PATIENT CASE REPORT. CATEGORY: PEDIATRIC
THREE YEAR OLD CHILD WITH CEREBRAL TRAUMA AND LUNG CONTUSION, WEANING WITH NAVA VENTILATION.

Clinical Background and Situation:
A 3 year old previously healthy child was brought to emergency department by the mobile intensive care unit with head injury. He fell from a second story window while playing. Upon arrival to hospital, the neck was stabilized and fixed with a stiffneck, further clinical exam showed a grunting child with closed eyes, he was also unresponsive but reacted only on pain stimuli. Shortly later, his neurological situation deteriorated and the patient showed an abnormal respiratory pattern which needed immediate laryngotracheal intubation under Propofol and mechanical ventilation. During the transport, pulse oximetry was good with a good air entry to the lungs, but the pupils became very small and not reactive to the light.

Interventions and course of ventilation therapy:
At the emergency department, the child was sedated with Midazolam and Propofol. He remained stable with a good pulse oximetry and normal blood pressure for the age. An urgent CT scan of the brain as well the cervical spine was performed and showed a large skull fracture with a temporal, frontal as well as a parietal subdural hematoma with a large brain oedema and a shift of the midline (Figure 1). The CT scan of the thorax showed a lung contusion and pneumonia which was also confirmed by the X-ray of the chest. Further radiological investigation did not show other abnormalities.

The subdural hematoma was drained, the skull fracture was reduced and intracranial pressure (ICP) monitoring was placed in the lateral ventricle by the neurosurgeon (Figure 2).

The ICP was raised upon arrival to the PICU, and continued to increase up to 42 mmHg, despite the increase of the sedation, fluid administration,

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drainage of the spinal fluid and the use of the Noradrenaline in order to improve the cerebral perfusion pressure (CPP) above 60 mmHg.

According to our protocol, the patient was cooled down to 33°C in order to reduce the ICP; this was reduced to 12 mmHg. The cooling was continued for 3 days and the patient was re-warmed very slowly for the next 24 hours.

The patient was ventilated on Pressure Regulated Volume Control (PRVC) with a tidal volume (TV) of 140 ml, respiratory frequency of 20/min, positive inspiratory pressure of 16 cm H₂O, the positive end expiratory pressure was 5 cmH₂O, and a FiO₂ of 100%.

**Weaning process and results:**

On day 2 after admission, the patient became bradycardic and hypotensive which resolved after fluid administration and increasing the amount of Dobutamine. CT scan control of the brain showed no extra bleeding but an increase in the cerebral oedema.

On the following days, his respiratory condition improved, the FiO₂ was reduced, as well as the TV. On day 6 after admission, a NAVA Edi catheter was inserted via the intranasal method and positioned according to the ECG signal captured on the NAVA screen (Figure 3). During the first hours after the NAVA Edi catheter was inserted, the sedation was reduced while the patient remained on PRVC mode. This reduction of sedation increased his respiratory frequency up to 43/min and his ICP up to 20 mmHg, while before the ICP was below 12 mmHg (Figure 4). We decided to start the patient on NAVA mode and to further decrease the sedation.

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This led to a decrease and normalisation of the ICP as well as the respiratory frequency (Figure 5). 24 hours later, the patient was weaned from the ventilator and remained on oxygen for another 24 hours. The rehabilitation was started quite rapidly and the patient was discharged from PICU on day 12 and from the hospital 9 days later. The patient recovered well, he had some neurological disability that disappeared quite rapidly during his stay at the general ward (Figure 6).

**Case summary:**
A 3 year old child admitted into PICU because of a high level fall, with cerebral trauma and lung contusion. Because of sustained high ICP, the patient was cooled down to 33°C for a period of 3 days and re-warmed gradually. He was mechanically ventilated with PRVC mode and later on NAVA mode which allowed us to wean the patient without increase in the ICP.
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