BRIEF COMMUNICATION

Acute Fatal Alcohol Intoxication in a 3-Day-Old Neonate

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1. Introduction

There are few reports on alcohol intoxication in infants, and associated death has never been reported. A literature search showed nine cases of alcohol intoxication involving infants < 12 months of age: two of these were iatrogenic and seven were accidental (Table 1).1–7 We report the case of a 3-day-old male infant with alcohol intoxication due to child abuse, and include a review of the current literature. To the best of our knowledge, this neonate is the youngest child with ethanol intoxication, and this study is the first reported fatal case.

2. Case Presentation

This boy was born via normal spontaneous delivery in Min-Sheng General Hospital (Taoyuan, Taiwan) in 2015. He was taken home after 2 days and cared for only by his father, who had a history of domestic violence and was intoxicated with alcohol throughout the day. The father gave approximately 50 mL of rice wine to the infant instead of milk. When the father woke up from his binge the next day, he found that the neonate had general cyanosis and was not spontaneously breathing. He called for an emergency medical technician, and the baby was brought to our pediatric emergency room. On arrival, no heartbeat or respiration was found. Pulseless electrical activity was detected through an electrocardiogram. Cardiopulmonary–cerebral resuscitation (CPCR) with chest compression was performed, and then the neonate was intubated. There were no obvious signs of trauma.

After the patient was admitted to our pediatric intensive care unit, CPCR was continued with intermittent mandatory ventilation support. The blood gases revealed severe acidosis (pH = 6.5) and carbon dioxide retention. Sodium bicarbonate, epinephrine, and fluid challenge with normal saline were applied. CPCR was continued for 30 minutes; however, it failed and the patient died. Whole-body computed tomography and a long-bone survey revealed no obvious signs of fracture or internal bleeding. The cerebrospinal fluid collected via lumbar puncture was normal. An ophthalmologist found no obvious retinal detachment or hemorrhage. The blood alcohol concentration (BAC; 61 mg/dL) was elevated. We checked for other drugs, such as cocaine, amphetamine, acetaminophen, and diphenhydramine, but...
## Table 1  Comparison of all reported infants intoxicated with alcohol in the world by the sequence of their age.

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Country</th>
<th>BAC (mg/dL)</th>
<th>Symptoms and signs</th>
<th>Access of alcohol absorption</th>
<th>Treatment</th>
<th>Outcome</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 d</td>
<td>Boy</td>
<td>Taiwan</td>
<td>61</td>
<td>OHCA</td>
<td>Child abuse</td>
<td>CPCR and intubation</td>
<td>Death</td>
<td>This study</td>
</tr>
<tr>
<td>15 d</td>
<td>Girl</td>
<td>Japan</td>
<td>43</td>
<td>Flushed skin, tachycardia and low blood pressure, somnolence and metabolic acidosis</td>
<td>Giving formula milk that was accidentally diluted with sake (Japanese wine)</td>
<td>Intravenous fluid replacement</td>
<td>Recovery</td>
<td>Zaitsu et al²</td>
</tr>
<tr>
<td>15 d</td>
<td>Girl</td>
<td>France</td>
<td>440</td>
<td>Coma</td>
<td>Applying ethanol-soaked dressings to sterilize umbilical cord</td>
<td>Giving intravenous fluids with dextrose and intubation</td>
<td>Recovery</td>
<td>Autret et al³</td>
</tr>
<tr>
<td>29 d</td>
<td>Girl</td>
<td>USA</td>
<td>301</td>
<td>Strange behavior, inattentiveness, a weak cry, and hypotonia</td>
<td>Ingesting formula that had been prepared with gin.</td>
<td>Giving intravenous fluids with 5% dextrose</td>
<td>Recovery</td>
<td>Fong and Muller⁴</td>
</tr>
<tr>
<td>1 mo</td>
<td>Girl</td>
<td>Italy</td>
<td>362</td>
<td>Lethargy, hypotonia, tachycardia, tachypnea, and mildly hypotension</td>
<td>Using ethanol soaked gauze to promote umbilical cord detachment</td>
<td>Giving intravenous fluids</td>
<td>Recovery</td>
<td>Minera and Robinson¹</td>
</tr>
<tr>
<td>1 mo</td>
<td>Boy</td>
<td>Italy</td>
<td>75</td>
<td>Torpor, tremors, slight fever</td>
<td>Giving white wine mixed in a milk formula</td>
<td>Giving intravenous fluids</td>
<td>Recovery</td>
<td>Palano et al⁵</td>
</tr>
<tr>
<td>9 wk</td>
<td>Boy</td>
<td>USA</td>
<td>330</td>
<td>Dazed eyes, tachycardia</td>
<td>Smelling of alcohol</td>
<td>Giving dextrose 5% and normal saline solution (D5NS)</td>
<td>Recovery</td>
<td>Minera and Robinson¹</td>
</tr>
<tr>
<td>6 mo</td>
<td>Boy</td>
<td>USA</td>
<td>220</td>
<td>Coma, hypoglycemia, hypothermia, tachycardia, and tachypnea</td>
<td>Using ethanol on his trunk and extremities for a sponge bath</td>
<td>Giving 50% glucose in water intravenously</td>
<td>Recovery</td>
<td>Moss⁶</td>
</tr>
<tr>
<td>7 mo</td>
<td>Boy</td>
<td>USA</td>
<td>183</td>
<td>Tachycardia, tachypnea, and mild hypotension</td>
<td>Giving vodka mixed in a formula</td>
<td>Giving intravenous fluids</td>
<td>Recovery</td>
<td>Minera and Robinson¹</td>
</tr>
<tr>
<td>9 mo</td>
<td>Girl</td>
<td>USA</td>
<td>524</td>
<td>Floppiness, unresponsiveness</td>
<td>Giving a bottle of formula mixed with vodka</td>
<td>Intubation and fluid resuscitation</td>
<td>Recovery</td>
<td>Edmunds et al⁷</td>
</tr>
</tbody>
</table>

