Non-Accidental Trauma

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9 m/o “not acting right”

- Do you suspect a non-accidental cause?
- Do you know how to manage severe intracranial injury?
- Do you have the right equipment?

1 y/o “not acting right”
Pupillary Abnormalities

1 y/o “not acting right”

Types of Intracranial Hemorrhage and Brain Hemiation

Epidural hematoma

Subdural hematoma
Situational Awareness
• Survival depends on it: yours, your partner’s, your patients
• Rallye Rejviz 2001: 51 teams, US wins because of a high degree of paranoia
  – How many are dispatched with police?
• “Trust no one, you’re surrounded by assassins”
• “Scene” vs “Crime scene”?

The Hidden Epidemic
• “Multiforme”
  – Physical, sexual, psychological, neglect
• U.S. incidence: “in our own backyard”
  – 4 million children per year
  – Less than half of all cases are reported
  – 2,000 children die per year (US DHHS, 1996)
• Under age 2, 80% of head trauma is abuse-related
• 25% of all infant disability from injury is due to abuse

The Hidden Epidemic
• The challenge to society and individuals
• Child maltreatment is the most stressful of all diagnoses for caretakers
• Child protection is an instinctual process
  – Inequality of the power relationship
• Medical science and law intersect with emotion: no room for “a shadow of a doubt”
• Scientific “evidence” ≠ legal outcome
• Improved conviction rates with specialized multidisciplinary child protection teams

Hx: Shaken Baby Syndrome
• Caffey, 1946: noted the pathologic-radiologic association
  – Subdural and retinal hemorrhages
  – Metaphyseal avulsions and subperiosteal hemorrhages
• Kempe, 1962: “battered child syndrome”
  – Caffey’s findings figured centrally
• Caffey, 1974: “whiplash shaken-baby syndrome”
  – Incongruity between the absence of signs of external trauma and the severity of brain injury
  – Concluded injuries caused by “habitual, moderate, casual manual whiplash shaking”

Shaken Baby Syndrome
• Medico-legal wall set up by Caffey’s paper
  – How can such severe injuries exist in the absence of external signs of trauma?
  – Are retinal hemorrhages simply an incidental finding?
• Dire consequences of false-negative/positive diagnosis
• How to “prove” this?
  – Scientific “evidence” (laboratory animal models)
  – Perpetrators’ reports
  – Anecdotal reports (not prospective)
  – Cohort studies

Severe injury without external signs
• Injury incidence in a “controlled” setting
  – Witnessed falls in house, MD’s office, hospital
  – 246 children, < 5 yrs old, falls > 3 feet to hard surface (e.g. linoleum floor)
  – Results: no life-threatening injuries, 1 linear skull fracture (no associated morbidity), no ICH
• Conclusion: always question the mechanism of injury reported—is it consistent with the pattern of injury??
Severe injury without external signs

- Injury spectrum in a “controlled” setting
  - Prospective cohort of 200 children w/ head trauma
    - 170 children had no suspected abuse/GSW
    - 2/140 had retinal hemorrhages
      - Restricted, backseat passengers in side-impact crashes
      - 1 died from injuries, other had SAH and contusion
  - Challenged Caffey’s “casual shaking” claim
  - Conclusion: retinal hemorrhages are rare and “malicious violence” is necessary to produce them

Retinal hemorrhages

- Ophthalmologic perspective:
  - High frequency in conjunction with SDH/ICH
  - Proposed mechanism: high ICP/CVP => venous congestion => retinal capillary tear
  - DDx: leukemia, coagulopathy, birth trauma (plus CPR, ECMO, DIC, hypertension)
  - 40% of vaginal deliveries +/- forceps/vacuum, Pit
  - Majority disappear in a week, ~all by 3 weeks
  - No correlation with ICH, no prognostic importance

Retinal hemorrhages

- Trauma perspective:
  - Prospective, mean 9 mos, accidental vs. inflicted
  - Inflicted: 9/24 had retinal hemorrhages vs 1/76 accidental (fatal MVA with SDH)
  - Inflicted: 13/24 with SDH/SAH vs 3/9 MVAs
  - Defined “shaken impact syndrome”: ICH from “rapid angular deceleration to the brain and requires impact”

