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Case Report

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Bile Cast Nephropathy in a Child with Acute Viral Hepatitis A: A Case Report

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ABSTRACT

Acute viral hepatitis A-induced kidney injury and bile cast nephropathy are rarely reported in children. Bile cast nephropathy after viral hepatitis A infection is not a devastating condition, but when developed, it usually needs kidney replacement therapy. Bile cast nephropathy, traditionally known as cholemic nephrosis, is a unique form of kidney injury occurring in patients with hepatic failure resulting from tubular obstruction by bile casts and direct bile acid injury to tubular epithelial cells and its risk increases as serum bilirubin rises above 20 mg/dL. In this study, we report the clinical course of a young boy who developed acute viral hepatitis A infection with severe liver dysfunction and thereafter acute kidney injury which lasted for 4 weeks. Kidney biopsy showed deposition of greenish brown pigment casts in tubular lumen suggestive of bile cast nephropathy. He required hemodialysis for a week, and later on, urine output was established with subsequent normalization of kidney and hepatic functions at 6 weeks.

Keywords: Bile cast nephropathy, hepatitis A and kidney failure

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INTRODUCTION

Acute viral hepatitis A (HAV) is generally a self-limited illness and accounts for 50%-60% of all viral hepatitis in children in Pakistan.[1] Bile cast nephropathy (BCN) is a distinctive form of acute kidney injury (AKI) occurring in patients with hepatic failure resulting from tubular obstruction by bile casts and direct bile acid injury to tubular epithelial cells. Kumar et al[2] reported a 1.3% of hepatitis A-infected children with AKI. So far only 2 case reports of BCN in children have been reported.

In this study, we report a case of BCN in a child with acute HAV infection who developed AKI in the setting of rising bilirubin and subsequent improvement in kidney functions as bilirubin levels declined.

CASE PRESENTATION

An 8-year-old boy, well grown for age, student of grade I, and no known co-morbidities was admitted with a history of fever, jaundice, and vomiting for 3 days. There was no history of blood transfusion and family history was unremarkable for liver or kidney disease. On examination, he was drowsy but arousable, deeply icteric with total liver span of 8 cm. Laboratory evaluation revealed total bilirubin of 51 mg/dL, direct bilirubin of 23 mg/dL, alanine aminotransferase (ALT) of 589 U/L, aspartate aminotransferase (AST) of 341 U/L, gamma-glutamyl transferase (GGT) of 62 U/L, serum albumin of 2.8 g/dL, international normalized ratio (INR) of 1.4, and serum creatinine of 4.3 mg/dL. There was no active sediment and no significant proteinuria on urine examination. Immunoglobulin (Ig) M against HAV was positive

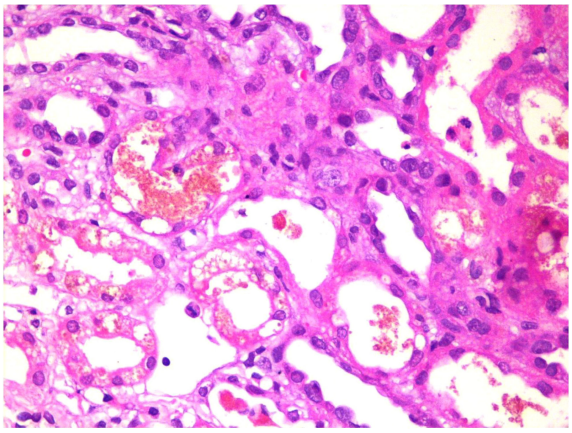

Figure 1. Representative area of kidney biopsy showing acute tubular necrosis and bile pigments in tubular epithelial cells (HE, ×400). HE, hematoxylin and eosin.

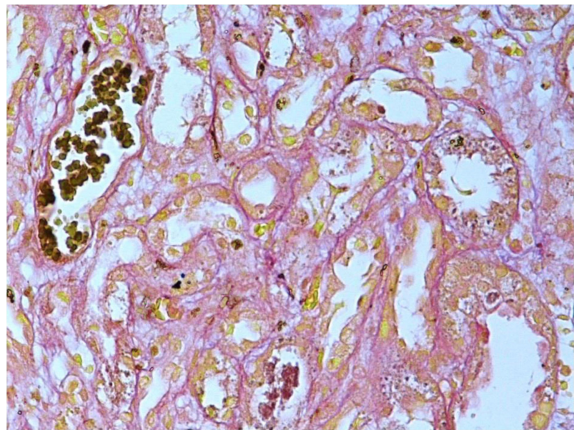

Figure 2. Fouchet stain showing positivity of bile pigments (Fouchet stain, ×400).

with low serum complements. Ultrasonography of abdomen showed normal liver, spleen, and kidneys with no evidence of obstruction. His kidney functions further deteriorated to a serum creatinine of 8.5 mg/dL with anuria for which kidney replacement therapy was started. In the view of requirement of hemodialysis and low serum complements, kidney biopsy was performed suspecting immune-mediated glomerulonephritis. The biopsy showed 22 glomeruli with minor changes without segmental scaring and glomerular basement membrane thickening. Immunofluorescence was negative for C3, IgA, IgG, IgM, C1q, fibrinogen, kappa, and lambda. There was marked acute tubular necrosis (ATN) with interstitial edema and inflammation (Figure 1). Fouchet stain of tubular casts was positive, supporting the diagnosis of BCN (Figure 2). Post-biopsy supportive therapy was continued. On the seventh day of admission, urinary output recovered, and serum creatinine and bilirubin improved (Figure 3). Follow-up at 3 months showed serum creatinine of 0.2 mg/dL, total bilirubin of 0.9 mg/dL, direct bilirubin of 0.3 mg/dL, ALT of 146 U/L, AST of 130 U/L, GGT of 39 U/L, and normal serum complements. At 6 months follow-up, he is doing well with normal kidney and liver functions.

