Child Abuse: Physical findings History, and Work up

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History

- "The history of childhood is a nightmare from which we have only recently begun to awake. The further back in history one goes, the lower the level of child care and the more likely children are to be killed, abandoned, beaten, terrorized and abused."

Lloyd De Mause, The History Of Childhood (1974).

History

Auguste Ambroise Tardieu (1818-1879)

- The pre-eminent forensic medical scientist of the mid-19th century.

From Silverman, Radiology 104: 337- 353, August 1972

Tardieu's syndrome

- In recognition of his first clinical descriptions of battered children, Battered Child Syndrome, is also known as **Tardieu's syndrome**.
- **Tardieu's ecchymoses**, subpleural spots of ecchymosis that follow the death of a newborn child by strangulation or suffocation, were first described by Tardieu in 1859.

Origins of Child Protection

- 1874
- Mary Ellen – case of a little girl who was horribly abused who lead to the the founding of the New York Society for Prevention of Cruelty to Children.
- Her case was aided by Henry Bergh, president of the American Society of the Prevention of Cruelty to Animals (ASPCA).

John Caffey, MD

- In 1946, Dr. Caffey, a pediatric radiologist in Pittsburgh, published the results of his research showing that subdural hematomas and fractures of the long bones in infants were inconsistent with accidental trauma.

Caffey, *Multiple Fractures in the Long Bones of Infants Suffering from Chronic Subdural Hematoma*, 56 Am. J. Roentgenology 163 (1946).

Dr. Kempe

- In 1961 C. Henry Kempe, a pediatrician, and other colleagues made their first presentation about "The Battered Child Syndrome" in Chicago at the 30th Annual Meeting of the American Academy of Pediatrics, October 3.
- In 1962, Kempe, published the landmark article, *The Battered Child Syndrome.*

Kempe, Silverman, Steele, Droegmueller & Silver, *The Battered Child Syndrome*, 181 JAMA 17 (1962).

Objectives

- Give a medical perspective on child abuse
- Review case studies
- Discuss medical decision making
- Discuss a multidisciplinary approach to child protection, criminal prosecution, and placement
- Child advocacy as a pediatrician

Definitions Child Abuse

"The physical and mental injury, sexual abuse, negligent treatment or maltreatment of a child under the age of 18 by a person who is responsible for the child's welfare under circumstances which indicate that the child's health and welfare is harmed or threatened thereby."

Federal Child Abuse Prevention and Treatment Act(1974)

TYPES OF ABUSE

- NEGLECT/EMOTIONAL 62%
- PHYSICAL 24%
- SEXUAL 13%

Definitions Child Abuse - Physical

"…results in physical injury, including fractures, burns, bruises, welts, cuts, and /or internal injury. Physical abuse often occurs in the name of punishment and ranges from a slap of the hand to use of an object"

National Center on Child Abuse and Neglect

Definitions Child Abuse - Neglect

A child's essential needs are not met-from the basics of food, clothing, shelter, education, and medical care. Neglect can be physical or psychological/emotional or both.

Definitions
Child Abuse - Sexual Abuse

"...the engaging of a child in sexual activities that the child cannot comprehend, for which the child is developmentally unprepared and cannot give informed consent, and /or behavior that violate the social and legal taboos of society."

The American Academy of Pediatrics

INCIDENCE OF ABUSE

- Unknown but estimates range from 1-4 million cases per year
- Over 1 million cases/year are substantiated
- 2000 annual fatalities from child abuse
- Comprise 10% of traumatic injuries in children < 5 years old that present to the emergency department

CHILD ABUSE
How Do We Identify The Problem?

- By understanding the important components of a medical history dealing with suspected abuse
- By recognizing patterns of injury from the physical exam/age of child

MEDICAL HISTORY

- Often the ***MOST*** important clue to the possibility of abuse
- If the story is suspicious, then inquire further to the exact nature of the history.

MEDICAL HISTORY

Remember!

•Begin with open ended questions

•Realize that the caretaker's history may be false for self protection

•Realize that the child's history may not reveal abuse for because of fear or loyalty

MEDICAL HISTORY

Key elements

Preceding events

- -Who had access to child
- -Caretaker's response to injury
- -Developmental level of the child
- -Past medical history
- -Affect of the patient/caretaker

MEDICAL HISTORY

Preceding events (Obtained in great detail)

- How did the injury occur?
- When did the injury occur?
- Was there a lack of supervision?
- When did you first notice symptoms?
- How has the injury evolved and how has each symptom developed?

•***NO*** history or absence of history is a **RED FLAG!**

MEDICAL HISTORY

Patient access

- Who was the caretaker during the time of the injury?
- Who else was in the home?
- Could there have been a witness?