Scientific Conclusions

- Repeated studies have shown:
  - SDH, SAH and retinal hemorrhages (RH) are each far more common in abused children
  - Retinal hemorrhages is “nearly” diagnostic of child abuse
  - Short falls (< 4 feet) do not cause serious injury in children except in cases of epidural hematomas
  - SDH and SAH are seldom seen and RH never seen in short falls
  - Abused children are younger (avg 1 y/o vs 2 y/o), more severely injured, and have higher mortality
Child Abuse: Diagnosis

- Building block approach to diagnosis
  - History
  - Physical exam
  - Laboratory examinations
  - Radiographic studies
  - Consultations
  - Child protection team
  - Social and state protective services

The key to diagnosis is history

- Developmental stage of the child and reported mechanism
  - 4 y/o with multiple cigarette burns
  - 2 m/o fell downstairs
  - 4 m/o fell off tricycle
  - Newborn fell off couch onto carpeted floor
- Reasonable supervision or negligence?
- Plausibility: 18 m/o hit 4 y/o in head with bat
- Physical exam:
  - Pattern of injuries
  - Types of fractures

History: Details, details, details

- Specifics of injury: date, time, location, caregiver
- Child/caretaker reactions: reported, observed
- Events pre- and post-injury
- Delay in seeking care? Why?
- PMHx: prior traumas? Hospitalizations, IMZs
- Growth and Developmental Hx: plot on curve
- Social situation
- Parental history: medical, social, legal

Red Flags

- History inconsistent with injuries
  - Not compatible with development
  - Injuries attributed to sibling/playmate
- History changes over time
- Conflicting histories given by parents/caretakers
- No history of trauma given
- Delay in seeking care
- “Instinctual” inconsistencies: parental affect, child’s behavior, etc.

Complete Physical Exam

- A-B-C’s: in that order, every time
- Head-to-toe
- Attention to detail:
  - Skin exam
  - Genital exam
  - Growth parameters
- Multiple examiners
- Documentation of findings: photos

Laboratory Examinations

- Be complete, not conservative:
  - Coagulation profile: CBC, Plts, INR, PTT
  - Abdominal trauma: LFTs, amylase, lipase, UA, CPK
  - Toxicology studies: chem 7, osmolar gap, APAP, ASA, urine tox screen
  - Other: urine ß-HCG
Radiographic Studies

- Skeletal survey:
  - All children < 2 y, rarely useful if > 5 y
  - C-spine: consider SCIWORA
  - Appendicular & axial: AP and laterals
- Skull: plain films, CT
- Brain: CT, MRI
- Abdomen: CT w/ & w/o contrast
- Radionuclide bone scan: even if negative skeletal survey

Acute Life-Threatening Events

- A.k.a. “Near-miss SIDS”
- “An episode that is frightening to the observer and that is characterized by some combination of apnea (central or occasionally obstructive), color change (cyanotic or pallid), marked change in muscle tone, choking or gagging . . .” NIH, 1986
  - Is it non-accidental?

- Southall, Plunkett, et al Pediatrics 1997;100:735-760
  - Covert video surveillance
  - 39 children referred for dx of ALTE
  - Control group: 46 with natural ALTE
  - Abuse seen with CVS in 33/39 cases
  - Age of 1st ALTE: 3.6 mos in CVS vs 0.3 mos in control
  - Bleeding reported in 11/38 CVS, 0/46 controls
  - Siblings & SIDS: CVS 12/41 vs 1/52 controls

Mandated Reporting

- All states have legislation for mandatory reporting of abuse, including suspected abuse or neglect
- Criminal violation not to report
- Report to child protective services
- Reporters include: hospitals/clinics, health care professionals, teachers, social workers, child care providers, mental health providers and law enforcement

Resources

- National Clearinghouse on Child Abuse and Neglect
  - http://www.calib.com/nccanch
- American Academy of Pediatrics
  - http://www.aap.org
- Child Abuse Prevention Network
  - http://www.child-abuse.com
- Kempe Children’s Center
  - http://kempecenter.org
- Prevent Child Abuse Wisconsin
  - http://www.preventchildabusewi.org