DISCUSSION

Viral hepatitis A causing kidney failure is underreported in the literature. To the best of our knowledge, this is the first case report of HAV-induced bile cast nephropathy in children. It is estimated that by adulthood, 50% of the American population is exposed to HAV infection, and usually, the disease course is mild and fewer patients develop complications.[3] Previously, 2 pediatric bile cast nephropathy cases have been published, but the underlying etiology was Wilson disease. Though the prognosis of bile cast nephropathy is generally excellent but both kids expired due to concomitant septic shock, it remains unexplained that AKI had exaggerated or contributed to the ultimate fatal outcome.[4,5] Shroff et al treated 2 adult patients with confirmed HAV and kidney failure out of which one required dialysis and another was treated with N-acetyl cysteine. This report concluded that hepatic and kidney dysfunction run parallel and N-acetyl cysteine may help in the recovery of kidney functions.[6] Another case report of 17-year-old male patient admitted to the hospital with appetite loss and anorexia nervosa was reported. During admission, he developed hepatitis A complicated by kidney failure for which hemodialysis was prescribed. Bile cast nephropathy had benign nature in this boy as he completely recovered normal kidney functions within 5 weeks of illness with supportive

MAIN POINTS

- Bile cast nephropathy is a rarely reported entity in the literature though it has a very good prognosis.
- It should be considered in a child with acute hepatic dysfunction with kidney involvement.
- Serial monitoring of kidney and liver functions with supportive therapy is key objective.

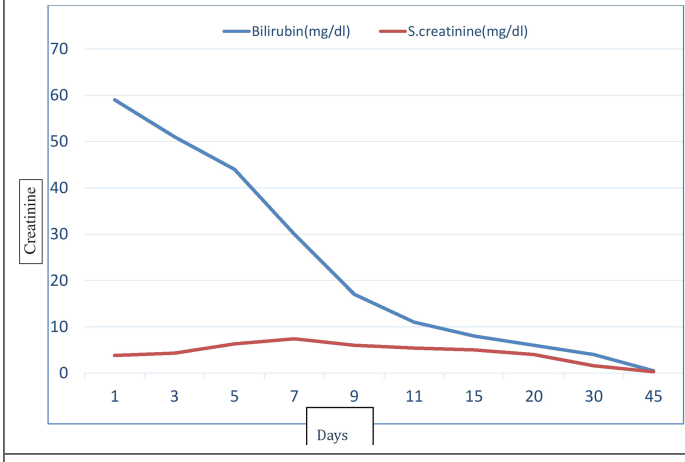

Figure 3. Trends of serum bilirubin and serum creatinine.

therapy. Authors emphasized that in such cases, kidney functions should be monitored and kidney biopsy should be performed.[7] Vesely et al reported a 38-year-old patient with hepatitis A and kidney failure requiring kidney replacement therapy. Though kidney function and hepatitis A settled within 12 weeks, as a sequalae of the latter, patient developed diabetes mellitus.[8] Similarly, 2 other case reports having 3 adult patients with hepatitis A and kidney failure were published. One patient died during the course of the disease, while the rest recovered back to normal.[9,10] Lee et al[11] described that the severity of hepatic impairment correlates with kidney dysfunction, and in our patient, we noted similar phenomena. Serum bilirubin of more than 20 mg/dL is considered the risk factor for the development of kidney failure. Our patient had bilirubin 51 mg/dL which is 2.5 times the identified risk factor and it also explains the severity of kidney function deterioration.[12] Exact underlying pathophysiologic mechanism leading to kidney impairment is poorly understood. It may be attributed to hemodynamic changes causing ischemic injury, the direct cytopathic effect of virus, or bile pigment causing mechanical obstruction and tubular necrosis.[13]

The kidney biopsy has diagnostic role in BCN, and characteristic finding is bilirubin cast which is visible on Fouchet stain. Acute interstitial nephritis (AIN) has also been reported with slightly delayed recovery, but we did not find AIN in our kidney biopsy sample.[14] Interestingly, Takeshita et al reported mesangioproliferative glomerulonephritis along with AIN in a patient with AKI requiring hemodialysis, and the course was satisfactory with complete recovery in a month.[15] Bairakatri et al have studied the effect of bile salts on tubular functions and concluded that they lead to generalized tubular dysfunction.[8] Our child has no persistent features of tubular dysfunction like serum electrolyte disturbances, phosphaturia, and low-grade tubular proteinuria. His low complement C3 remains unexplained, but it recovered back to normal within 6 weeks, raising a possibility of temporary complement pathway activation.

Hepatitis A-induced bile cast nephropathy is a severe disease and the independent prognostic factor is attainment of normal kidney functions. Supportive measures including kidney replacement therapy and frequent monitoring of kidney functions are necessary. We suggest performing kidney biopsy to ascertain the underlying cause.

Informed Consent: Written informed consent was obtained from the patient who participated in this study.

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