MEDICAL HISTORY

Developmental level

Is the explanation of the injury age appropriate?

Is the child physically capable of the acts described by the family?

DEVELOPMENTAL IMPORTANT MILESTONES

Milestone	Mean age(mo)	S.D.
Roll over		
•front to back	3.6	1.4
•back to front	4.8	1.4
Creep	6.7	1.5
Crawl	7.8	1.7
Cruise(walk holding on)	8.8	1.7
Walk	11.7	1.9

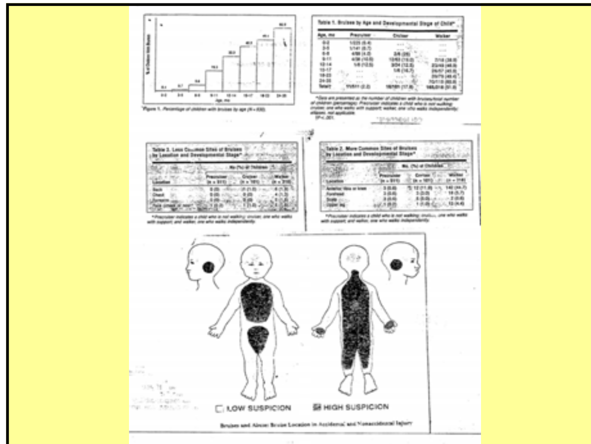
Child Abuse Physical Exam Findings

Bruise and contusions	52%
Burns	13%
Skeletal	8%
Central Nervous System	15%
Toxic Ingestion	4%
Abdominal	2%
Miscellaneous	6%

Physical Exam Findings

SKIN

- Bruises
- Abrasions
- Lacerations, punctures
- Bites
- Burns



Physical Exam Findings
SKIN

Bruises and Contusions

- •Comprise ~ 52% of physical abuse
- •Most commonly injured body organ
- •Undergo recognizable stages of healing and therefore may be dated - multiple bruises with various stages of healing is highly suspicious for abuse
- •May exhibit recognizable patterns

Physical Exam Findings
SKIN

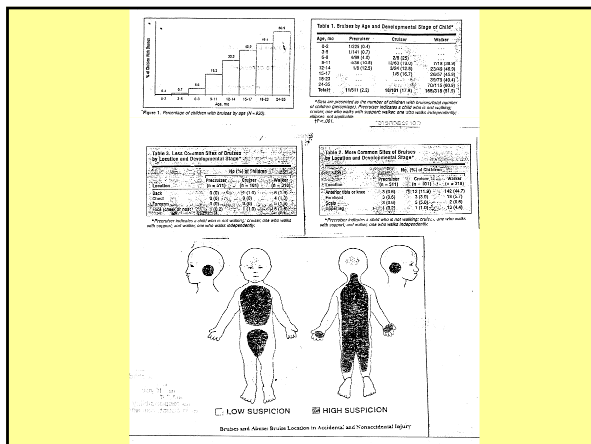
Estimating the Age of Bruises is NOT an exact science!

•NEW(0-7 days)	Tender and swollen, red, purple, blue
•OLD(7-10 days or >10 days)	Yellow, brown
•2-4 weeks	Cleared or gone

Physical Exam Findings
SKIN

Patterns of Injury - LOCATION

- •Accidental - Shins, forehead, exposed bony surfaces such as knees, elbows
- •Suspicious areas are padded surfaces like the buttock, cheeks, genitalia or relatively protected areas like the earlobes, neck, and upper lip



Physical Exam Findings
SKIN

Patterns of Injury

- •Grab or pinch marks - Leave bruises produced by the tips of the fingers as force is applied

Physical Exam Findings SKIN

Patterns of Injury

•Hand slapping marks = "Linear bruises alternating with clear, spared areas are the result of forceful slapping with an open hand."

Physical Exam Findings SKIN

Burns - Comprise 13% of physical abuse

Types of burns

Scald burns - heated liquids

Contact burns - heated solids

Flame burns

Electrical, Chemical, and Microwave burns

Physical Exam Findings SKIN

Patterns of Abuse in Scald Burns

Immersion - Sharply demarcated edges with few splash marks. Often buttocks and lower extremities as a punishment for toilet training accidents. Palms and sole may be spared because of increased thickness to the skin. Flexural areas may also be spared, as well as areas that contact cooler surfaces.

Physical Exam Findings SKIN

Patterns of Abuse in Scald Burns

Splash - Difficult to differentiate from accidental injuries. Most splash burns are from child pulling hot liquid from stove or table. Face, arms, chest are most often injured. History and developmental age of child will help determine answer.

Child Abuse Findings SKELETAL

- Skeletal injuries comprise ~8% of physical abuse. They are common accidental injuries, but in young infants they are suspicious.
- 30% of ALL childhood fractures are inflicted
- Age is most important factor

Child Abuse Findings SKELETAL

Age is most important factor!

- 80% of abuse fractures are <18months
- Only 2% of accidental fractures are found in children <18 months old

Child Abuse Findings SKELETAL

•The history of accidental trauma is often inconsistent with the force necessary to cause the injury.

•The developmental motor skills may not be consistent with the history of accidental injury.

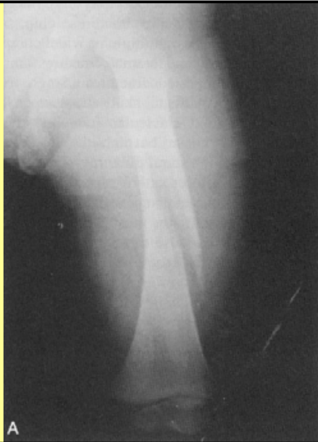
Child Abuse Findings SKELETAL

•Fractures are usually the result of direct blows, twisting or squeezing the infant.

•Fractures to the arms and legs are the most common skeletal injuries in abused children, and have long been recognized as important indicators of child abuse.

•Usually the fractures occur in the long bones, and can be easily identified.

2 year old with A spiral femur fracture



Child Abuse Findings SKELETAL

Age is the most important factor!

•80% of children with abuse fractures are <18months

•In children less than one year 75% of fractures are likely to be inflicted

Skeletal Survey

- Very important in young infants, and helpful in young children that are non-verbal
- May identify old fractures or fractures that are not easily identified on the physical exam
- Fractures of different ages, or that have different stages of healing or signs of chronic ongoing abuse

Radiologic Work Up for Suspected Child Abuse

- Skeletal Survey
- Bone Scintillography
- CT - Head
- CT – Abdomen (IV and Enteral Contrast)
- MRI

Skeletal Survey

- Method of choice for global skeletal imaging
- Mandatory in all suspected cases of child abuse younger than 2 years
- 2 – 5 year olds should be handled individually based on specifics

POLICY STATEMENT/ Diagnostic Imaging of Child Abuse/Section on Radiology
PEDIATRICS Vol. 123 No. 5 May 2009, pp. 1430-1435)

Complete Skeletal Survey

Appendicular skeleton
- Arms (AP)
- Forearms (AP)
- Hands (PA)
- Thighs (AP)
- Legs (AP)
- Feet (PA or AP)

AP = anteroposterior
PA =posteroanterior.

Axial skeleton
- Thorax (AP and lateral), to include thoracic spine and ribs
- AP
  - Abdomen
  - Lumbosacral spine
  - Bony pelvis
- Lumbar spine (lateral)
- Cervical spine (AP and lateral)
- Skull (frontal and lateral)

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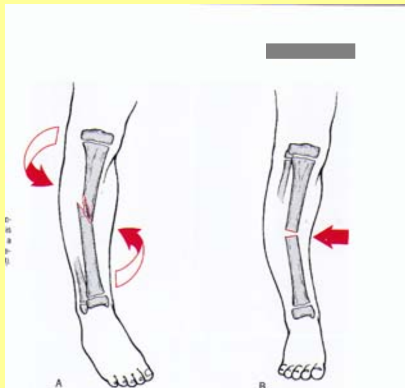


From: Green and Swiontkowski. Skeletal Trauma in Children. WB Saunders, 1998.

Child Abuse Findings CENTRAL NERVOUS SYSTEM

Central nervous system injuries comprise ~15% of child abuse.

3 Major injury types:

•Direct blows

•Shaking injuries

•Asphyxia

Subdural Hematomas

- **Subdural hematomas** are most often caused by head injury, when fast changing velocities within the skull may stretch and tear small bridging veins.
- Subdural hematomas due to head injury are described as traumatic.

Subdural Hematomas

- Subdural hemorrhages generally result from shearing forces due to various rotational or linear forces.
- Subdural hemorrhage is a classic finding in shaken baby syndrome

Radiology of Subdural Hematomas

- Most of the time, subdural hematomas occur around the tops and sides of the frontal and parietal lobes.
- Subdural hematomas can expand along the inside of the skull, creating a concave shape that follows the curve of the brain,

Radiology of Subdural Hematomas

- On a CT scan, subdural hematomas are crescent-shaped
- Shape is concave surface away from the skull

Child Abuse Findings CENTRAL NERVOUS SYSTEM

Shaken Baby Syndrome

Caused by ***violent*** shaking of infant's head, back and forth

- Shearing forces tear intracranial blood vessels, causing bleeding and bruising
- Infant will be lethargic, septic appearing or having seizures. There *may* be a bulging fontanel or retinal hemorrhages. Otherwise the physical exam is normal.

