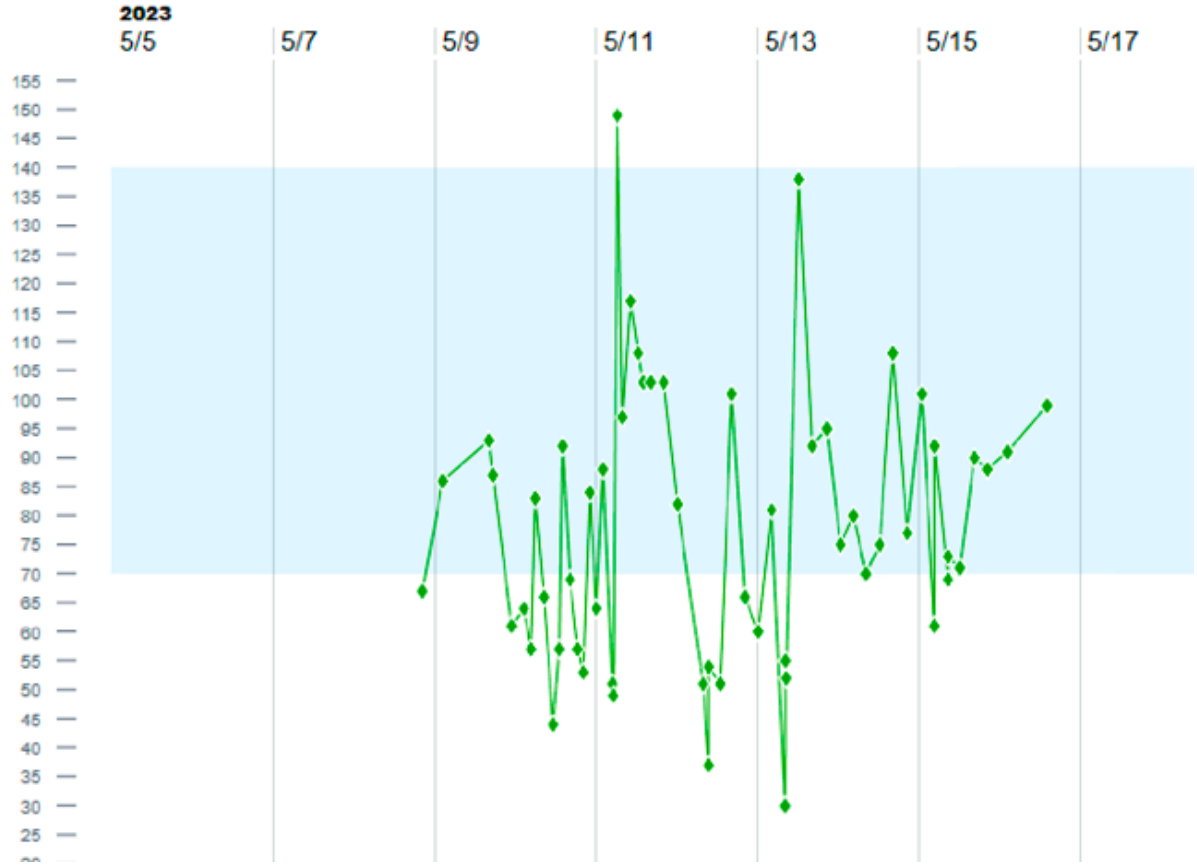


***Figure. Glucose values:*** *Glucose values were low before surgery on 5/11/2023, and hypoglycemia persisted for 48 hours after surgery despite the resumption of oral feedings.*

The family history was not informative. This child was the first offspring of both parents. Mother, age 30 years and 4' 11.5" in height, was adopted and knew little of her family history except that her mother was also 4'11.5" in height and was from Guadalajara, Mexico. The father, age 34, had three siblings, one of whom was a 34-year-old brother with an intellectual disability and autism. The father's family was from Mexico and El Salvador. The family history was negative for other relatives with pyloric stenosis.

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**Discussion:**

Persistent hypoglycemia has been described in association with malnutrition and pyloric stenosis (1,2). Severe malnutrition depletes glycogen stores, which was the cause of this baby's persistent hypoglycemia. His malnutrition was more severe than typically seen in an infant with pyloric stenosis because he had no reserves; he had not regained his birth weight after delivery. His poor nutritional status had a compound etiology: the first cause was a failure to thrive due to inadequate caloric intake over the first month of life, and the second was repeated emesis from pyloric stenosis over the four days prior to admission. A suspected urinary tract infection may have been an additional factor that brought him to the point of collapse. In this context, a metabolic cause for his hypoglycemia was unlikely, and it became even less likely as his glucose levels stabilized when his nutrition improved a few days after surgery.

*"This infant's bradycardia and elevated liver enzymes could also be explained by his severe malnutrition and fluid volume depletion. Dehydration reduces perfusion of the liver, and malnutrition adversely affects liver function. An elevated Pro-BNP value caused by cardiac muscle damage has been reported in patients with anorexia nervosa."*

This infant's bradycardia and elevated liver enzymes could also be explained by his severe malnutrition and fluid volume depletion. Dehydration reduces perfusion of the liver, and malnutrition adversely affects liver function. An elevated Pro-BNP value caused by cardiac muscle damage has been reported in patients with anorexia nervosa (3). In many respects, lessons learned from treating patients with anorexia nervosa might also apply to infants with severe malnutrition. In individuals with anorexia with severe bradycardia, the heart rate did not normalize until minimal weight gains were sustained for 3–10 days (4). The resumption of a normal heart rate may be a clinical indicator of cardiac and physiologic recovery. For this reason, waiting to increase from 20 kcal/oz to a more concentrated formula in the face of severe malnutrition may be the wiser course, as a slower recovery may be the safer option, putting less strain on the heart and other vital organs. The danger of increasing metabolic demands on a compromised heart that has lost glycogen reserves and muscle tissue from severe malnutrition is not lost on those of us old enough to remember the death of Karen Carpenter, who died of congestive heart failure after being treated for anorexia (5).

**Practical applications:**

1. Recognize that persistent hypoglycemia in the context of pyloric stenosis may result from malnutrition and failure to thrive due to glycogen depletion.
2. Look for evidence of cardiac and liver dysfunction in infants with failure to thrive, malnutrition, and those with pyloric stenosis.
3. Consider bradycardia in a malnourished infant a sign of a depleted heart.
4. Infants with severe malnutrition and patients with anorexia may benefit from a similar approach to slow refeeding.

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***Disclosures:*** *There are no reported disclosures*

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