Can Caffeine Overdose cause Rhabdomyolysis?

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Introduction:
- Rhabdomyolysis, a potentially life threatening condition, with a reported frequency of leading to Acute Kidney Injury as high as 50%, has a number of aetiologies.
- Rhabdomyolysis accounts for an estimated 8% to 15% of cases of acute renal failure and is associated with a mortality rate of 5%.
- Caffeine Ingestion to an unacceptably large amount leads to Rhabdomyolysis and eventually Acute Kidney Injury.
- The toxic dose of caffeine is 20mg/kg and fatal dose is 150-200mg/kg.

Case Report:
- A 31-year-old gentleman admitted with a history of ingestion of Caffeine powder (33 gram) with an intention to suicide.
- Found by a friend – agitated & confused in chair
- Several episodes of vomiting
- During resuscitation in ED - complaining of palpitation, headache & myalgia.
- Blood gases revealed metabolic acidosis with respiratory compensation.
- Urine was noticeably darker, dark brown in colour, output reduced.

Investigation

<table>
<thead>
<tr>
<th>Investigation</th>
<th>24 Hour</th>
<th>48 hour</th>
<th>72 hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creatinine</td>
<td>122</td>
<td>134</td>
<td>91</td>
</tr>
<tr>
<td>GFR</td>
<td>72</td>
<td>57</td>
<td>&gt;90</td>
</tr>
<tr>
<td>Creatinine Kinase</td>
<td>1735</td>
<td>7279</td>
<td>3397</td>
</tr>
</tbody>
</table>

Management:
- Gastric Lavage & Activated Charcoal in 1 hour of ingestion
- Intravenous Fluid and monitoring Input/Output
- Cardiac Rhythm Monitoring
- Diazepam/ Lorazepam for agitation
- Renal Replacement therapy in severe case

Discussion:
Rhabdomyolysis due to caffeine is a rare condition, being reported only 7 times since 1989. Though a relatively uncommon entity, but as caffeine overdose can involve several vital systems of the body, patient must be assessed and managed immediately to prevent major organ damage e.g. cardiac ( arrhythmia ), Kidney ( renal failure ) and neurological ( seizure ).

Caffeine-induced Rhabdomyolysis is proposed to occur through stimulation of intracellular calcium stores in myocytes causing tetanic contractions which induce muscle injury.

An alternative mechanism of Rhabdomyolysis is due to muscle paralysis occurring as a result of severe hypokalaemia (hypokalemic muscle paralysis), as caffeine stimulates sodium-potassium ATPase leading to hypokalaemia and caffeine induces kaliuresis through increased adrenergic tone acting on renal tubular system. [4]

Caffeine is a common content of a wide range of beverage, an approximate amount of caffeine in each type of beverage is tabulated in the following chart. [1]

<table>
<thead>
<tr>
<th>Beverage</th>
<th>Amount of Caffeine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brewed coffee</td>
<td>56 – 100 mg /100 ml</td>
</tr>
<tr>
<td>Instant coffee and tea</td>
<td>20 – 73 mg/ 100 ml</td>
</tr>
<tr>
<td>Carbonated sodas</td>
<td>9 – 19 mg / 100ml</td>
</tr>
<tr>
<td>Energy drinks</td>
<td>14 – 31 mg /100ml</td>
</tr>
<tr>
<td>Chocolate</td>
<td>5 – 80 mg / 100g</td>
</tr>
</tbody>
</table>

Learning Points:
- In A&E/AMU’s, caffeine overdose can present with Rhabdomyolysis leading to AKI.
- In this era of growing depression and self harm, doctors need to be aware of life threatening complications of rarer overdose medications.
- Guidelines should be in place to manage these rather uncommon clinical conditions.
- This case identifies the fact that clinical knowledge about caffeine toxicity, requesting correct laboratory investigation and timely intervention can save life.

Reference