A previously healthy 6-week-old infant presented to the emergency department with two episodes of sudden-onset jerky movements of the left extremities followed by drowsiness that lasted for a few minutes. The parents denied any fever, vomiting, changes in color, or trauma.

The patient’s vital signs were a temperature of 100.3°F, heart rate of 172 beats per minute, respiratory rate of 60 breaths per minute, blood pressure of 101/61 mm Hg, and oxygen saturation of 100% on room air. Physical examination showed a decrease in arousal, bulging anterior fontanelle, bilateral medial subconjunctival hemorrhages (Figure 1), staring gaze, and intermittent jerky movements of all four extremities.

Laboratory studies revealed a white blood cell count of 13,700/mm³ with 45% neutrophils, 47% lymphocytes, hemoglobin of 7.5 g/dL, mean corpuscular volume of 98.2 fl, platelet count of 578,000/mm³, and normal venous pH. Comprehensive metabolic profile showed normal electrolytes, with aspartate aminotransferase of 141 U/L (normal, 0-40 U/L), alanine aminotransferase of 186 U/L (normal, 5-35 U/L), total bilirubin of 2.3 mg/dL, and alkaline phosphatase of 1,040 U/L. Blood, urine, and viral cultures were sent but the parents refused lumbar puncture. The patient was started on ceftriaxone, vancomycin, and acyclovir for presumed meningitis. Further studies revealed the diagnosis.
Diagnosis: Nonaccidental Trauma

A chest radiograph demonstrated multiple rib fractures (Figure 2). A computed tomography (CT) scan of the patient’s brain showed multifocal subdural and bilateral subarachnoid hemorrhages. A magnetic resonance imaging (MRI) scan of the brain showed bilateral extensive cerebral cortical hemorrhages, cerebral ischemia/infarcts, subarachnoid hemorrhage, and subdural hemorrhages of varying ages. An MRI scan of the spine showed extensive anterior and posterior intradural extramedullary early subacute hemorrhage in the cervical, thoracic, and lumbosacral spine. Bilateral retinal hemorrhages were noted on fundoscopy (Figure 3). The liver, spleen, adrenals, kidneys, and pancreas were grossly intact on abdominal CT.

The patient was intubated the next day for airway protection. Anemia was likely due to the intracranial bleed, and the patient received a blood transfusion that normalized her hemoglobin level. She remained on the ventilator for 8 days and the antibiotics were discontinued after the cultures were negative for 3 days. The liver enzymes and bilirubin levels returned to normal levels. Both parents were found to be responsible for the trauma and are now in legal custody. The patient was placed in a rehabilitation program and subsequently into foster care.

She was observed on levetiracetam and had a seizure episode at 5 months characterized by sudden bending of the body with stiffening of the arms and legs. Electroencephalogram (EEG) was consistent with infantile spasms. Topiramate was initiated along with a steroid taper. She remained seizure free at age 9 months. She continues to receive developmental therapy. She sits up with support, and can occasionally sit without support. She babbles, laughs, and smiles. She can hold her neck up to turn sideways and can feed herself with a bottle but not with a spoon.

DISCUSSION

The constellation of intracranial injuries, retinal hemorrhages, spinal injuries, and rib fractures led to the diagnosis of nonaccidental trauma in our patient. Physical abuse is a leading cause of traumatic brain injury in young children, with significant morbidity and mortality.1

The brain injuries may be primary or secondary. Primary injuries occur due to rotational and translational forces (acceleration-deceleration) that cause rotation of the head on its axis with differential movement of the skull/dura and intracranial contents.1,2 Secondary hypoxia and/or ischemia, such as from prolonged seizures, set up a vicious cycle and exacerbates the insult.

Subdural hemorrhages are strongly associated with nonaccidental trauma, especially if they are of varying density/age, located in the interhemispheric region or posterior fossa, and if they extend over the convexity of the brain as in our patient. Spontaneous resorption of the subdural hemorrhage occurs in most cases.2

Retinal hemorrhage is another cardinal manifestation of nonaccidental trauma in children. It is caused by vitreoretinal traction from repetitive acceleration-deceleration forces.3 In a systematic review covering the years 1950 to 2009, retinal hemorrhages were found in 78% of children with abusive head trauma, and the odds ratio of abuse in a child with head injury and retinal hemorrhages was 14.7, with a probability of 91%.4

Spinal injuries from nonaccidental trauma are often overlooked and can

Figure 2. (A) A lateral chest radiograph showing fracture of the posterior 6th and 8th ribs on the day of admission. (B) A chest radiograph 3 weeks later showing callus formation in the 6th, 7th, and 8th ribs.
range from vertebral fractures to nerve root injuries or avulsions, epidural/subdural hemorrhages, or spinal cord injuries. A recent study found that more than 60% of children with abusive head trauma who underwent thoracolumbar imaging had subdural hemorrhage in the spinal canal.\textsuperscript{5}

Blunt abdominal trauma is caused by a direct blow or pressure to the underlying organs, causing contusion or laceration of the solid organs (eg, spleen, liver). However, as in our case, external bruises may not be evident, and indirect markers such as elevated liver enzymes or serum lipase can contribute to the diagnosis.\textsuperscript{6} Further imaging with ultrasound and CT scan should be pursued in such cases.

Physical abuse remains an under-reported problem, and up to 31% of children with abusive head trauma are initially misdiagnosed.\textsuperscript{7} Clinicians must exercise a high index of suspicion in such cases with obscure or changing history, so that appropriate investigations and management are performed in a timely manner.

\textbf{REFERENCES}