Identifying Non-Accidental Trauma in Pediatrics

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Learning Objectives

The participant will be able to:

- Explain the relationship between clinical history and physical abuse diagnosis
- Recognize sentinel injuries
- Determine when to screen for occult injury
- Review common physical abuse injuries

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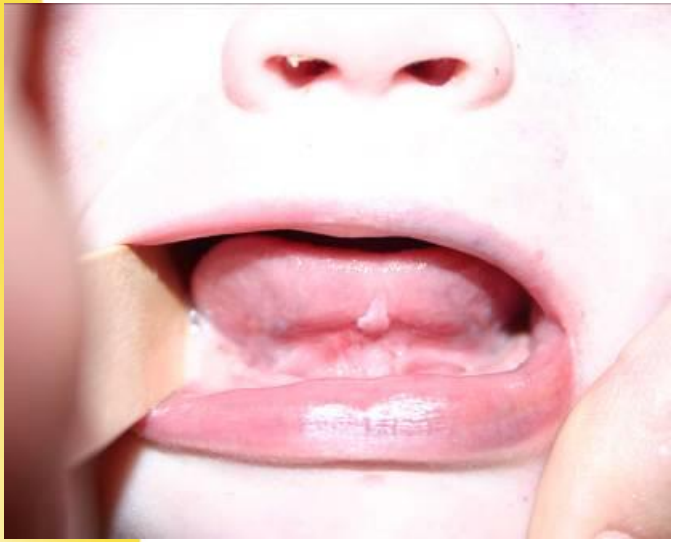
The Case for Increased Screening

Time 1



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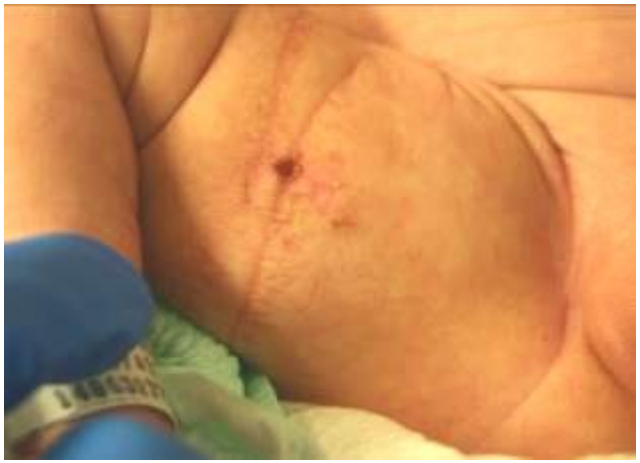

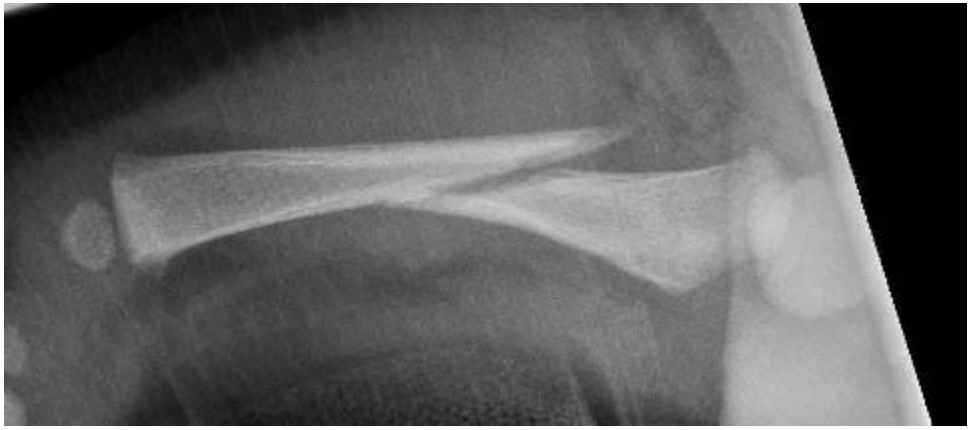

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More than Anecdotes

- Jenny ’99
  - 30% of Abusive Head Trauma initially missed
- Ravichandran ’10
  - 20% of abusive fractures initially missed
- Theodore ’05
  - Phone surveys identify abuse in ~1% of children (40-150 times the rate of reports)

Beyond the Isolated Risk

- Long term exposure is emotionally detrimental
- Prevention of more serious injuries
- Other children in home
- Recognition of concomitant violence

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Recognizing Inflicted Injury Is Challenging

- Histories are misleading
- Injuries are occult
- Emotionally stressful
  - Medical-legal
  - Confrontation
  - Anger

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Making the Leap

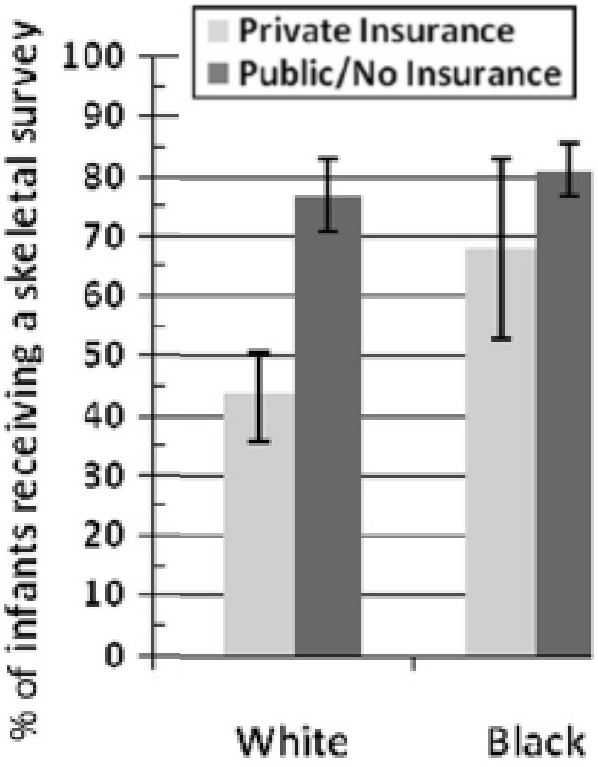
TABLE 2 **Level of Clinician Suspicion According to Decision to Report to CPS**

Management Status	Level of Suspicion, *n* (%)			
	Unlikely	Possible	Likely	Very Likely
Reported to CPS	7 (0.5)	34 (24.3)	25 (86.2)	29 (64.4)
Not reported to CPS	1464 (99.5)	106 (75.7)	4 (13.8)	16 (35.6)

aherty

Fairness

- Disproportionately decreased screening in Caucasian families with higher SES



Wood et al 2010

Social History

- It’s worth the extra time.
- There is no caregiver profile.
- Develop the skill to ask the difficu questions and know your comfort level.
- Start from a supportive viewpoint.
- Strengths and weaknesses

Don’t Do Anything Differently

Assess the finding thoroughly

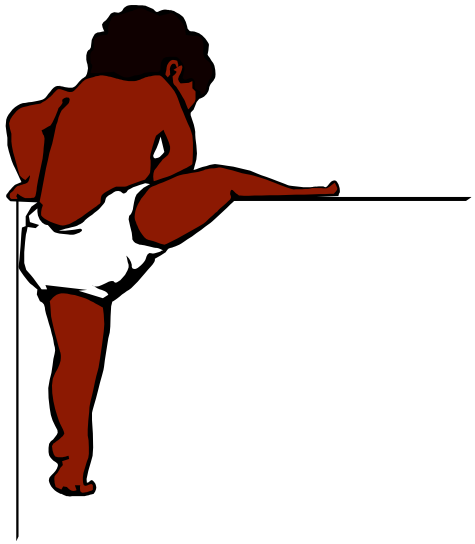
Be objective in assessment, including other diagnosis

Consider SCREENing

Document accurately (and with photography if possible)

Physical Abuse Diagnosis

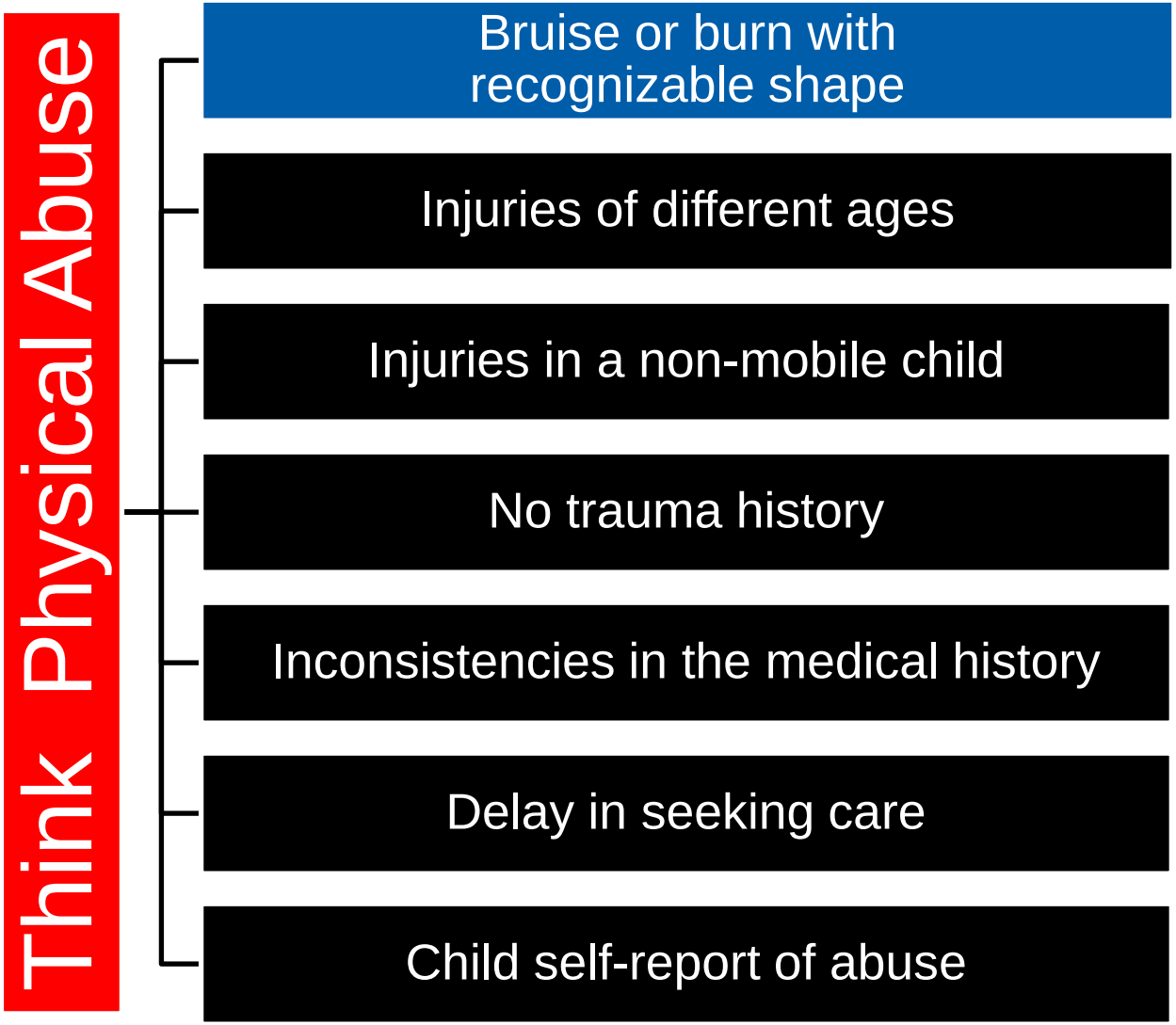
- Does the mechanism fit the injury?
- Some injuries are more specific for abuse but none are pathognomonic.



Do the facts as given in the history, correlate with the following:

- severity of the injury?
- age of the injury?
- location of the injury?
- pattern of the injury?
- developmental age of the child?

