Failure to Thrive with Polyuria

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Abstract

Polyuria is excessive or an abnormally large production or passage of urine. Frequent urination is usually an accompanying symptom. Polyuria often appears in conjunction with polydipsia (increased thirst). The most common cause of polyuria in both adults and children is uncontrolled diabetes mellitus, which causes osmotic diuresis, when glucose levels are so high that glucose is excreted in the urine. This case report discusses about a seven-month-old male patient with failure to thrive and polyuria in the setting of known sickle cell disease.

Keywords: Polyuria; Fanconi syndrome; Acidosis; Failure to thrive

Abbreviations: HEENT: Head, Ears, Eyes, Nose and Throat; kg: Kilogram; BUN: Blood Urea Nitrogen; CO₂: Carbon dioxide; IV: Intravenous; GT: Gastrostomy Tube; ESRD: End Stage Renal Disease

Introduction

A seven-month-old male presents with failure to thrive and polyuria in the setting of known sickle cell disease. His exam was notable for frontal bossing, gross motor delay and palpable beading along the anterolateral aspect of the chest. Abdominal examination revealed heart with regular rate and rhythm, lungs with transmitted upper airway sounds, and palpable beading along the anterolateral aspect of the chest. Abdominal exam revealed a palpable liver edge without splenomegaly. Abdomen was otherwise soft with normal bowel sounds. Musculoskeletal examination revealed poor muscle tone and gross motor delays without achievement of independent sitting.

Laboratory workup at presentation revealed a blood urea nitrogen (BUN) of 2 mg/dL (4-14 mg/dL), creatinine of 0.2 mg/dL (0.2-0.4 mg/dL), sodium of 138 mmol/L, potassium of 3.5 mmol/L chloride of 111 mmol/L, low carbon dioxide (CO₂) of 11 mmol/L, and a low phosphorus of 1.9 mg/dL (4.0-7.8 mg/dL). His hemoglobin and hematocrit were low at 7.9 g/dL (11.0-16.3 g/dL) and 25.5% (31.5% to 48.9%) respectively. His initial treatment included hydration with intravenous (IV) fluids and he was placed on a strict feeding regimen to meet caloric goals for catch up growth. Despite these interventions, he had a persistent acidemia with serum bicarbonate levels ranging from 11-13 mmol/L. Venous blood gas revealed a venous pH of 7.26 (7.33-7.43) and a total venous CO₂ of 15 mmol/L (23-29 mmol/L).

Case Presentation

We present a seven-month old Somali man with a history of Sickle Cell Disease Hgb-SS who presented with a two to three-week history of upper respiratory symptoms. History was also positive for cough, nasal congestion, decreased oral intake, and poor weight gain. He had been taking about one ounce of formula every two to three hours as well as two to three ounces of free water. He reportedly had been making two or three wet diapers per day with normal appearing stools. Review of his growth chart revealed a normal birth weight at 2.8 kilograms (kg) and adequate weight gain for the first four months of life, following between the 15th and 35th percentile for weight and length for age. At four months of age, his weight percentile dropped to the 8.7th percentile and length was stable at the 21.3rd percentile for age. At presentation, his weight was at the 0.28th percentile and length was at the 15th percentile for age.

Physical examination on presentation revealed a small for age seven-month-old male with nearly closed anterior fontanelle and prominent forehead. Head, eyes, ears, nose, and throat (HEENT) examination revealed no periorbital congestion, decreased oral intake, and poor weight gain. He had been taking about one ounce of formula every two to three hours as well as two to three ounces of free water. He reportedly had been making two or three wet diapers per day with normal appearing stools. Review of his growth chart revealed a normal birth weight at 2.8 kilograms (kg) and adequate weight gain for the first four months of life, following between the 15th and 35th percentile for weight and length for age. At four months of age, his weight percentile dropped to the 8.7th percentile and length was stable at the 21.3rd percentile for age. At presentation, his weight was at the 0.28th percentile and length was at the 15th percentile for age.

Physical examination on presentation revealed a small for age seven-month-old male with nearly closed anterior fontanelle and prominent forehead. Head, eyes, ears, nose, and throat (HEENT) examination revealed no periorbital edema with nasal mucosa edema and rhinorrhea. Chest examination revealed heart with regular rate and rhythm, lungs with transmitted upper airway sounds, and palpable beading along the anterolateral aspect of the chest. Abdominal exam revealed a palpable liver edge without splenomegaly. Abdomen was otherwise soft with normal bowel sounds. Musculoskeletal examination revealed poor muscle tone and gross motor delays without achievement of independent sitting.

