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EXPERIENCE AND REASON:

Fatal Child Abuse by Forced Water Intoxication

RF - FAMILY

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▲	<u>Top</u>
•	<u>Abstract</u>
▼	<u>Introduction</u>
▼	<u>Results</u>
▼	<u>Discussion</u>
▼	<u>References</u>

► **ABSTRACT**

Background. Although water intoxication leading to brain damage is common in children, fatal child abuse by forced water intoxication is virtually unknown.

Methods. During the prosecution of the homicide of an abused child by forced water intoxication, we reviewed all similar cases in the United States where the perpetrators were found guilty of homicide. In 3 children punished by forced water intoxication who died, we evaluated: the types of child abuse, clinical presentation, electrolytes, blood gases, autopsy findings, and the fate of the perpetrators.

Findings. Three children were forced to drink copious amounts of water (over 6 L). All had seizures, emesis, and coma, presenting to hospitals with hypoxemia ($PO_2 = 44 \pm 8$ mm Hg) and hyponatremia (plasma Na = 112 ± 2 mmol/L). Although all showed evidence of extensive physical abuse, the history of forced water intoxication was not revealed to medical personnel, thus none of the 3 children were treated for their hyponatremia. All 3 patients died and at autopsy had cerebral edema and aspiration pneumonia. The perpetrators of all three deaths by forced water intoxication were eventually tried and convicted.

Interpretation. Forced water intoxication is a new generally fatal syndrome of child abuse that occurs in children previously subjected to other types of physical abuse. Patients present with coma, hyponatraemia, and hypoxemia of unknown etiology. If health providers were made aware of the association, the hyponatremia is potentially treatable. *Key words:* forced water intoxication, child abuse, hyponatremia, hypoxemia, death, brain damage, hyponatremic encephalopathy.

Oral water intoxication leading to hyponatremia and death or permanent brain damage has been extensively reported in prepubertal children.¹⁻³ The plasma antidiuretic hormone (ADH) levels are usually above normal, largely accounting for the abnormal water retention,^{4,5} which may lead to hyponatremic encephalopathy. Hyponatremic encephalopathy is potentially lethal in prepubertal children.^{1-3,6}

A rare cause of acute hyponatremic encephalopathy in children is punishment by forced water intoxication. There are only 2 reported pediatric patients.^{2,7} Although both had hyponatremic encephalopathy, neither required therapy with hypertonic NaCl and both recovered. Child abuse is often life-threatening, and the perpetrators frequently do not inform medical personnel about prior events.⁸ We now present a new syndrome of fatal child abuse in 3 children who developed fatal hyponatremic encephalopathy attributable to punishment by forced water intoxication.

► PATIENTS AND METHODS

Three cases of punishment by forced water intoxication occurred in children, all whom were admitted to hospitals in comatose states. The forced water intoxication was never revealed to medical personnel, the cause of coma was thus not established antemortem, therapy for the hyponatremia was never administered, and all 3 died of a treatable disorder. All three perpetrators of the forced water intoxication were tried for homicide. One of the authors (B.A.K.) was the prosecutor (Deputy District Attorney) and the other (A.I.A.) was a consultant (expert witness) in case 1. In preparing for the trial, a search was conducted of all criminal cases of forced pediatric water intoxication in the United States. Two additional cases were located^{9,10} (Table 1). The medical records, autopsy reports, trial investigation documents, and interviews from these 3 cases were the primary source of the data in this report. The Glasgow Coma Scale was determined for each child.¹¹

TABLE 1	
View this table:	Demographics and Laboratory Values
[in this window]	
[in a new window]	

One child was in a foster home, and 2 were living with their natural mothers and the mother's male live-in partner.

▲ Top
▲ Abstract
▲ Introduction
• Results
▼ Discussion
▼ References

► RESULTS

The demographics and admission laboratory findings of the 3 cases are shown in Table 1. The mean age was 10 years (case 1 was developmentally disabled), 2 were female, and in all there was a profound history of physical abuse (Table 2). All 3 patients, as eventually admitted by the perpetrators, were forced to drink over 6 L of water at one sitting as punishment for "misconduct" (Table 2). The primary symptoms were urinary and fecal incontinence, emesis, bizarre behavior, seizures, and respiratory arrest. Using the admission plasma sodium, body weight, and calculated total body water, the quantity of water actually retained was calculated, and ranged from 125 to 141 mL/kg (this calculation is based on the assumption that water ingestion occurred acutely; urine and emesis were not collected for analysis so loss of water and cation have been ignored) (Table 2). All were taken to the hospital by emergency medical services (EMS) personnel. The history of forced water intoxication was not provided to either physicians, nurses, or EMS personnel.

TABLE 2

View this table: Abuse, misconduct, and autopsy findings
[\[in this window\]](#)
[\[in a new window\]](#)

On admission to the hospital, all 3 children had extensive physical evidence of abuse, including: a) burns (from cigarettes and electric iron) on the arms and trunk; b) bruises on the trunk, the soles of feet, the arms and legs; and c) rope burns on the wrists and ankles. These physical findings of abuse were not appreciated by physicians or EMS personnel. Subsequent investigation by personnel from social welfare, police, and the District Attorney's office eventually confirmed the findings of child abuse. Initially, all three perpetrators told authorities that the children had in the past consumed large quantities of water of their own volition. This assertion was not substantiated for any of the children.