Abuse Algorithm



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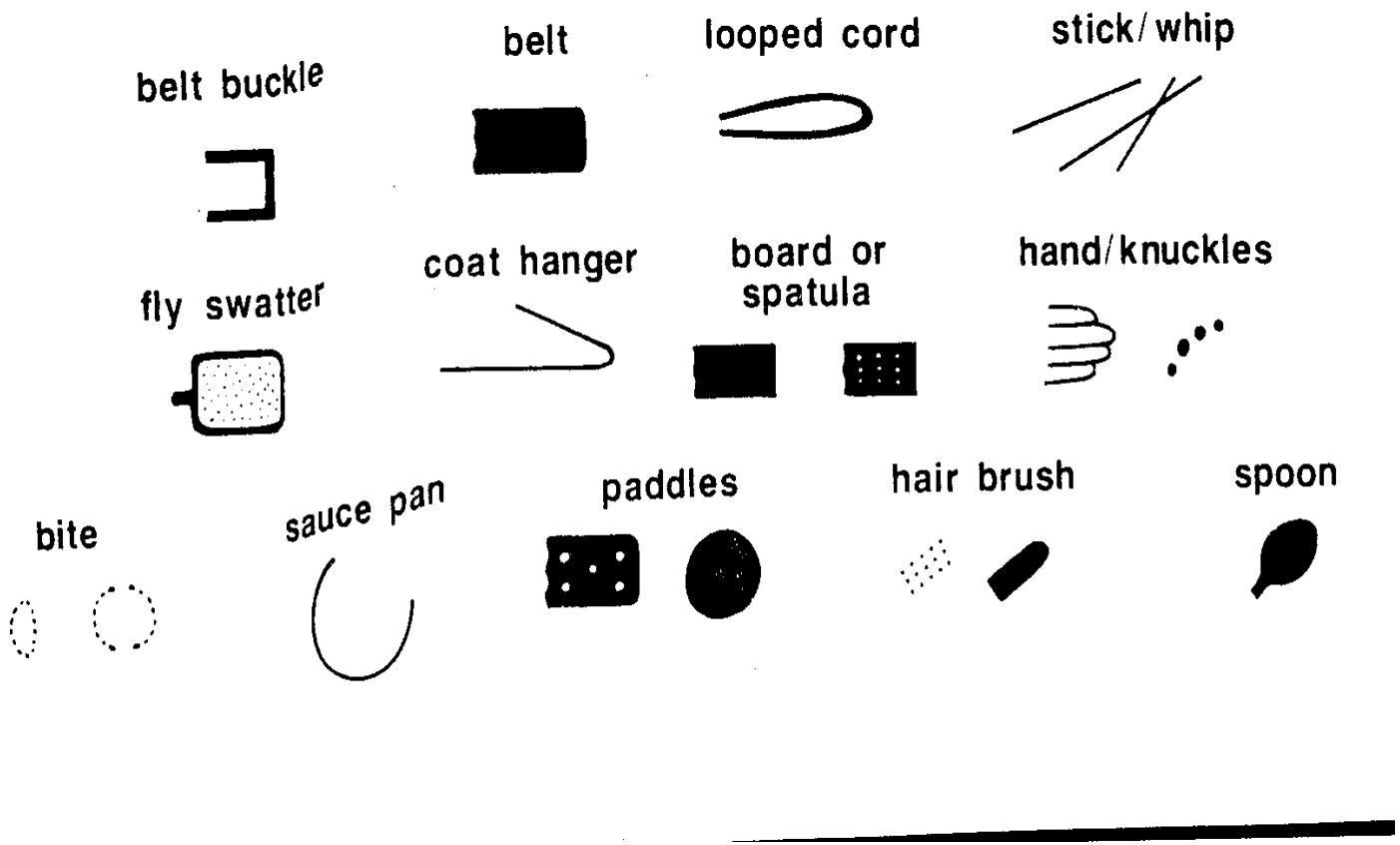
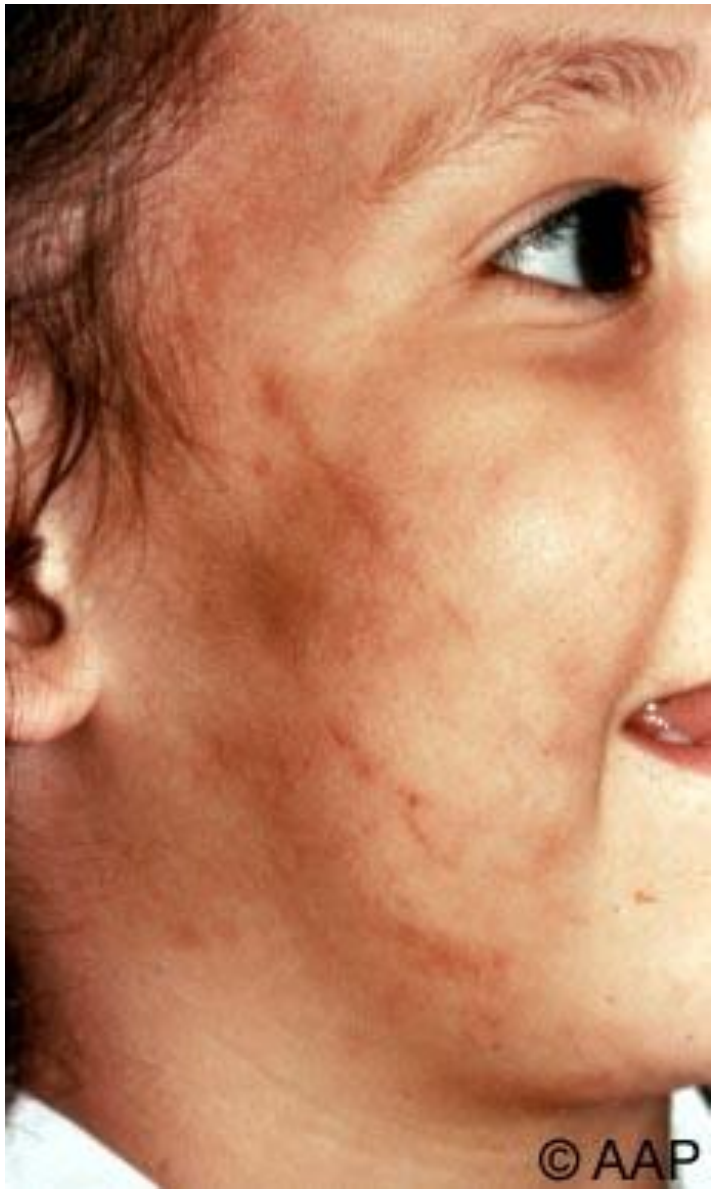
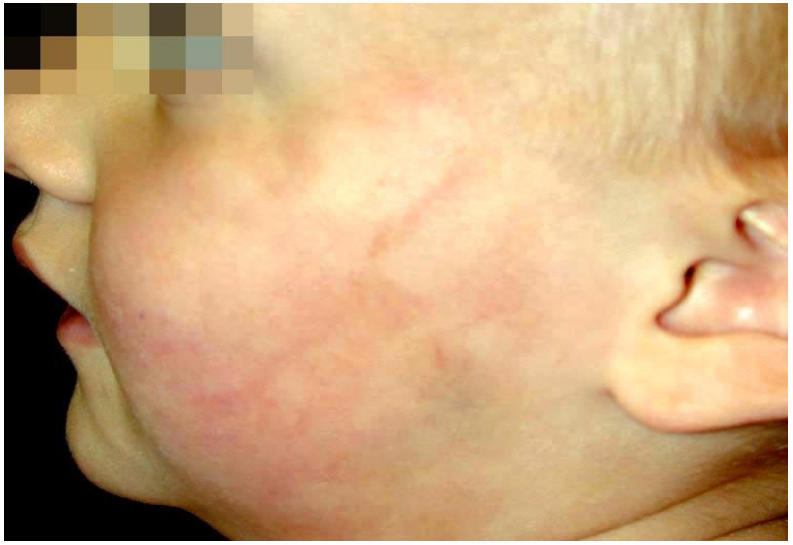
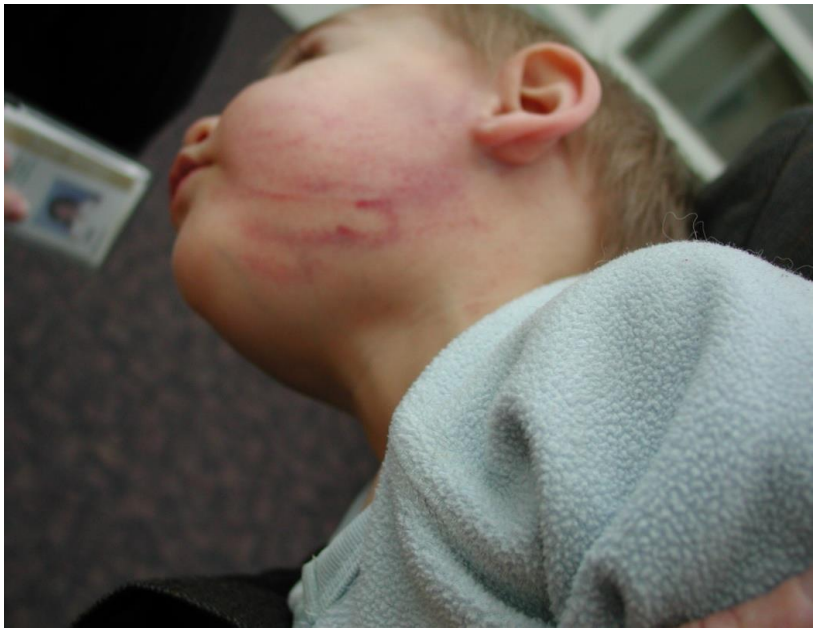
MARKS from INSTRUMENTS



Bruise with recognizable shape







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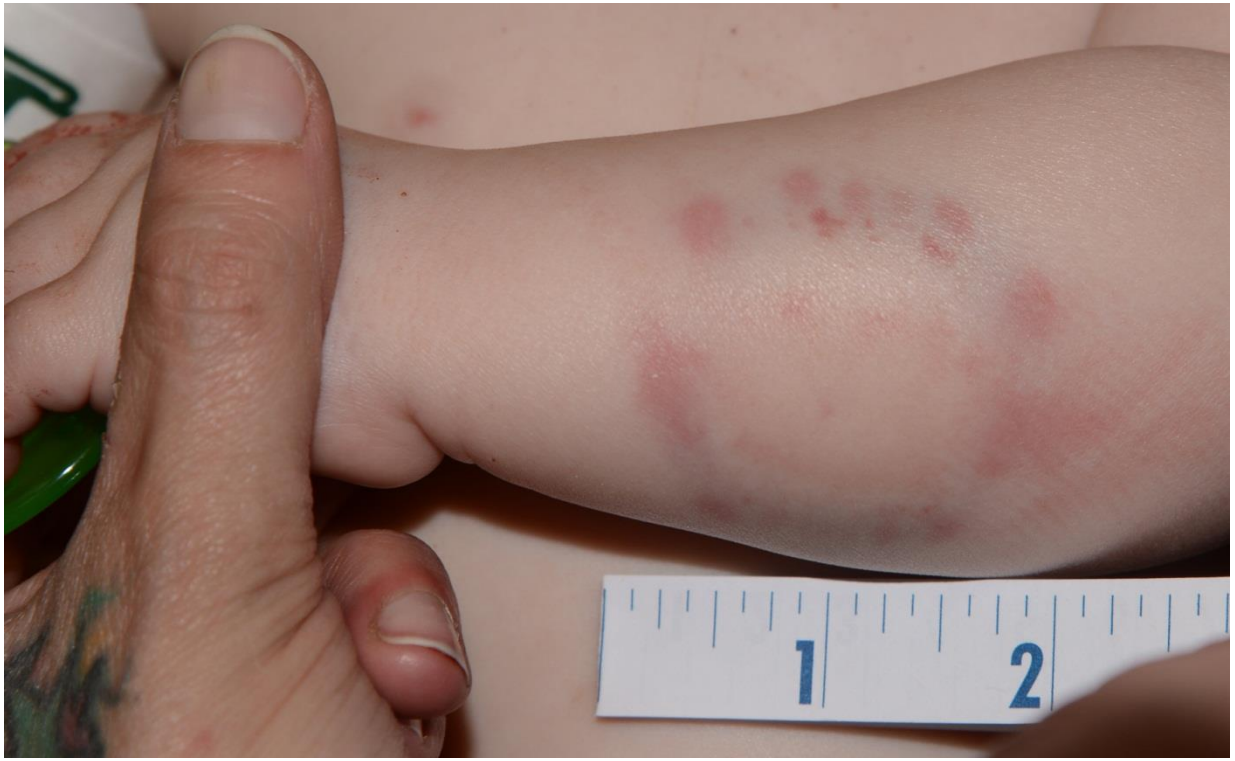
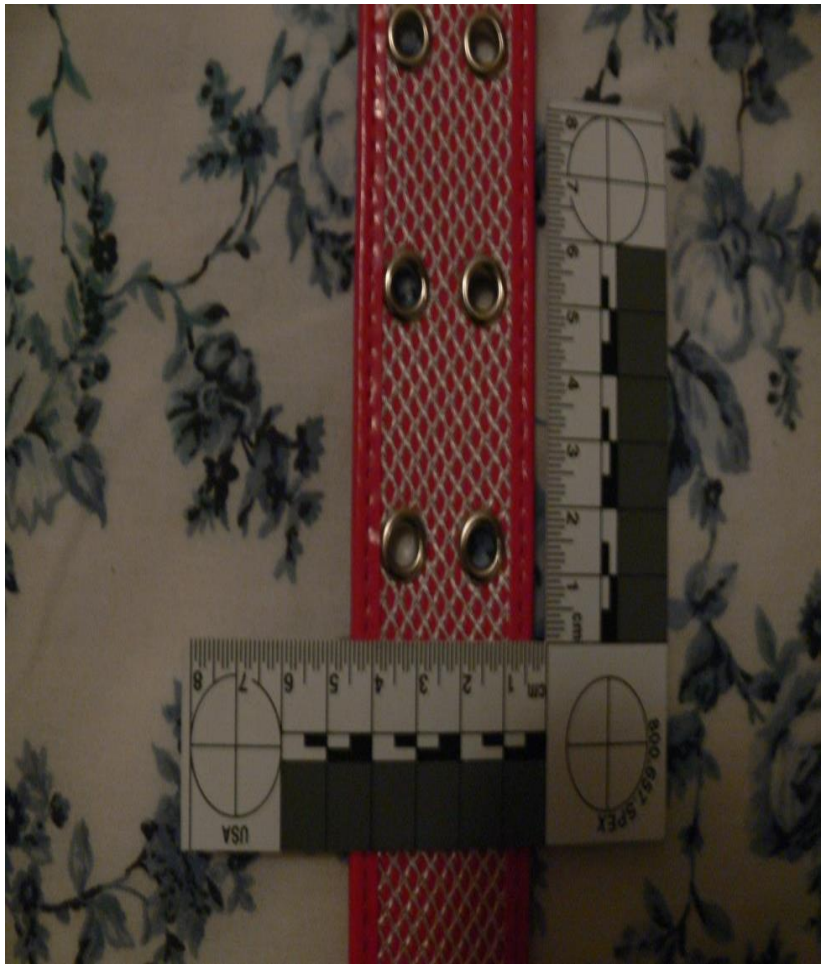
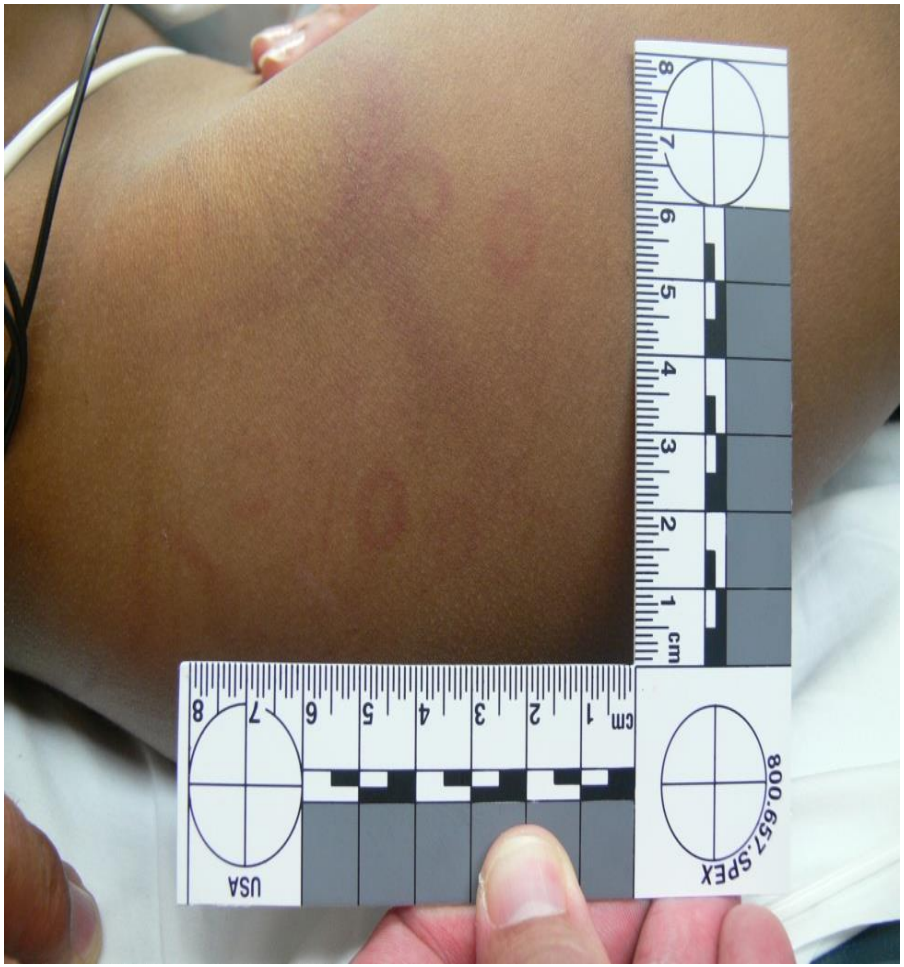
Bruise with recognizable shape



Bruise with recognizable shape





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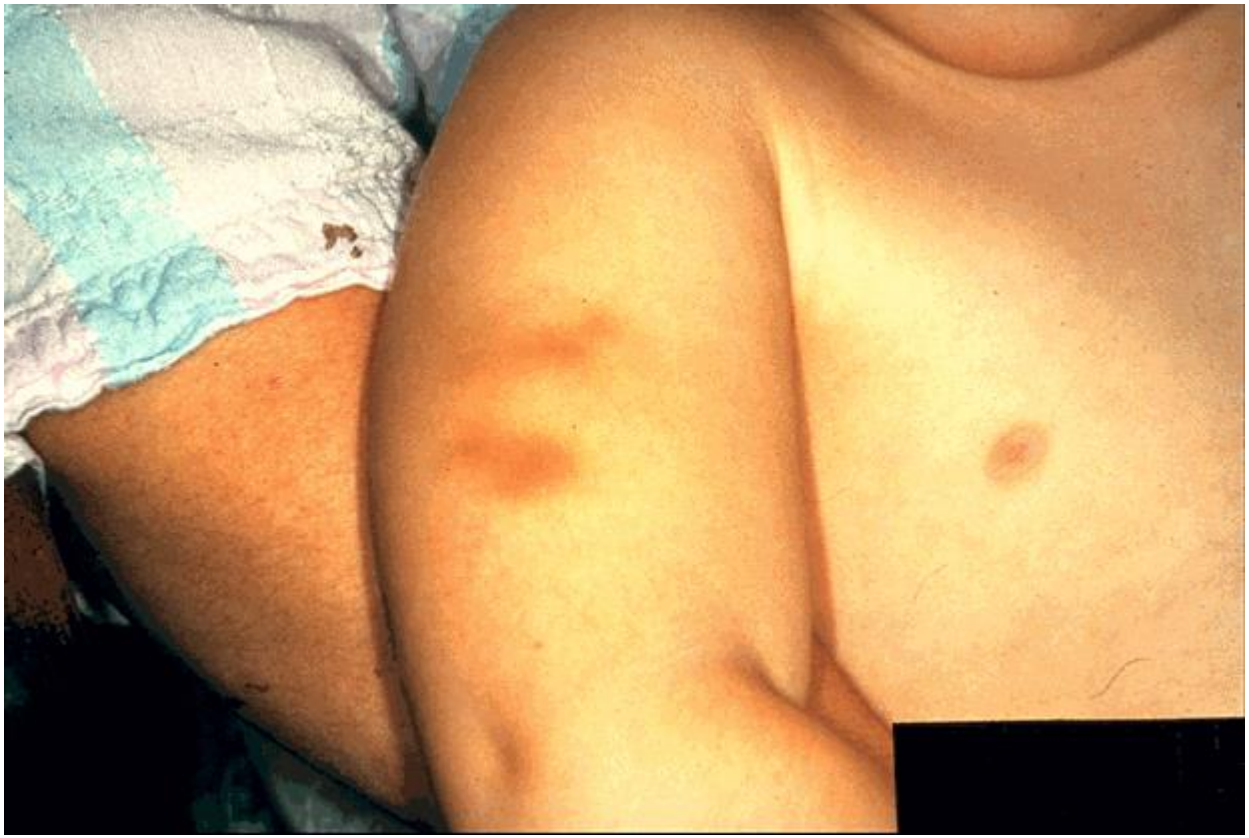
Bruise with recognizable shape