Non Accidental Blunt Abdominal Trauma

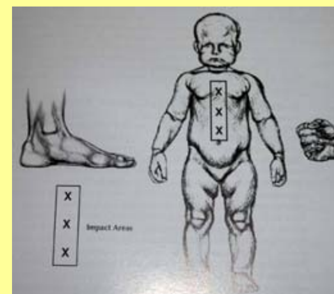
- Abuse accounts for <1% of abdominal trauma admitted to hospitals
  - Approx 4% of patient seen in the ED for trauma
- Difficult diagnosis
  - Inaccurate/misleading history
  - Frequent lack of external signs/symptoms
  - Victims usually younger
    - (mean age 2-3 y/o)-makes Hx and PE more difficult

Blunt Trauma

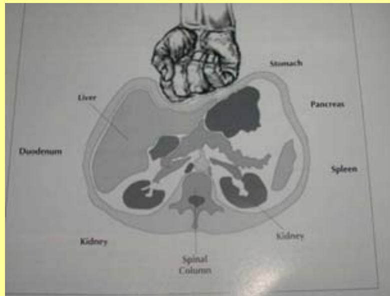
- Blunt trauma is the primary type of injury that is associated with thoracoabdominal injury in pediatric patients
- Penetrating injuries from gunshot wounds and stabbing are on the rise
- Visceral injuries account for only 2% of child abuse but are the second leading cause of death behind central nervous system injuries.

J.A. MONTELEONE, CHILD MALTREATMENT, Clinical Guide and Reference

Thoracoabdominal trauma



Abdominal organ injury



Blunt abdominal trauma

- Children with abdominal trauma secondary to assault or abuse have the highest mortality rate out of all causes of abdominal trauma.
- Abdominal trauma related to child abuse also carries a particularly high risk of hollow viscous injury.

Non Accidental Blunt Abdominal Trauma

- This type of abdominal trauma has a mortality that varies from 45-50%
  - Injuries are usually more severe
  - Difficulty in achieving a timely diagnosis
- Liver and spleen injuries are most common

Blunt Abdominal Trauma

- In up to 10% of all cases of fatal child abuse caused by blunt abdominal trauma, no marks are visible anywhere on the external body surface.

DiMaio and DiMaio, Forensic Pathology, 1989

- Soft tissue hemorrhage may require incisions to expose the injuries, particularly in dark skinned individuals.

Non Accidental Blunt Abdominal Injury

- Most patients also have associated findings
  - 95% have soft tissue injuries
  - 45% head trauma
  - 27% bony fractures
  - 18% skull fractures

Inflicted Thoracic Trauma

- Represents 1-8% of traumatic thoracic injuries in childhood
- Underlying thoracic visceral injury is uncommon but reported
  - Pneumothorax
  - Hemothorax
  - Chylothorax
  - Pulmonary contusion
  - Cardiac contusion

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Rib Fractures

- Rib fractures are the most common finding
  - Represent 5-27% of all abusive fractures
  - Predominantly posterior; lateral and anterior costochondral fractures less common
- If caused by CPR, very rare
- Because ribs are compliant, substantial force is required to fracture

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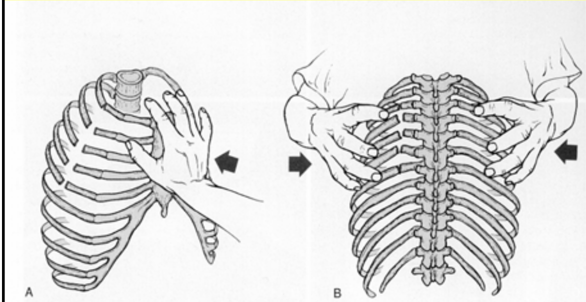
Mechanism for rib fractures



From: Green and Swiontkowski. Skeletal Trauma in Children. WB Saunders, 1998.

Approach to the Abused Patient

- As with any trauma victim
- ATLS
  - Primary survey
  - Resuscitation
  - Secondary survey

ATLS – Primary Survey

- A
- B
- C
- D
- E – Consider Gastric tube, urinary catheter

Secondary Survey

- Careful head to foot exam.
- Pay close attention to the skin findings, they may offer clues to the etiology of the trauma.
- Specifically patterns of abrasions, contusion, lacerations.
- Look for old scars, marks, or burns

Blunt Abdominal Trauma

- In all children with suspected inflicted injury, the abdomen must be thoroughly evaluated.
- This investigation may include laboratory assessment and/or imaging (CT scanning) to help detect abdominal injury.