In case 2 the perpetrator tied the victim's hands behind her back and instructed a sibling to hold the victims' mouth open while the perpetrator poured water down her throat. In the other 2 cases, threatening verbal coercion by the perpetrator toward the child was later documented. All children had suffered respiratory arrest at home and were comatose on admission to the hospital. The Glasgow Coma Scale score was 7 for patient 1; 8 for patient 2, and 7 for patient 3 (mean, 7.5). No specific therapy was ever administered. The plasma electrolytes and arterial blood gases are shown in [Table 1](#). There was hyponatremia, hypokalemia, and hypoxemia with metabolic acidosis. All patients had respiratory depression on admission and were intubated and mechanically ventilated immediately (within 5 minutes). In all 3 patients, the diagnosis of coma secondary to hyponatremia was not suspected, and as a result, no therapy was administered for the hyponatremia. None survived more than 36 hours, and all were declared brain dead while on respirators. Autopsies were performed on all 3 children. The major findings were cerebral edema, brainstem herniation, and pulmonary edema ([Table 2](#)). The mean brain weight was 1332 g, each being about 10% higher than the normal age-corrected value.^{3,12}

All patients had a substantial past history of physical abuse, which was administered by either the foster mother (case 1) or the natural mother's male live-in partner (cases 2 and 3) ([Table 2](#)). The perpetrators of all three deaths were eventually tried and convicted.^{9,10,13} The perpetrator in case 1 received 6 years in state prison, which was affirmed on appeal.¹³

▲ [Top](#)
▲ [Abstract](#)
▲ [Introduction](#)
▲ [Results](#)
• [Discussion](#)
▼ [References](#)

► DISCUSSION

These data demonstrate that prepubertal children can be forced to ingest sufficient water to cause hyponatremic encephalopathy, seizures, respiratory arrest, and death.

The history of abuse by forced water ingestion was never revealed to health care providers. All 3 children had extensive physical evidence of abuse, but not only was this evidence not noted by medical providers, hyponatremia as a cause of coma was not suspected either.

These 3 cases have many characteristics of Munchausen syndrome by proxy.^{14,15} In Munchausen syndrome by proxy, a parent may expose a child to a toxin, including salt or water, to simulate a disease process.¹⁶ The parent (usually the mother) gains attention from relationships formed with caregivers. However, the 3 cases here described differ from Munchausen syndrome by proxy in that the "toxin" (water) was administered not by the mothers but in fact by a live-in companion, and rather than the perpetrator gaining attention by interacting with caregivers, the caregivers were excluded from the process as much as possible. These 3 cases are in many respects more like physical child abuse,^{8,17} where the perpetrator attempts to hide the source of the child's injury from caregivers. In particular, all 3 children had evidence of extensive physical abuse (Table 2).

The symptoms were similar to those previously described for acute water intoxication,^{2,3,18} and failure to consider water intoxication as a cause of coma and respiratory arrest was a major contributory factor in all three deaths. All patients were successfully intubated but none received hypertonic NaCl. It is now well-established that prompt and appropriate therapy with hypertonic NaCl can lead to recovery in children with hyponatremic encephalopathy, even after respiratory arrest.^{2,19,20}

Inappropriately elevated plasma levels of ADH are often present in individuals subjected to abuse in the past.²¹⁻²³ Punishment by forced water ingestion could result in elevated plasma ADH levels, resulting in hyponatremic encephalopathy. The average amount of water retained in 4 hours was >41 mL/kg/hr, a quantity far exceeding the normal capacity to excrete water.^{24,25}

If medical personnel had been aware of the association of child abuse with forced water intoxication, the hyponatremic encephalopathy, which is usually reversible,^{2,19} could have been successfully treated. There are multiple reports of children initially said to have died from accidental falls or sudden infant death syndrome who have in fact been victimized by various forms of child abuse.^{8,17} All 3 children had multiple findings of severe physical abuse. Because the perpetrators often fail to notify medical personnel of the cause of the child's coma, awareness of this syndrome may lead to increased detection and survival.

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► ABBREVIATIONS

ADH, antidiuretic hormone; EMS, emergency medical services.

▲ [Top](#)
▲ [Abstract](#)
▲ [Introduction](#)
▲ [Results](#)
▲ [Discussion](#)
• [References](#)

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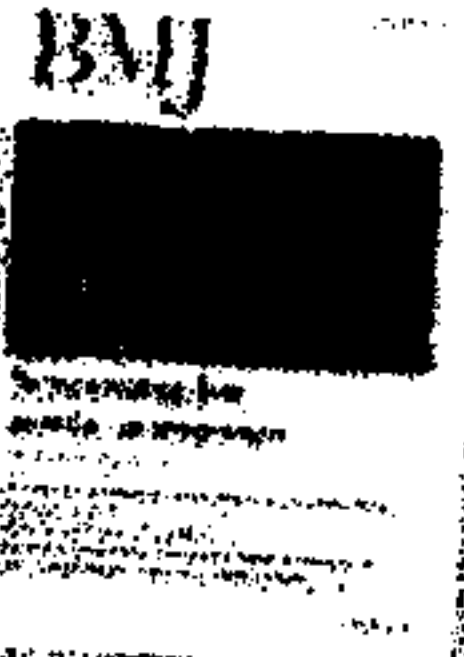


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