Burns with recognizable shape

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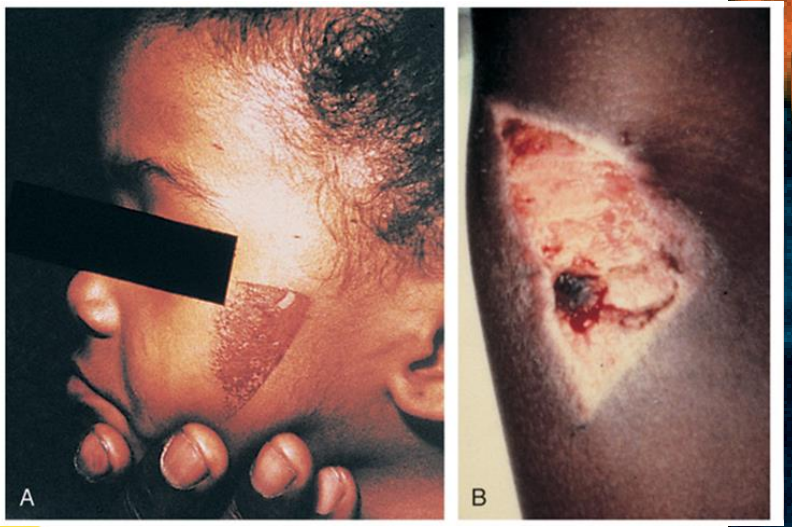

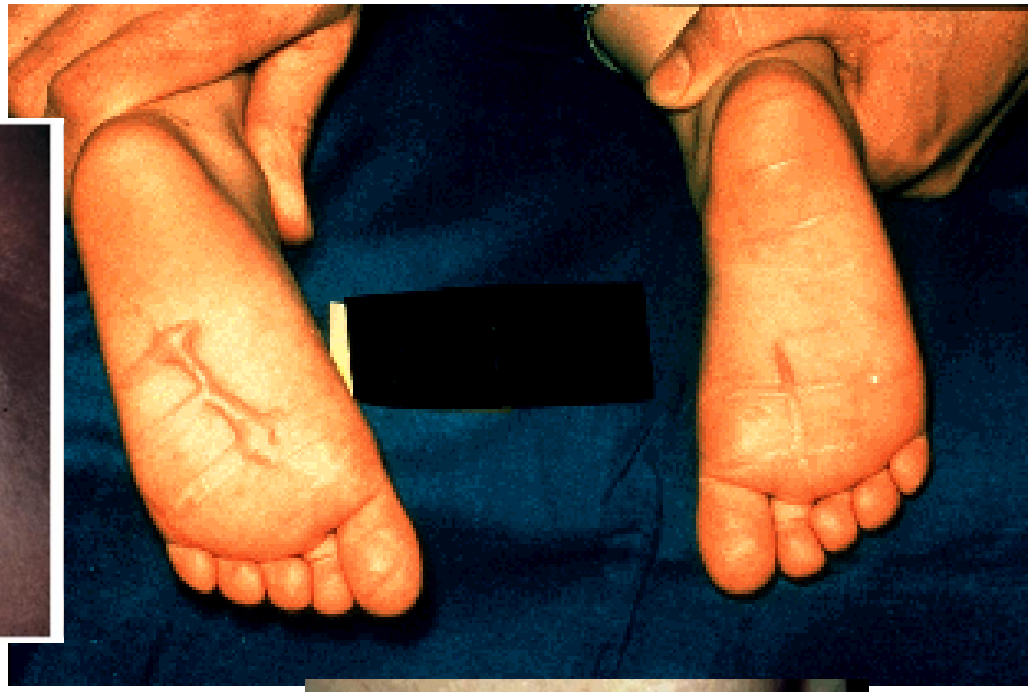

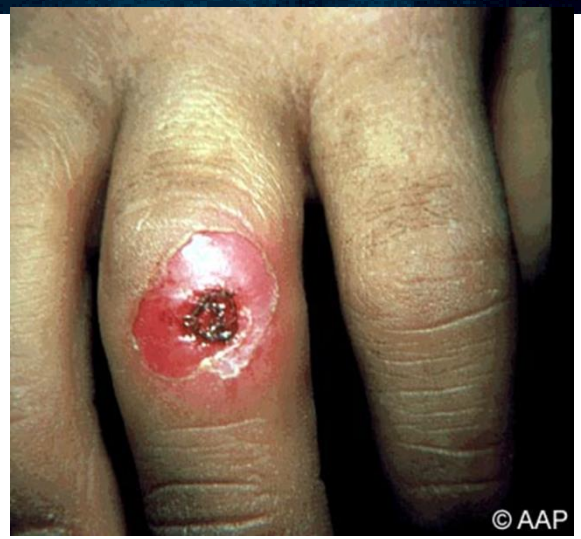

Level of water results in uniform demarcation line

Flexing results in apposition of skin surfaces and burn protection

Surface contact protects skin from hot water

Immersion burns often result in typical patterns that give clues to mechanism of injury

JOHN A. CRAIG, MD
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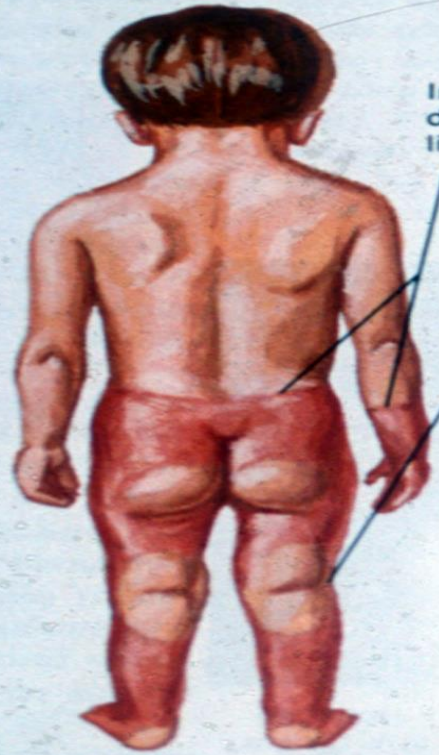
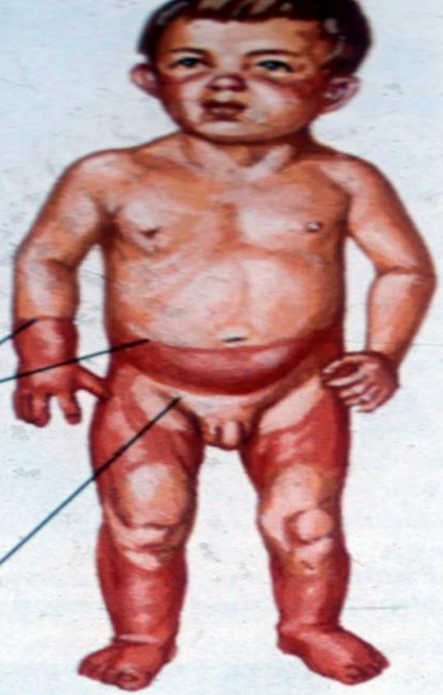
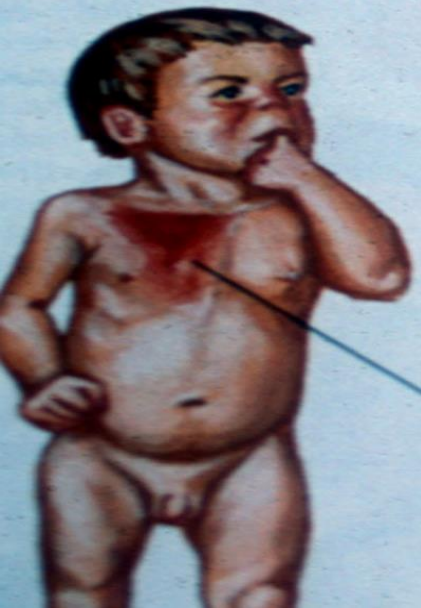


Immersion demarcation line

Areas of skin spared by flexion

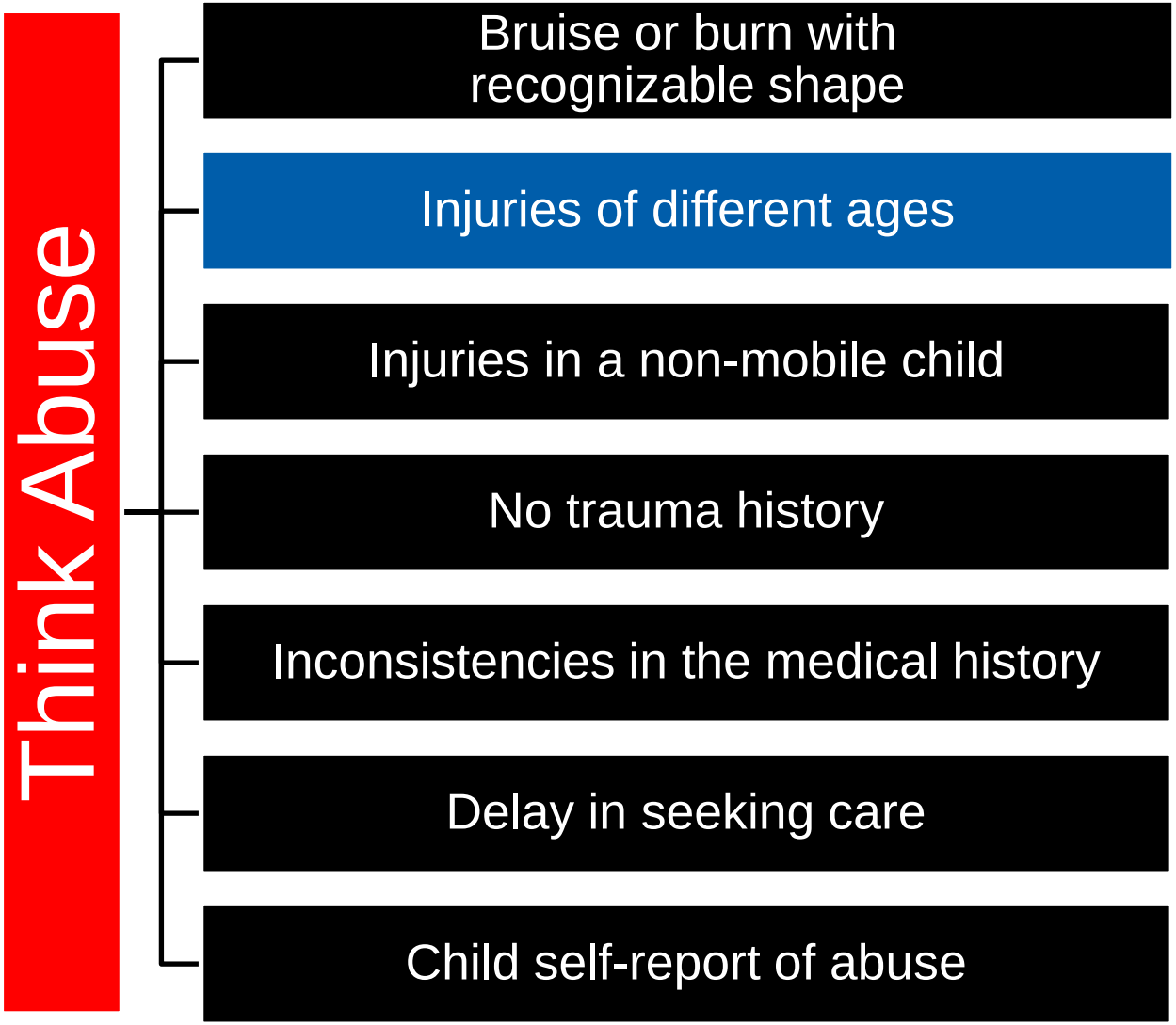


Typical immersion burn. Uniform degree of injury with interspersed protected areas



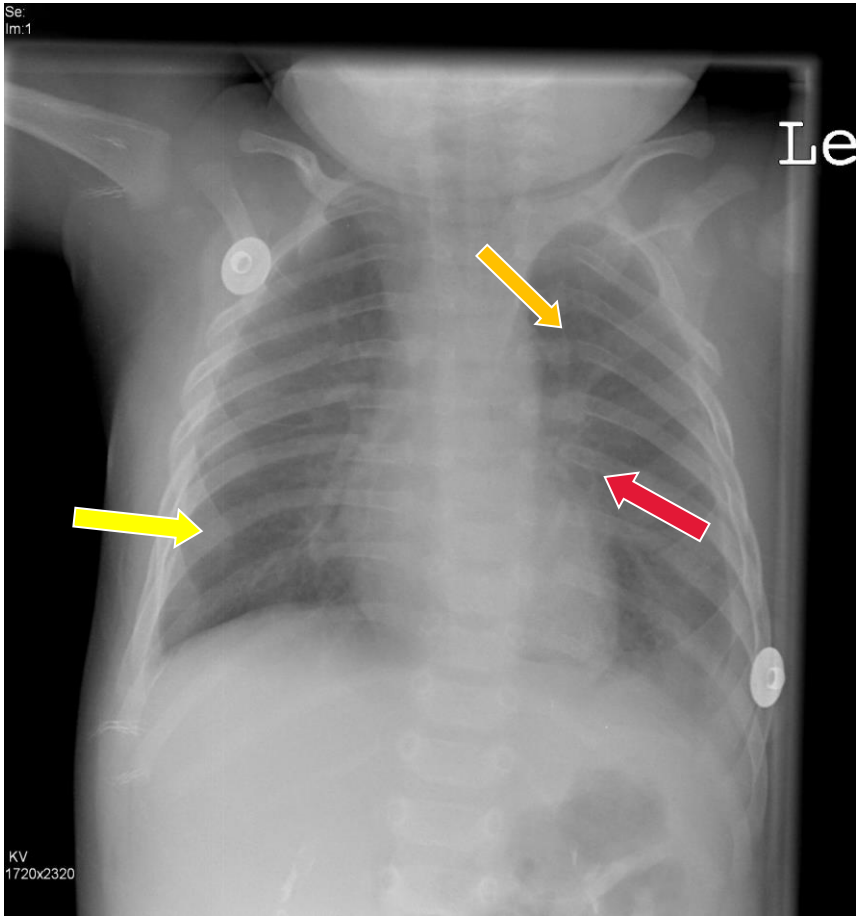
Scald or splash injury from liquids usually results in single burn that diminishes in intensity from point of contact

