INVESTIGATING CHILD ABUSE AND NEGLECT

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Day #1
Medical Piece of the Puzzle:
Understanding Abusive Injury
Mechanisms

Matthew Cox, M.D.

“The Battered Child Syndrome”

- Landmark article published in JAMA in 1962
- The article contained the results of a survey of district attorneys who reported a large number of children were being severely beaten
- This article alerted medical professionals to the problem of child abuse
- Between 1963 and 1968 all fifty states enacted mandatory reporting laws

Handouts

- The handouts do not include case specific slides
- The majority of the studies referenced in the talk are referenced in a footnote

“Child abuse thrives in the shadows of privacy and secrecy. It lives by inattention.”

David Bakan, in The Slaughter of Innocents

Child Abuse Pediatrics

- All pediatricians have some training in the recognition and evaluation of child abuse and neglect
- Comfort among pediatricians varies
- “New” sub-specialty of pediatrics emerging

Risk Factors for Child Abuse:
Child Characteristics

- Age < 3 years
- Premature birth/Low birth weight
- Impaired bonding
- Children with chronic illness
- Physical disabilities
- Emotional/behavioral difficulties
- "Difficult" children
- Unwanted child

Risk Factors for Child Abuse:
Parent Characteristics

- Parents abused as children
- Family stressors and lack of support
  - Money, homelessness
  - Lack of appropriate parenting skills
  - Mother <20 years
  - Limited education (<high school)
  - Low self esteem/depression
  - Alcoholism, addiction, or psychosis
  - Unrealistic expectations of child’s behavior

Risk Factors for Child Abuse:
Social & Situational Stresses

- Isolation
- Family/domestic violence
- Non biologically-related male in the home
- Poverty
- Unemployment/financial problems
- Single parent

Triggering Situations

- Crying
- Fussy baby
- ‘Misbehavior’
- ‘Discipline’
- Family conflict
- Vomiting
- Toilet training
- Unknown

Indicators of Child Abuse and Neglect

- Histories inconsistent with injuries
- History incompatible with child’s development
- History that changes with time
- Contradictory histories
- Delay in seeking treatment
- Pathognomonic injuries

Medical Evaluation of Suspected Child Abuse
The History

- **History of Present Illness (What happened)**
  - Detailed history is essential
  - Interview parent and child separately if possible
  - Does the history fit with injury?
- **Family history**
  - Infant deaths, small children, easy bruising, red flags
- **Social history**
  - Risk factors?
  - Caretakers
- **Documentation is very important**

Suspicious Stories – Fatal Cases

- Child fell from low height
- Child fell onto furniture, floor, object
- Unexpectedly found dead
- Child choked, shaken to dislodge object
- Child turned blue, shaken to revive

*Kirschner

Common Suspicious Stories

- Resuscitation efforts caused injuries
- Traumatic event day or more prior
- Tripped or slipped carrying child
- Sibling did it
- Child left alone for short time
- Child fell down stairs

Complete Physical Examination

- **General appearance**
- **Head, eyes, ears, nose, throat**
  - Injuries present in 50% of abuse cases
- **Abdomen**
- **Skin**
- **Extremities**
- **Genitals**

Laboratory and Radiographic Assessment as Indicated

- **Imaging studies**
  - Skeletal survey
  - Neuroimaging
- **CBC, PT/PTT**
- **Toxicology tests**
- **LFTs, amylase, lipase**
- **Urinalysis**
- **Cultures and serologies**
- **RPR, HIV, hepatitis**

Child Abuse... Not an isolated event

- Alexander, et al, showed that 71% of fatally injured infants had prior evidence of maltreatment
- Kleinman, et al, 29 of 31 fatally injured infants had evidence of healing fractures at time of post-mortem examination
- Important to have high index of suspicion for abuse

5 B’s of Physical Abuse

**Bruises**

**Burns**

**Bones (fractures)**

**Belly (abdominal trauma)**

**Brains**

**Bu**

**ruises**

**Burns**

**Bones (fractures)**

**Belly (abdominal trauma)**

**Brains**

**Bruises**

- Bruises are caused when soft tissue is compressed between 2 hard surfaces and blood vessels leak blood into the tissue
- Swelling is secondary to inflammation
- Swelling resolves over the first 2-3 days
- Two characteristics separate abusive from accidental bruises:
  - LOCATION
  - PATTERN

**Definitions**

**Contusion**

- Blunt impact occurred at the site of discoloration

**Ecchymosis**

- Blood that has dissected through tissue planes to become visible externally

**Gluteal Bruising**

- Paddling or whipping
- Skin along the gluteal cleft margin with vertical contusion/petechiae
- Convex surface likely creates shear injury between impacted and non-impacted tissue

**Patterned Injuries**

- Slap marks, finger impressions
- Grab marks of face, extremities, thorax
- Frenulum tears
- Bite marks
- Loop marks
- Particular instruments leave imprints
- Petechiae of face, neck, eyes – strangulation
- Bruises on ears from “boxing,” pinching

**Strangulation Injury**

- Linear or circumferential ligature marks
- Petechiae of face or neck (not reliable)
  - Samuels Arch Dis Child 1992 – 14 observed on covert video surveillance, none with marks lasting > 60 seconds
- Blood of mouth, nose or face (not reliable)
  - Meadow Arch Dis Child 1999 – 10 of 81 children smothered to death, only 39% with bleeding
- Vocal cord paralysis
- Weak voice or cry
- X-ray findings are rare – may see calcification from fat necrosis

Acute Frenum Injuries

Mechanisms
- Oral intubation
- MVC with airbag deployment
- Falls learning to ambulate
- Blunt trauma to the mouth
- Direct laceration with an object forced into the mouth

Sites of bruises

<table>
<thead>
<tr>
<th>Location</th>
<th>Precruiser</th>
<th>Cruiser</th>
<th>Walker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior tibia</td>
<td>3</td>
<td>12</td>
<td>142</td>
</tr>
<tr>
<td>Forehead</td>
<td>3</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Scalp</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Upper leg</td>
<td>1</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Back</td>
<td>0</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Chest</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Forearm</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Face</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>


Percentage of Children with Bruises by Age

Age (months) | Precruiser | Cruiser | Walker |
-------------|------------|---------|--------|
0-2          | 1/225      |         |        |
3-5          | 1/141      |         |        |
6-8          | 4/99       | 2/8     |        |
9-11         | 4/38       | 12/63   | 7/18   |
12-14        | 1/8        | 3/24    | 23/49  |
15-17        | 1/6        | 26/57   |        |
18-23        |            | 39/79   |        |
24-35        |            | 70/115  |        |


“Those who don’t cruise rarely bruise”

<table>
<thead>
<tr>
<th>Location</th>
<th>Precruiser</th>
<th>Cruiser</th>
<th>Walker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper arms</td>
<td>Shins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trunk</td>
<td>Bony prominences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper anterior legs</td>
<td>Lower arms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sides of face</td>
<td>Forehead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ears and neck</td>
<td>Under chin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genitailia, buttocks</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


“When Inflicted Injuries Constitute Child Abuse”

- AAP policy statement
- A definition of significant trauma is any injury beyond temporary redness of the skin
- Practical criterion often used → “any inflicted injury that lasts more than 24 hours constitutes significant injury and child abuse”
Aging of Bruises

- Color changes occur as bruises age
- Colors vary widely with age of bruises
- Variability in color dependent upon:
  - Depth of bruise
  - Location
  - Vascularity of underlying tissue
  - Age and complexion of child

Differential Diagnosis for Bruises

- Mongolian spots
- Coagulopathy (ITP, Hemophilia)
- Henoch Schonlein Purpura (HSP)
- Phytophotodermatitis
- Cultural practices
  - Cao gio
  - Quat shat
  - Cupping

Cultural Practices

<table>
<thead>
<tr>
<th>Region/culture</th>
<th>Clinical presentation</th>
<th>Cultural practice</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>Causes black and blue marks on the face, chest, and limbs</td>
<td>Locating, compressing, eczamening</td>
<td>From, abdominal pain, edema, bruising, facial appearance</td>
</tr>
<tr>
<td>Europe</td>
<td>Causes black and blue marks on the face, chest, and limbs</td>
<td>Locating, compressing, eczamening</td>
<td>From, abdominal pain, edema, bruising, facial appearance</td>
</tr>
<tr>
<td>United States</td>
<td>Causes black and blue marks on the face, chest, and limbs</td>
<td>Locating, compressing, eczamening</td>
<td>From, abdominal pain, edema, bruising, facial appearance</td>
</tr>
</tbody>
</table>

Burns

Epidemiology of Burns

- Pediatric burns cause:
  - Over 250,000 injuries per year necessitating medical attention
  - Over 15,000 hospitalizations per year
  - Over 10,000 cases of severe physical disability per year
  - 1100 deaths per year
  - Third leading cause of mortality in children <5 years
First Degree Burns

- Redness
- Dry skin
- Skin that is painful to touch
- Pain usually lasts 48 to 72 hours
- Peeling skin

Second Degree Burns

- Blisters
- Deep redness
- Skin that is painful to touch
- Burn may be white or discolored

Third Degree Burns

- Dry and leathery skin
- Black, white, brown, or yellow skin
- Swelling
- Lack of pain
- New skin will not grow

Medical treatments

- Fluid management
- Pain control
- Wound care
- Topical antibiotics
- Medical complications
- Surgery
- Physical therapy

