International Journal of Integrative Pediatrics and Environmental Medicine, V5, 2020, 2-4

Case Report

A RARE PRESENTATION OF ACUTE KIDNEY INJURY SECONDARY TO RHABDOMYOLYSIS AS A RESULT OF CHILD

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Abstract: Child abuse leads to substantial health problems and is extremely worrisome to the pediatric medical community. The child presented in our case was a victim of severe physical abuse leading to rhabdomyolysis, acute renal injury, who subsequently required renal replacement therapy. The objective of this case is to raise awareness and advise medical personnel to check renal function, creatine kinase, and myoglobin in bruised children subjugated to physical abuse. Child abuse leading to severe decline in renal function is rare and needs to be recognized in a timely manner and adequately treated.

Key words: child abuse, acute kidney injury, rhabdomyolysis

INTRODUCTION Acute renal injury (AKI) in severely ill patients has a guarded prognosis [1]. AKI, secondary to rhabdomyolysis, is typically associated with crush injuries. The relationship between child abuse and rhabdomyolysis-induced renal injury has been described in a small number of cases in the literature [2]. Overall, it is very difficult to estimate the frequency of child abuse because so many cases go unreported. The US Department of Health and Human Services estimated that 676,000 children were victims of abuse and neglect during fiscal year 2016 [3]. The child presented in our report was a victim of severe physical abuse that lead to AKI and subsequently required renal replacement therapy.

CASE PRESENTATION A 9-year-old African American male without significant past medical history, presented to the emergency department with his parents, with complaints of vomiting and increased tiredness for one day. His mother claimed that he had been struck in the head with a ball and subsequently complained of a headache. The father stated that he had given the patient aspirin but reported that the child had since been vomiting continuously.

Upon arrival at the hospital, the child was in mild discomfort from pain, but interactive with a normal neurological examination. His vital signs were within normal indices. Physical examination was normal, apart from musculoskeletal and skin findings. Bruises were extensively distributed to his buttocks, legs, and back, with numerous open wounds and scars and healing abrasions. The child presented with multiple bruises of different ages at the involved locations. Upon further questioning, the child stated that his father had subjected him to physical abuse using a baseball bat a week prior to the admission [Figure 1].

The child's injuries were photographed, and the patient was admitted with a diagnosis of child abuse. Law enforcement and child protective services were immediately notified. Computer tomography of the head was performed and was negative for intracranial bleeding. Laboratory data revealed a hemoglobin of 8.1 g/dL, hematocrit of 24%, white blood cell count of 13.6x10 µL, and platelets of 261x10 µL. Serum electrolytes displayed a sodium of 127 mmol/L, potassium of 7.6 mmol/L, chloride of 92 mmol/L, and bicarbonate of 15 mmol/L. He had a creatinine of 13.1 mg/dL and a BUN of 157 mg/dL. His creatinine phosphokinase level was 10,234 IU/L. Microscopic urine analysis showed 6 to 10 red blood cells per high-power field, with 3+ blood. Coagulation studies, including prothrombin time, partial thromboplastin time, and international normalized ratio, were all normal. Based on the laboratory data, the patient was diagnosed with anemia and AKI. Hydration did not restore renal function. On the night of admission, the patient became

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Figure 1 Child's buttock and upper leg showing open wounds, healing abrasions, and scars.

hypoxic due to pulmonary edema and consequently developed acute respiratory failure, with subsequent oro-tracheal intubation and mechanical ventilation. In due course, the patient was extubated and weaned to room air without issues. With appropriate hydration, and renal replacement therapy, his renal function and electrolytes were normalized. Due to the unclear etiology behind the decline in renal function, a renal biopsy was performed that revealed diffuse interstitial edema without chronic cortical injury. The presence of myoglobin casts supported the clinical diagnosis of rhabdomyolysis [Figure 2]. In addition, the biopsy showed positive staining for IgA. The patient was initiated on renal replacement therapy and received 3 sessions of hemodialysis. Subsequently, he completely recovered his renal function within 13 days. Ultimately the patient was discharged home under the care of his mother. His father was arrested.

H&E: diffuse interstitial edema

Figure 2 Renal biopsy revealed diffuse interstitial edema and myoglobin casts (Hematoxylin and Eosin Staining).

DISCUSSION Child abuse leads to substantial health problems and is an extreme concern for the pediatric medical community. Child abuse leading to a severe decline in renal function is rare and needs to be recognized in a timely manner and appropriately and adequately treated.

In the United States, approximately 1% of patients admitted to hospitals have AKI at the time of admission. The estimated incidence rate of AKI during hospitalization is 2-5%. AKI develops within 30 days postoperatively in approximately 1% of general surgery cases [4]. There are many different possible causes of AKI in abused children including dehydration, overuse of pain control medications, trauma, and rhabdomyolysis.

The patient had a combination of prolonged treatment with nonsteroidal anti-inflammatory medications (at least a week in addition to multiple previous episodes), dehydration related to persistent vomiting (possibly secondary to a head injury) and substantial rhabdomyolysis. Rhabdomyolysis is a syndrome characterized by muscle breakdown and the release of creatinine kinase (CK) and myoglobin into the circulation [5]. Historically, crush syndrome resulting in renal failure and death was first identified in the German literature around World War I [5].

There are multiple causes of muscle breakdown, such as physical trauma, viral infection, metabolic myopathies, drugs, toxins, hyperthermia, and autoimmune causes. In a study that included 191 pediatric patients with rhabdomyolysis, viral myositis and trauma were found to be the most common underlying causes [6]. These cases require special attention from the pediatric nephrology community.

The characteristic triad of complaints in rhabdomyolysis include increased CK levels, muscle pain, and myoglobinuria. In cases of child-abuse-induced-rhabdomyolysis, CK levels peak 48-72 hours after injury, and typically decrease by about half every 48 hrs [7]. CK usually has no adverse effects on the kidneys. Myoglobin,

on the other hand, may lead to renal tubular damage and acute renal failure. The exact mechanism of how myoglobinuric rhabdomyolysis leads to acute renal failure is not fully understood. Several theories have been proposed, including direct toxic effects of myoglobin leading to a decreased glomerular filtration rate, tubular plugging, or myoglobin-induced vasoconstriction [8]. Dehydration, acidosis, and hypotension increase the risk of myoglobin-induced-renal-failure. In the presented case, nonsteroidal anti-inflammatory drugs and dehydration may have precipitated the negative impact of myoglobin. Myoglobin has a short half-life of 2-3 hours; therefore, levels must be determined soon after the injury or results may appear normal.

Unfortunately, child abuse and AKI have long-term consequences. Acute kidney injury may increase the risk for chronic kidney disease, end-stage renal disease, and even future mortality risk [9,10]. Psychological trauma persists through years as posttraumatic stress reactions (PTSR). The recent case indicated that PTSR may be an important mediator in the relationship between child abuse and future physical health complaints [11].

CONCLUSION This case is presented to raise awareness and advise physicians to check renal function, CK, and myoglobin in bruised children who present to the ED. Treatment for acute renal failure is critical in these patients and entails early recognition, supportive hydration, alkalization of urine, avoidance of nephrotoxic medications, and renal replacement therapy.

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