Child Physical Abuse 101: A Primer for the General Pediatrician

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Objectives:

- Review general statistics, risk factors and history gathering in Child Abuse
- Review the general concepts of Bruises, Burns, Fractures, and AHT, including potential mechanisms of injury
- Review the responsibilities of medical providers in the context of suspected Child Physical Abuse

Defining Child Abuse and Neglect:

- “The Battered Child Syndrome”:
  - “abuse” is where a child exhibits “evidence of fracture of any bone, subdural hematoma, failure to thrive, soft tissue swellings or skin bruising... where the degree and type of injury is at variance with the history given regarding the occurrence of trauma”
Defining Child Abuse and Neglect:

- **Child Abuse Prevention and Treatment Act (CAPTA)** (42 U.S.C.A. §5106g)

- **Texas (Fam. Code § 261.001):**
  - "Abuse"—Physical injury that results in substantial harm to the child or the genuine threat of substantial harm from physical injury to the child...

Defining Child Abuse and Neglect:

- "Child Maltreatment": any act or series of acts of commission or omission by a parent or other caregiver that results in harm, potential for harm, or threat of harm to a child
  - Definition came out of long process of many meetings with multiple levels of review by multiple experts

Defining Child Abuse and Neglect:

- "Physical Abuse" is defined as the intentional use of physical force against a child that results in or has the potential to result in physical injury
  - Exception is physical injury involving anal/genital areas of sexual nature

The Scope Of Abuse

- **In the US, 2005-2006:**
  - NCANDS (passive surveillance) & NIS-4 (active surveillance)
  - 905,000-1.25 million children maltreated
  - Incidence of 12.1/1000 children
  - 1530 deaths; incidence of 2.04/100,000

The Scope Of Abuse (12/1000):

- Comparison incidence of diseases:
  - All childhood cancers--1 to 2 per 10,000 children in the US (National Cancer Institute)
  - Type 1 Diabetes--19.0 per 100,000 children; Type 2 Diabetes--5.3 per 100,000 (CDC)
  - Epilepsy--45,000 children under the age of 15 develop epilepsy each year.

Texas 2008

- Child population 6.44 million
- 249,850—Reports of maltreatment
- 70,589—Confirmed victims (16.6% of reports)
- 213 fatalities

- Bexar County (2006)
  - Child population: 419,165
  - Confirmed victims: 6,612
  - Confirmed victims per 1000: 15.8
  - Fatalities from abuse: 12
### Types of Abuse:

(US Dept. of Health and Human Services, 2007)

<table>
<thead>
<tr>
<th>Type of Abuse</th>
<th>Texas</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neglect</td>
<td>73%</td>
<td>59%</td>
</tr>
<tr>
<td>Physical Abuse</td>
<td>17.9%</td>
<td>10.8%</td>
</tr>
<tr>
<td>Sexual Abuse</td>
<td>7.8%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Emotional Abuse</td>
<td>1.3%</td>
<td>4.2%</td>
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### Missed Abuse:

- Abusive head trauma in Maine infants: medical, child protective, and law enforcement analysis.
  - Abuse victims younger than 24 months, 75% had evidence of previous trauma or history of a previous injury.
- Analysis of missed cases of AHT.
  Jenny et al. JAMA 1999;281:621.

- Analysis of missed cases of AHT.
  Jenny et al. JAMA 1999;281:621.
  - 173 children < 3 years of age (mean age 8 months) with Abusive Head Trauma
  - 54/173 (31%) were classified as “missed”; Mean number of physician visits until dx: 2.8
  - Likelihood of missed AHT increased with: Young age of child, White race, Less severe symptoms, “Intact family”

- Analysis of missed cases of AHT.
  Jenny et al. JAMA 1999;281:621.
  - Most frequent erroneous diagnoses: Viral gastroenteritis (14), Accidental Head injury (10), Rule out sepsis (9), Increasing head size (6)
  - 4/5 deaths could have been prevented; 28% re-injured due to delayed diagnosis; 41% had medical complications related to delay

  Author’s conclusions: 1) Be alert to the presence and significance of lesions of face and head & 2) Consider head trauma when evaluating children with non-specific symptoms such as irritability and vomiting.