Types of Burns

- Thermal burns
  - Application of a liquid (scald)
  - Application of a hot object (contact)
  - Application of a flame
- Chemical burns
- Electrical burns
- Microwave burns

Thermal Burns

- Scald burns
  - Immersion
    - Uniform burn depth
    - Flexion sparing
    - Waterline – linear demarcation
  - Absence of splash marks
  - Flowing liquid
  - Splash
  - Splatter
Contact burns

- Characterized by the configuration of the burning object
  - Relatively superficial – ex: cigarette burns
  - Deep – ex: metal iron
- Abusive contact burns
  - Branding type injury – distinct margins, clearly inscribed patterns, injuries normally covered with clothes
- Non-abusive contact burns

Chemical Burns

- Cause tissue damage through chemical reactions which alter
  - Extracellular matrix
  - Cellular membranes
  - Intracellular structures and molecules
  - Production/resorption of heat
- Alkali > acids
- Bleach burns – does not immediately produce pain, splash marks might be absent

Rates of Pediatric Burn Injuries

![Graph showing rates of burn injuries and types of burns according to year for children <8 years of age.](image)


Burns Caused by Abuse/Neglect

- Proportion of burns in children due to abuse/neglect
  - Range from 1% - 30%
- More common in:
  - Lower socioeconomic status
  - Children from single-parent families
- Scald burns from tap water are the most common abusive burns
- Abuse-related burns carry higher morbidity than accidental burns (up to 30%)

Abuse vs. Accidental Burns

<table>
<thead>
<tr>
<th>Age</th>
<th>Abused (%)</th>
<th>Nonabused (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 yr</td>
<td>21 (29.6)</td>
<td>95 (15.3)*</td>
</tr>
<tr>
<td>1</td>
<td>22 (31.0)</td>
<td>162 (26.1)</td>
</tr>
<tr>
<td>2</td>
<td>10 (14.1)</td>
<td>91 (14.6)</td>
</tr>
<tr>
<td>3</td>
<td>7  (9.8)</td>
<td>58 (9.4)</td>
</tr>
<tr>
<td>4</td>
<td>5  (7.0)</td>
<td>47 (7.6)</td>
</tr>
<tr>
<td>&gt;4</td>
<td>6  (8.4)</td>
<td>104 (26.9)*</td>
</tr>
<tr>
<td>*N = 678</td>
<td>71 (10.5)</td>
<td>607</td>
</tr>
</tbody>
</table>

* p < 0.05.

Abuse vs. Accidental Burns

<table>
<thead>
<tr>
<th>Cause</th>
<th>Abused (%)</th>
<th>Nonabused (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scalds</td>
<td>58 (61.7)</td>
<td>312 (53.7)*</td>
</tr>
<tr>
<td>Tap water</td>
<td>48</td>
<td>49†</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
<td>263*</td>
</tr>
<tr>
<td>Flame</td>
<td>7  (9.6)</td>
<td>192 (33.1)*</td>
</tr>
<tr>
<td>Hot solid</td>
<td>6  (8.4)</td>
<td>76 (13.1)NS</td>
</tr>
</tbody>
</table>

* p < 0.05.
† p < 0.001.

How long would it take?
How hot is the water?

“Hot enough to burn the skin”

Table I: Temperature vs time vs burn injury depth

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Degree</th>
<th>Duration of Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>120°F (49°C)</td>
<td></td>
<td>15 minutes</td>
</tr>
<tr>
<td>130°F (55°C)</td>
<td></td>
<td>30 seconds</td>
</tr>
<tr>
<td>140°F (60°C)</td>
<td></td>
<td>5 seconds</td>
</tr>
<tr>
<td>149°F (65°C)</td>
<td></td>
<td>2 seconds</td>
</tr>
<tr>
<td>158°F (70°C)</td>
<td></td>
<td>1 second</td>
</tr>
</tbody>
</table>


Importance of Time in Causation of Cutaneous Burns


Patterns of Burn Injuries

Burns Caused by Abuse/Neglect

- Boys 2-3 times as likely to sustain abusive burns
  - Mean age between 2 and 4 years
  - Corresponds with times of high ‘demand’
    - Toilet training*
    - Enuresis
    - Excessive crying

- Children with inflicted burns 2.4-4.8 times more likely to have burns to hands, arms or legs bilaterally than children with accidental burns

Sparing Pattern

- Child abuse was found in nearly half of children < 2 years with scald burns to perineum and/or genitalia
  - Angel J Pediatr Surg 2002

- May see spared skin in areas of joint mobility
  - Elbows
  - Wrists
  - Popliteal fossa
  - Inguinal creases

  - Implies either reflexive or forced flexion/extension of the area

Case Discussions
Concurrent Injuries

Accidental or Abusive
“When Inflicted Injuries Constitute Child Abuse”

- AAP policy statement
- A definition of significant trauma is any injury beyond temporary redness of the skin
- Practical criterion often used “any inflicted injury that lasts more than 24 hours constitutes significant injury and child abuse”


Incidence of Fractures Among Children with Burns with concern regarding abuse

TABLE 1. Characteristics of the Patients With Abusive Injuries

<table>
<thead>
<tr>
<th>Variable</th>
<th>All Patients (n=1071)</th>
<th>Burns (n=974)</th>
<th>Burns vs No Burns (n=97)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>3.3 (2.0-7.9)</td>
<td>3.3 (2.0-7.9)</td>
<td>1.4 (1.1-2.1)</td>
<td>0.087</td>
</tr>
<tr>
<td>Age group (years)</td>
<td>0-1</td>
<td>32 (33.7%)</td>
<td>5 (5.2%)</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>2-4</td>
<td>71 (73.5%)</td>
<td>20 (20.7%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 4</td>
<td>50 (51.6%)</td>
<td>29 (30.1%)</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>79 (82%)</td>
<td>65 (67%)</td>
<td>0.697</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>28 (28%)</td>
<td>22 (23%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>White</td>
<td>89 (92%)</td>
<td>70 (72%)</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>18 (19%)</td>
<td>8 (8%)</td>
<td></td>
</tr>
<tr>
<td>Medical history</td>
<td>Positive</td>
<td>8 (8%)</td>
<td>6 (6%)</td>
<td>0.235</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>84 (88%)</td>
<td>71 (74%)</td>
<td></td>
</tr>
<tr>
<td>Skin involvement</td>
<td>No</td>
<td>86 (89%)</td>
<td>70 (72%)</td>
<td>0.362</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>20 (21%)</td>
<td>13 (13%)</td>
<td></td>
</tr>
</tbody>
</table>

Values for categorical variables represent number of patients. Percentages may not add 100% because of rounding off.


Incidence of Fractures Among Children with Burns with concern regarding abuse

Skeletal Surveys in Children with Abusive Burns

TABLE 2. Other Injuries Identified Among Children With Burns Who Were Evaluated For Abuse

<table>
<thead>
<tr>
<th>Injury</th>
<th>All Patients (n=1071)</th>
<th>Burns (n=974)</th>
<th>Burns vs No Burns (n=97)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cauterous injury (any)</td>
<td>887 (82.9%)</td>
<td>799 (82%)</td>
<td>9 (9.4%)</td>
<td>0.000</td>
</tr>
<tr>
<td>Bruises</td>
<td>605 (56.2%)</td>
<td>549 (56%)</td>
<td>48 (50%)</td>
<td>0.050</td>
</tr>
<tr>
<td>Burns</td>
<td>141 (13.2%)</td>
<td>127 (13%)</td>
<td>14 (14.9%)</td>
<td>0.190</td>
</tr>
<tr>
<td>Fractures</td>
<td>755 (70.5%)</td>
<td>659 (67%)</td>
<td>86 (90%)</td>
<td>0.000</td>
</tr>
<tr>
<td>Traumatic brain injury</td>
<td>363 (33.4%)</td>
<td>314 (32%)</td>
<td>49 (51%)</td>
<td>0.000</td>
</tr>
<tr>
<td>Abdominal injury</td>
<td>54 (5.0%)</td>
<td>48 (5%)</td>
<td>6 (6.3%)</td>
<td>0.025</td>
</tr>
<tr>
<td>Retinal hemorrhage</td>
<td>151 (14.2%)</td>
<td>129 (13%)</td>
<td>22 (22.7%)</td>
<td>0.005</td>
</tr>
</tbody>
</table>

Some cutaneous injuries, eg, bruising, abrasions, lacerations, or ecchymoses were not reported separately. NA indicates not applicable.


