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Adenovirus Induced Rhabdomyolysis Causing Hemodialysis Dependent Acute Renal Failure

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Background

Adenovirus is an extremely hardy virus, adenovirus is ubiquitous in human and animal populations, survives long periods outside a host, and is endemic throughout the year. It is transmitted via direct inoculation to the conjunctiva, fecal-oral route, aerosolized droplets, or exposure to infected tissue or blood. The clinical syndromes commonly associated with adenovirus (ADV) infection, which is usually in children, includes pharyngitis with or without conjunctivitis, severe and often fatal pneumonia, keratoconjunctivitis, acute hemorrhagic cystitis, and asymptomatic intestinal infection.

In adults, it causes acute respiratory disease, which varies from mild, febrile pharyngitis and tracheitis to severe, fatal pneumonia, keratoconjunctivitis. Among non-traumatic causes infectious etiology is warranted when appropriate clinical presentations is present. Treatment includes supportive care, intravenous fluid resuscitation, and renal replacement therapy. Continuous renal replacement therapy should be considered in severe cases for management of severe electrolyte abnormalities and volume status.

Case Presentation

The patient was in his usual state of health until approximately 2 weeks before his hospital admission when he noticed pharyngeal and drainage in his left eye consistent with a viral conjunctivitis. He has associated self remitted diastolic illness. Shortly thereafter in the next couple of days he developed severe muscle aches to an extent of impaired ambulation and associated with increased fatigue, subjective fevers with chills.

He had around this time developed "dark urine" for which he was evaluated at his PCP's office where a urine dipstick was positive for blood. He was given a script for Trimethoprim-sulfamethoxazole empirically for presumed urinary tract infection. The hematuria continued afterwards. He eventually became oliguric, for which he presented to ER at our facility and was found to be in frank Rhabdomyolysis.

Further research on his symptoms were not preceded by any specific medication changes, denied stool use, excessive alcohol use, recreational drug abuse, seizure activity, prolonged immobilization, severe physical exertion, eating wild game, crush injury or compartment syndrome.

Family history was significant for kidney disease of unknown etiology in his Mother but no family history of muscle disorders/myopathies/muscular dystrophy.

On physical examination, his blood pressure was 150/82 mmHg, heart rate was 85 beats per minute, temperature 96.3°F, and oxygen saturation 96% on room air. On presentation he was found to have oliguric renal failure with creatinine of 5.04 [previous unknown baseline] with significant anemia, hyperkalemia, hyperphosphatemia, and hypocalcemia. The serum CPK level was elevated at 857,200 U/L (normal = 5-200).

Continuous renal replacement therapy should be considered in severe cases for management of severe electrolyte abnormalities and volume status. The hematuria continued afterwards. He eventually became oliguric, for which he presented to ER at our facility and was found to be in frank Rhabdomyolysis.

Serum Level: Alcohol
POSITIVE

Serum Level: Salicylates
Negative

Blood Culture x 2
No growth in 5 days

Influenza A and B
Negative

IgG antibody
EBV and VCA
NEGATIVE

Comprehensive Hepatitis Panel
NEGATIVE

Table 1: Laboratory Data

<table>
<thead>
<tr>
<th>TEST</th>
<th>DAY 1</th>
<th>DAY 2</th>
<th>DAY 3</th>
<th>DAY 4</th>
<th>DAY 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin</td>
<td>7.7</td>
<td>7.7</td>
<td>7.7</td>
<td>4.1</td>
<td>4.2</td>
</tr>
<tr>
<td>Hematocrit</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>White blood cell count</td>
<td>12,100</td>
<td>13,000</td>
<td>11,000</td>
<td>10,000</td>
<td>9,500</td>
</tr>
<tr>
<td>Neutrophil</td>
<td>80</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Lymphocyte</td>
<td>20</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>Platelet</td>
<td>300,000</td>
<td>250,000</td>
<td>200,000</td>
<td>150,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Creatine phosphokinase (CPK)</td>
<td>857,200</td>
<td>1,360,000</td>
<td>1,149,533</td>
<td>900,500</td>
<td>245</td>
</tr>
<tr>
<td>Potassium (mmol/L)</td>
<td>5.2</td>
<td>5.8</td>
<td>5.5</td>
<td>6.4</td>
<td>4.1</td>
</tr>
<tr>
<td>Phosphorus (mg/dL)</td>
<td>4.7</td>
<td>7.3</td>
<td>6.7</td>
<td>6.4</td>
<td>4.1</td>
</tr>
<tr>
<td>Sodium (mmol/L)</td>
<td>14.6</td>
<td>9.9</td>
<td>14.3</td>
<td>14.2</td>
<td>13.5</td>
</tr>
</tbody>
</table>

Table 2: Laboratory Data

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<thead>
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<th>TEST</th>
<th>IG</th>
<th>MDA</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total bilirubin</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Direct bilirubin</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Albumin</td>
<td>5.5</td>
<td>5.1</td>
<td>5.3</td>
<td>5.4</td>
<td>5.2</td>
</tr>
<tr>
<td>Total protein</td>
<td>6.5</td>
<td>6.1</td>
<td>6.3</td>
<td>6.4</td>
<td>6.2</td>
</tr>
<tr>
<td>Albumin/globulin ratio</td>
<td>1.4</td>
<td>1.3</td>
<td>1.4</td>
<td>1.5</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Discussion

Rhabdomyolysis is a clinical syndrome characterized by severe muscle injury causing elevated serum concentrations of creatine phosphokinase (CPK) and myoglobinuria leading to acute kidney injury from rhabdomyolysis require hemodialysis, but the majority recover renal function. One of the most important goal of Rhabdomyolysis Treatment is to avoid Acute Renal Failure. Aggressive fluid management to aim urinary output goal of 200 mL/h, urine pH <6.5, and plasma pH <7.5 should be achieved.

Renal replacement therapy should be promptly started in patients who fail to respond to fluid management.

Follow-up

Despite aggressive volume resuscitation, the patient remained oliguric and hyporeninemic, and was initiated on hemodialysis (HD) on hospital day 2. Or admission the patient weighed 111 kg. His peak body weight was 118.5 kg on hospital day 9, reflecting accumulated volume from fluid resuscitation. On day of discharge the patient weighed 110 kg.

He was still dependent on hemodialysis on the day of discharge and eventually HD was stopped and his last known CPK was 245.

Conclusions

Adenovirus infection can be a rare but fatal cause of Rhabdomyolysis which in turn is a life threatening condition with complications like Acute renal failure and compartment syndrome. A very high index of suspicion for Viral etiology is required while working up a case of Rhabdomyolysis. A comprehensive viral panel is warranted when appropriate clinical presentations is present. Treatment includes supportive care, intravenous fluid resuscitation, and renal replacement therapy. Continuous renal replacement therapy should be considered in severe cases for management of severe electrolyte abnormalities and volume status.

References: