

Physical Abuse 101

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Objectives

- Recognize common physical abuse injuries
 - Cutaneous findings
 - Sentinel injuries
 - Fractures
- Develop a diagnostic approach to potentially inflicted injuries
- Be able to accurately interpret findings for MDT partners



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VISIBLE INJURIES



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What is a sentinel injury?

- A relatively “minor” injury identified in a child
- Most often in pre-cruising infant
- May not be a serious injury alone but is a sign of potentially worsening abuse
- Sentinel injuries may be missed or downplayed by medical providers
 - This results in missed opportunities to protect children



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TEN-4-FACES^{sp}
Bruising Clinical Decision Rule for Children <4 Years of Age

When is bruising concerning for abuse in children <4 years of age?
If bruising in any of the three components (Regions, Infants, Patterns) is present without a reasonable explanation, strongly consider evaluating for child abuse and/or consulting with an expert in child abuse.

REGIONS	INFANTS	PATTERNS
<p>TEN Torso Ears Neck</p> <p>FACES Frenulum Angle of Jaw Cheeks (fleshy part) Eyelids Subconjunctivae</p>	<p>4 months and younger</p> <p>Any bruise, anywhere</p>	<p>Patterned bruising</p> <p>Bruises in specific patterns like slap, grab or loop marks</p>

See the signs. Unexplained bruises in these areas most often result from physical assault. TEN-4-FACES^{sp} is not to diagnose abuse but to function as a screening tool to improve the recognition of potentially abused children with bruising who require further evaluation.

TEN-4-FACES^{sp} was developed and validated by Dr. Mary Clude Penne and colleagues. It is published and available for FREE download at <http://archfamily.org/en-4-faces>.

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Sentinel Injuries

- 200 abused infants compared to 101 non-abused matched cases
 - 27.5% of abused infants had history of previous sentinel injury
 - None of the non-abused infants has a previous sentinel injury
- 66% of sentinel injuries were in infants <3m
- 95% occurred in patients ≤7m
- A medical provider was aware of the injury in 42% of the cases



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Types of Injuries

- Intraoral injury
- Ear injury
- Subconjunctival hemorrhage (not present in perinatal period)
- Bruises in non-mobile infants

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Oral Injuries

- Frena/Frenula/Frenum: piece of tissue attaching the lip to the gum (top and bottom) and the tongue to the floor of the mouth
- May be injured accidentally in a mobile child
 - Running with something in the mouth
 - “Face plant” with a drag
 - Falling on the face

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Oral Injuries

- If torn in an infant, very frequently associated with inflicted trauma
 - Shoving something (pacifier, bottle, medicine dropper) in the mouth
 - May be seen with suffocation/smothering
- Appearance of a lot of blood due to blood mixing with saliva
- Heals rapidly
- May look like an isolated spot of thrush when healing

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Ear Injuries

- Ears tend to be in protected location and are not commonly injured in falls
- Accidents can happen but wouldn't be “unknown” in non-mobile infants
- Injuries caused by being hit or pinched/pulled
- Can be permanently disfiguring depending on severity

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Subconjunctival Hemorrhage

- Infants DO NOT sustain subconjunctival hemorrhages from
 - Constipation
 - Coughing (unless they have pertussis)
 - Vomiting
 - Crying
- Infants DO sometimes have subconjunctival hemorrhages from delivery
 - Early documentation is key

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Subconjunctival Hemorrhage

- Subconjunctival hemorrhages in infants are often due to
 - Smothering
 - Suffocation
 - Strangulation
 - Direct injury to the eye

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Cutaneous Injuries

- Bruises are the most common presenting injury in abused children
- Bruises often are considered “minor” or “normal”
- If a medical provider sees the injury, they may underestimate its importance and not document it or the history provided for it

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Bruising by Age

- “Those who don’t cruise, rarely bruise”
- Study of almost 1000 children <36m of age
 - 20% had bruises on exam

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Bruising by Age

- By age, however, their developmental status was key
 - 0.6% <6m
 - 1.7% <9m
 - 2.2% in non-cruisers (not up on 2 feet)
 - 17.8% cruisers
 - 51.9% walkers
- Sugar, et al, 1999

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Cutaneous Findings

- Remember, there are very few, truly pathognomonic findings of child abuse
- History is essential
- Developmental status is also very relevant
- Take pictures with and without size standards
- Palpate the area
- Objectively document, don’t subjectively speculate

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Timing the Injury

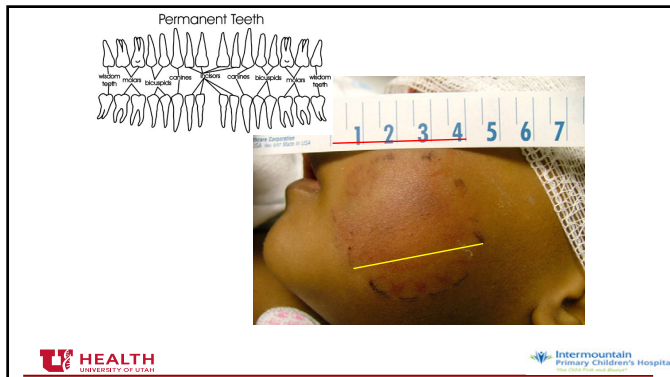
- Bruises CANNOT be dated clinically
 - Evolution of bruise varies based on body fat, UV exposure, depth and extent of injury, skin complexion
- Guessing at an age is not helpful and may be misleading
- “Bruising of more than one age” is suggesting you know any age of any bruise

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Bites

- Human bites
 - Bruises
 - Suction mark (hickey)
 - Can have tears—consider antibiotics
- Animal bites
 - Punctures
 - Tears
 - Often needs antibiotics
- Insect bites
 - Can be confused for cigarette burns

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Diagnostic Approach

- Take a GOOD history
 - How long has it been there?
 - What is the story—open ended narratives, use quotes, clarifying questions
 - Others in household with similar findings?
 - Changes?
 - Concurrent symptoms?
 - Recurrence?