Occult Abdominal Trauma

TABLE 4. Test Characteristics of Transaminases and Several Clinical Examination Findings

<table>
<thead>
<tr>
<th>Finding</th>
<th>Sensitivity, % (95% CI)</th>
<th>Specificity, % (95% CI)</th>
<th>PPV, %</th>
<th>NPV, %</th>
<th>LR*</th>
<th>LR-</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>AST or ALT &gt; 80 IU/L</td>
<td>77 (65-87)</td>
<td>82 (80-84)</td>
<td>16</td>
<td>99</td>
<td>4.5</td>
<td>0.5</td>
<td>1272</td>
</tr>
<tr>
<td>Abdominal tenderness</td>
<td>52 (39-65)</td>
<td>98 (98-99)</td>
<td>55</td>
<td>58</td>
<td>36.9</td>
<td>0.5</td>
<td>1514</td>
</tr>
<tr>
<td>Abdominal distraction</td>
<td>46 (33-60)</td>
<td>97 (98-98)</td>
<td>5</td>
<td>89</td>
<td>16.8</td>
<td>0.6</td>
<td>1058</td>
</tr>
<tr>
<td>Abnormal bowel sounds</td>
<td>67 (56-78)</td>
<td>97 (98-98)</td>
<td>19</td>
<td>88</td>
<td>7.2</td>
<td>0.6</td>
<td>1515</td>
</tr>
<tr>
<td>GCS score ≤ 15</td>
<td>40 (39-40)</td>
<td>83 (80-86)</td>
<td>16</td>
<td>89</td>
<td>3.6</td>
<td>0.6</td>
<td>1552</td>
</tr>
<tr>
<td>Lippa ≥ 100 K/L (µ)</td>
<td>44 (33-55)</td>
<td>71 (72-70)</td>
<td>20</td>
<td>81</td>
<td>1.0</td>
<td>0.6</td>
<td>501</td>
</tr>
<tr>
<td>Vomiting</td>
<td>57 (53-60)</td>
<td>86 (87-87)</td>
<td>6</td>
<td>99</td>
<td>5.2</td>
<td>0.7</td>
<td>1555</td>
</tr>
<tr>
<td>HbR ≥ 15 K/L</td>
<td>55 (46-64)</td>
<td>70 (69-70)</td>
<td>4</td>
<td>95</td>
<td>0.9</td>
<td>1.1</td>
<td>1552</td>
</tr>
<tr>
<td>Hematocrit (any)</td>
<td>26 (16-45)</td>
<td>50 (39-55)</td>
<td>24</td>
<td>84</td>
<td>4.1</td>
<td>0.8</td>
<td>439</td>
</tr>
<tr>
<td>Abdominal tenderness or</td>
<td>52 (47-57)</td>
<td>70 (71-70)</td>
<td>13</td>
<td>99</td>
<td>4.1</td>
<td>0.2</td>
<td>1552</td>
</tr>
<tr>
<td>GCS score ≤ 15</td>
<td>67 (57-61)</td>
<td>70 (70-70)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PPV indicates positive predictive value; NPV, negative predictive value; LR*, positive likelihood ratio; LR-, negative likelihood ratio; n, number of patients for whom test results were documented; WO, white blood cells.

Prevention of Burn Injuries

Key Points - Burns

• Severity of burn is dependent on temperature of liquid and duration of exposure
• History of injury must be carefully correlated with observed pattern of injury, depth, and wound appearance
  - Accidental burns – splash marks, varying depths, indistinct borders
  - Intentional/abusive burns – uniform depth, distinct borders, “waterline”
• Scene investigation is critical
  - Measure water temperature

Abdominal Injury

Part 2

Abdominal Trauma
And Fractures

Visceral Manifestations of Abuse

• Major blunt trauma to the abdomen is an infrequent injury in abused children
  - <1% of reported cases of abuse
• Abdominal trauma is among the leading causes of death from physical abuse
• High mortality due to:
  - Young age of victims, severity of injuries sustained, delay in seeking appropriate medical care, delayed medical diagnosis
• Blunt abdominal trauma has been demonstrated in 14% of fatally abused children in autopsy series

“Impact” of abdominal injuries

- Highly lethal – 50% mortality rate
- Most die of hemorrhage
- Less die from sepsis and intestine injury
- Most common intra-abdominal injuries are mesenteric injuries, intestinal perforation (duodenal then jejunal), pancreatic injuries, and liver injuries


Abusive Visceral Injuries
(Sites of Injury)

Liver
Spleen
Stomach
Duodenum
Pancreas
Kidney

From Kleinman Diagnostic Imaging of Child Abuse, 1987

Mechanism of Injury

- Direct blow /Blunt Trauma
- Blow out injury
  - Stomach
  - Duodenum
- “Pinch” – between the object of the blow and the spine
  - Pancreas
  - Bowel
  - Vessels
- Shearing injury

Kisch Pediatric Annals 1983
Dworkind, Pediatrics May 1990.

Accidental Abdominal Injuries

- Motor vehicle collisions (70%)
- Auto-pedestrian
- Passenger
- Motorcycle rider
- Falls (20%)
- Other (10%) – contact sports, struck by falling objects, kicked by farm animals


Diagnostic and Surgical Implications of Child Abuse

<table>
<thead>
<tr>
<th>Organ</th>
<th>Accidental Injured</th>
<th>Child Abuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spleen</td>
<td>65 (47)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Kidney</td>
<td>55 (40)</td>
<td>3 (18)</td>
</tr>
<tr>
<td>Liver</td>
<td>47 (34)</td>
<td>8 (47)</td>
</tr>
<tr>
<td>Bowel</td>
<td>11 (8)</td>
<td>11 (55)</td>
</tr>
<tr>
<td>Pancreas</td>
<td>11 (8)</td>
<td>2 (12)</td>
</tr>
<tr>
<td>Diaphragm</td>
<td>5 (4)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Total</td>
<td>194 (140)</td>
<td>24 (100)</td>
</tr>
</tbody>
</table>

Clinical Presentation

• Signs of peritonitis
• Vomiting
• Abdominal distension
• Fever
• Hypovolemic shock
• Delay in seeking care
• Usually no history of trauma
• May not have soft tissue injury

Physical Examination

• Abdominal wall bruising is often absent
• 12-40% of children with intra-abdominal injury had abdominal wall bruising

Table 4. Symptoms of Intra-abdominal Trauma Seen in the Emergency Department (ED; N = 42)

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal injury being the primary cause</td>
<td>27 (64%)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>8 (19%)</td>
</tr>
<tr>
<td>Abdominal pain (total n)</td>
<td>22 (52%)</td>
</tr>
<tr>
<td>Pain in assessable children (n = 27)</td>
<td>22 (81%)</td>
</tr>
<tr>
<td>Pain localized</td>
<td>8 (30%)</td>
</tr>
<tr>
<td>Guarding</td>
<td>7 (26%)</td>
</tr>
<tr>
<td>Rebound tenderness</td>
<td>2 (7%)</td>
</tr>
<tr>
<td>Abdominal distraction</td>
<td>14 (33%)</td>
</tr>
<tr>
<td>Abdominal wall bruising</td>
<td>17 (40%)</td>
</tr>
<tr>
<td>Altered consciousness</td>
<td>19 (45%)</td>
</tr>
<tr>
<td>Caused by head injury</td>
<td>12/19 (63%)</td>
</tr>
<tr>
<td>Areflex (prior to or in ED)</td>
<td>4 (10%)</td>
</tr>
<tr>
<td>Fever</td>
<td>4 (10%)</td>
</tr>
<tr>
<td>Pallor</td>
<td>10 (43%)</td>
</tr>
<tr>
<td>Diaphoresis</td>
<td>2 (5%)</td>
</tr>
<tr>
<td>Decreased peripheral pulses</td>
<td>6 (14%)</td>
</tr>
<tr>
<td>Uncompensated shock</td>
<td>7 (17%)</td>
</tr>
</tbody>
</table>

Things to look for

• Fever
• Tachycardia (increased heart rate)
• Tachypnea (increased respiratory rate)
• Decreased Urine Output
• Increasing Pain
• Change in the exam

Injury Types

• Oropharyngeal injury
• Cardiac trauma
• Lung injury
• Solid organ injury
• Intestine (bowel) injury
• Genito-urinary injury
Abusive Esophageal Perforation

- Abusive esophageal perforation is a rare entity
  - Approximately 40 case reports in literature
- Mechanism of injury is using shoving an object or a finger in the oropharynx
- Clinical features are often nonspecific:
  - Respiratory distress
  - Drooling
  - Difficulty with secretions

Ng CS. Arch Dis Child 1997;77:167-74.

Hemothorax and Pneumothorax

- Most commonly seen in conjunction with rib fractures and adjacent lung trauma
- Pulmonary contusions seen with compression forces to chest
- CXR and chest CT
- Ventilator support and/or surgical management may be needed for more severe chest trauma

Thoracic Trauma

- Rib fractures most common manifestation of trauma to chest
- Lung and cardiac injuries are uncommon
- Clinical symptoms varied – typically severe

Increased Risk Due to Anatomical Factors

- Intra-abdominal organs are not as well protected by rib cage (larger organs in children)
- Increased compliance of ribs results in more energy transmitted to the underlying structures
- Abdominal wall musculature is less well developed and less protective

Liver Injury

- Most common abusive visceral injury
- Clinical presentation depends on the location and severity of injury and associated injuries
  - Bleeding
  - Hypotension
- CT is diagnostic imaging choice
- Treatment is usually non-operative and may depend on severity grade
“Markers of Occult Liver Injury in Cases of Physical Abuse in Children”

- 49 patients without clinical signs of abdominal trauma
  - 27 girls, 22 boys
  - Age range 1-135 months
  - 4 (6%) children with elevated transaminases
  - 3 with occult liver laceration on imaging

Pancreas Injury

- Vulnerable location in mid abdomen
  - Center of abdomen, draped across the spine
  - Higher risk of associated small bowel trauma
- Management depends on integrity of main duct (damaged duct needs operative care)
- Pancreatic pseudocyst formation is known complication

Pancreatitis in Childhood

- Causes of childhood pancreatitis (n=49)
  - Biliary tract disease (n=16)
    - Sickle cell disease
  - Trauma (n=16)
    - Child abuse represents 1/3 of trauma cases
  - Systemic disease (n=6)
  - Congenital anomalies (n=8)
  - Idiopathic (n=3)

Splenic Injury

- Most commonly accidental injury
  - May be protected by the rib cage but in abuse often seen with rib fracture and/or associated liver injury
  - Contrast enhanced CT for diagnosis
  - Management depends upon severity of injury and grading scale

Hollow Visceral Injury

- Stomach
- Small bowel (duodenum, ileum, jejunum)
- Rectum/colon
Intestine Injury

- Typically seen in proximal small intestine
  - Duodenum, jejunum
  - Stomach, colon, rectum much less common
- Blow to abdomen crushes intestine against spine causing perforation or compression of lumen causing intramural hematoma
  - Dramatic presentation or insidious onset
  - Bruising is not always present
  - High mortality secondary to delay in care

Intestinal contusion/hematoma

- Primarily cause by blunt trauma
- Delay in diagnosis can occur due to vague presenting signs and symptoms and poor sensitivity of radiographic tests

Timing of the Perforation

- Delayed perforation can occur
- Mechanism is vascular compromise
- Delay can occur a week after initial injury
- All patients had persistent abdominal pain for the days prior to perforation
- Spinal cord injury did not prevent abdominal pain

Duodenal Hematoma

- Progressive vomiting
- Dehydration
- Develops slowly – over days

Summary

Chest and Abdominal Injuries

- Uncommon but potentially lethal injury type
- Blunt trauma to chest/abdomen
  - Usually from front/anterior
- Wide range of clinical symptoms
- Varied timing of symptoms
- Index of suspicion and medical evaluation are mandatory

Fracture:
The act or process of breaking

Definitions

• Biomechanics
  • The science that examines forces acting upon and within a biological structure and the effects produced by such forces

• Force
  • Action that changes the state of motion of a body or changes the relative position of the molecules composing the body

Anatomic terms

- Lateral
- Posterior
- Anterior
- Proximal
- Distal

Force

• The push or pull acting on a body
• Pure forms of force
  • Compression
  • Tension
  • Shear

Compression
Pressing or direct axial squeezing force

Tension
• Stretching or pulling directly axially

Shear
• Forces that cause one part of the body to slide with respect to adjacent part

Long Bone Fractures
• Spiral fracture
• Buckle fracture
• Transverse fracture
• Oblique fracture
• Metaphyseal (Corner) fracture
• Comminuted fracture

Spiral Fracture
• Torsional loading (twisting) → caused to twist about its longitudinal axis
• NOT diagnostic of abuse
• Example: Toddler injuries

Buckle Fracture
• Typically results from axial loading (compression)
• Usually occurs at the junction of the metaphysis and the diaphysis
• Example: Fall onto outstretched arm

Transverse Fracture

- Fracture line that is perpendicular to the long axis of the bone
- Failure under tensile loading and from bending loads (tension and compression)
- Example: direct blow to the leg

Oblique Fracture

- Result of combination loading (compression, rotation, transverse)
- Example: fall from bed with twisting at impact or forced bending of extremity

Metaphyseal Fracture

- Planar fracture through the immature metaphyseal bone
- Shear and tensile stresses
- Examples: pulling and yanking on an extremity

Classic Metaphyseal Lesion (CML)

- Corner or Bucket Handle appearance - angle of radiographic projection.
- Rotational forces + rapid accel/decel → shearing forces to metaphysis generated w/ shaking
- Pulling and twisting of the extremity
- High specificity for abuse

Comminuted Fracture

- Multiple fracture fragments
- Increasing forces results in increased number of fracture fragments
Rib Fractures

- Due to compressive forces, not direct blows
- Seldom see overlying bruises
- After fractures, infant is usually asymptomatic
- Not associated with birth trauma
- Not associated with CPR

Skull Fractures

Simple
- Linear – not crossing suture lines
- < 2 mm separation of edges of fracture

Complex
- Linear – crossing suture lines
- > 2 mm separation of edges of fracture
- Branching, comminuted, or stellate
- Depressed, compound, diastatic
**Fractures in Child Abuse**

- Fractures seen in 5-18% of abused children
- History is key
- Timing
- Mechanism
- Age of patient
- Developmental stage
- Activity level

**The Skeletal Survey**

- Plain x-ray studies
- Mandatory in all cases of suspected abuse in kids <2 years
- Patients age 2-5 years based on clinical indicators

**Follow-up skeletal survey**

- 23/181 children had repeat skeletal survey 2 weeks after initial skeletal survey (SS)
- Children were in custody of DSS
- Initial SS revealed 70 definite fractures
- Follow-up SS revealed 89 definite fractures, a 27% increase (p=0.005)
  - 8 metaphyseal fractures
  - 8 rib fractures
  - One spinous process, one sacrum, one metacarpal
  - Also helped date 13/70 initially identified injuries


**Healing Process**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Time</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Induction</td>
<td>3-7 days</td>
<td>Inflammation, pain, swelling</td>
</tr>
<tr>
<td>Soft callus</td>
<td>Infants 7-10 days Children 10-14</td>
<td>Periosteal new bone formation</td>
</tr>
<tr>
<td>Hard callus</td>
<td>14-21 days</td>
<td>Union at fx site</td>
</tr>
<tr>
<td>Remodelling</td>
<td>3 months-1 year</td>
<td>Woven to lamellar bone</td>
</tr>
</tbody>
</table>

Cases of Long Bone Fractures

Fractures in Young Children

• Fractures felt to be accidental if:
  • Distal extremity in child > 1 year
  • Femur fracture in child > 1 year running and falling
  • Clavicle

• Increased likelihood of abuse when:
  • Young age
  • Lower SES
  • Developmental handicaps
  • Prematurity
  • Other associated injuries
  • Implausible history


Highly Suspicious Fractures

• No history of trauma or accident
• History of minor fall
• Multiple, bilateral fractures
• Repetitive fractures
• Fractures of hands or feet
• Metaphyseal fractures
• Long bone fractures in children under a year
• Posterior rib fractures
• Medial or lateral clavicular fractures
• Scapular fractures
• Spine fractures
• Sternum fractures
• Fractures in varying stages of healing
• Extremity plus skull fracture
• Intracranial injury plus skull fracture

Challenges with OI

• Often confused for child abuse. Genetic or biochemical tests to confirm diagnosis is not required, but may be helpful to confirm for law enforcement/CPS and for family.
• Physical features can be classic and striking such as blue sclera and limb bowing, but may also be subtle such as radiographic evidence (often thought to be obvious with OI). Genetic/biochemical tests are both highly specific and sensitive, but not 100% accurate...
• Main point- an allegation of child abuse, which is much more common should not be missed, but also carries significant morbidity to patients and families, and should be done after thorough evaluation.


Conclusion

• Fracture evaluation must include an evaluation of the medical history provided to assess feasibility of the mechanism of injury
• Complete radiographic evaluation in cases of suspected child abuse is important

BRAINS: Abusive Head Injury
Case Example

- 14 month old girl presented to OSH
- Left in room with 4 year old boy
- Care provider in bathroom heard a noise
- Returned to room to find patient sitting on floor holding her head
- Possible fall from bed
- Fall from porch day before with mother

Abusive Head Trauma

- Pattern of brain injury (global brain injury)
- Presence of other injuries
  - Bruises, whip marks
- Changing history of trauma
  - Unwitnessed fall, fall when bouncing on bed, other child pushed her off bed...
- Mechanism described does not explain severity of injury

Abusive Head Trauma Objectives

- Anatomy and definitions
- Epidemiology
- Medical findings
- Medical evaluation
- Mechanisms of brain injury
- Outcomes
- Arguments
- Case Examples

Basic Anatomy

- Scalp
- Skull
- Meninges
  - Dura mater
  - Arachnoid
  - Pia mater
- Brain
  - Gray matter
  - White matter

Normal Brain
Subarachnoid space

Brain

Skull

Epidural space

Dura mater

Subdural “space”

Arachnoid

Sub-arachnoid space

Epidural Hematoma (EDH):
Blood between the skull and dura mater

Subdural Hematoma (SDH):
Blood between the dura mater and the brain

Subarachnoid Hematoma (SAH):
Blood between Arachnoid membrane and brain

Parenchymal contusion:
Bruise to the brain tissue

Infarction:
Area of tissue death due to lack of blood flow

Day of admission

2 days later
Ischemia:
A decrease in the blood supply to the brain

Epidemiology of AHT

Abusive Head Trauma

- Most common cause of mortality and morbidity in physical child abuse
- Most occurs in children < 2 years
- Approximately 80% of deaths from head trauma in infants and children < 2 years were inflicted injuries
- Mortality rate 15-38%
- Incidence 17-30 per 100,000 infants


Risk Factors

- Young, unmarried mothers
- Maternal education < high school
- Unstable family situation
- Low socioeconomic status
- Multiple birth pregnancies
- Disability / prematurity
- Parent in the military

Perpetrators of AHT

Epidemiology of AHT

- 64% of head injury in infants (<1 year) are abusive
- 95% of infant serious intracranial injuries are abusive
- 33-40% cases have evidence of previous trauma
- Male victims predominate
- 35% have no obvious external trauma


<table>
<thead>
<tr>
<th>Relationship</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Father of child</td>
<td>47</td>
<td>37</td>
</tr>
<tr>
<td>Boyfriend of mother</td>
<td>26</td>
<td>20.5</td>
</tr>
<tr>
<td>Female baby-sitter</td>
<td>22</td>
<td>17.3</td>
</tr>
<tr>
<td>Mother</td>
<td>16</td>
<td>12.6</td>
</tr>
<tr>
<td>Male baby-sitter</td>
<td>5</td>
<td>3.9</td>
</tr>
<tr>
<td>Step-father</td>
<td>4</td>
<td>3.1</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>5.5</td>
</tr>
<tr>
<td>Total</td>
<td>127</td>
<td>100</td>
</tr>
</tbody>
</table>

