Medical Evidence of Child Abuse and Neglect

Jordan Greenbaum, MD
Children’s Healthcare of Atlanta

Overview

• Physical Abuse
  – Skin injuries
  – Bony fractures
  – Head trauma
• Sexual Abuse
  – Disclosure
  – Sexualized behavior
  – Exam and physical findings
• Neglect
  – Long term adverse effects

Inflicted Skin Injuries
Accident vs Abuse

- Multiple injuries
- Severity of injuries
- Pattern injuries
- Location of injury

Patterned Injuries

Most accidental bruises are on:

- Bony prominences
- Front of body
Accidental bruises are unusual on:
- Ears
- Soft part of cheek
- Neck
- Trunk
- Buttocks
- Inner thighs/genitals
- Hands/feet

When did the injury occur?
(How old is the bruise?)

Diagrams Are Not Reliable!
Estimating The Age Of A Bruise

- Very difficult and often inaccurate
- Much individual variation
- Colors disappear and reappear
- Resolution time depends on many factors

Inflicted Bony Fractures

- Typically <3 years old
- Some are relatively unique to infants
- Age and site of fracture are important factors

Specificity for Abuse

<table>
<thead>
<tr>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corner/bucket-handle fractures</td>
<td>Collar bone (clavicle) fractures</td>
</tr>
<tr>
<td>Rib fractures</td>
<td>Long bone shaft fractures</td>
</tr>
<tr>
<td></td>
<td>Linear skull fractures</td>
</tr>
</tbody>
</table>
“Bucket-handle” Fracture

- Highly specific for abuse
- Infants <1 year
- Shearing forces
- Yank, twist, jerk, flail
Rib Fractures

Squeezing Action

lateral fracture
posterior fracture
What causes rib fractures?

• Abuse in vast majority of cases
• Much less frequently:
  – Bone disease
  – Birth injury
  – Accidental injury

Long Bone Fractures

Bony Fractures and Child Abuse

• Site of fracture and age of child are important
• Up to 50% of fx’s in infants <12 months are related to abuse
• After 3 years of age, abuse much less likely to be cause of fx
• A fracture may be the only injury you see
  – In ~50% of inflicted fractures, the fracture is the only injury found
Estimating the Age of a Fracture

Abusive Head Trauma

• >40% of lethal child abuse occurs in children younger than 1 year
• AHT typically occurs in infants and toddlers
• Average age ~4 months
• “SBS” is a subset of AHT
  – Involves shaking, often with impact

Abusive Head Trauma

• Very often repeated abuse over time
• Often prior DFCS involvement
• Perpetrators typically male, often the father
• Risk factors similar for child physical abuse
• Increased prevalence during economic crisis
Spectrum of AHT

- From mild to severe to fatal
- Varying mechanisms of injury
- "Mild" does not imply minor forces

What happens during a shaking episode?

There is often an impact
The trauma may cause child to stop breathing.

- This can lead to secondary injuries that spiral out of control.
- Prompt treatment critical.

Signs/Symptoms of AHT

- Mild
  - Irritable, with prolonged crying
  - Sleepy
  - Poor feeding
- Moderate/severe
  - Vomiting
  - Limp, flaccid
  - Abnormal breathing
  - Seizures
  - Coma

How do you make the diagnosis of abusive head trauma?
All aspects of the case must be considered carefully before making the diagnosis of abusive head trauma.

Common physical findings
- Subdural hemorrhage (bleeding around the brain)
- Brain injury
- Retinal hemorrhages (bleeding in the back of the eyes)
- Fracture of skull, or other bones
- Bruising on head or body

But you also need:
- Absence of adequate non-intentional history to explain them
- No evidence of relevant disease
What causes the physical findings in head injury?
Bleeding In Subdural Space (Subdural Hematoma)
Swelling of Brain

Brain edema

Sutures of skull widened

White Matter Tears
What about retinal hemorrhages?
Eye Hemorrhages

- 65-95% patients with AHT
- Typically extensive, in multiple layers
- Usually involve both eyes (90%)
- May see retinal folds or detachments

Common Defense Arguments

Can a short fall cause injuries that mimic AHT?
What Happens In A Short Fall?

Short Fall

• Short falls: approx. 4 ft. or less
• Typically occur in household
• Very common
• Injury primarily from contact

Contact Injury

• Head strikes, or is struck by, an object
• Causes focal strains, especially at impact site
• Can cause distant injuries
What injuries do you see?