### Why Would Parents Abuse Their Children?

**Major risk factors for abuse & neglect**

- **Substance Abuse**
  Present in 70% of Bexar County removals

- Domestic violence
  15x higher risk of abuse/neglect

- Poverty/Lack of education

- Mental illness
Common “Triggers” for Serious Abuse: The Three “T’s”

- Tears (Crying)
- Toilet Training
- Temper Tantrums

Other “Red Flags” for Abuse

1. Injury unexplained by history
2. Absent, changing, or evolving history
3. Delay in seeking medical care
4. Unusual affect of caregiver
5. Unrealistic expectations of child
6. Social or physical isolation of child or family
7. Prior history of abuse of caregiver as child

Child Abuse Medical History:

- Ask specific, open-ended questions!
- With re: to the injury/symptoms in question: ask detailed questions about timing, evolution, parent and child’s response to symptoms
- When was the child last well?
- Trigger
- If trauma, witnessed or unwitnessed?
- If there is a fall, how exactly did the child land?
- Always ask specific trauma questions dating back several weeks
- Most recently observed developmental capabilities

Hettler J & Greenes D. Can the initial history predict whether a child with a head injury has been abused? Pediatrics 2003; 111:602-7

- Retrospective review 163 children age 0-3 years admitted for head trauma
- Classified as “definite abuse” or “not definite abuse” on basis of eye, imaging and physical findings
- 49 (30%) met criteria for “definite abuse”
- No history of trauma had a high specificity (0.97) and positive predictive value (0.992)
- Injuries were blamed on home resuscitation efforts in 12% of “definite abuse” cases and 0% of “not definite abuse” cases

Child Abuse Social History:

- Family constellation
- Unrelated people or non-family adult and children in home
- How is the child viewed in the context of their family
- Detailed discipline beliefs and practices
- Support system
- Babysitters: who? Licensed? in home or a center? Is it a boyfriend or girlfriend?
- Detailed stressors
- Drug and alcohol abuse or addiction
- Violence and weapons
- Prior Legal or criminal involvement?

DOCUMENT, DOCUMENT, DOCUMENT!!!

- Date and Time all entries
- Sign and title all entries
- Make objective statements of FACT
- Write legibly
- Avoid Judgmental phrases:
  - “Seem nice...normal...they could never hurt a child”
  - “Look like child busers...perpetrators”
  - “Has a medical problem so it can’t be abuse or neglect...”
**Bruises: Most Common Manifestation of Physical Abuse**

- **Location**
  - 60% of abusive injuries involve the oro-facial area (Cairns, Mok, & Welbury, 2005)
  - Bruises on torso, ear, or neck in a child <4 yrs old are predictive of abuse (MC Pierce et al, 2009)
- **Configuration/pattern**
- **Age**

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**“If you’re not old enough to cruise, you’re not old enough to bruise”**

- Bruises were observed only 2.2% of the time in infants who were not yet cruising
- Any bruising on an infant <6 months of age should be considered suspicious for abuse

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**Not so Fast!!—Problems in “Dating” Bruises**

- Bruises can change color at different rates, and color may vary with lighting
- Vascularity, skin color, location can affect bruise characteristics
- In general, red bruises are <7 days and yellow/green are more than 1-2 days old (Maguire, Mann, Sibert & Kemp, 2005)
- We’re bad at it: fewer than 50% can date bruises within 24 hours of actual age (Bariciak et al, 2003)

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**Not so Fast!!—Absence of bruising**

- Among 192 children with inflicted fractures, no bruising was noted in 58% (Peters et al, 2008)
- Penetrative injuries to the abdomen are more likely to cause internal damage and more commonly do not leave external bruises (Thompson, 2005)
- 29% of 24 fatal AHT cases had no bruises (Atwal, 1998)
Bruises:
- Differential diagnoses
  - Accidental trauma/cultural practices
  - Bleeding disorders (congenital and acquired)
  - Birthmarks (Mongolian spots, hemangiomas)
  - Vasculitides (HSP, ITP)

Diagnostic testing:
- Coagulopathy workup: CBC, PT, PTT/INR, Factor XIII, PFA-100
  - Head injured children may develop coagulopathy due to parenchymal damage
- If mid-lower torso bruising, CMP (LFT's), amylase, lipase; consider ESR, CRP, urinalysis
- Any child <2 y/o with suspicious bruising = Skeletal Survey
Mimickers

Bruises in a 4 month old infant?

- Coin rubbing (Gua sha)
  - Firmly rubbing a person’s skin with a ceramic soup spoon or large coin
  - Leaving red and purple marks on the skin that look painful but are not

- Cupping

Burns
Types of Burns:
- Thermal/Scald
- Electrical
- Chemical
- Radiation

Assessing burn injuries:
- History, Pattern & location of injury are important
  - Burns secondary to falling or splashing of hot liquid usually have a non specific pattern and typically involve many different planes (Leventhal, et al, 2001)
  - Thermal injuries with a stocking glove distribution usually represent immersion injuries
  - Contact burns: is pattern continuous on curved body surfaces?

Burns:
- Differential diagnoses
  - Accidental trauma
  - Hypersensitivity reactions (phytophotodermatitis, senna products)
- Diagnostic testing: All suspicious burns in a child <2y/o=Skeletal Survey

<table>
<thead>
<tr>
<th>Water Temperature C° (F°)</th>
<th>Time of Exposure (seconds)</th>
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<tbody>
<tr>
<td>52 (125.6)</td>
<td>70</td>
</tr>
<tr>
<td>54 (129.2)</td>
<td>30</td>
</tr>
<tr>
<td>66 (132.8)</td>
<td>14</td>
</tr>
<tr>
<td>58 (136.4)</td>
<td>6</td>
</tr>
<tr>
<td>60 (140.0)</td>
<td>3</td>
</tr>
<tr>
<td>62 (143.6)</td>
<td>1.6</td>
</tr>
<tr>
<td>64 (147.3)</td>
<td>1</td>
</tr>
</tbody>
</table>


Mimickers

Fractures
Fractures:
- Exact incidence in suspected abuse is unknown—range 11-55% [American College of Radiology, Evaluation of the Child with Suspected Physical Abuse, 2009]
- No fracture is pathognomonic for abuse!
- Must consider the age, mobility and developmental level of the child
  - Fractures in small infants and non-mobile children are highly specific for non-accidental trauma
  - Obtain detailed, specific history of mechanism of injury

Differential Diagnosis:
- Accidental trauma
- Birth trauma
- Prematurity/Chronic medical disease predisposing to immobility
- Nutritional/Metabolic disorders
  - Rickets
  - Menke’s disease
- Skeletal dysplasia
- Osteogenesis Imperfecta
- Neoplasm
- Leukemia/Langerhans histiocytosis
- Infection
  - Congenital Syphilis

Fractures & Abuse
- HIGHLY SPECIFIC - ribs, metaphyseal-epiphyseal, scapula, sternum, spinous processes of vertebral bodies
- HIGHLY SUGGESTIVE- multiple fractures or fractures of different ages, complex skull fractures
- NONSPECIFIC- diaphyseal (shaft of long bone), clavicular, linear skull

Suspicious of Abuse:
- Detailed history and physical exam
- Skeletal survey in all children under age 2 (older if nonverbal) if abuse is suspected
- Consider CMP (calcium, mag, phos, Alk phos), intact PTH, Vit D 25-OH
- Repeat skeletal survey in 2 weeks for high risk cases (Kleiman, Nimkin, Spevak, et al., 1996)
Fracture Mechanisms:

- **Spiral fractures**
  - Pulling / twisting (especially humerus fractures)

- **Transverse fractures**
  - Bending forces; requires 10x more force than spiral!

- **Metaphyseal fractures**
  - Twisting / pulling / yanking
  - Difficult to date due to lack of periosteal reaction
  - Chip fractures
  - Bucket-handle fractures

Spiral Fracture of Femur

Transverse fracture

3 m/o fall with caretaker
Bucket handle / corner fractures

Mechanism of Rib Fractures:

Abusive Head Trauma
Abusive Head Trauma Mechanisms:

- Shaking (acceleration, deceleration, rotational)
- Shaking with impact
- Direct impact, “blow or throw”, blunt trauma
- Penetration
- Asphyxiation and hypoxia (smothering)

Pathogenesis of Abusive Head Trauma (inertial injury)

Abusive Head Trauma

- Described in past by many other terms; now preferred term is AHT
- Often no external signs of trauma
- Subdural/Subarachnoid hematoma (predisposed to interhemispheric, convexities)
- Retinal hemorrhages
- +/- Cerebral edema
- +/- Skull fracture and evidence of impact
- +/- Associated fractures of ribs, extremities

Retinal hemorrhages

- Occurs in up to 80% of abusive head trauma seen in infants
  - Mechanism: most likely acceleration-deceleration at vitreo-retinal interface; unclear what contribution increased intracranial pressure plays
  - Source: Levin, 2009; Morad, Kim, Armstrong, et al., 2002
- Severe RH’s have high statistically significant association with AHT
  - Source: Maguire et al, 2009
- Traumatic retinoschisis: specific to rotational abusive head injury in infants
  - Source: Levin et al., 2004

Abusive vs Nonabusive head trauma in young children

- Abused children are:
  - Younger (.7 years)
  - Have more severe intracranial injuries (46%)
  - Less frequent concussions (0%)
  - More likely to have retinal hemorrhages (33%)
  - More likely to have skeletal or cutaneous injuries (50%)
  - More likely to die (13%)

AHT:

- Skull fractures can occur with minor (< 60 cm) falls, but are uncommon
  - (Gruskin & Schutzman, 1999)
  - Wide (diastatic) or complex skull fractures imply more force
- SDH/SAH’s are very rare in simple, linear short falls
- Severe RH’s have not been associated (but not well-studied) with short falls
AHT & Short Fall Mortality Risk

Annual Risk of Death Resulting From Short Falls Among Young Children: Less Than 1 in 1 Million

objective: The objective of the work was to develop an estimate of the risk of death resulting from short falls of <1.5 m in vertical height, affecting infants and young children between birth and the fifth birthday.

Method: A review of published materials, including 5 book chapters, 2 medical society statements, 7 major literature reviews, 3 public injury databases, and 177 peer-reviewed, published articles indexed in the National Library of Medicine, was performed.

Conclusion: The best current estimate of the mortality rate for short falls affecting infants and young children is <0.48 deaths per 1 million young children per year.

Child Abuse Reporting Requirements:

"Any person having cause to believe that a child's physical or mental health or welfare has been or may be adversely affected…

must report their concern to Child Protective Services or to a law enforcement agency.”

Texas Family Code 261.001 et seq.

How do I report?

Texas Child Abuse Reporting Hotline:

1-800-252-5400

Or

http://txabusehotline.org

Center for Miracles: 210-704-3800

- 3 Doctors
- 2 Fellows
- Center Coordinator
- Nurse Practitioner
- CNA
- 2 Social Workers
- Project Manager
- 2 Administrative assistants
- 2 Part-Time Psychology
- Doctoral Students
- Community Outreach Liaison

Conclusions

- Child abuse is common; If you don’t think about the possibility of abuse, you will miss it every time!
- A detailed history is vital, with focus on specifics of injury mechanism; ask specific, open ended questions
- Don’t suggest a mechanism of injury!
- Document well and objectively
- Bruises/Burns: can’t date them very accurately; focus on location and pattern

Conclusions

- Fractures: certain fractures (rib, CML) are highly specific; others are not (long bone, spiral, simple linear skull)
- AHT is still common; SDH’s & RH’s are highly associated
- Skeletal survey in all children <2 where abuse is suspected (older if non-verbal)
- Involve us early and often!
- Reporting suspected abuse is imperative and required by law
“Abusive parents love their children very much but not very well.”

C. Henry Kempe