Gerber and Coffman. Child Nerv System. 2007

Clinical Presentation of AHT

Signs and Symptoms

• Variable, depending on duration and number of shakes, presence of impact, severity of injury

• Continuum from:
  • Decreased responsiveness, irritability, lethargy, limpness
  • Seizures, tachypnea, bradycardia, hypothermia
  • Coma, death

Reasons for Seeking Care

<table>
<thead>
<tr>
<th></th>
<th>Inflicted TBI</th>
<th>Noninflicted TBI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apnea</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>Respiratory distress</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Faint breathe</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Seizure</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Unexplained facial bruising/limb deformity</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Lethargy</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Irritability</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Urinary</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Vomiting</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Asymptomatic/paternal concern</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Facial/head-wrapping postinjury</td>
<td>0</td>
<td>7</td>
</tr>
</tbody>
</table>


Medical and Event History

• What time did event happen?
• What exactly happened?
• Who was present?
• What did child look like after the event?
• How did symptoms begin and change?
• If a fall, what were the specifics? Height, flooring, how did child land?
• Previous injuries or physical symptoms?
• Detailed medical, family, social, and ROS

Diagnostic Utility of History

• 163 children with acute traumatic intracranial injury
• 49 (30%) definitely abused
• Examined clinical history of trauma
• NO history of trauma specific for abuse
• Hx of no or low impact fall with persistent neurologic sequelae diagnostic of abuse
• Home resuscitation excuse suggests abuse


“Can the initial history predict whether a child with a head injury has been abused?”

“Can the initial history predict whether a child with a head injury has been abused?”


Missed Abusive Head Injury

- 173 head injured patients
- 54/173 with missed diagnosis
- 15 children were re-injured after missed diagnosis
- 4 deaths might have been prevented if abuse recognized
- Factors associated with missed diagnosis:
  - Both parents living in home
  - White children
  - Lack of significant respiratory symptoms or seizures


Medical Evaluation of AHT

- Plain x-ray studies
- Mandatory in all cases of suspected abuse in kids <2 years
- Patients age 2-5 years based on clinical indicators

The Skeletal Survey


Laboratory Studies

- CBC, serial hematocrits
- Coagulation studies (PT, PTT)
- Electrolytes, BUN, Creatinine, Osmolality
- Urinalysis
- Liver Enzymes, amylase, CPK
- Consider:
  - Urine organic acids
  - Acylcarnitine profile
  - Factor XIII level

RH in Inflicted Neurotrauma

- Incidence between 50-100%
- Dilated retinal examination
- Performed by Ophthalmologist
- Detailed description or photographic documentation IMPORTANT
- Location topographically, layer, number or severity

Location of RHs

- Subretinal
  - Blood vessels seen over the hemorrhage
- Intraretinal- most common
  - Blood vessels usually obscured
  - Dot, Blot- round
  - Flame- very superficial
- Preretinal
  - Subhyaloid (between retina and vitreous)
- Vitreous

Differential Diagnosis of RH

- Vaginal delivery- intraretinal
- Child abuse
- Severe accidental injury
- Coagulopathy, Vasculitis, Leukemia
- Severe hypertension
- AV malformations
- Papilledema (flame shaped, around optic nerve)
- Meningitis
- Metabolic diseases

### Table 3

<table>
<thead>
<tr>
<th></th>
<th>Inflicted</th>
<th>Noninflicted</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Injuries</strong></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Retinal hemorrhage</td>
<td>61</td>
<td>76.3</td>
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<tr>
<td>Rib fracture</td>
<td>22</td>
<td>27.5</td>
</tr>
<tr>
<td>Long-bone fracture</td>
<td>15</td>
<td>18.8</td>
</tr>
<tr>
<td>Skull fracture</td>
<td>14</td>
<td>17.5</td>
</tr>
<tr>
<td>Metaphyseal fracture</td>
<td>14</td>
<td>17.5</td>
</tr>
<tr>
<td><strong>Brain injuries</strong></td>
<td></td>
<td></td>
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<tr>
<td>Subdural</td>
<td>75</td>
<td>90.6</td>
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<td>Edema</td>
<td>25</td>
<td>31.3</td>
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<tr>
<td>Anoxic ischemic</td>
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<td>18.8</td>
</tr>
<tr>
<td>Hydrocephalus</td>
<td>12</td>
<td>15.0</td>
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<tr>
<td>Other brain injuries</td>
<td>10</td>
<td>12.5</td>
</tr>
<tr>
<td>Subarachnoid</td>
<td>9</td>
<td>11.3</td>
</tr>
<tr>
<td>Contusion</td>
<td>8</td>
<td>10.0</td>
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<tr>
<td>Intracranial hemorrhage</td>
<td>5</td>
<td>7.0</td>
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<td>Epidural</td>
<td>1</td>
<td>1.3</td>
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<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
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<tr>
<td><strong>Laboratory Studies</strong></td>
<td></td>
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<tr>
<td>CBC, serial hematocrits</td>
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<td>Urinalysis</td>
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<td>Liver Enzymes, amylase, CPK</td>
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<td>Consider:</td>
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<tr>
<td>Urine organic acids</td>
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<td>Acylcarnitine profile</td>
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<td>Factor XIII level</td>
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</table>


### Table 4

<table>
<thead>
<tr>
<th></th>
<th>Abuse (N = 15)</th>
<th>Accident (N = 67)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RH</td>
<td>60% (9/15)</td>
<td>10% (7/67)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Unilateral RH</td>
<td>20% (3/15)</td>
<td>9% (6/67)</td>
<td>.36</td>
</tr>
<tr>
<td>Bilateral RH</td>
<td>40% (6/15)</td>
<td>1% (1/67)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Pre-RH</td>
<td>30% (5/15)</td>
<td>0% (0/67)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Single RH</td>
<td>0% (0/15)</td>
<td>4% (3/67)</td>
<td>1.0</td>
</tr>
<tr>
<td>With RH extending to periphery</td>
<td>27% (4/15)</td>
<td>0% (0/67)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>With premacular RH</td>
<td>20% (3/15)</td>
<td>0% (0/67)</td>
<td>.005</td>
</tr>
<tr>
<td>Vitreous hemorrhage</td>
<td>13% (2/15)</td>
<td>0% (0/67)</td>
<td>.03</td>
</tr>
</tbody>
</table>

Mechanisms of Injury

Mechanisms of TBI

**TRANSLATIONAL**
- Scalp contusion
- Skull fracture
- Epidural hematoma
- Superficial brain contusions
- Brain lacerations
- Subdural hematoma

**ROTATIONAL**
- Concussion
- Traumatic axonal injury
- Deep brain contusions
- Deep brain hematomas
- Gliding contusions
- Subdural hematomas

**CONTACT**

**Non-CONTACT**

Translational (Impact) Forces

- Linear type event (fall)
- Rectilinear movement with essentially no complex movements or twisting about the axis of the head or body
- Impact events

Rotational, Non-contact forces

- Forces that result in a rotation of the brain about its center of gravity cause diffuse brain injury
- Sudden angular deceleration experienced by the brain and cerebral vessels results in intracranial injury


Biomechanics of AHT

- Genarelli, Thibault, Ommaya, et al 1960s
  - Adult monkeys subjected to 5-30 msec accelerations on sleds
    - Head immobilized (linear accelerations)
    - Head NOT immobilized (angular accelerations)
  - Three primate species with different brain sizes used
  - Thresholds for concussion, SDH, and axonal injury established for each species

Duhaime 1987 study

- 48 cases of SBS – 2/3 showed impact
- All fatal cases (n=13) – evidence of impact
- 3 doll models used to show shaking alone could not generate sufficient forces to produce injuries
- “Shaking alone in an otherwise normal baby is unlikely to cause SBS”

Perpetrator Confessions

- Retrospective study comparing 81 cases with perpetrator confessions with 90 cases with no confession
  - 32/69 cases shaking only
    - 29 with SDH, 27 with RH
  - 20/69 impact only
    - 17 with SDH, 14 with RH, 8 with skull fx
  - 17/69 shaking and impact

Primary Brain Injury

- Brain injury that is the direct result of the **initial** traumatic force
- Examples:
  - Shear injury, cortical contusions, gliding contusions
- Potential clinical signs:
  - Cardiorespiratory depression, loss of consciousness, apnea, seizures, vomiting, lethargy, irritability

Secondary Brain Injury

- Brain tissue becomes damaged as a consequence of primary injury
- Common secondary injuries:
  - Hypoxic-ischemic changes, brain swelling, herniation
- Potential clinical signs:
  - Decreased mental status, irritability, seizures, changes in pupils, focal neurologic findings
Terminology

- Whiplash shaken-baby syndrome
- Shaken baby syndrome
- Shaking impact syndrome
- Shaken – slam syndrome
- Non-accidental head injury
- Inflicted head injury
- Inflicted Traumatic Brain Injury
- Inflicted childhood neurotrauma
- Abusive head trauma

Outcomes

- 20% mortality
- 80% of survivors with neurologic impairment

Late Complications

- Cognitive, neuromotor, and behavioral problems
- Seizure disorders
- Visual impairment
- Hydrocephalus
- Cerebral atrophy

Conclusions

- AHT is commonly misdiagnosed
- Typically associated with other injuries (fractures, ret heme)
- No history of trauma or minimal trauma history most common
- Onset of symptoms immediate
- Mechanism of trauma typically not exactly known
- Severe and violent traumatic forces

Head Injury - Summary

- Most fatal form of child abuse
- Requires major mechanical forces
- Associated injuries
  - Fractures
  - Retinal hemorrhages

"The American Academy of Pediatrics recommends that pediatricians...embrace a less mechanistic term, abusive head trauma, when describing an inflicted injury to the head and its contents."
Part 4
Sexual Abuse

What Is Child Sexual Abuse?