CPCR = cardiopulmonary–cerebral resuscitation; OHCA = out-of-hospital cardiac arrest.
the results were negative. High glutamate oxaloacetate transaminase (GOT) (3955 U/L), high glutamate pyruvate transaminase (GPT) (517 U/L), low glucose (48 mg/dL), high creatinine (1.11 mg/dL), and acidosis (pH = 6.543) values were found. A social worker was consulted regarding child abuse.

3. Discussion

We reviewed all reported cases of alcohol intoxication of infants worldwide (Table 1). Acute alcohol intoxication can be life threatening, and can result in coma, seizures, hypothermia, acidosis, or death with BAC values > 400 mg/dL.1 The neonate’s BAC value (61 mg/dL) was likely low owing to the delay from the time of consumption to resuscitation, while his father was intoxicated with alcohol and was unconscious. The clearance of alcohol follows zero- or first-order kinetics at an average rate of 21.6–49.7 mg/dL per hour.1,7 We estimated that the delay from the time of intoxication to resuscitation exceeded 10 h; therefore, his highest predicted BAC was probably > 400 mg/dL.

Alcohol poisoning can occur in infants owing to accidental ingestion, child abuse, skin absorption from alcohol-containing materials, or by smelling alcohol (Table 1). In addition to drowsiness, infants with alcohol intoxication most commonly have lethargy, torpor, tremors, strange behavior, inattentiveness, weak cry, hypotension, and metabolic anomalies. Those symptoms are typical of classic acute alcohol intoxication, such as hypoglycemia, hypothermia, tachycardia, tachypnea, metabolic acidosis, and coma.

The mainstays of therapy are supportive care with dextrose-containing intravenous fluids and respiratory support including mechanical ventilation. Hemodialysis can speed alcohol clearance, but is generally reserved for severe cases of alcohol intoxication complicated by coma, acidosis, and hemodynamic instability.7

Prior to this case, the reported outcome of alcohol intoxication in infants was benign, with complete recovery without complications, even after resuscitation including intubation. This might mislead us to conclude that delaying the treatment of infants with alcohol intoxication causes little harm. This report demonstrates that delaying treatment in infants with alcohol intoxication may lead to death.

In conclusion, we report a case of acute alcohol intoxication in a 3-day-old infant due to child abuse, resulting in delayed treatment and death, in contrast to the full recovery reported in all nine other similar cases in infants. This case alerts us about the unfortunate outcome probably caused by acute alcohol intoxication in the infant; moreover, clinicians should be aware of the fatality of such cases. Therefore, it is very important to initiate immediate treatment in alcohol intoxication by performing hydration with dextrose-containing fluids and resuscitation. We also emphasize the importance of considering the risk of percutaneous or gastrointestinal alcohol absorption, particularly in young infants, and the need for toxicology screening in every child with drowsiness of unknown etiology.

Ethical statement

This study has been approved by the institutional review board of Chang Gung Memorial Hospital (IRB No. 102-0498B).

Conflicts of interest

All authors declare no conflict of interests.

References