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## Letter to the Editor

# Decision making during resuscitation of a drowned child with cardiac arrest



Sir,

Several studies have shown that drowned children with cardiac arrest have a poor prognosis, especially when duration of resuscitation is >25 min.<sup>1–3</sup> We report the exceptional case of a child who survived prolonged submersion and resuscitation with a favourable neurological outcome.

During the summer 2017, a 3-year old previously healthy girl was rescued from the water of a lake in Western Austria after approximately 35 min of continuous submersion. Disappearance of the child was not witnessed. Resuscitation was started immediately by members of the water rescue and a HEMS team.

Initially, ventilation was extremely difficult because of massive regurgitation of water and stomach content with subsequent aspiration into the lungs. After extensive suctioning and insertion of a gastric tube, sufficient bag-mask-ventilation could be performed, followed by endotracheal intubation short after.

Interestingly, the ECG showed ventricular fibrillation. Over 15 min, three shocks were applied (50J each) without any change in cardiac rhythm. Furthermore, injection of 75 mg of amiodarone and a cumulative dose of 0,5 mg of adrenaline (epinephrine) did not have any effect. Unfortunately, measuring of body temperature was not possible due to technical reasons. The water temperature during the time of year, in which the incident occurred, was 22–24 °C.

After short discussion within the team, it was decided to bypass the nearest hospital with a pediatric intensive care unit (PICU) and to transfer the patient with ongoing CPR to a facility with ECMO availability. During flight and 48 min after initiation of CPR, a raise in end-tidal CO<sub>2</sub> indicated a return of spontaneous circulation. The ECLS center was reached 40 min after departure from the scene. On arrival at the Emergency Department, haemodynamics were stable and a body core temperature of 34 °C was measured (Table 1).

Shortly after admission to the PICU, the oxygenation deteriorated rapidly (Horowitz Index of 48 mmHg). Since a trial of high frequency ventilation showed no improvement, five hours after intubation, venovenous ECMO was initiated and could be terminated 91 h later. However, the child developed cerebral edema and seizures. Finally, after 45 days of mechanical ventilation, she was successfully extubated. During this period, targeted temperature management but no therapeutic hypothermia has been performed.

After 54 days in hospital, the patient was transferred to a rehabilitation center.

One year after the event, and after intensive rehabilitation measures, the child is at home. She has a Pediatric Cerebral Performance Category Score of 2 and a good quality of life. Limitations are a slight ataxia and a moderate visual impairment.

In our opinion, the key messages of this case are:

1. Despite long submersion time (more than 25 min) and long duration of resuscitation, survival with acceptable neurological recovery is possible.
2. No termination of resuscitation efforts in children with a shockable cardiac rhythm even when the underlying cause is presumed to be hypoxia.
3. After drowning with a cardiopulmonary arrest and ROSC, but also during cardiopulmonary resuscitation, a direct transport to a facility with ECLS capacity is worth considering.<sup>4,5</sup>

The consent of the patient's parents for publication has been obtained.

## Conflict of interest statement

The Authors declare no conflict of interest.

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**Table 1 – First arterial blood gas analysis.**

pH	6,67
PaO <sub>2</sub>	78,5 mmHg
PaCO <sub>2</sub>	77,4 mmHg
BE	–21,6 mmol/l
Lactate	14,8 mmol/l
Sodium	131 mmol/l
Potassium	2,8 mmol/l

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