• Involvement of children in sexual activities that...
  • They cannot understand
  • They are not developmentally prepared for
  • They cannot give informed consent for
  • Violate societal taboos

Outline

• Definitions
• Anatomy
• Medical evaluation
• Medical findings
• Case studies
• Sexually transmitted infections

Sexual Abuse Evaluation

Multidisciplinary Team

• Child Protective Services (CPS)
• Law Enforcement
• Social Workers
• Forensic Interviewers
• Mental Health Services
• Victim Support/Advocacy groups
• Nurses and Medical Assistants
• Physicians and Nurse Practitioners
• District Attorneys

Reasons Children Present for Medical Care

• Disclosure / Outcry
• Behavior changes
• Genital symptoms
• Parental concerns
Medical Evaluation Process

• Purpose:
  • Gather information from available sources
  • Patient-friendly examination
  • Photo-documentation
  • Unbiased conclusion based on history, physical and evidence

• Process:
  • Forensic Interview
  • Medical History
  • Examination
  • STD testing
  • Evidence collection
  • Evaluation of other pertinent information
  • Explanation to family, agencies involved
  • Repeat examination if necessary

Interviewing the Child

• Minimize the number of interviews
• Do you need to talk to child?
• Age of child- history from parent?
• May want to talk to patient/parent alone
• Gather basic information
• Open ended questions
• Body parts/“good touch/bad touch”
• Avoid leading questions

History of Event

• Who is the AP
• What event occurred
  – Fondling
  – Penetration- where, with what
  – Oral Contact
  – Ejaculation
• When did the event(s) occur
  – How long ago
  – Single or multiple incidents

• Where did event occur
• Clothing
  – Same clothing
  – Where are the clothes
• Hygiene since incident:
  – Bathing
  – Eating
  – Brushing Teeth
  – Urinating
  – Defecation

Medical History

• Current complaint
  – Forensic Interview
• General health/ROS
• Past History
  – Hx of UTI, Vaginitis
  – Injuries-genital area
  – Hygiene
  – Hx of illness
• Behavior changes
  – School performance
  – At home, with peers
  – Sleeping

• Family Hx
  – HPV/STD
• Ano-Genital Complaints
  – Genital/Anal Pain
  – Genital/Anal Bleeding
  – Dysuria
  – Frequency
  – Genital/Anal Itching
  – Discharge
  – Constipation

Behaviors Indicative of Sexual Abuse

• Non-specific behaviors:
  • Sleep disturbance, Fear/Anxiety
  • Abdominal pain, Headache
  • Enuresis, Encopresis
  • Acting out, Withdrawn
• Sexually acting-out behaviors suggestive of abuse
• No behaviors are diagnostic of sexual abuse

“Normative Sexual Behavior in Children”

<table>
<thead>
<tr>
<th></th>
<th>Girl 2-4</th>
<th>Boy 2-8</th>
<th>Girl 6-9</th>
<th>Boy 6-10</th>
<th>Girl 10-12</th>
<th>Boy 10-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touches sex parts in public</td>
<td>15.1</td>
<td>26.5</td>
<td>6.3</td>
<td>13.8</td>
<td>2.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Masturbates with hand</td>
<td>15.8</td>
<td>16.7</td>
<td>5.3</td>
<td>12.8</td>
<td>7.8</td>
<td>3.7</td>
</tr>
<tr>
<td>Masturbates with toy</td>
<td>6.0</td>
<td>3.5</td>
<td>2.9</td>
<td>2.7</td>
<td>4.3</td>
<td>1.2</td>
</tr>
<tr>
<td>Shows sex parts to children</td>
<td>6.4</td>
<td>9.3</td>
<td>2.4</td>
<td>4.8</td>
<td>1.1</td>
<td>0.0</td>
</tr>
<tr>
<td>French kisses</td>
<td>1.8</td>
<td>4.3</td>
<td>3.0</td>
<td>1.1</td>
<td>0.0</td>
<td>1.3</td>
</tr>
<tr>
<td>Tries to have intercourse</td>
<td>1.1</td>
<td>0.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Puts mouth on sex parts</td>
<td>0.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Pediatrics, April 1998
Concerns: Parental

- Sexualized behaviors/Behavioral issues
- Virginity
- STD
- Pregnancy
- Future behavior
- Abuse in parents past

Concerns: Child

- 104 sexually abused children interviewed about fears/concerns.
- 24% Children
  - STD
  - Pregnancy
  - Body image, integrity

Who Needs an Examination?

- Acute/Immediate
  - Forensic evidence
  - Acute symptoms
    - Bleeding
    - Pain
- Routine/Scheduled
  - Forensic Evidence not collected

Physician Knowledge of Genital Anatomy

<table>
<thead>
<tr>
<th>Structure</th>
<th>Chief residents' original paper (%)</th>
<th>Lenton and Johnson (2000) (%)</th>
<th>Ladoon et al. (1987) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clitoris</td>
<td>94</td>
<td>94</td>
<td>89</td>
</tr>
<tr>
<td>Posterior commissure</td>
<td>87</td>
<td>87</td>
<td>81</td>
</tr>
<tr>
<td>Urethra</td>
<td>63</td>
<td>72</td>
<td>78</td>
</tr>
<tr>
<td>Labia minora</td>
<td>90%</td>
<td>83%</td>
<td>76%</td>
</tr>
<tr>
<td>Labia majora</td>
<td>90%</td>
<td>79%</td>
<td>87%</td>
</tr>
<tr>
<td>Phymosis</td>
<td>94</td>
<td>62</td>
<td>59</td>
</tr>
</tbody>
</table>

Take Home Points: Increased education, need for experienced/trained specialists doing examinations.

Purpose of the Medical Exam in suspected SA cases

- Injury identification
- Collect evidence
- STD screening/treatment
- Reassurance to child and parents

SEXUAL ABUSE EXAMINATION
Genitalia Terminology  
Female n=63

<table>
<thead>
<tr>
<th>Term</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom</td>
<td>(5)</td>
</tr>
<tr>
<td>Cootchi</td>
<td>(1)</td>
</tr>
<tr>
<td>Kittycat</td>
<td>(1)</td>
</tr>
<tr>
<td>Nuckie</td>
<td>(1)</td>
</tr>
<tr>
<td>Privacy</td>
<td>(1)</td>
</tr>
<tr>
<td>Toto</td>
<td>(1)</td>
</tr>
<tr>
<td>Vulva</td>
<td>(1)</td>
</tr>
<tr>
<td>Bucket</td>
<td>(1)</td>
</tr>
<tr>
<td>Flower</td>
<td>(1)</td>
</tr>
<tr>
<td>Little popo</td>
<td>(1)</td>
</tr>
<tr>
<td>Pocket book</td>
<td>(1)</td>
</tr>
<tr>
<td>Tinkle</td>
<td>(1)</td>
</tr>
<tr>
<td>Tushie</td>
<td>(2)</td>
</tr>
<tr>
<td>Potty</td>
<td>(1)</td>
</tr>
<tr>
<td>Cooch</td>
<td>(1)</td>
</tr>
<tr>
<td>Garage</td>
<td>(1)</td>
</tr>
<tr>
<td>Monkey</td>
<td>(1)</td>
</tr>
<tr>
<td>Potato</td>
<td>(1)</td>
</tr>
<tr>
<td>Tonton</td>
<td>(1)</td>
</tr>
<tr>
<td>Vagina</td>
<td>(33)</td>
</tr>
</tbody>
</table>

Genitalia Terminology  
Male n=54

<table>
<thead>
<tr>
<th>Term</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banana</td>
<td>(1)</td>
</tr>
<tr>
<td>Dingadoo</td>
<td>(1)</td>
</tr>
<tr>
<td>Dingaling</td>
<td>(1)</td>
</tr>
<tr>
<td>Dinkus</td>
<td>(1)</td>
</tr>
<tr>
<td>Dippy bird</td>
<td>(1)</td>
</tr>
<tr>
<td>D-bird</td>
<td>(1)</td>
</tr>
<tr>
<td>Dingdong</td>
<td>(1)</td>
</tr>
<tr>
<td>Jug Jug</td>
<td></td>
</tr>
<tr>
<td>Pecker</td>
<td>(1)</td>
</tr>
<tr>
<td>Peeppee</td>
<td>(12)</td>
</tr>
<tr>
<td>Penes</td>
<td>(1)</td>
</tr>
<tr>
<td>Private</td>
<td>(3)</td>
</tr>
<tr>
<td>Schmuck</td>
<td>(2)</td>
</tr>
<tr>
<td>Thing</td>
<td>(3)</td>
</tr>
<tr>
<td>WeeWee</td>
<td>(3)</td>
</tr>
<tr>
<td>Weenie</td>
<td>(1)</td>
</tr>
<tr>
<td>Wormy willy</td>
<td>(1)</td>
</tr>
</tbody>
</table>

Patient comfort/Anxiety reduction

- Explain entire physical exam, including genital exam, to family and patient
- Show child equipment used:
  - Colposcope
  - Swabs
- Allow patient to undress in private
- Drape appropriately throughout
- Give patient control:
  - Patient decides who is in the room
  - Chosen family member can hold patient’s hand, talk to them
  - Patient can decide to see colposcope screen or not
  - Explain results to family AND patient

Children’s reactions to SA Exam

- 43 mothers and daughters (3-15yo) interviewed before + after exam [Steward, CAN, 1995]
- Children not re-traumatized by exam
- Children less distressed after the examination
- Mothers feelings: moderately negative before and after exam.
- Stress can be reduced by: [Berson, Child Welfare, 1993]
  - Preparing the child for the examination
  - Giving the child greater control
  - Debriefing after the exam

Reality

**SPECULUM NOT USED IN PREPUBERTAL CHILDREN**

- Well accepted, well tolerated
- Not forced; sedation usually not used
  - “Teens generally reported that the medical examination, which included the use of video colposcopy, was beneficial...”
  - the girls’ feelings about the medical examination were significantly more positive afterwards”.

