HISTORY

3 month old, previously healthy infant, brought to the primary care physician due to a fall

He was being carried by the father, who tripped over the family dog

Fell from dad’s arms to the hardwood floor

Cried immediately and eventually settled down

No loss of consciousness but was fussy and vomited three or four times prior to presenting to the PMD

Father waited for the mother to come home from work before they both decided to bring the baby to the office

Birth History and Family History unremarkable

Social History - Lives with mother and father (and dog)

No prior CPS history

Father unemployed
PAST MEDICAL HISTORY
- Received first set of immunizations at 2 months
- Had several episodes of vomiting within a few days after becoming irritable after shots
- Multiple documented phone calls to the pediatrician
- Evaluated 2 weeks prior to the current presentation and diagnosed with gastroenteritis
- A brown bruise was noted under the left eye at that time
- HT/WT/HC were at the 50%

THE CULPRIT

PHYSICAL EXAMINATION
- Baby was irritable and slightly pale
- No swelling or bruising identified
- Vital signs were normal
- Ht and Wt were at the 50% for age, but HC now at the 95%
- Non-focal neurological exam
- Anterior fontanel was bulging in sitting and lying positions
Indirect Ophthalmologic examination was normal (no retinal hemorrhages)

Skeletal survey - Negative for fracture, including the skull

A right subdural hematoma outlining the right cerebrum measuring 10 mm in greatest thickness is noted demonstrating high signal on T1 and T2 weighted imaging. A left subdural hematoma is also noted measuring 8 mm in greatest thickness demonstrating isointense signal on T1 and T2 weighted imaging. These likely indicate subdural collections of different ages.
MRI - INTENSITY BASED ON BIOCHEM FORM OF HEMOGLOBIN

- T1 --- Iso-low with hyperacute bleed
  - Iso-low with acute
  - High I with early subacute, late chronic, early chronic
  - Iso-low I with chronic
- T2 --- High I, with hyperacute
  - Low I with acute, early subacute
  - High with late subacute, early chronic
  - Low I with chronic

MRI IN OUR PATIENT

AX T2

AX T2 FLAIR

AX T1

AX T2*

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INTERPRETATION OF AGE

- MRI is better for determining old vs. new blood.
- CT is more sensitive and specific than MRI or US for hyperacute/acute hemorrhage in all compartments.
Mixed density convexity SDH is often speculated to be the result of multiple traumas.

Heterogeneous subdural collections could be admixtures of clotted blood and spinal fluid or acute clotted blood and hyperacute unclotted blood.

Mixed density can be seen within 48 hours of the time that the trauma has occurred (even in accidents). Tung, G. A., M. Kumar, et al. (2006).

Case study where CT in 8 mo mimicked acute on chronic hemorrhage but autopsy showed no evidence of chronic SDH. Barnes & Robson (2000).

MIXED DENSITY BLEEDS

- Use caution about making inferences on the specific timing, pattern or cause of brain injury from a single noncontrast CT scan.

ABUSIVE HEAD TRAUMA

- Rate of hospitalization for infants with abusive head trauma has been reported to be as high as 30/100,000 infants.
- Risk factor for increased mortality include RH, cerebral edema and low Glasgow coma Scores.
- Chronic subdurals are associated with decreased mortality.


SIGNS AND SYMPTOMS

- Asymtomatic
- Lethary
- Irritability
- Vomiting
- Apnea
- Loss of consciousness
- Seizures
- Sudden arrest
- Bulging fontanel, enlarging HC
- Poor tone
- Bruising
EXTRACRANIAL SIGNS AND SYMPTOMS
- Retinal hemorrhages
- Other fractures
- Abdominal trauma
- Bruises

WHEN DO SYMPTOMS OCCUR AFTER INJURY?
- Laskey, J Peds 2004, 11/38, 29% had positive neuroimaging findings despite being neurologically asymptomatic.
- Starling, Arch Ped 2004 study of perpetrator confessions; 52/57 symptoms were nearly immediate.
- Biron J Paeds 2007 (16 cases)
  - The period between the assault and the onset of symptoms is brief.
  - 15 minutes--10 hours

RECOGNITION OF SYMPTOMS
- Are they really "asymptomatic"?
- Did a parent know something was wrong and ignore the symptoms?
- If physician’s miss the diagnosis, how can we expect parents to recognize the symptoms?
MISSED ABUSE


- 54/173 infants seen by their physicians and diagnosis missed--98 visits with dx
- Mean time to correct diagnosis was 7 days

FREQUENT ERRONEOUS DIAGNOSES

- Viral gastroenteritis or flu (14)
- Accidental head injury (10)
- Rule out sepsis (9)
- Increasing head size (6)
- Non-accidental trauma (not-head injury) (4)
- Otitis media (5)
- Reflux (3)
- Apnea (2)
- URI (2)
- UTI (2)
- Bruising of unknown etio (2)
- Hydrocephalus (2)
- Meningitis (2)
- Others

“THOSE THAT DON’T CRUISE RARELY BRUISE”

FOLLOW UP
- Serial head circumferences
- Early intervention
- Eye examinations
- Repeat skeletal surveys

CAUTIONARY THOUGHTS ON TRADITIONAL TEACHING!
- Low height falls do not cause intra-cranial injury.
- Intra-cranial hemorrhage evolves radiographically in a predictable fashion.
- Impact injuries will have evidence of impact.

OTHER KEY POINTS
- Recognize the symptoms and the common "stories."
- Timing is almost always important in the legal case and the need for further protection.
- Signs of abusive trauma are often subtle and missed.