Abuse Algorithm

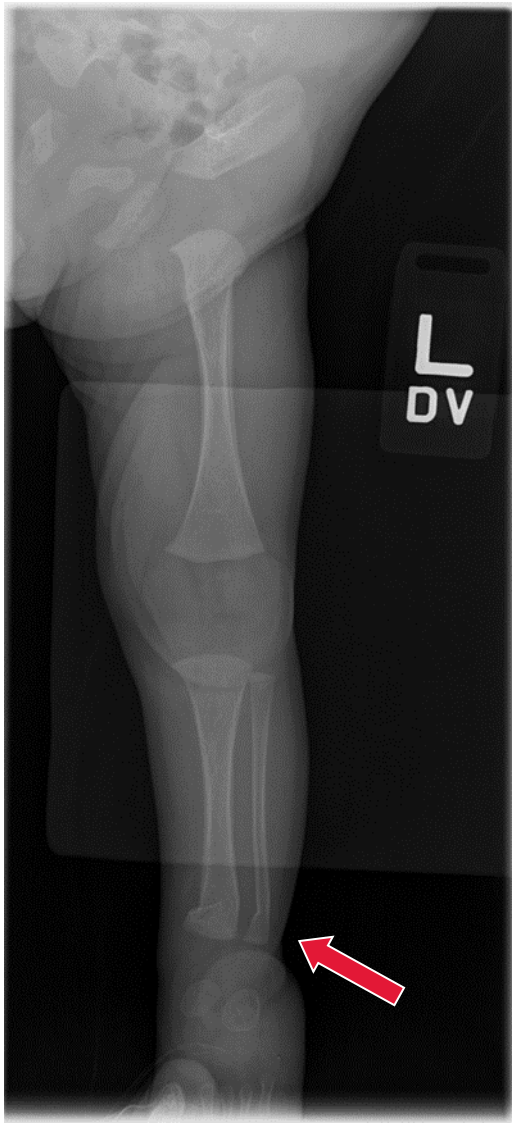


Multiple Injuries, Different Ages

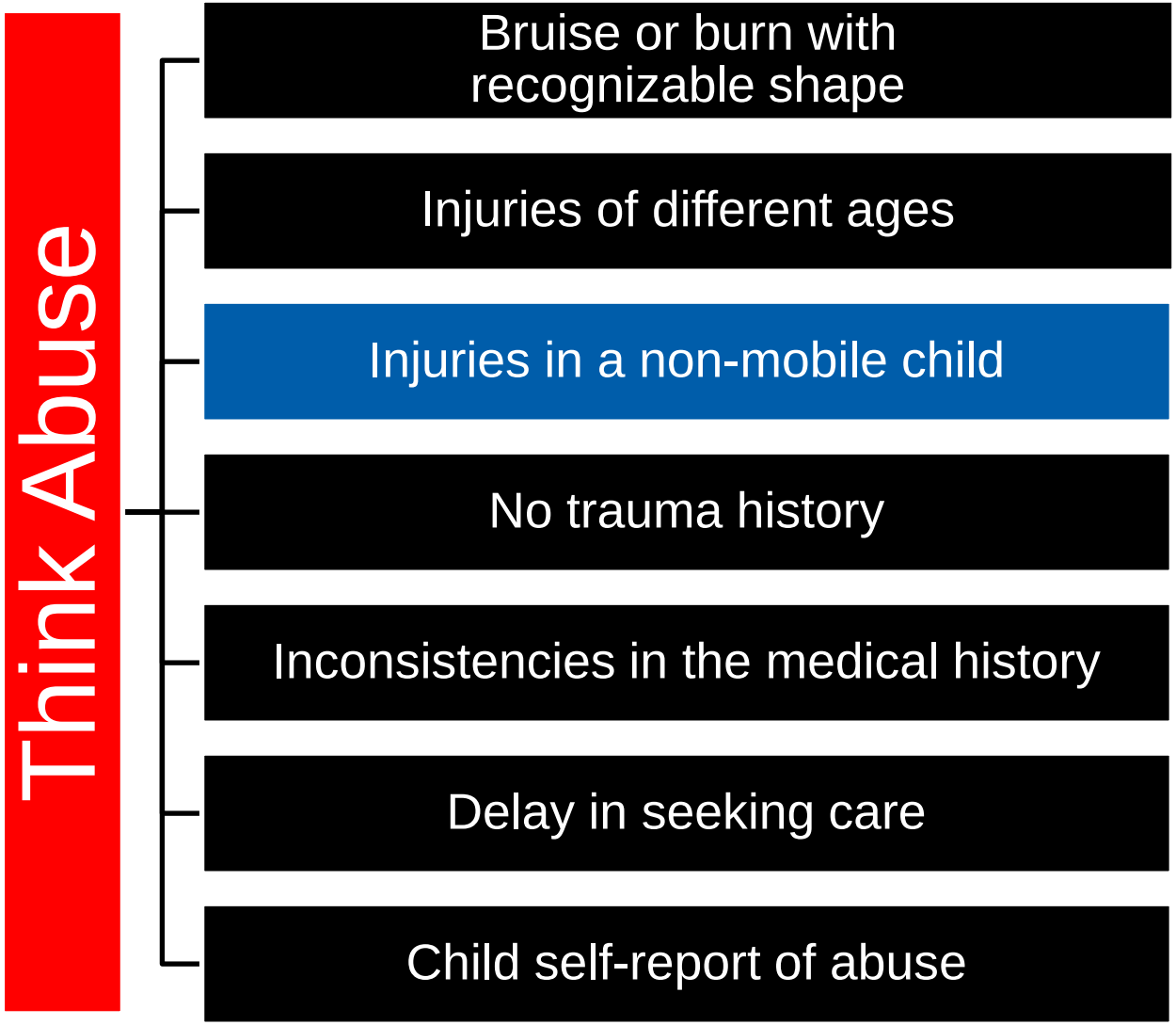
Acute & Healing Rib Fractures



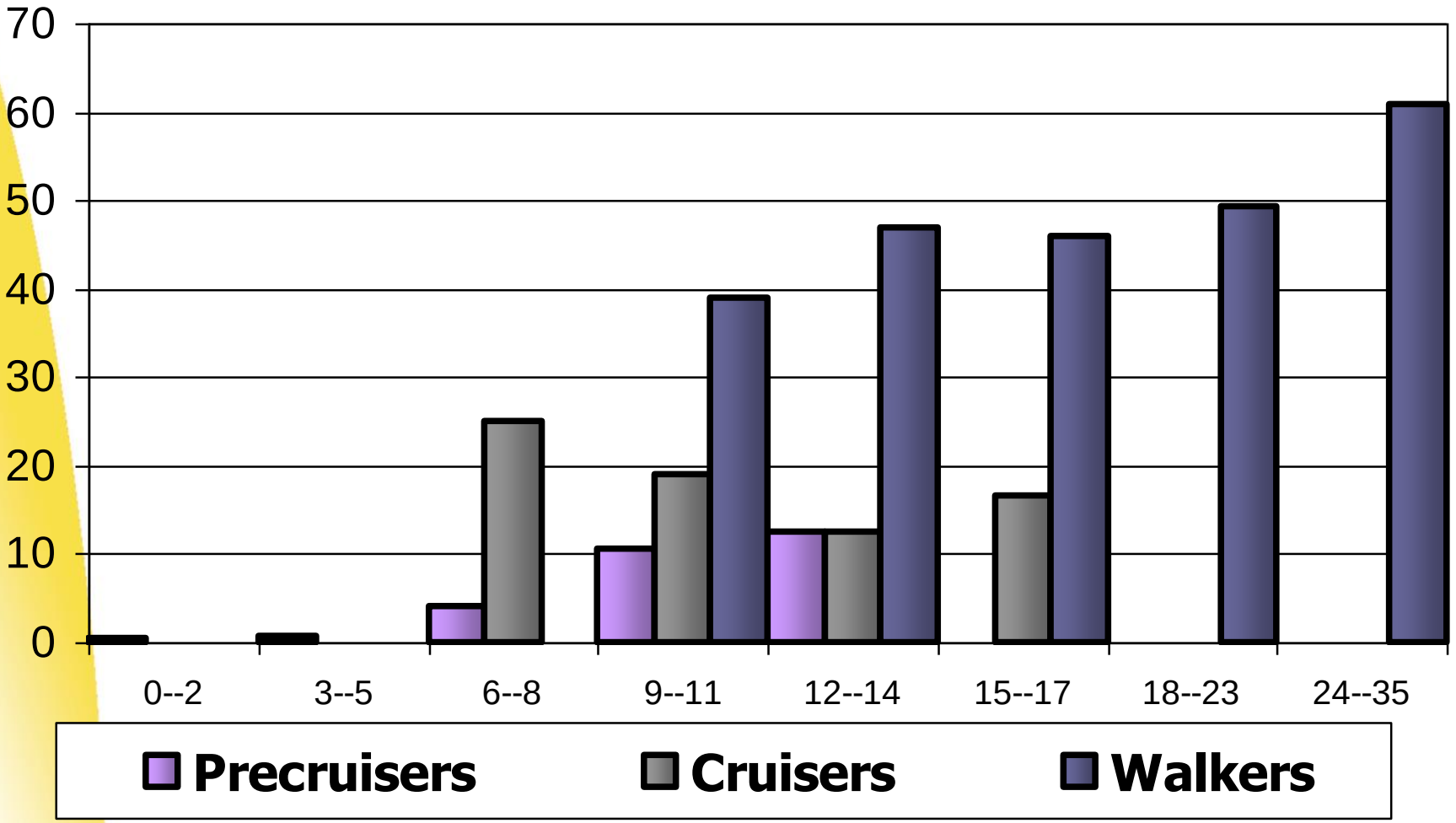
Acute Distal Tibia & Fibula Fractures



Abuse Algorithm



Epidemiology of Accidental Bruising



Sentinel injuries

- Of 200 definitely abused infants, **27.5%** had a previous sentinel injury
  - 8% of the 100 infants with intermediate concern for abuse.
  - none of the 101 non- abused infants had a previous sentinel injury
- The type of sentinel injury:
  - **bruising (80%)**
  - **intraoral injury** (11%)
  - **other injury** (7%).
- Occurred in early infancy:
  - 66% at <3 months of age
  - 95% by 7 months.
- Medical providers aware of injury in 41.9% of cases

TEN-4-FACESp

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

TEN

Torso | **E**ars | **N**eck

FACES

Frenulum
Angle of Jaw
Cheeks *(fleshy part)*
Eyelids
Subconjunctivae

INFANTS

4 months and younger

Any bruise, anywhere

PATTERNS

Patterned bruising

Bruises in specific patterns like slap, grab or loop marks

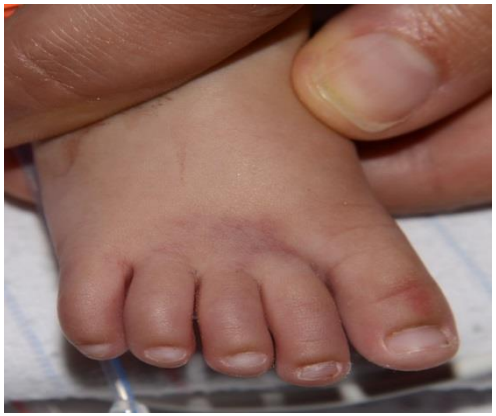
See the signs

Unexplained bruises in these areas most often result from physical assault.
TEN-4-FACESp 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.

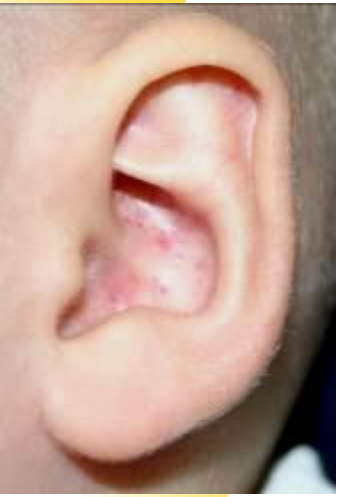
Ann & Robert H. Lurie
Children's Hospital of Chicago®

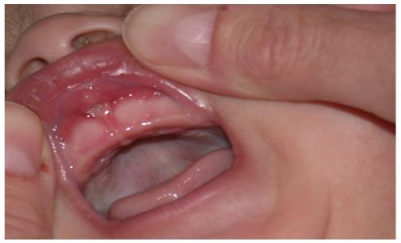
Sentinel Injuries

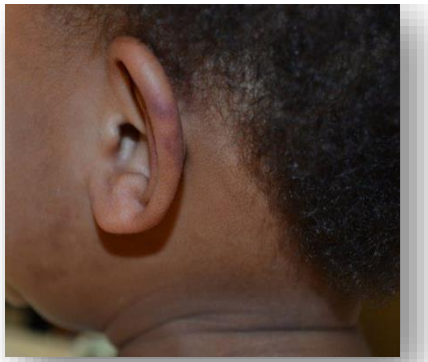
(Sheets *Pediatrics* 2013)

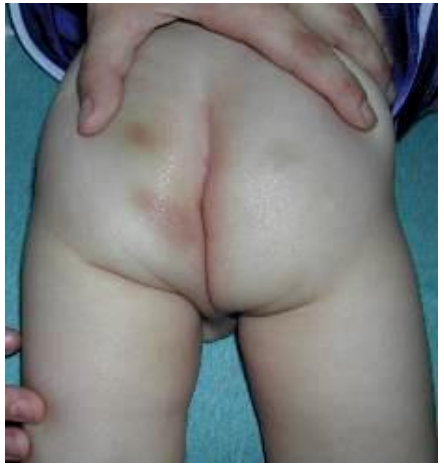


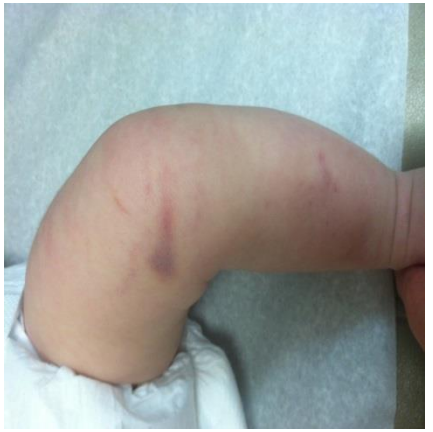
Particularly: ears, mouth (lips, palate, frena, teeth), genitalia

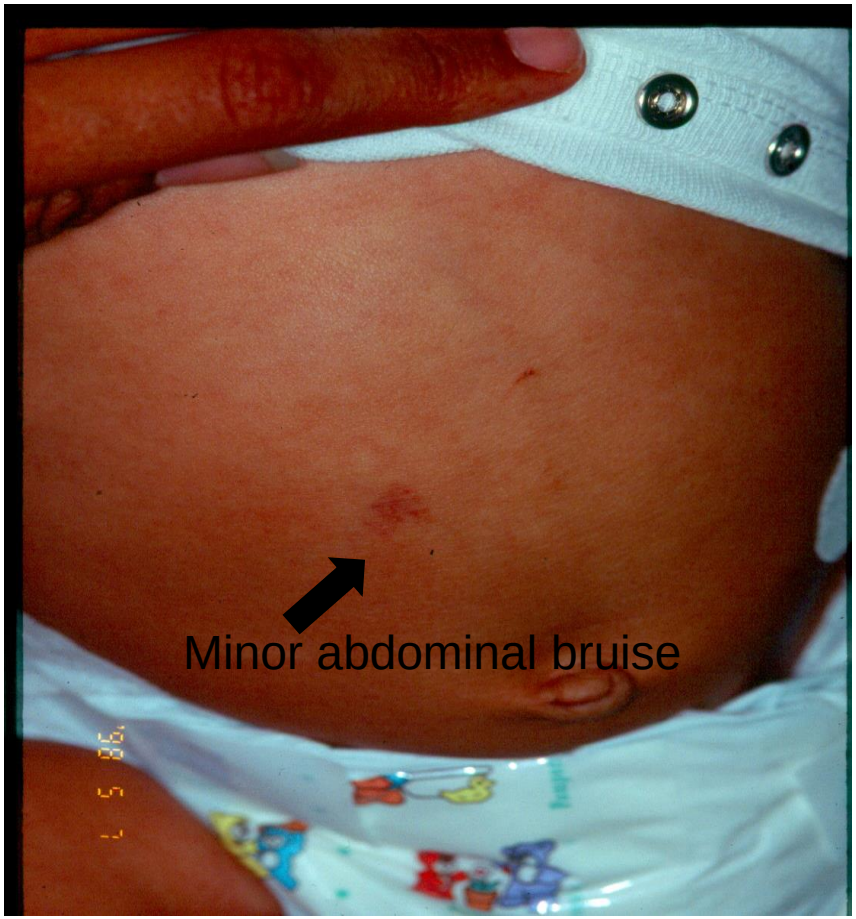


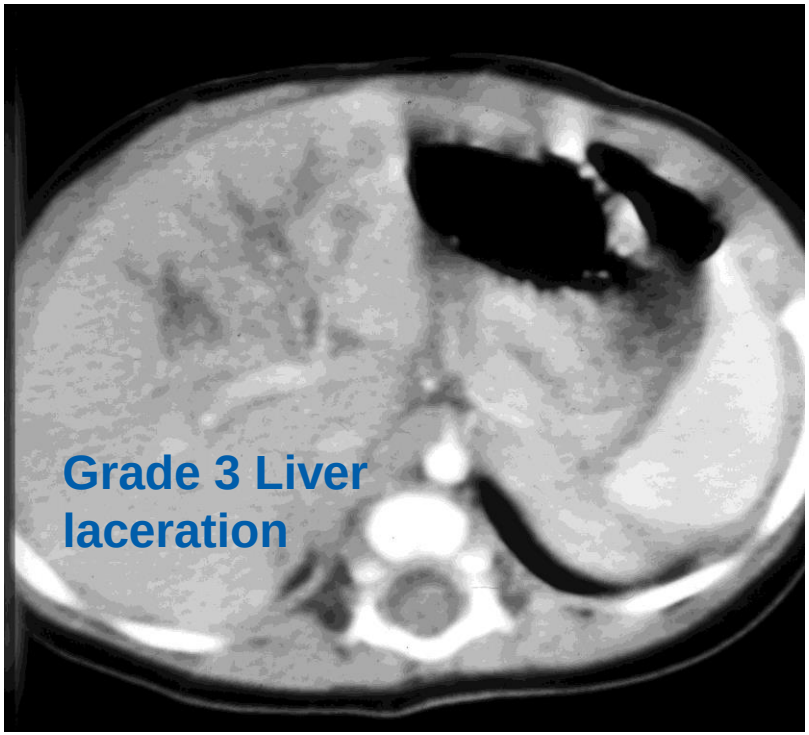









Minor abdominal bruise


Grade 3 Liver laceration

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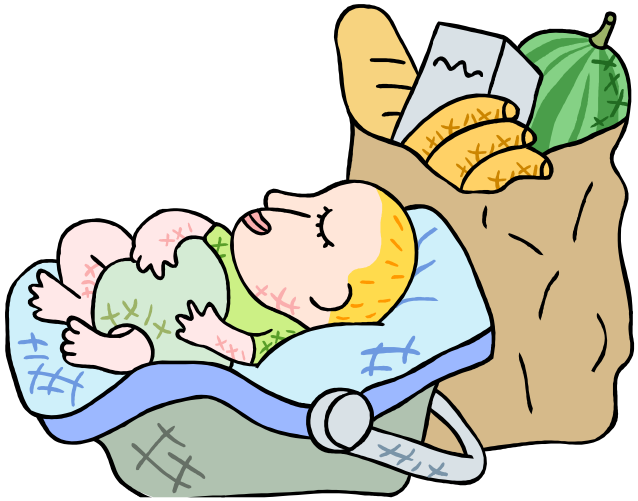
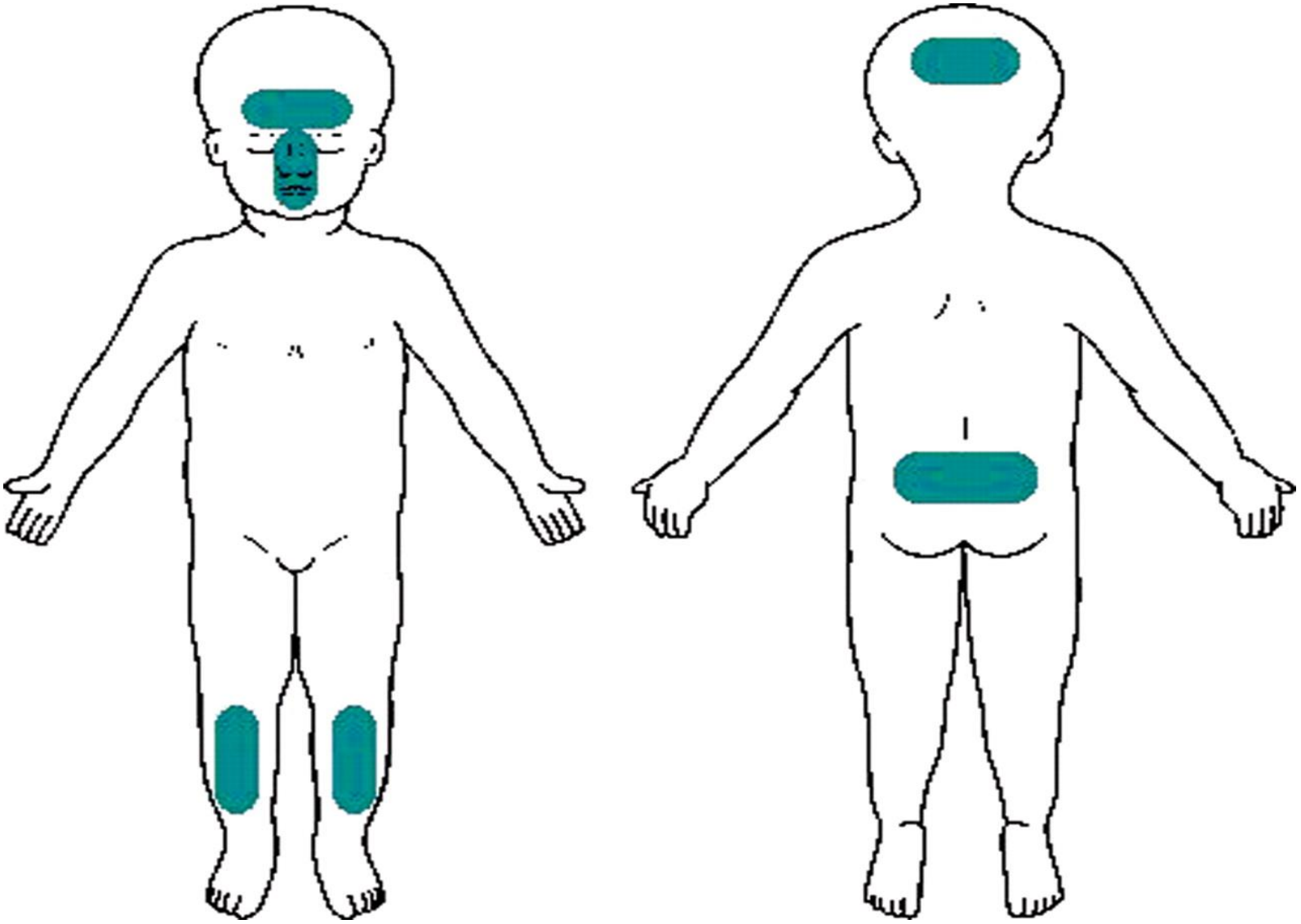
Bruising in Infants

If a baby isn't cruising, there should be no bruising.

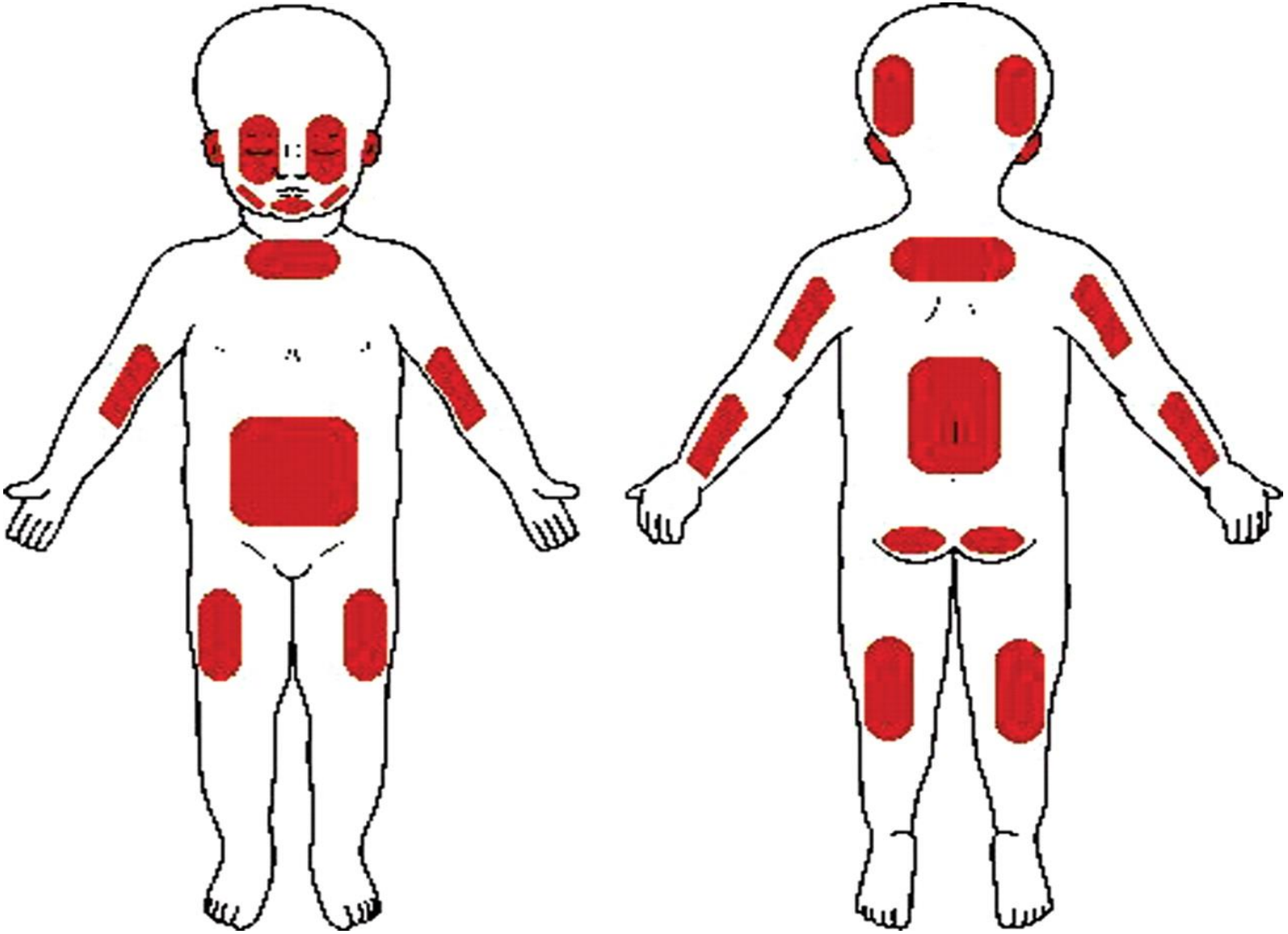


Accidental bruising patterns



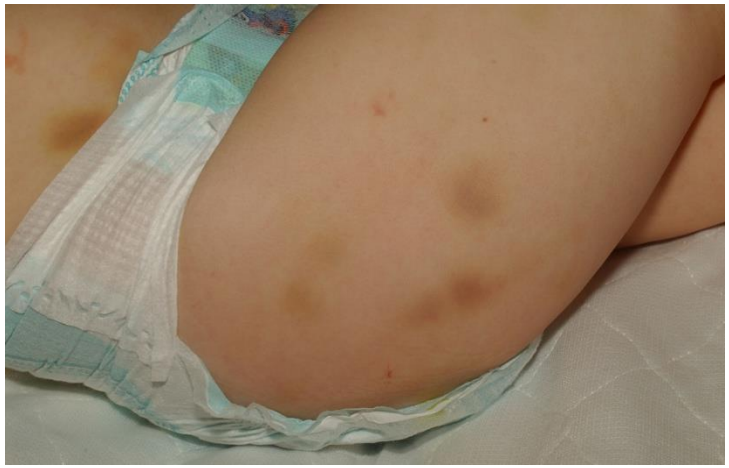
Maguire S Arch Dis Child Educ Pract Ed 2010;95:170-177

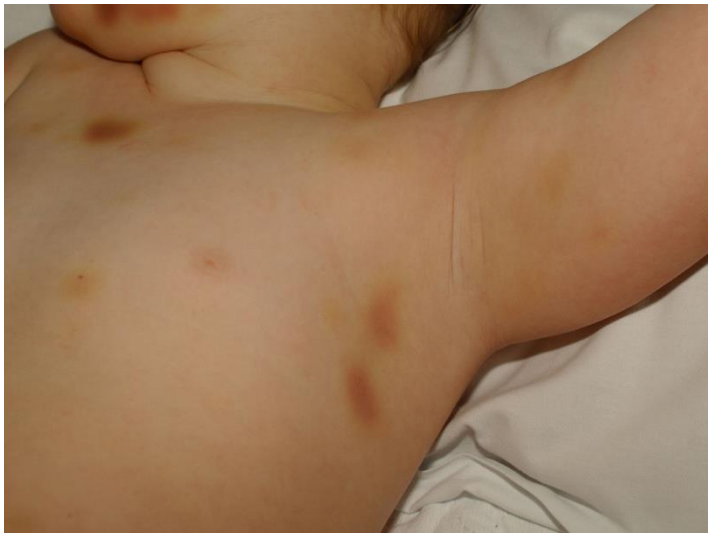
Abusive bruising patterns.



Maguire S Arch Dis Child Educ Pract Ed 2010;95:170-177

Suspicious locations





Abuse Locations

- ✓Upper anterior thighs
- ✓Trunk (torso,chest, *back*)
- ✓Upper arms
- ✓Face and ears
- ✓Neck and cheeks
- ✓Hands and feet
- ✓Buttocks

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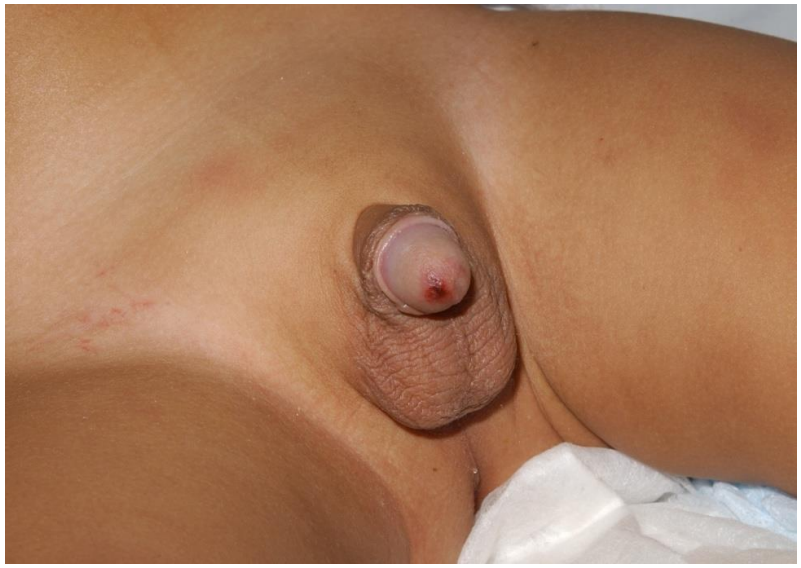
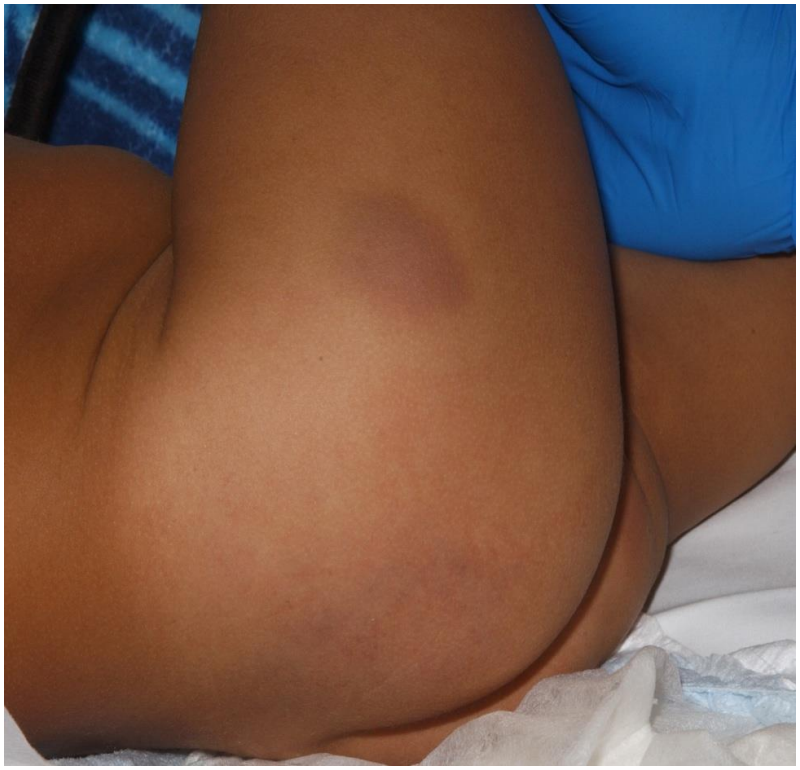
Two injuries: one trigger event?



