**ABSTRACT** – We present the case report of a 13-month-old Caucasian toddler with symptoms of loss of consciousness, central cyanosis and uncontrolled movements of the upper limbs while taking a warm bath. The diagnosis of hot water epilepsy was supported by an ictal EEG. Hot water epilepsy, also known as bathing epilepsy or water-immersion epilepsy, is, in the Caucasian population, a rare form of benign epilepsy, where seizures are provoked by immersion in a hot or even just a warm bath. This is the first comprehensive video publication of a seizure provoked by water-immersion in a Caucasian child. [Published with video sequences].

**Key words:** hot water epilepsy, seizures, induced seizures

Hot water epilepsy (HWE), also described as bathing epilepsy or water-immersion epilepsy, is a benign type of reflex epilepsy. In this disease, seizures are provoked by an external stimulus consisting of hot or even warm water (Keipert, 1969, Engel, 2001). This type of epilepsy has mostly been described in India, Japan and Turkey, and is rare in Western countries (De Keyzer et al. 2005). Satishchandra has reported a prevalence in South-India as high as 3.6 to 6.9% (Satishchandra et al. 1988, Grosso et al. 2004). Conversely, the percentage of patients with HWE among people with epilepsy is only 0.6% (Bebek et al. 2001).

Most frequently, patients show complex partial seizures with or without secondary generalisation. Rather exceptional is a primary generalised tonic-clonic convulsion. Sometimes seizures are preceded by an aura consisting of flashbacks, rising epigastic sensations, and staring. HWE is mostly seen in children (boys more often than girls), but it has also been described in adults (Satishchandra et al. 1988, Gururaj et al. 1992, Bebek et al. 2001, loos et al. 2000).

**Case report**

The patient is a 13-month-old boy who had been referred to the university hospital for exclusion of Dravet syndrome. He was referred by the pediatrician after a loss of consciousness for a few minutes while taking a bath. Medical history was negative and clinical examination on admission was normal. Height and weight were consistent with age. He had never suffered from febrile seizures and his psychomotor development was normal.
Family history revealed the presence of convulsions of unknown cause in the maternal grandfather and his sister. Routine blood examination and brain imaging were normal. The postictal EEG revealed no signs of epilepsy or lateralisation. During hospital admission, a seizure could be provoked by placing the child in a warm bath (T = 36.6°C), while taking an EEG (see video sequence). Twenty seconds later the patient stopped playing, started to stare and consciousness was altered. He became pale, had peri-oral cyanosis, became hypotonic and showed some uncontrolled movements involving both upper limbs. The nurse took him out of the bath and the seizure stopped spontaneously after, in total, 1 min 30 sec. In the postictal phase, the child fell asleep.

The EEG preceding the seizure showed a polymorphic curve with a normal background rhythm (figure 1A) for his age. Stimulation with light flashes did not provoke a seizure. When the seizure started, there was a paroxysmal delay of the base rhythm followed by a two to three Hz pattern with high voltage delta waves of 150-200 µV, starting in the occipital region and diffusely disseminating over all leads (figure 1A and B). There were no other epileptic discharges (figure 1C). This episode stopped shortly after the child was taken out of the bath (figure 1D). The simultaneously-recorded ECG remained normal. Avoiding bathing in hot water and just washing the child with lukewarm (32°C) water seemed to be sufficient to prevent recurrent seizures. Because the parents were very anxious, sodium valproate was started. At last follow-up at the age of three years, all medication was stopped, psychomotor development was normal and the patient was able to take a warm (37°C) shower without any problem. During the summer, he could play in an outside pool without experiencing any convulsions. Mutation analyses of SCN1A were normal, as expected.

**Discussion**

HWE, bathing or water immersion epilepsy is a reflex epilepsy that is frequent in South-India, Turkey and Japan, but is rather exceptional in Caucasian populations (Lenoir et al. 1989, Satishchandra et al. 1998, Argumosa et al.)

In most European countries, “hot water” means warm water with a temperature around 37°C, which is the normal temperature of a bath for infants (Grosso et al. 2004, De Keyser et al. 2005). In Turkey however, a “hot bath” means water with a temperature of up to 50°C (Incecik et al. 2004). It has also to be noted that most Caucasian patients are infants or toddlers, while in the series from India and Turkey most patients are much older or even adults.

Although the diagnosis is mostly clinical, EEG has an important contribution (Sathischandra et al. 1998, Bebek et al. 2001, Satishchandra, 2003).

Interictal EEG is usually normal, although lateralised or localised spikes in the anterior temporal region have been reported in a few isolated cases (Sathischandra, 2003). An ictal EEG is, for obvious reasons, difficult to obtain. In those cases where it has been observed, seizures are accompanied by lateralised rhythmic delta-activity, sharp and slow waves, sometimes bilateral spikes or localised temporal activity (Ioos et al. 2000, DiMario, 2001). Pictures of an ictal video-EEG recording of a single patient were first published by Roos (Roos et al. 1988). In two of the patients reported by Ioos, diagnosis of HWE was supported by ictal video-EEG recordings (Ioos et al. 2000).

Here we present, for the first time, a video of a complete seizure provoked by water immersion in a Caucasian toddler with HWE.

Differential diagnoses of vagal syncope, breath-holding spells and febrile seizures can nearly always be made by careful history-taking (Fukuda et al. 1997, DiMario, 2001). As illustrated in this case report, the suspicion of an incipient epileptic syndrome must always be excluded. Although children with Dravet syndrome have seizures provoked by water immersion, the most frequent, initial clinical presentation of a long-lasting febrile convulsion, the evolution of the seizures and development is completely different from that of HWE (Ceulemans et al. 2004).

Other types of epilepsy with onset at this age such as benign myoclonic epilepsy of infancy or benign familial non-familial, infantile seizures (Watanabe-Vigerano syndrome) are not associated with seizures provoked by water-immersion.

Febrile seizures are, as a rule, provoked by fever and are mostly generalised tonic-clonic convulsions. Rare cases of aquagenous urticaria might also be a kind of HWE (Mouterde et al. 1997). Treatment consists of avoiding contact with warm water. In some cases, a good result may be obtained with conventional anti-epileptic drugs or oral prophylaxis with benzodiazepines before taking a hot bath (Mouterde et al. 1997, Ioos et al. 2000, Sharma et al. 2002, Incecik et al. 2004).

The prognosis for hot water epilepsy is usually favourable. There is mostly spontaneous remission and psychomotor development remains normal (Argumosa et al. 2002). Rather exceptionally, there may be an evolution to non-reflex epilepsy (Satishchandra et al. 1988).

Legend for video sequence
The video shows a seizure provoked by placing the child in a warm bath.

References