Laboratory Assessment

- CBC with differential
- Chemistry Panel
- LFTs
- Amylase, Lipase
- UA
- PT/PTT
- Type and Cross

Radiologic Work of Suspected Visceral Injuries - Child Abuse

Radiologic Exam Procedure

- X-ray, skeletal survey
- CT, abdomen and pelvis, with contrast
- US, abdomen and pelvis
- MRI, abdomen and pelvis

Slovis TL, et al. Expert Panel on Pediatric Imaging. Suspected physical abuse--child. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 5 p.

Radiologic Work of Suspected Isolated Head Injuries - Child Abuse

Radiologic Exam Procedure

- X-ray, skeletal survey
- MRI, brain
- CT, brain

Slovis TL, et al. Expert Panel on Pediatric Imaging. Suspected physical abuse--child. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 5 p.

Medical Decision Making About Reporting

- History
- Physical Evidence
- Diagnostic Testing

Medical Decision Making About Reporting

- History
  - Child's own history
  - Delay in diagnosis
  - Inappropriate behavior
  - Poor home environment

Medical History

- Most of the time the history of abuse is unavailable at the time of presentation, or it is unreliable.
- An in depth interrogation of the child is not appropriate in the ER and should be reserved for a forensic interviewer, in a child friendly environment.

Medical History

<u>**Key question**</u>:

Not did anyone hurt you or what happened to you?

But, "Are you afraid of anyone?" or "Does anyone scare you?"

Usually the child will disclose to this question because they have not been coached not to, and they are ***VERY*** afraid!

Physical evidence of child abuse

- Age of child and developmental capabilities
- Injury or Fracture pattern
- Mechanism of injury
- Related physical findings suggestive of abuse
- Diagnostic tests or culture results indicating abuse

Reporting – Building Blocks

- A case is made based on the entire set of findings
- Or can be made by a single physical diagnosis

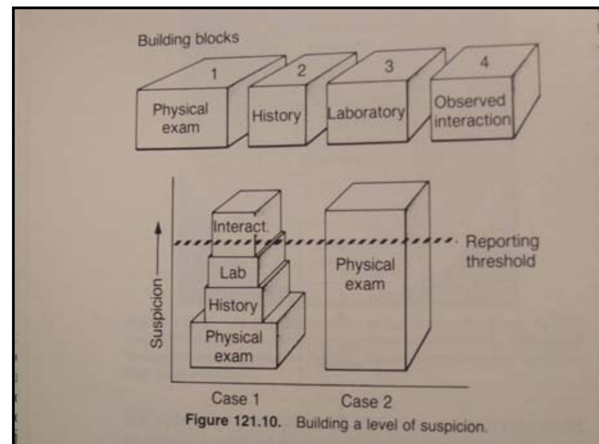


Figure 121.10. Building a level of suspicion.

Role of the ER for Suspected Child Abuse

- <u>**Reporting**</u>: Many times it is the ER physician or nurse that makes the initial outcry of child sexual or physical abuse
- The ***medical opinion*** often if the most important factor in the decision to remove children from the home, or their relatives.

Child Abuse Reporting

•Physicians, nurses, and social workers are all mandated reporters

Reporting

If child abuse is suspected the following services are notified:

- Social Services
- Department of Family and Children's Services
- Law Enforcement who should in turn notify the district attorney's office
- Coroner(if a fatality)
- Child Protection Team CHOA

Child Abuse Reporting

•Reporting is ***mandatory***

•Reporters are ***protected***

•Non reporters are ***liable***

Any person mandated by law to report who "knowingly and willfully fails to do so will be guilty of a misdemeanor"(O.C.G.A 19-7-5)

Lesson Learned

- **Victim work is a partnership!**
- Listening and working together is a crucial part to insure the best outcome for families and their children.
- Doctors need DFACS, Law Enforcement and Social Services, and the legal system all together to get the best result.

Multidisciplinary Approach

- Getting all the involved parties together at one time can be crucial to having a complete picture of the child's injuries, home situation, previous reports, or encounters with the legal system
- Routine meetings involving the District Attorneys office, DFACS, medical and social services should be mandatory

Pediatrician's Primary Goals

Summary

- Care and treatment for the child
- Collect historical and forensic evidence
- Protection of the child
- Serve as the patient's advocate

Child Advocacy

- **Child advocate:** Speak for the victim, either to help protect, or to help them navigate a confusing, difficult system