Pinched penis



Spanked bottom

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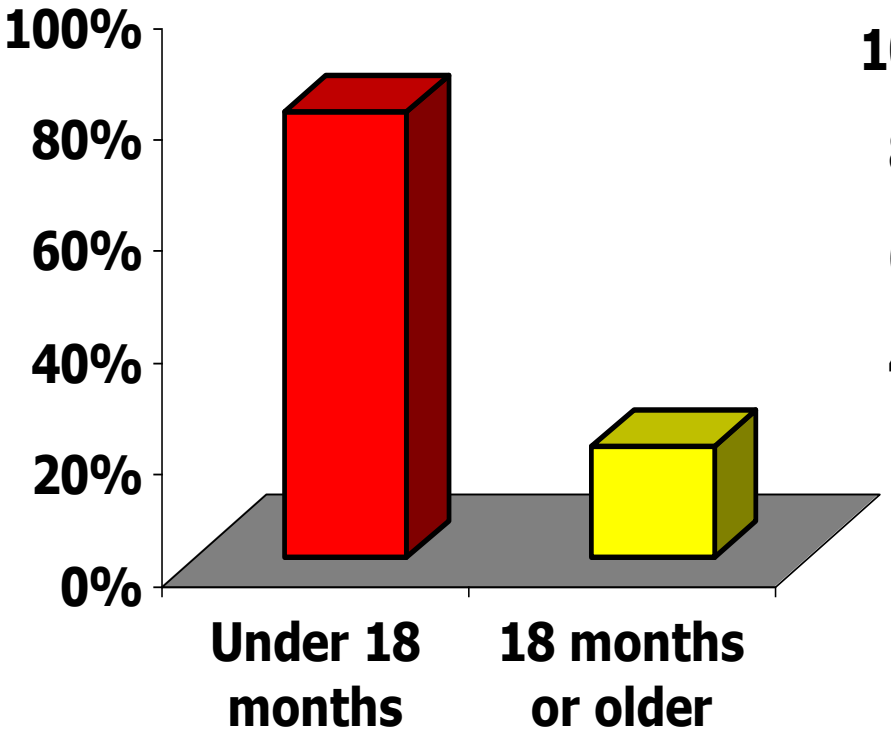
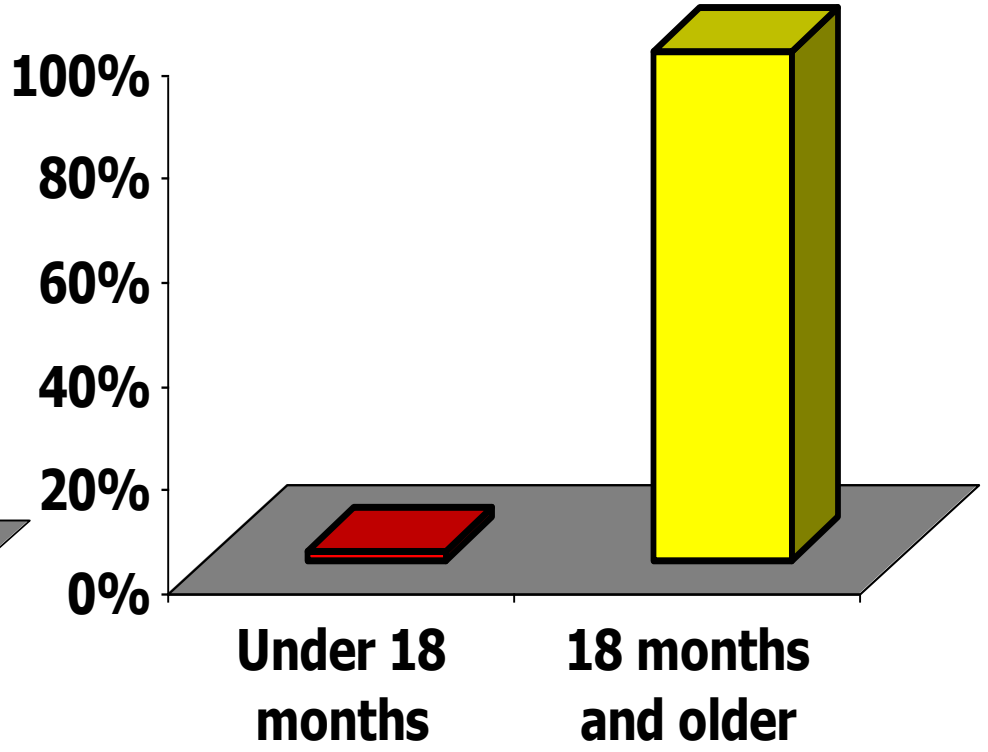
CANNOT DATE BRUISES