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During his work up for failure to thrive and acidosis, his urinalysis revealed a specific gravity of 1.006 with 2000 mg/dL glucose and 30 mg/dL of protein. Polyuria was noted with a urine output measuring 7.5 cc/kg/hr. Thyroid studies were normal. Further urine studies revealed significant levels of low molecular weight proteinuria with 46.3% albumin and 53.7% globulin on urine electrophoresis. Urine beta-2 microglobulin was considerably elevated at 530,000 mcg/g creatinine. Quantitative analysis of CTNS gene and slit lamp exam confirmed cystinosis causing photophobia [1,2,5]. The focus of this discussion will be infantile nephropathic cystinosis.

Because of its rarity, the diagnosis of cystinosis is often delayed [2]. Patients are typically asymptomatic until 6-12 months of age, at which time they present with non-specific findings of growth failure, vomiting, polyuria, and dehydration [1,5]. Much like the patient we presented, patients with cystinosis typically have normal birth weight and lengths with growth retardation beginning around 6-12 months of age [1]. Further testing reveals significant evidence of proximal tubule dysfunction. Laboratory investigation typically reveals serum electrolyte abnormalities including hypokalemia, hypophosphatemia, metabolic acidosis, and hypocalemia. Patients also have urinary loss of amino acids, sodium, potassium, bicarbonate, magnesium, carnitine, calcium, phosphate, glucose, and low molecular weight proteins [1-3]. Patients can also have vitamin D resistant hypophosphatemic rickets [1-4]. Serum creatinine is typically normal at presentation, but if left untreated or if treatment is delayed to early childhood, infantile nephropathic cystinosis will lead to renal failure within the first ten years of life [1,4].

There are three means for confirming the diagnosis of cystinosis [1]. Primarily cystinosis is confirmed by detection of elevated cysteine levels in white blood cells. This requires a dedicated laboratory. Additional testing includes genetic analysis of CTNS gene and slit lamp exam demonstrating corneal cystine crystal accumulation [1-4]. It is important to note that corneal crystals are typically not visualized on slit lamp ophthalmologic exam until between one and two years of age [1-3]. In developing nations where other means of diagnosis are not as widely available, this may delay diagnosis [1]. Newborn screening as not yet been developed [1].

Although rare, cystinosis fortunately has disease-specific treatment and is the only lysosomal storage disease treatable with cystine-depleting therapy [1]. Oral cysteamine, an aminothiol, depletes lysosomal cystine in the body, delaying progression to end stage renal disease by several years. Immediate release cysteamine therapy is administered every 6 hours around the clock and must be continued throughout the patient’s lifetime. The dose is based on body surface area and adjusted based on the trend of the leukocyte cystine level [1,5]. The side effects of oral cysteamine include nausea; often times requiring proton pump inhibitors and/or a Nissen fundoplication [1].

Oral cysteamine also helps ameliorate many extra-renal manifestations of cystinosis including preventing growth retardation if started in early infancy, although does not affect tubular dysfunction or reduce corneal cystine accumulation. For this, topical cysteamine is used to dissolve the corneal cystine crystals [1,4,5], and must be used frequently throughout the day, often resulting in poor compliance. As expected, poor compliance with both oral cysteamine and topical cysteamine has a detrimental effect, with more rapidly progressive renal insufficiency and poor growth [1,7].
Management of the organ complications of cystinosis is a large piece to the treatment, in addition to targeted cystine-depletion therapy [1,2]. Symptomatic treatment includes maintaining adequate fluid, electrolyte, and vitamin supplementation, as well as appropriate nutrition to support catch up growth. Supplementation often includes sodium, potassium, bicarbonate, phosphorus, and 1-25 (OH)₂ cholecalciferol [1,3,4]. Due to growth failure accompanied by poor appetite and vomiting, children most often require early gastric tube placement [2,3]. With the multiple endocrinopathies that accompany cystinosis, hormonal therapy may be necessary. This includes thyroid hormone, growth hormone, and testosterone therapy [1].

Conclusion

In the event of end stage renal disease (ESRD), renal transplantation is the treatment of choice. Most often, native nephrectomy is not required, but may be considered based on the degree of polyuria. Although renal transplantation is a cure for the renal component of cystinosis, it does not affect the extra-renal complications. Because of this, cysteine-depleting therapy must be continued. Graft survival is reported to be superior to that of other renal diseases [1-3].

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

This can be provided upon request.

Availability of data and material

Not applicable.

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MB compiled the patient data, researched review articles, drafted the initial manuscript, reviewed and revised the manuscript, and approved the final manuscript as submitted.

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References