- No injury, OR
- Minor injury to scalp or forehead
- 1-3% may have skull fracture
- No widespread brain damage

What about subdural hemorrhages in short falls?

- Unusual
- Typically small and at site of impact
- Typically do not cause symptoms
- Usually associated with greater heights or more complicated fall
What about retinal hemorrhages in short falls?

It is extremely rare (if it happens at all) to have extensive retinal hemorrhages from a short, uncomplicated fall.

Not all retinal hemorrhages are alike

- Lots of things can cause RHs
- Must consider
  - Number
  - Layering
  - Distribution in eye
  - Other findings (vitreous blood, schisis)
- Also consider the company they keep
“Shaking, alone, can’t cause serious brain damage. You must have impact to the head.”

The argument over mechanism.

Monkeys, pigs and mice

• Experiments with whiplash motion create injuries like those seen in AHT

• Rotational acceleration is much worse than straight-line motion

Monkeys, pigs and mice

• Multiple shakes are worse than one
• Age is important
  – Babies more sensitive to rotational injury than adults
  – Babies tolerate contact injury better than older animals
Critique of animal models

- Species-specific differences in brain
  - Topography
  - Maturation
  - Response to injury
  - Response to hypoxia
- Contact vs. noncontact injury
- Low numbers of animals
- Controlled circumstances

Playing With Dolls

- Shaking, alone, does not cause brain injury
- Yes, it does

Critique of Biomechanical Models

- Injury thresholds are extrapolated
  - nonhuman primates
  - adult humans
  - human cadavers
- Good evidence that infant brains are very different from above
- Models crude
Critique of Biomechanical Models

• What about
  – multiple shakes?
  – shaking outside of A-P axis?
  – secondary damage?
  – Volunteers who aren’t stressed or angry
• Small changes in doll parameters lead to major changes in results

Conclusions:

• May never be an adequate model of infant head trauma
• Too many variables to consider
• May be helpful with qualitative info rather than quantitative
• Need to look at data from human babies
  – Accidental and abusive trauma
  – Autopsy examinations

Can infants act normally after a serious inflicted head injury?
(Is a ‘lucid interval’ common?)
What is “Lucid”?

• Definitions differ with studies
• GCS 13-15
• “Lucid” is not the same as “normal”
• What does a lucid 2-month-old look like?
• Lucid “interval” may be very short

Study on Perpetrator Admissions to AHT

• 81 cases of AHT with perpetrator confessions
• >90%: symptoms appeared immediately
• Remaining 9% of cases: timing unclear, but within 24 hours
• None of the victims behaved normally after event


Study on Perpetrator Admissions to AHT

• Most common initial symptoms:
  – Limpness
  – Seizures
  – Vomiting
  – Lethargy
  – Apnea

Conclusions Regarding History

• In very severe and fatal cases of AHT, it is highly unlikely that the infant was acting completely normally after the injury event.

But what about infants with less severe injury?

• Be cautious
• May be hard to detect “abnormal” mental status in very young infant
• Symptoms may be unrelated to trauma
• Seizures can occur anytime
• Look at how child acts in ED or in hospital

An example of a true ‘lucid’ interval...

• 9 month old
• Short fall from standing
• >10 hours of normal behavior
• Gradual deterioration
The difference is clear...

Conclusions

- AHT is severe form of abuse typically seen in infants
- Varied presentation (‘mild’ to severe)
- With or without external injuries, fx’s
- Does not resemble injury from short fall
- Must evaluate thoroughly to rule out other diagnoses

Child Sexual Abuse
Outline

• General info
• Disclosure of sexual abuse
• Sexualized behavior
• Physical Findings in CSA

Scope of Sexual Abuse

• 1 in 4 American females will have a sexual abuse experience by age 18.

• 1 in 7-9 American males will have a sexual abuse experience by age 18.

• Vast majority know the offender
• Females:
  – are most often abused by someone in their home/family.
• Males:
  – are often abused by someone close to them outside of the home.
Perpetrators

• ~30% have more than one victim
• >50% of cases: child is <12 years old
• Up to 50% offenders are adolescents
• Vast majority of offenders are heterosexual

Disclosure

• Most common way we learn about abuse
• Accidental or purposeful
• Often deny abuse initially
• May be incomplete statement

The truth about disclosures:

• Delay in disclosure is normal
• Why?
Recantation

• Not unusual

• Risk factors:
  – Child <10 yo
  – Perpetrator still in home
  – Unsupportive caregiver

Behavioral Changes and Sexual Abuse

• Changes in
  – Eating habits
  – Sleep habits
  – School performance

• Nightmares

• Withdrawal, aggression

• Enuresis/encopresis

• Depression/anxiety

Signs of Stress
What is “normal” sexual behavior?

- Friedrich’s extensive research helped establish normative behaviors
- Child Sexual Behavior Inventory
  - 38 items
  - Parental report
  - Frequency of child’s behaviors in last 6 months

Normative Sexual Behavior

- Sexual behavior strongly correlated with age
- Increasingly sexual up to age 5, then drops off
- Sexual behavior is related to
  - Maternal education
  - Maternal attitude about normalcy of sexual behavior in children
  - Reported family sexuality
  - Hours in day care
  - Family violence and total life stress

Normative Behaviors: 2-5 yo

- Stands too close to people
- Touches or tries to touch mom’s or other women’s breasts
- Touches sex parts when at home
- Tries to look at people when nude or while undressing
- Touches sex parts in public places (boys only)
Sexual Behaviors in Young Children

**Less common:**
- Rub body against others
- Insert tongue during kiss
- Touch another’s genitals
- Crude mimicking of sex act movements

**Uncommon:**
- Put mouth on genitals
- Ask to engage in specific sex acts
- Imitating intercourse
- Insert object into vagina or anus

**Sexual Behaviors in Young Children**

- Rarely seen in nonabused children:
  - Sexual behaviors in kids 4 or more years apart
  - Daily occurrence of behaviors
  - Sexual behavior associated with other physically aggressive behavior
  - Sexual behaviors that involve coercion.

**Conclusions**

- Broad range of sexual behaviors in nonabused children
- All behaviors on CSBI were noted in at least some nonabused children
- More intrusive behaviors less frequent, especially after 5 yo
- Sexual behaviors more frequent in abused children (data from other studies)
In general….

- Sexual behavior is more concerning if...
  - Occurs in older children
  - Involves coercion or significant power differential
  - Behavior is excessive and child not distractable
  - Involves more intrusive behavior

Physical Exam and Findings in Sexual Abuse

- History from caregiver and MDT
- Info from child
- Head-to-toe physical exam
- Detailed anogenital exam (‘scope or camera)
- Sexual assault evidence kit
- STI testing (+/- give meds)
- Conversation with the child, then with parent
The anogenital exam

- Boys and girls
- No speculum for young children
- Rarely need sedation

Why Do An Exam?

- Document recent injury or scarring
- Identify STI’s
- Identify disease or other process mimicking abuse
- Reassure the child and parent

The vast majority of children presenting to sexual abuse clinics will have normal or nonspecific anogenital exams.

It’s normal to be normal.
Exam Findings in Child Sexual Abuse

- Over 2,000 pts referred for possible CSA
- 3 mo to 14 yo
- 96% of children had normal exams
- Only 6% of girls reporting penetration had abnormal findings (1% of boys)

Heger A., CAN, 2002; 26:645-659

How can you have a normal hymen in CSA?

- Type of abuse may not involve penetration
- Elasticity of hymen
- Estrogenization
- Delay in disclosure

Healing of Hymenal Injuries

- 239 girls, 4mo to 18yo
- Accidental and inflicted injury
- Injuries left NO residua, except deep lac's
- Petechiae resolved within 48-72 hours
- Abrasions and mild bruising: ~3-4 days
- Marked bruising may last ~11-15 days
- Blood blister may last >30 days
- No scar tissue seen

McCarron J. Peds, 2007;119:e1094
Sexually Transmitted Infections (STI's)

- Incidence ~2-4% for Gonorrhea/Chlamydia in young kids
- Much higher in adolescents, but they may be sexually active

“Confirms mucosal contact with infected and infective secretions; contact most likely sexual”

- Gonorrhea (outside neonatal period)
- Syphilis (if perinatal transmission ruled out)
- Chlamydia (>3 yo)
- HIV (perinatal, blood products, needle contamination ruled out)

