

Pediatric Trauma: Identification of Child Maltreatment

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Objectives

- Recognize physiologic differences in pediatric trauma patients
- Identify abusive patterns of injury
- Understand the importance of a complete trauma history
- Learn some common pitfalls in abuse diagnosis
- Become familiar with your legal responsibilities

Nothing to disclose

Child Maltreatment: Facts at a Glance

- Data from 2011
 - CPS received 3.7 million referrals for children being abused or neglected
 - CPS estimated 681,000 children (9.1 per 1000) were victims of maltreatment
 - The lifetime economic burden resulting from new cases of fatal and nonfatal child maltreatment is approximately \$124 billion.

<http://www.cdc.gov/violenceprevention/pdf/cm-data-sheet--2013.pdf>

Facts at a Glance cont.

- Child maltreatment fatalities:
 - In 2011, an estimated 1,750 children died
 - < age 4 81.6%
 - 4-7 9.5%
 - 8-11 4.6%
 - 12-15 2.2%
 - 16-17 1.4%
- 35% of victims were younger than 3 years old, with children younger than 1 having the highest rate of victimization.

<http://www.cdc.gov/violenceprevention/pdf/cm-data-sheet--2013.pdf>

Cont.

- Characteristics of Perpetrators:
 - Parent 80.8%
 - Relative 5.9%
 - Unmarried partner of parent 4.4%
 - Other unrelated adults 2.9%
 - Men 45%
 - Women 53%

<http://www.cdc.gov/violenceprevention/pdf/cm-data-sheet--2013.pdf>

Obvious Battering



- How do we help control escalation to fatal or life threatening events?
 - Awareness that child abuse occurs
 - Keeping it on your differential
 - Recognition of abusive patterns of injury

Less obvious injury patterns



- Child with fading cheek bruise
- Toddler with tibia corner fracture
- Baby with hand burn



Where to start with
assessment of injury?

Pitfalls in the Diagnosis of Abuse

- