

Topic: Head trauma in a 5-month-old baby

Why this case is of interest: The inherent difficulties assigning chronic appearing brain findings in young infants to postnatally acquired injuries

Case summary: This is a 5-month-old previously healthy boy born by C-section because of cardiac decelerations. Some hours after presentation to the ED with 2 days of vomiting and constipation and negative evaluation for intussusception, he developed mental status changes and seizures. Neuroimaging showed biparietal skull fractures, underlying brain contusion, and shear injury. Family had no explanation. Areas of chronic encephalomalacia and supratentorial and infratentorial effusions were also identified. The baby was treated with anti-epileptics, ventilator support, and did well. Three months later he has some residual left side weakness but is otherwise on target and progressing developmentally.

Key learning points:

1. The non-specific presentation of symptoms and signs of head injury in young infants can delay the diagnosis.
2. In the absence of a trauma history, chronic subdural and brain findings in an infant can be difficult to distinguish from birth trauma.
3. C-section delivery does not protect from head and brain injury.
4. Accessory sutures can be distinguished from fractures by healing pattern of fractures.
5. Developmental progress during infancy may be normal despite significant acute and chronic brain abnormalities.

Summary of literature:

Dupuis O, et al. Comparison of "instrument-associated" and "spontaneous" obstetric depressed skull fractures in a cohort of 68 neonates. *American Journal of Obstetrics and Gynecology*. 2005; 192:165-170.

This study notes that spontaneous (without instrumentation) depressed skull fracture can occur during vaginal delivery or elective C-section as a result of pressure on the soft fetal skull from the maternal fifth lumbar vertebrae, sacral promontory, symphysis pubis, ischial spines, asymmetric or contracted pelvis, or uterine myoma. Instrumentation related fracture is more common, and only instrumentation resulted in intracranial lesions.

Jenny C, Hymel KP, Ritzen A, Reinert SE, Hay TC. Analysis of missed cases of abusive head trauma. *JAMA*. 1999; 282(7):621-626.

Fifty-four (31.2%) of 173 abused children with head injuries had been seen by physicians after AHT and the diagnosis was not recognized. The mean time to correct diagnosis among these children was 7 days (range, 0-189 days). Abusive head trauma was more likely to be unrecognized in very young white children from intact families and in children without respiratory compromise or seizures. In 7 of the children with unrecognized AHT, misinterpretation of radiological studies contributed to the delay in diagnosis. Fifteen children (27.8%) were reinjured after the missed diagnosis. Twenty-two (40.7%) experienced medical complications related to the missed diagnosis. Four of 5 deaths in the group with unrecognized AHT might have been prevented by earlier recognition of abuse.

Patonay B. Can birth trauma be confused for abuse? *J Forensic Sci.* 2010; 55:1123-1125.
Case report of death of 4 ½ month old infant one of twins deemed a SIDS death. Prolonged labor, C-section delivery, had healing cephalohematoma at autopsy; no new injuries.

Loneragan GL, Baker AM, Morey MK, Boos SC. Child abuse: Radiologic-pathologic correlation. *Radiographics.* 2003; 3:811-845.

Excellent review of radiology studies in child abuse assessment.

Reichard R. Birth injury of the cranium and central nervous system. *Brain Pathology.* 2008; 18:565–570.

Review of pathology of head trauma resulting from birth trauma:
Birth injury of the scalp, skull and central nervous system (CNS) is a complication of a difficult delivery. The rate of birth trauma has dropped precipitously, accounting for fewer than 2% of neonatal deaths. Despite this dramatic decrease in birth trauma mortality, significant injuries still occur. Recent neuroradiology studies indicate that intracranial hemorrhage, even in asymptomatic infants, is not rare. Neuropathologists and forensic pathologists appreciation of the spectrum of birth injuries and their sequelae is critical in order to be able to distinguish these from inflicted and post-mortem injuries.

Sanchez T, Stewart D, Walvick M, Swischuk L. Skull fracture vs. accessory sutures: How can we tell the difference? *Emerg Radiol.* 2010; 17:413–418.

If cranial CT is deemed clinically necessary in trauma patients, questionable fractures can be differentiated from unusual accessory sutures by bilaterality, symmetry, associated diastasis, and presence of soft tissue swelling. In difficult cases, follow-up studies can demonstrate healing of fractures, thereby differentiating them from accessory sutures.

Skull fracture:

Associated diastasis
Sharp lucency with non-sclerotic edges
Associated soft tissue swelling
Widens as it approaches a suture
Can cross adjacent suture lines
Often unilateral and asymmetric

Accessory suture:

Zigzag pattern with sclerotic borders
No associated diastasis
Merges with the adjacent suture
Often bilateral and fairly symmetric
No soft tissue swelling