Approach to Interpretation of Medical Findings in Suspected Child Sexual Abuse: 2009. Adams et al

Indeterminate for Abuse

- Genital or anal warts (Condyloma acuminate)
- Herpes Types 1 or 2 in genital or anal area
Differential Diagnosis of Abusive Trauma

- Accidental trauma
  - Self-inflicted (masturbatory)
  - Straddle
- Hemangioma
- Lichen sclerosis
- Crohn’s disease
- Purpura fulminans

- Henoch-Schönlein purpura
- Thrombocytopenia or coagulopathy
- ITP/TTP
- Urethral prolapse
- Labial adhesions

But most exams won’t have injury, disease or a mimic...
So, why do the exam??

- First step of healing process
  - There are other kids out there just like you
  - Your body is normal
  - Your privates look just like any other child your age.
- Reassurance of parents

Isn’t it stressful for the child?

- Thorough preparation
- Child has control
- No pain
- “just looking on the outside”

So, who needs a medical evaluation?
So, who needs a medical evaluation?

(virtually) Any child who is suspected victim of sexual abuse (recent or remote).*

Who should do the exam?

Ideally, a provider trained in maltreatment evaluations.
Problems with exams by untrained providers:

• They are often reluctant to do exam
• May not recognize anatomy and document injuries accurately
• May ‘overcall’ findings
• May not see an injury (suboptimal exam)
• Often not familiar with guidelines on conducting evaluations (rape kits, STI testing)

Conclusions

• Most CSA cases do not rest on physical exam findings
• Exam is important
• Appropriate interpretation of findings critical
• Child’s statement and corroboration by investigation forms mainstay of case
• No behavior is diagnostic of child sexual abuse

Long-term Effects of Child Neglect
Long-Term Effects of Neglect

- Research has limitations
  - Correlation does not equal causation
  - Confounding factors (other abuse, environmental factors)
  - Neglect vs. subtypes of neglect
  - Mild and severe cases combined; cases missed
  - Chronicity and age of child likely influence outcome
  - Mitigating factors

But there have been improvements...

- More studies with control groups
- Larger sample sizes
- Consider effect of poverty
- Longer follow-up periods
- Bringing science into it (brain development)

Studies consistently show that neglected children have worse outcomes than physically or sexually abused, or nonmaltreated children.
Long-Term Effects by Age Group

- Infants and Toddlers
- School-Age Children
- Adolescents
- Adults

Attachment Theory

- Definition: Proximity-seeking behavior of child when distressed
- Biological instinct
- Develops “internal working models” of self and others
- Begins developing in middle of first year

Attachment Theory

- Attachment Styles
  - Secure
  - Anxious-Ambivalent
  - Anxious-Avoidant
  - Disorganized
Infancy and Toddlerhood

- Increased risk of anxious or disorganized attachment
- Egeland ('83):
  - Higher proportion of neglected infants anxiously attached at 12 and 18 months than nonmaltreated children
- Carlson ('89):
  - 82% of maltreated* group had disorganized attachment

Infancy and Toddlerhood

- Egeland ('83):
  - More angry, frustrated and noncompliant at 24 months
  - Problems coping
- Other studies:
  - Developmental delays
  - Especially in expressive/receptive language
- Emotional neglect especially high risk
  (Hildyard, ’02)

Middle Childhood (6-12 years)

- Higher incidence learning and academic problems:
  - Reading
  - Math
  - Language
- Higher incidence grade repeats
- Higher incidence school absences
Middle Childhood (6-12 years)

- 6-year-olds:
  - Inattentive, impatient and disrespectful
  - Anxious, withdrawn, unpopular
  - Aggressive
  - 65% referred for special help in school
  - Poorer overall social, emotional and academic functioning than nonabused group.

Erickson, et al, 1989

Adolescence

- Continued poor academic performance
- 58% drop out of high school (vs. 34%)
- Significantly more
  - Truancy
  - Grade repeats
  - Suspension/expulsion

Widom, 1994

Adolescence

- Increased risk of
  - Running away from home
  - Engaging in prostitution
  - Engaging in violent crime
Adulthood

• Higher frequency of
  – Criminal activity (both sexes)
  – Violent offenses (men)
  – Arrest for crime
  – Lower IQ scores (abused and/or neglected)
    • Average reading ability; level of 6th grader
    • >50% had reading scores in deficient range