Types of Findings:
Description- Common Language

ANTERIOR

POSTERIOR

Description of Findings

• Genital Structures:
  • Outside ➔ In
  • Injury
  • Signs of disease

• Hymen:
  • Amount of tissue
  • Smooth rim
  • Injury or sign of disease

Misconceptions: Sexual Abuse

• Misconception:
  • No Injury ➔ No Abuse
  • Examiner can always tell

• Correct:
  • "Its Normal to be Normal"
  • Studies show: most sexually abused children have normal examinations

Its Normal to be Normal

• 236 files reviewed- cases with perpetrator conviction for SA
  • 215 girls, 21 boys
  • Age 8mo-17y, mean age 9y

Findings:
• 49% non-specific
  • Erythema, increased vascularity, LA
• 28% normal
• 14% suspicious or suggestive
• 9% clear evidence genital; 1% anal
• 6 cases confessed penetration- NONE had abnormal exams.


Anatomic Changes from SA

• 192 cases, 200 controls
• Most seen >7d after abuse
• Age 3-8yo
• Only 2.5% of subjects had findings unique for abuse

Berenson. Am J Obstet Gynecol

Heger, CAN 2002

- 2384 children; 5-year prospective study (1985-1990); tertiary CA referral center.
- Children 3mo-14yo
- Mean age 6.9 yrs girls; 5.5 yrs boys
  - Disclosing: 7.8yrs
  - Non disclosing: 4.5 yrs

Penetration
Heger CAN 2002

- 68% of girls and 70% of boys reported penetration of vagina or anus.
- Penetration-associated with a higher percentage of abnormal findings in girls (6%) compared to 1% of the boys.
- Total: 5.5% cases with penetration abnormal vs. 1.7% who denied abuse.

Conclusions
Heger CAN 2002

- Only 4% of all children referred for medical evaluation of sexual abuse have abnormal examinations at the time of evaluation.
- Even with a history of severe abuse such as vaginal or anal penetration, the rate of abnormal medical findings is only 5.5.
- History from the child remains the single most important diagnostic feature in coming to the conclusion that a child has been sexually abused.

Genital Anatomy in Pregnant Adolescents: “Normal” Does Not Mean “Nothing Happened”

- Genital examination on 36 pregnant girls
  - Average age 15.1 years (12.3-17.8)

<table>
<thead>
<tr>
<th>Normal/nonspecific exam</th>
<th>64% (n=22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconclusive finding</td>
<td>22% (n=8)</td>
</tr>
<tr>
<td>Suggestive</td>
<td>8% (n=4)</td>
</tr>
<tr>
<td>Definite penetration</td>
<td>6% (n=2)</td>
</tr>
</tbody>
</table>


Why, Continued

- Delay in disclosure
- Healing of Injuries
  - Normal
  - Clefts
- Adolescents: Effects of estrogen on hymen
  - Elasticity
  - Possibly obscures previous trauma
  - Definition of “in”
  - Definition of penetration (however slight)

Healing Trauma

- Pediatrics 2003: 10yr prospective study
- 94 children [81 girls/13 boys]
  - 37 hymenal injuries
  - 47 posterior fourchette injuries
  - 31 anal injuries
  - All healed without diagnostic changes except
    - 15 hymenal transections (15/17 complete hymenal tears; 2 healed w/ surgery)
    - 6 cases scarring in PF after surgical repair
    - 2 cases anal scarring after surgical repair

Heppenstall-Heger, Pediatrics 2003
Prevalence of STI’s

- Approximately 5% of sexually abused children will acquire a STI from their abuse
- In sexually abused children:
  - Gonorrhea <3%
  - Chlamydia <5%
- Adolescents: it is estimated that 25% of adolescents will develop a STI before graduating from high school.

AAP: Evaluation of SA In Children

<table>
<thead>
<tr>
<th>STD Continued</th>
<th>Sexual Abuse</th>
<th>Suggested Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gonorrhea</td>
<td>Diagnose</td>
<td>Report</td>
</tr>
<tr>
<td>Chlamydia</td>
<td>Diagnose</td>
<td>Report</td>
</tr>
<tr>
<td>HIV</td>
<td>Diagnose</td>
<td>Report</td>
</tr>
<tr>
<td>TPHA</td>
<td>Highly suspect</td>
<td>Report</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>Hepatitis test</td>
<td>Report</td>
</tr>
<tr>
<td>Hepatitis C</td>
<td>Hepatitis test</td>
<td>Report</td>
</tr>
<tr>
<td>HIV</td>
<td>Hepatitis test</td>
<td>Report</td>
</tr>
<tr>
<td>Syphilis</td>
<td>IgM</td>
<td>Blood Trucorr</td>
</tr>
</tbody>
</table>

STD Evaluation Guidelines: AAP

- Child has or had symptoms of an STD
- Suspected assailant is known to have or be at high risk for an STD
- Sibling or household member has STD
- Family requests testing
- Prevalence of STD in community is high
- Evidence of penetration or ejaculation

STD Testing

- SCREENING:
  - Urine (Nucleic Acid Amplification Test)
  - Chlamydia
  - Gonorrhea
- Cultures
  - Primary/confirmatory
  - Standard for Court
- Blood/Other
  - HIV
  - Syphilis
  - Hepatitis B, C
  - Wet Prep- Trichomonas
STD Colloquialisms

• Brothel-sprouts
• Cold-in-the-dong
• Crotch-rot
• Crud
• Cupid’s itch
• Dirty-barrel
• Foul-disease
• Galloping knob-rot
• Green-pee

Gonorrhea

• Green, purulent vaginal discharge, vulvitis, erythema
• Diagnostic for sexual abuse if not perinatal
• Typically presents with a discharge
  • Rectal and pharyngeal infections can be asymptomatic
• Girls presenting w/ discharge to ER: 9-11%*

Gonorrhea (the Clap): The Facts

• Bacterial infection
• Transmitted by sexual contact
  • Oral, penile, vaginal, rectal
• Symptoms:
  • Green, thick vaginal/penile discharge
  • Burning with urination
  • Asymptomatic - women
• Diagnosed by culture (gold standard)
• Diagnostic for sexual abuse/contact
• Treated with shot of antibiotics
• CAN be cured, may spontaneously resolve

2002 CDC STD Guidelines

Chlamydia (C. trachomatis )

• Most prevalent sexually transmitted infection in the US today (>20% adults)
• Often co-infection w/ Gonorrhea
• ~50% of infected males and 80% of infected females are asymptomatic
• Discharge– not always seen
• Obligate intracellular organism– fomite transmission very, very rare.

Chlamydia trachomatis: The Facts

• Bacterial infection
• Transmitted by sexual contact
  • Penile, vaginal, rectal, oral
• Symptoms:
  • Asymptomatic - women 50%, men 80%
  • Burning with urination
  • Discharge
• Diagnosis by culture for prepubertal children
• Diagnostic for sexual abuse/contact
• Treated with oral antibiotics
• CAN be cured, may spontaneously resolve

Herpes Simplex Virus (HSV)

• Herpesviruses: group of RNA viruses
• HSV 1 (mostly oral, ocular, skin, brain
• HSV 2 (mostly ano-genital)
• Varicella Zoster
  • Chicken Pox
  • Shingles-latent infection
• Oral, skin HSV- common infection in children


Transmission/Exposure

• Asymptomatic shedding of virus common.
• Transmission higher with active lesions.
• "Direct contact other than sexual intercourse can result in viral spread if an area of viral shedding comes in contact with skin or mucous membranes of a susceptible person".

Kimberlin, NEJM 350;1970-7

Genital Herpes: The Facts

• Viral infection
• Transmitted by sexual contact, direct contact of virus with non-intact tissues (non-sexual), autoinoculation
• Symptoms:
  • Painful ulcers
  • Dysuria
  • Fever
  • Recurrence less painful / shorter
• Diagnosis by viral culture, DFA, PCR testing
  • Antibody titers of little use
  • Suspicious for sexual transmission
  • No curative treatment
  • Incubation period 2-14 days


Warts

• Common in adults:
• ~10% of the adult population have clinically apparent ano-genital warts (HPV)
• Molecular testing- presence of HPV in up to 80% of asymptomatic, sexually active women
• Vaccine recently licensed for girls and young adults to prevent cervical cancer and warts from many strains of HPV.