Epidemiology of Fractures

Inflicted fractures

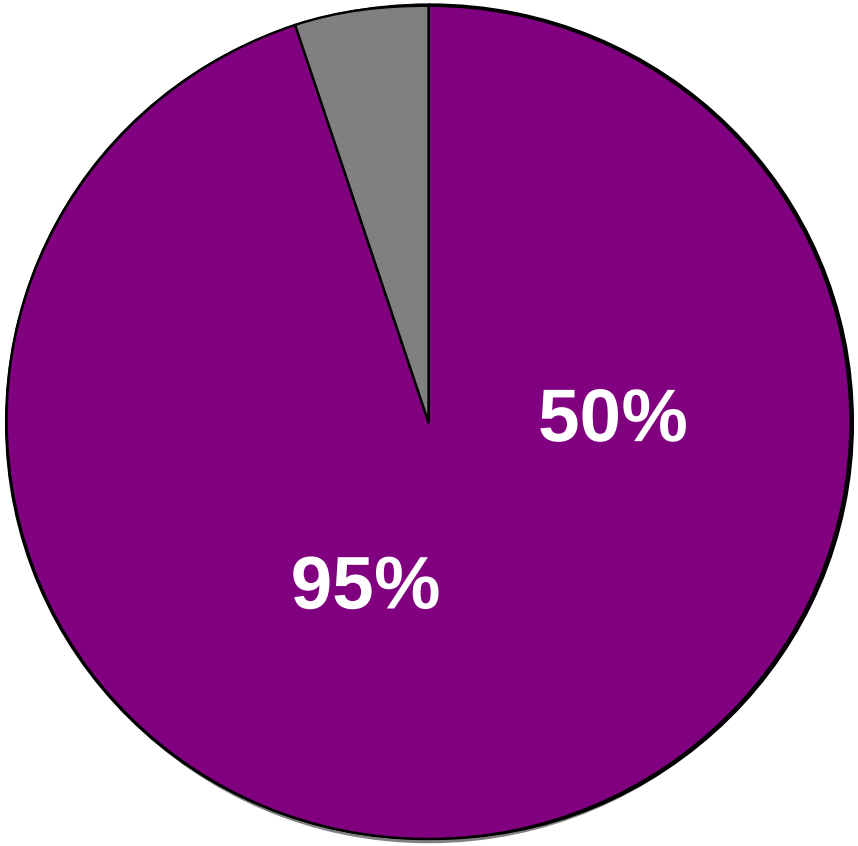


Accidental Fractures

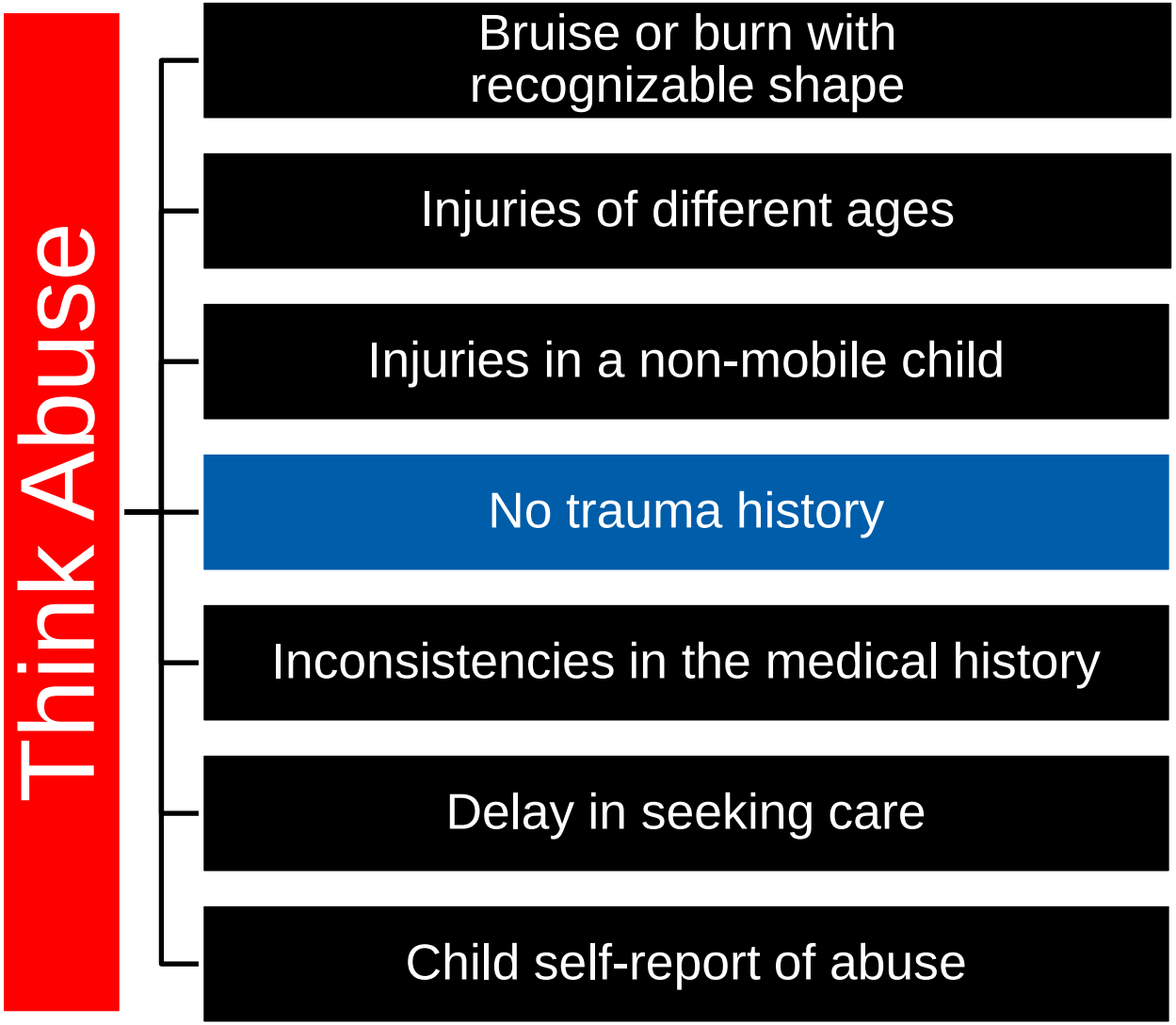


Epidemiology of Head Injury

- Serious infant head injuries
- 50 - 95% Inflicted Injury
  - Auto Accidents

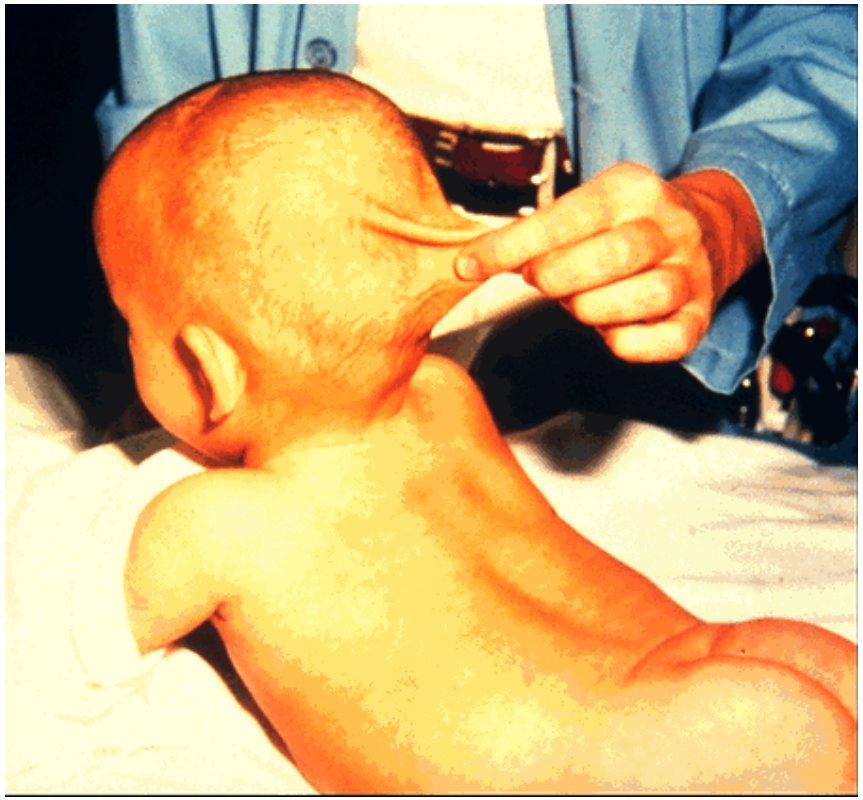


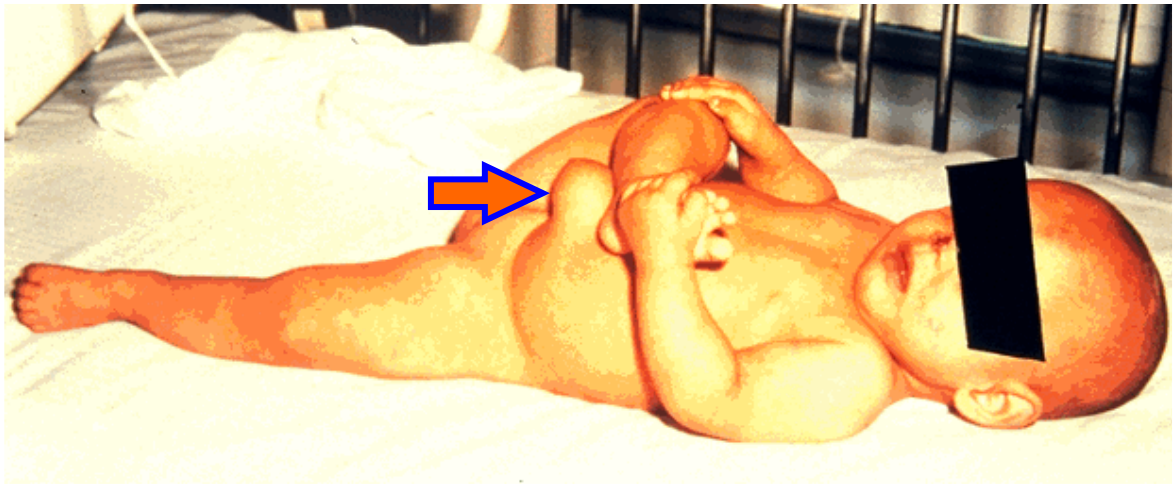
Abuse Algorithm

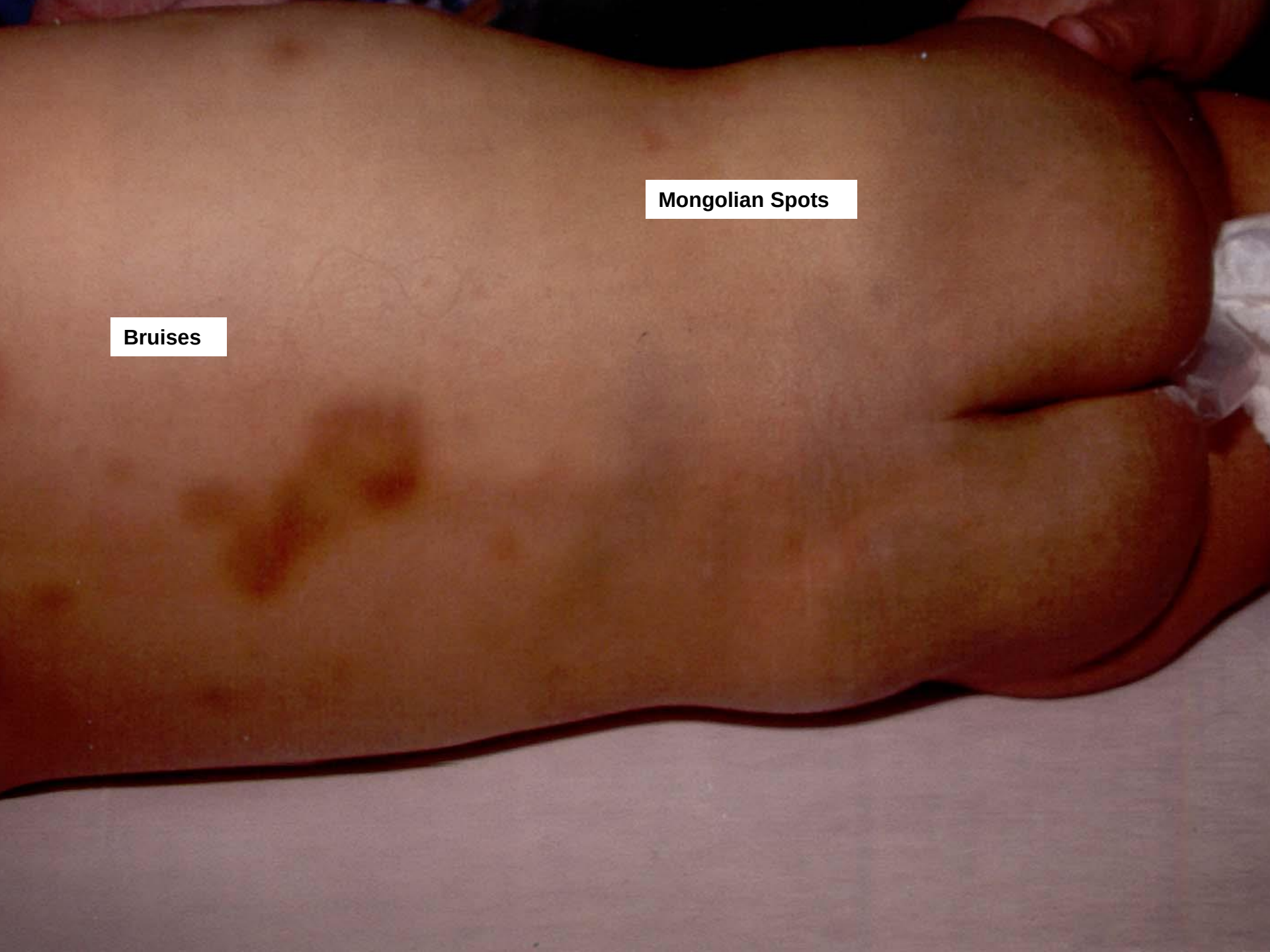


Lack of Trauma History

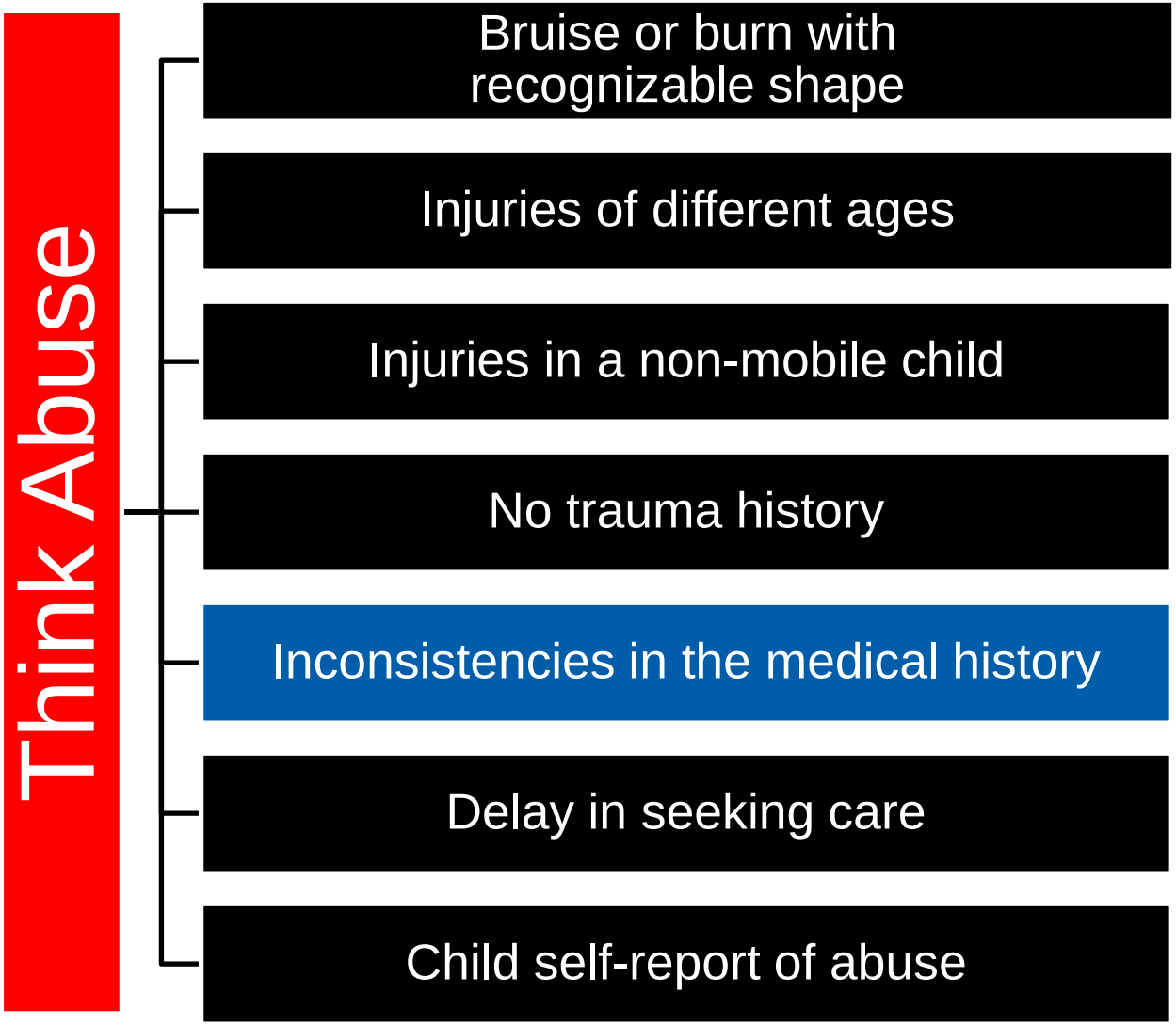
- THE CORNERSTONE OF AN ABUSE DIAGNOSIS
- You still must consider other medical causes.
  - Mimics
  - Birth related findings
  - Vitamin K deficiency
  - Collagen disorders






Mongolian Spots
Bruises

Abuse Algorithm



Inconsistency

- **Internal inconsistency**
  - History changes with repetition or by informant.
- **Developmental Inconsistency**
- **Inconsistent mechanism**
  - Minor trauma causing severe injury

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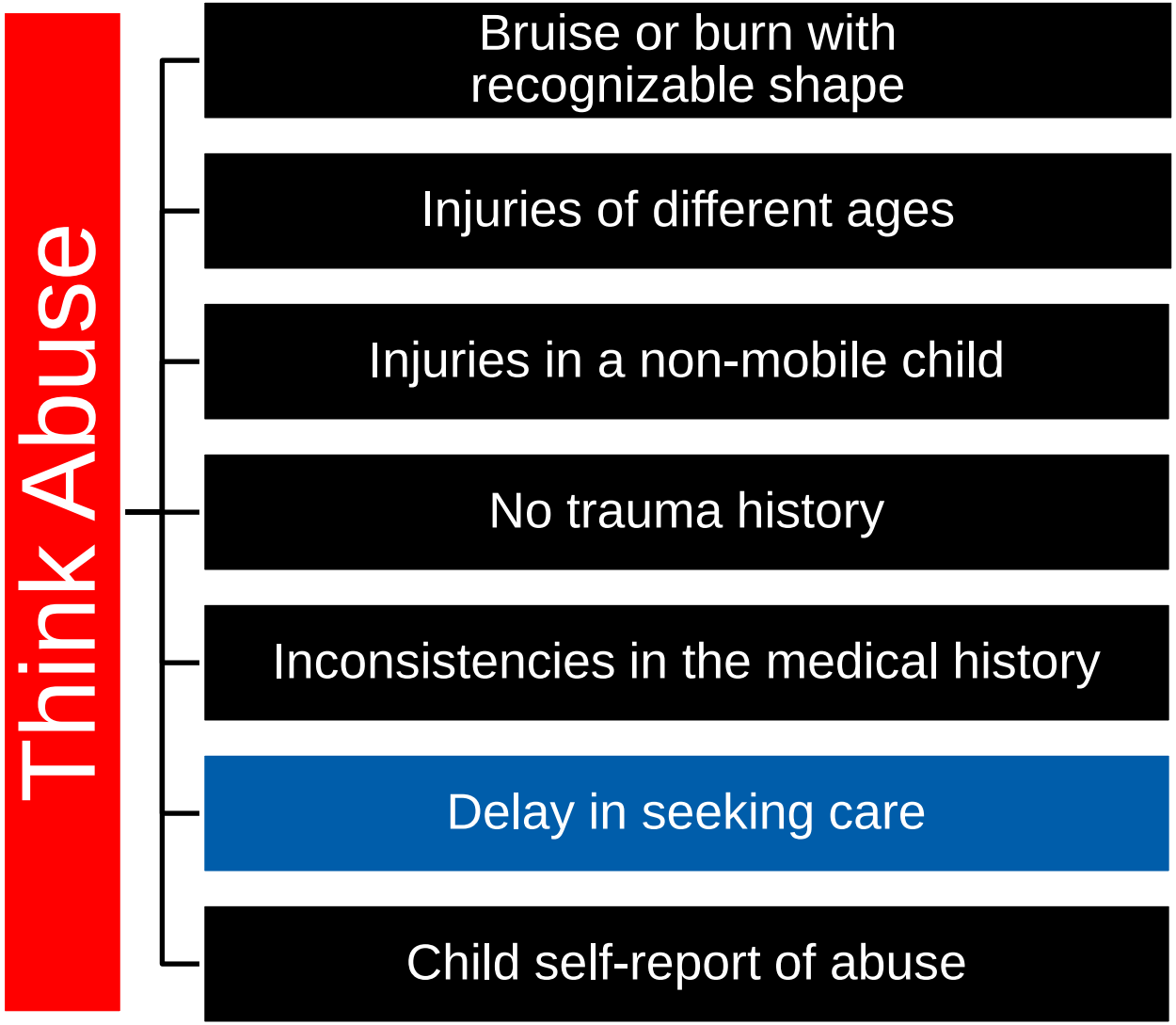
Fractures: Abuse or Accident?

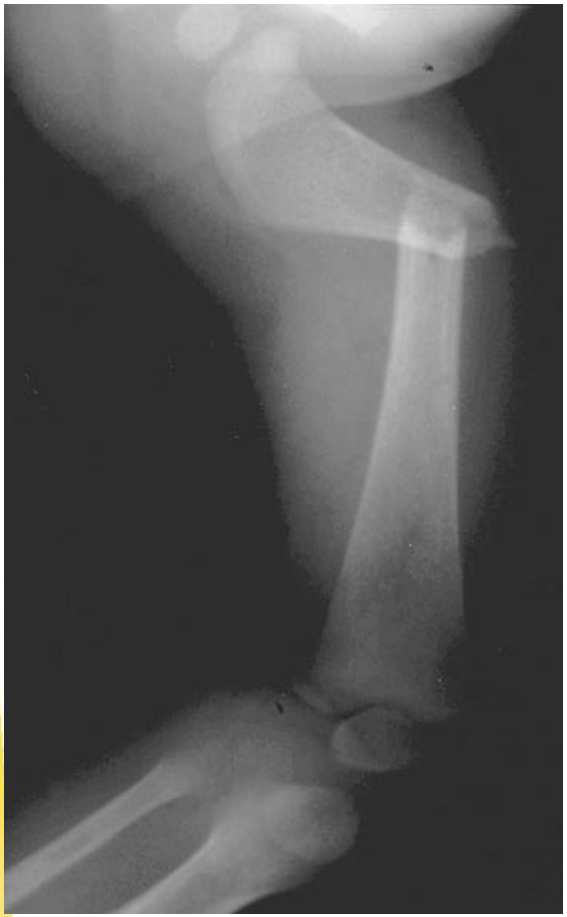
- **Diagnosis relies on more than just fracture type or location alone**.
- No such thing as a pathognomonic fracture.
- Some types more specific than others.
- Consideration and elimination of underlying medical conditions or collagen disorders
  - Medical history dictates work up!