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Diagnostic Approach

- Complete physical exam
- Pictures
- Review the chart
- Consider labs
 - SHF
 - Derm
 - ID

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FRACTURES

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Fractures

- 55%-70% of all inflicted fractures occur in children <12 months of age
- **80%** of all inflicted fractures occur in children <18 months of age
- Only 2% of accidental fractures occur in children <18 months of age

Merten, et al 1983
Kirkham, et al 1995
Gross, et al 1983
Worlock, et al 1986

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Identifying Fractures

- Fractures in infants can be *VERY* hard to identify during a clinical exam
- Overlying bruises are rare
- Swelling can be difficult to appreciate
- Pain presents non-specifically

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Key Point

- No fracture is *pathognomonic* for abuse, though some have a high specificity
 - Posterior rib fractures
 - Metaphyseal fractures
- Spiral fractures, in general, have a *low specificity* for abuse
 - Exceptions are in non-mobile infants

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Specific Fracture Features

- Can be seen in child abuse, but low specificity
 - Long-bone fractures (femur, tibia, humerus)
 - Linear skull fractures
 - Fractures of distal extremities in > 1 year old
- More likely to be accidental
 - Clavicle fracture
 - Supracondylar humerus fracture
 - Children > 1 year old fall while running

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Keys to Making the Diagnosis

- A thorough and comprehensive HISTORY
 - ...of the traumatic event—from eyewitnesses when possible
 - ...of child's development, diet, family and social environment

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Keys to Making the Diagnosis

- Documentation
 - History
 - Actual quotes AND the original question
 - Legible and intelligible (non-medical audience)
 - Objective: what is said, not what you interpret was being said

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Diagnostic Evaluation



- Skeletal surveys are **mandatory** in evaluation of physical abuse in child less than 2y
- May be used in children 2-5y
- Little use over 5y
- Post-mortem studies also important
- Minimum of 20 films

http://www.aap.org/SecondaryMainMenuCategories/quality_safety/guidelines/ck/mw/skeletal_surveys.aspx

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Posterior Rib Fractures

- Rib fractures can be difficult to detect acutely due to lack of displacement and overlying lung markings
- Callous formation can take 10-14 days to be radiographically evident, hence the value of follow-up skeletal surveys
- Posterior rib fractures may not be painful or obvious to non-offending caregiver

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Key Point: Posterior Rib Fractures

- Autopsy specimen of 2 week old infant who died of AHT
- Post-mortem SS was negative
- Posterior rib fractures with callous seen at autopsy
 - Post-mortem CT reviewed with new information and fractures could be seen—barely

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Posterior Rib Fractures

- Posterior rib fractures do NOT happen from CPR, crush injuries, falls or impacts
- They occur due to A/P squeezing of the chest
 - May be associated with clavicular fractures if the thumb is positioned over the clavicle with pressure exerted
- Caregivers that cause these fractures report feeling it and sometimes hearing it break

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Distal Femoral Buckles

- Associated with axial load to the knee
 - Falls from a surface (bed, changing table)
 - Being dropped and landing on a knee
 - Sitting devices that baby gets stuck being put in or being removed
- Can be a forceful bending while holding lower legs
 - Cannot sort out accident v. inflicted based on fracture
 - If presenting history is axial load as above and then the fracture is found, that could be a strong indicator of an accident
 - When in doubt, get a skeletal survey

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Key Point

- Sometimes the caregiver who presents to care is not the caregiver who was with the patient when it happened
 - Do not assume a “changing history” is the reason the information changes as people gather information, it may be additional data is sought or obtained
 - Eyes on history is always the best, even if it isn't an adult
 - An absence of a history does not always mean abuse or that someone is lying

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Key Point

- No matter the history, a complete, thorough physical exam is necessary
- A skeletal survey may be necessary
- Consultation may be necessary
- Don't assume...
 - Nice families can have bad things happen
 - “Not nice” families may not have done anything wrong

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Metaphyseal Corner Fractures

- Almost exclusively in children <18m of age
- Happens when the corners or ends of the long bone physically are separated from the shaft through a yank or pull
- May be difficult to discern with a single view
 - Consider the use of laterals and repeat images to better define
 - Adult radiologists may miss these due to specific age in which it is found

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Siblings at Risk

- Siblings or other children in care of the same adult(s) require medical evaluation under a “sibling at risk” protocol
 - Complete skin exam in all children
 - Skeletal surveys in children <12 months
 - Consider head CTs in children <6 months or if findings on exam
 - Consider forensic interviews of verbal children
- Twins/triplets/higher order multiples are at especially high risk for abuse by same caregiver

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Reminder

- People who cause these injuries rarely intend to hurt the child
- Sentinel injuries are very frequently the result of a frustrated caregiver who is handling the infant more roughly than they would normally or have in the past

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Final Points to Remember

- Injuries in pre-verbal children often require multidisciplinary collaboration
- Thorough histories are essential to prevent over and under calls
 - Be wary of calling something a “changing history”, it could be poor history taking or poor documentation
- Skeletal surveys in children less than 2 years of age are necessary adjuncts to clinical evaluation of fractures when abuse is suspected

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