HPV Transmission

• Sexual
  • Oral-genital contact
  • Genital-genital contact
  • Genital-anal contact
  • Fondling
  • Digital penetration of the vagina or anus
• Non sexual
  • Autoinoculation
  • Direct contact with caretaker
  • Contact with objects or surfaces contaminated with HPV fomites
  • Vertical transmission (mother to infant)
  • Via bloodstream prior to birth
  • During vaginal delivery through infected birth canal
  • Via c-section
    • w/ or w/o early rupture of membranes


Human Papillomavirus (Genital Warts): The Facts

• Viral infection
• Transmitted by sexual contact, vertical transmission, non-sexual transmission
• Symptoms:
  • Genital bleeding
  • Asymptomatic lesions/bumps
• Clinical diagnosis
  • DNA typing / biopsy not indicated
• Suspicious for sexual transmission
• No curative treatment - meds to control symptoms

2002 CDC STD Guidelines

Syphilis

• Spirochete infection
• Transmitted by sexual contact, perinatal
  • Diagnostic of SA if not acquired from birth
• Symptoms:
  • Asymptomatic
  • Primary syphilis - chancres, moist ulcerations
  • Secondary syphilis - skin rash, palms, soles
• Diagnosed by blood test (RPR, VDRL)
• Treated with antibiotics (Penicillin)
• Curable

2002 CDC STD Guidelines
Sexual Abuse

Take Home Points

• Examination can usually not rule sexual abuse in or out.
• Most (> 90%) exams normal.
• Why?
  • Type of contact
  • Healing of injury
  • Elasticity
  • Child’s perception vs. adult

Take Home Points

• Medical Exam:
  • Part of investigation
  • Part of recovery for children, parents
  • Rule out medical conditions/causes
  • Exam well tolerated
  • Speculum not used in children
  • Important to prepare family for examination.

Medical Neglect

Neglect Definitions

• “A condition in which a child’s basic needs are not met, regardless of cause” (Helfer, Dubowitz)
• Acts of omission by those responsible for the child’s health or well-being
• Clear and identifiable harm or injury is the legal context for definition.

U.S. Definitions of Child Neglect

• Omission in care
• By parent or caregiver
• Causing significant harm
• Or, risk of significant harm
• Basic needs not met
  • Adequate food, clothing, healthcare, supervision, protection, education, nurturance, love, a home

Types of Neglect

• Nutritional Neglect
  • Failure to thrive
• Physical Neglect
  • Hygiene, clothing, shelter
• Supervisory Neglect
  • Frequency, chronicity, danger of environment (pool)
• Educational Neglect
  • Truancy, not enrolled in school, special needs not met
• Medical Neglect
Medical Neglect

- Non-adherence to medical recommendations
- Delay or failure in seeking medical care
- Failure to provide needed medical treatments
- Refusal to allow health care
  - Mistrust of medical care system
  - Religious or cultural attitudes

Questions to Ask in Medical Neglect Cases

1. Is there risk resulting from inaction?
2. Is there harm resulting from inaction?
3. Why did parents not seek care or comply?
4. How did system engage parents?
5. Potential benefits of care?

Questions to Ask in Medical Neglect Cases

6. Potential risks of care?
7. Expected outcome without care?
8. Expected outcome by providers?
9. Parents aware of providers’ expectations?
10. Outcome related to absent care?

Eczema

- Greek word “to effervesce or bubble or boil over”
- Atopic dermatitis – itchy, red rash
- 10% of children/infants
- Can be all over body
  - Infants – face
  - Children – neck, wrists, ankles, and flexural areas (elbows, knees)

Scabies

- Infestation with Sarcoptes scabei
- Clinical Signs
  - Intensely pruritic
  - Usually affects entire family
  - Scabies mite burrows into the skin
  - Scabies feces causes pruritis
- Diagnosis
  - Scraping of skin and microscopic exam
- Treatment
  - Permethrin or Benzene hexachloride cream
  - Wash all clothes and treat all family members

Asthma

- Inflammatory lung condition
- Bronchoconstriction (narrowing of airways)
- Medical management
  - Bronchodilators – as needed, rescue treatment
  - Inhaled steroids – daily use, preventative
  - Oral steroids – with acute episode
- Morbidity and mortality
  - Impaired daily function
  - Can be fatal
Obesity as Neglect

- Serious comorbid conditions that can be reversed or improved with weight loss
- Serious comorbid conditions that are not reversible in adulthood
  - Severe obstructive sleep apnea with cardiorespiratory compromise
  - Uncontrolled type 2 diabetes
  - Advanced fatty liver disease and cirrhosis


Obesity Treatment

- Court involvement may be warranted when all in-home approaches and alternative options are exhausted
  - Nutrition, exercise, behavioral interventions ("weigh ins", hospitalization, group homes)
- Case for removal stronger when comorbid conditions are no longer reversible (e.g. advanced hepatic fibrosis)
- Removal to provide necessary medical and lifestyle treatments


Obesity Treatment

- Goal of removal is to achieve modest weight loss to lessen or eliminate comorbid conditions → healthier child not a non-obese child
- Safe from imminent harm


Neglect Summary

- Not black and white – wide spectrum to consider with each case
- Education, patience, and close follow-up are the key
- Collaboration with investigators
- Criminal prosecution is not common

Medical Child Abuse 
aka 
Munchausen Syndrome by Proxy 
aka 
Factitious Disorder by Proxy/ 
Pediatric condition falsification

Historical Context

- Baron Karl Friedrich Hieronymous von Münchausen (1720-1797)
  - A mercenary who, upon returning from the war would tell tales of his exploits
  - Gained much regional notoriety and his tales grew
- Asher, Lancet 1951
  - Coined the term Munchausen Syndrome
- Meadow, Lancet 1977
  - Expanded the spectrum to include “Munchausen Syndrome By Proxy”

Vernacular

- Munchausen Syndrome By Proxy (MSBP) contains:
  - Factitious Disorder by Proxy (FDP)
  - DSM-IV (300.19)
  - Pediatric Condition Falsification (PCF)

Terminology

- Munchausen Syndrome By Proxy
- Factitious Disorder By Proxy
- Pediatric Condition Falsification
- Medical Child Abuse

Definition

- Medical child abuse occurs when a child receives unnecessary and harmful or potentially harmful medical care at the instigation of a caretaker

Examples:

- False epilepsy
- Extreme illness exaggeration
- Recurrent suffocation
- Polymicrobial sepsis
- Chronic intestinal pseudo-obstruction
Spectrum

- Three major divisions
  - "Inducers" (50%)
  - "Fabricators" (25%)
  - Mixed (25%)
- Victims
  - Most are younger than 1 year
  - Equal male and female distribution
  - Over 1/3 with siblings are also victims

Common Manifestations (Perpetrators)

- 95% are females
- Appear genuinely caring
  - Rarely combative, until confronted
- Commonly have medical knowledge
  - 80% work in healthcare
- 70% have somatoform disorder themselves
  - Chronic complaints

Age Distribution At Diagnosis

- Median = 20 months

Commonly Reported Histories

- Apnea, difficulty breathing
- Seizures
- Vomiting
- Cyanosis
- Fever
- Altered mental status
  - Coma/obtundation/"life-less"
  - Irritability

Commonly Described Behaviors

- Altering blood or urine samples
- Altering IVs, feeding tubes or charts
- Contaminating wounds, IV lines
- Poisoning (salt, drugs, medicines)
- Smothering
- Starvation
- Induced diarrhea

Common Clinical Characteristics

- Multiple food/drug allergies
- Atypical seizures, ALTE, SIDS, apnea
- Caretaker with similar medical history/concerns
- Laboratory results differ from how the child appears
- Persistent or recurrent illnesses
- Polymicrobial bacteremia
Common Clinical Characteristics (cont)
- Treatments are not tolerated
  - IV’s come out, vomiting after medicines
- Multiple physicians involved
- Multiple tests performed
- Mother very attentive, welcomes new procedures or tests
- Father typically passive; at work a lot
- Symptoms witnessed only by the mother

Motivation
- Termed “the perversion of mothering”
  - Often feeling unwanted
- History of neglect (by their fathers)
- Key to recognition is understanding the mother’s motivation
  - Motivation is very complex
  - Motivation is not to punish the child
  - Motivation is to assume “sick role” by proxy
  - Motivation is the intent to deceive

Motivation
- The behavior is not directed towards the child
  - The behavior is via the child
- The behavior results in a sense of control
  - A sense of power
  - A sense of respect
  - A sense of importance

Management Of MSBP
- Realization of MSBP comes slowly
  - Disbelief of the medical staff
  - Attachment to the parents
  - Disbelief that the medical team has been duped
  - Fear of being wrong in the allegation
- Intervention depends upon
  - Degree of proof
  - Degree of danger
    - Age of the child (<5 years)

Management Of MSBP
- Review of the history
  - Try to discern what is fabricated and what is real
  - What has occurred in the presence of any other person?
    - Talk to that person
    - Remember many will have real diseases as well
- Look for temporal relationship between the event and the mother

Management Of MSBP
- Check on the detail of the personal, social and family history given by the mother
  - There can be a web of fabrication
  - Many people of the medical team will recite the same falsehoods
  - Never assume truth
- Make contact with other family members
  - Talk with the father and grandparents
Definitive Test—Separation

• Truest diagnostic test is to take the mother (or father) out of contact with the child
• Try to convince the parent to be away from the child to “give her a break from the hospital”
• If they get better, it is strong evidence of their participation in the illness
• If they continue to be ill, it is strong evidence of an underlying illness
• Unless they have complications of the “induced” illness

Collaboration:
The Key to Child Protection