Abuse Algorithm

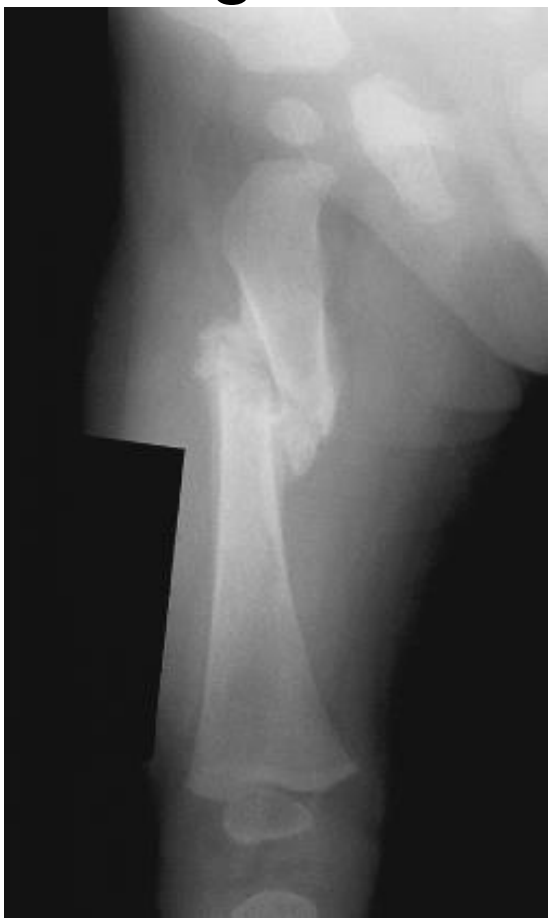


Delay in Care-seeking

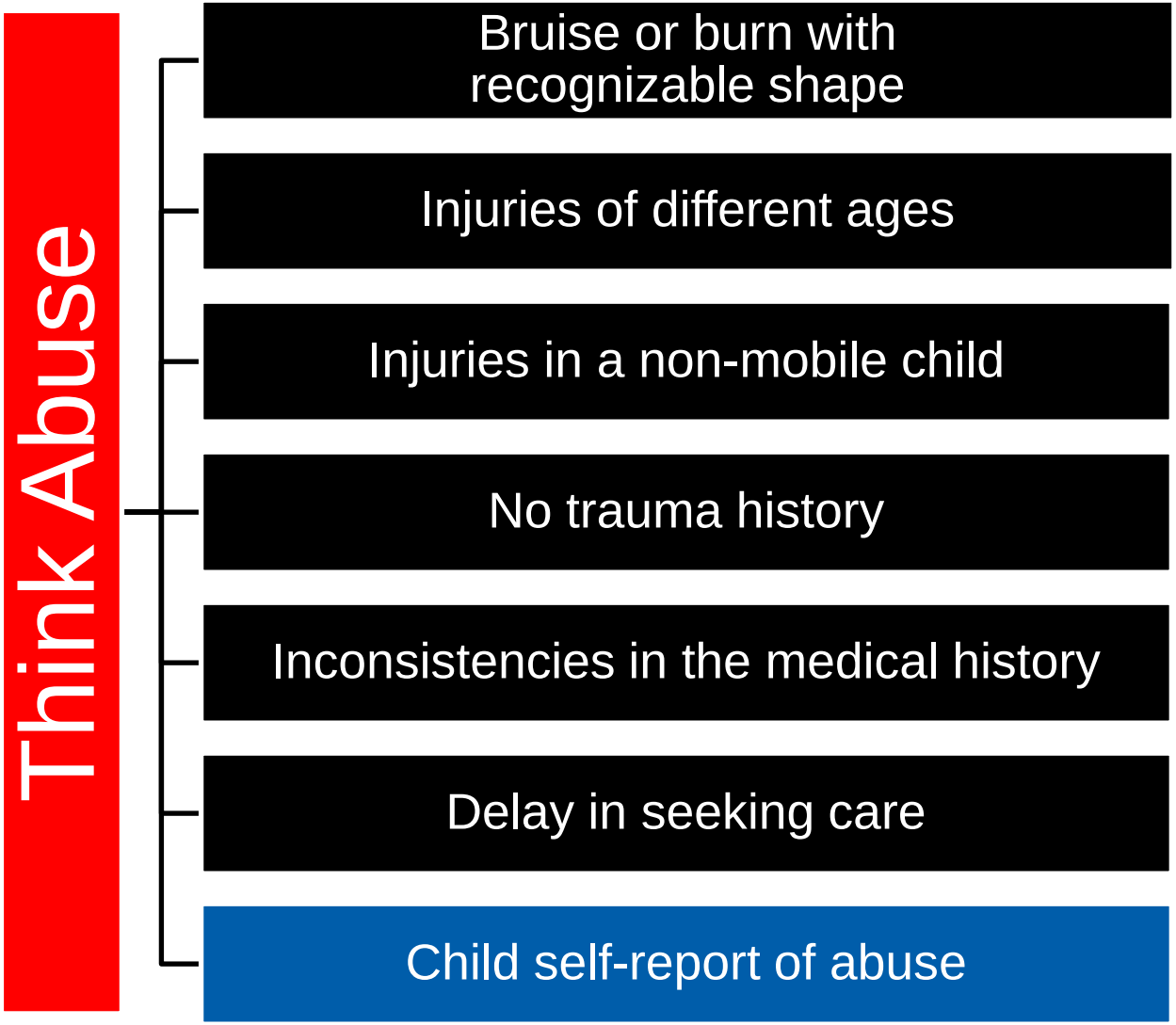
- New Fracture



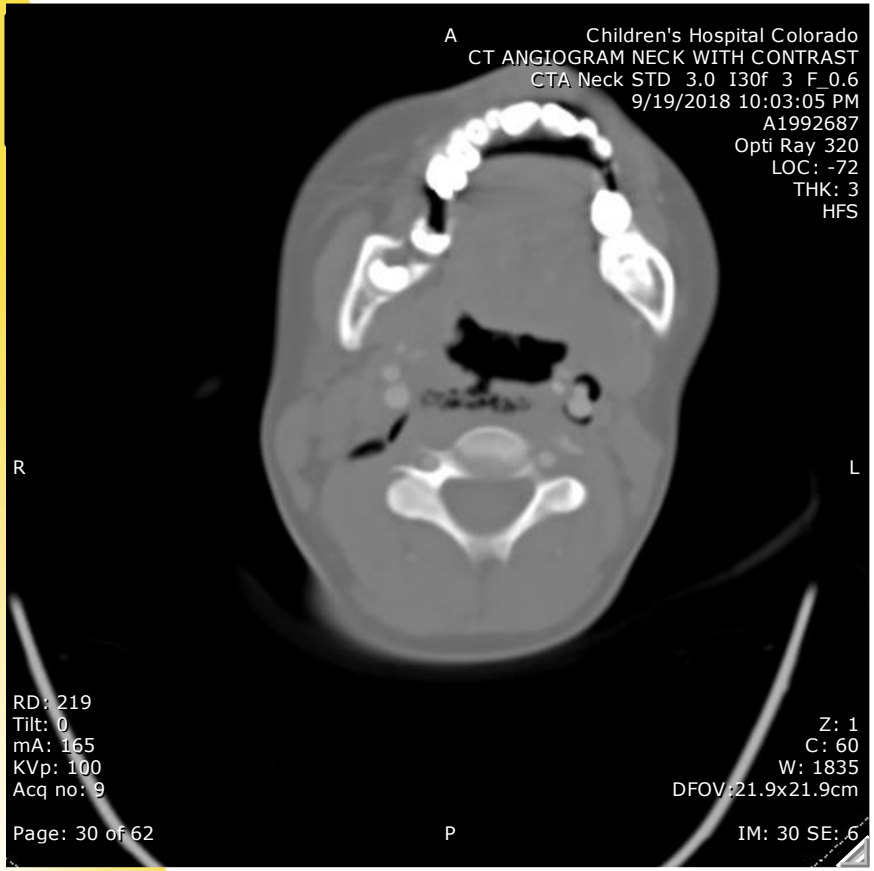
- Healing Fracture



Abuse Algorithm



7 year old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Children's Hospital Colorado
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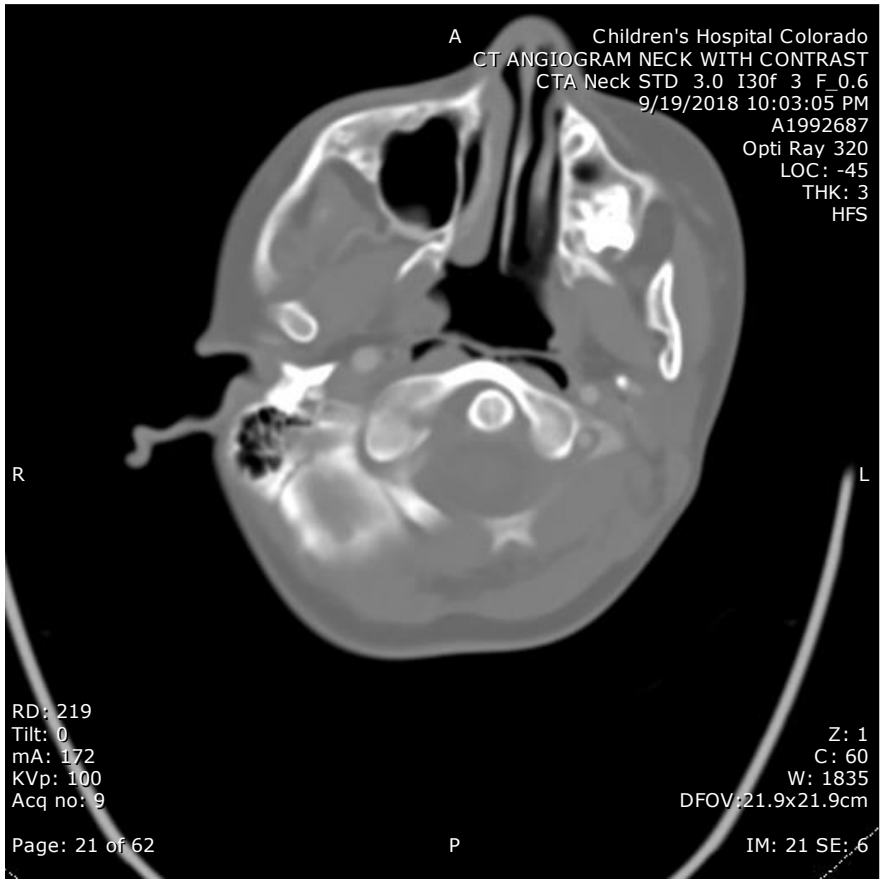
9/19/2018 10:03:05 PM
A1992687
Opti Ray 320
LOC: -72
THK: 3
HFS
R
L
RD: 219
Tilt: 0
mA: 165
KVp: 100
Acq no: 9
Z: 1
C: 60
W: 1835
DFOV:21.9x21.9cm
Page: 30 of 62
P
IM: 30 SE: 6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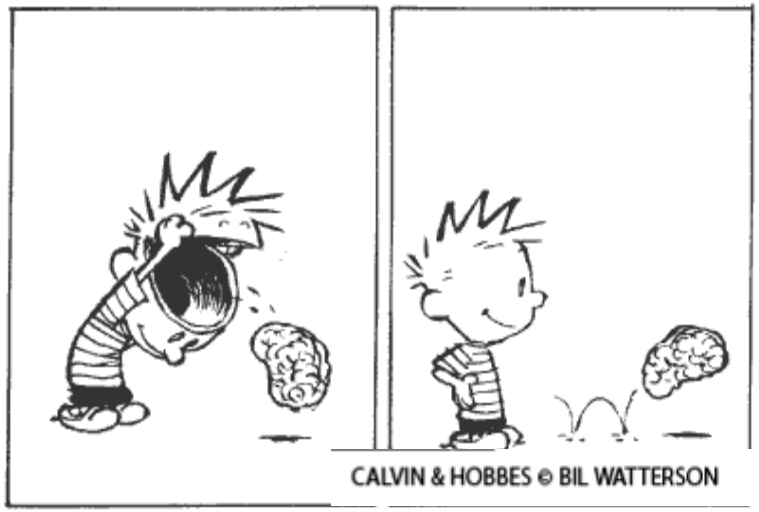
KVp: 100
Acq no: 9
Z: 1
C: 60
W: 1835
DFOV:21.9x21.9cm
Page: 21 of 62
P
IM: 21 SE: 6

Don’t Think, Just Screen

- Bruising (<6 months)
- Injuries without a GOOD explanation
- Long-Bone Fractures (infants)
- Oral/Pharyngeal Injuries (non-ambulatory)
- Patterned injuries
- Old and new injuries



OK, How?

- The Basics
  - Physical Exam for everyone
  - Skeletal Survey for patients <24 months
    - Follow up 2 weeks later
  - LFTs for patients <60 months
  - Neuroimaging:
    - <6 months old with:
      - Rib fracture(s)
      - >1 fracture
      - Facial bruising/injury

Neuroimaging

Pittsburg Infant Brain Injury Score for Abusive Head Trauma

- 30 days - 1 year, afebrile, well-appearing, no trauma history with:
  - ALTE
  - Vomiting without diarrhea
  - seizurelike activity
  - soft tissue swelling of the scalp
  - bruising
  - other nonspecific neurologic symptom
- Then score:
  - Abnormal skin exam - 2 pt
  - Hgb < 11.2 g/dl – 1 pt
  - Head circ > 85%ile – 1 pt
  - Age > 3mo – 1 pt
- Head CT:
  - <2 Neg Pred Value for detection of abnormal neuroimaging 96.0% (95% CI 93.6%–97.9%)
  - ≥2 Pos Pred Value for detection of abnormal neuroimaging 39.0% (95% CI 34.8%–43.6%)

Discussing Concerns with Families

- Be honest. It is acceptable to describe the injuries to the caregiver.
  - "I am concerned that the injuries do not fit the mechanism described."
  - "I am concerned that someone may have harmed your child."

- Describe your legal obligations.
  - "I am required by law to report my concerns to Social Services."

Document, Document, Document!!!

- Make objective statements of FACT
- Describe size, color and location of skin marks
- Avoid subjective judgments/statements. Be specific, especially about worrisome caregiver behaviors.
- Ask open-ended questions
  - Use quotation marks
  - Avoid leading questions
- Chart “unexplained trauma, concern for abuse”
- Work up prior to transfer including communication with family and outside agencies

Take Home Points

- Always ask yourself:
  - Is the injury consistent with the mechanism and the child's development?
  - Am I trying to explain away the findings?
  - Are there inconsistencies in the story?
- Do a complete physical on any child with an injury (especially non-verbal):
  - Ears, mouth, nose, back/buttocks
- Screen when indicated

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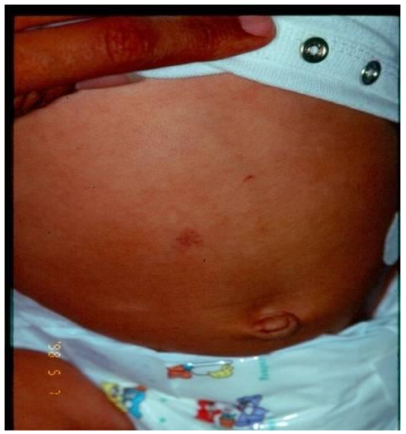
Case Study

Case Presentation

- CC: vomiting
- ex 36 week preemie, 78 day old twin male
  - No fevers. No diarrhea.
  - Worsening vomiting, now projectile
  - Nl VS, weight, exam
- DDx: overfeeding, reflux, pyloric stenosis
- ED Course: Pyloric US – negative
- Fed well in ED with spit up but no emesis
- Discharged home

Case Presentation

- 1 week later follow up seen by PCP.
  - Ongoing “spitting up, worse over past 2 weeks”
    - Weight gain substandard
  - Bruise noted on belly, photo on cell phone
    - PCP questions car seat as cause



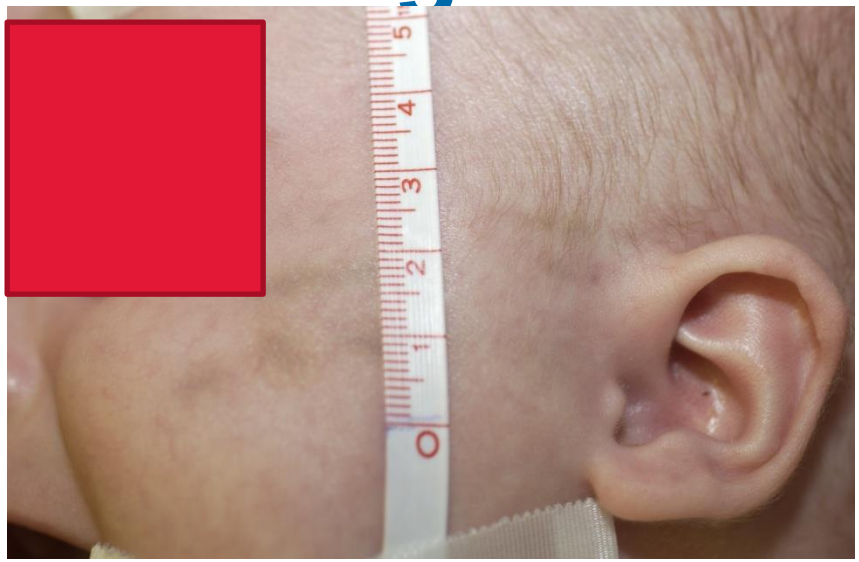
- Red Flags????

Case Presentation

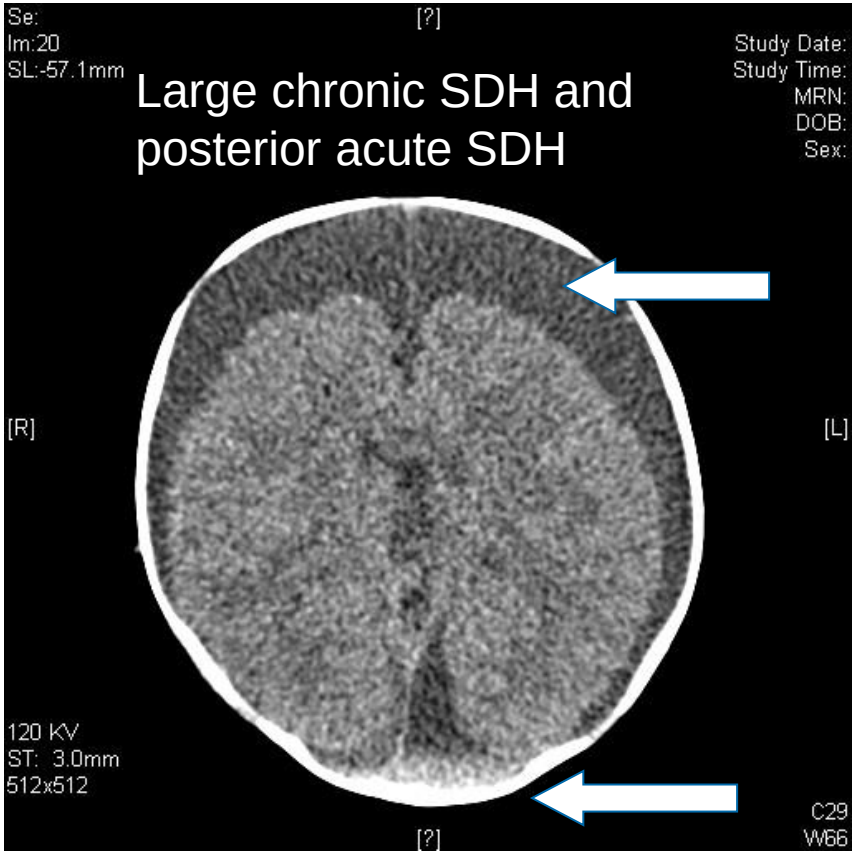
- 10 days later ER visit for ALTE, vomiting and fussiness
- VS ok but weight down
- CBC: WBC 6.57, HGB 9.4 ,PLT 309
- Repeat u/s for pyloric stenosis
- Dx - ALTE related to choking from spitting up

- Red Flags???

Last ER visit: Unifying Diagnosis of Child Abuse



OFC > 95%ile



Infant with bruising is a child abuse medical emergency!

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