

## Clinical Case Study: aEEG Monitoring on Infant with Critical Congenital Heart Disease

### Patient Characteristics

BB was a 37 week gestation newborn boy with a prenatal diagnosis of hypoplastic left heart syndrome.

The infant was delivered via emergency caesarian section at an outside hospital. During labor, non-reassuring fetal heart tones were detected. Apgar scores were 1, 3, and 5 at 1, 5, and 10 minutes, respectively. The infant was intubated at delivery for poor respiratory effort. A bedside balloon atrial septostomy was performed for a restrictive Patent Foramen Ovale. The infant was hypotensive so was started on dopamine and dobutamine and he was placed on prostaglandins for ductal patency. He was then transferred to the pediatric cardiovascular intensive care unit of a tertiary care pediatric hospital.

### Initial Exam and Clinical Impression

Upon arrival to the pediatric hospital, the infant was sedated on fentanyl and versed. On exam, he appeared mildly dysmorphic with low set ears. He had limited movement with stimulation and had low tone. His hemodynamic status was improving, so the pressor support was slowly weaned and the FiO<sub>2</sub> was reduced. He did not have clinical events concerning for seizure.

### aEEG and Brain Imaging Findings

Amplitude-integrated EEG (aEEG) monitoring was begun on day of life two with the Olympic Brainz Monitor per a research protocol. The background pattern was most consistent with burst suppression. There was no evidence for seizures on the aEEG. Head ultrasound on day of life two was normal.

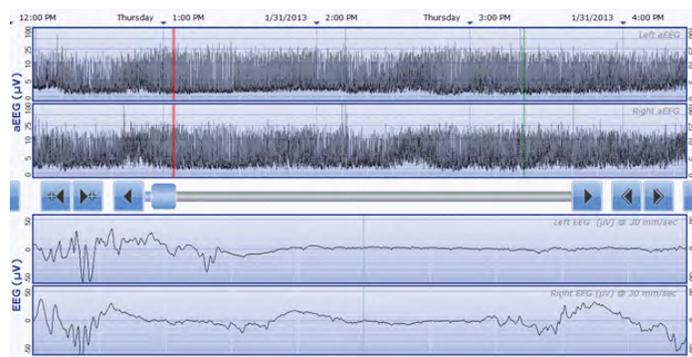
The brain MRI on day of life six revealed areas of restricted diffusion in the bilateral periventricular white matter. This finding is consistent with acute ischemic brain injury. There was also prominence of the extra-axial fluid spaces and of the ventricles concerning for some brain atrophy.

The infant underwent bilateral pulmonary artery banding surgery on day of life seven.

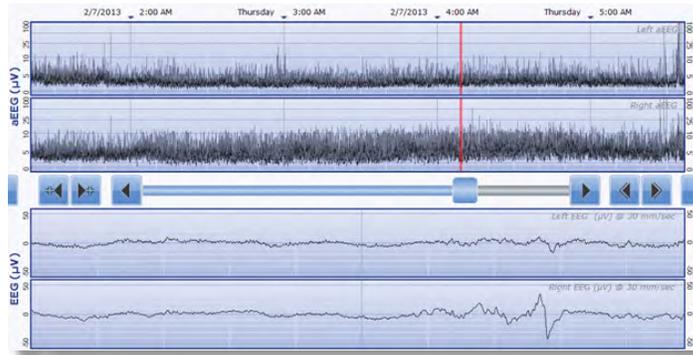
aEEG monitoring was performed again postoperatively to assess the cerebral background activity. The background pattern was suppressed, especially over the left hemisphere. There were no seizures. During the recording the patient was on morphine at 25mcg/kg/hr for sedation.

A postoperative brain MRI was performed at sixteen days of age which showed progression in brain atrophy and multifocal punctate areas of restricted diffusion in the deep white matter representing new areas of acute injury.

The infant developed a complication relating to his congenital heart disease and support was withdrawn.



Preoperative aEEG and raw EEG trace on day of life two



*Postoperative aEEG and raw EEG trace on day of life eight*

### Discussion

Newborns with critical forms of congenital heart disease, that require surgery during the neonatal period, are at high risk for brain injury. Brain injury can be seen preoperatively in up to 50% of these newborns.<sup>1</sup> Newborns with CHD may also present with hypoxic ischemic encephalopathy if they have poor tolerance to labor and delivery.<sup>2</sup>

Studies evaluating aEEG and EEG in the preoperative period in newborns with CHD show abnormal background patterns in about 60% and seizures in up to 20%.<sup>3,4</sup> Accordingly, the recent American Clinical Neurophysiology Society's Guidelines for EEG monitoring in newborns suggest EEG monitoring for newborns with CHD that require early surgery.<sup>5</sup>

aEEG monitoring can therefore provide important information about the neurologic status and may identify seizures in newborns with critical congenital heart disease.

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### References

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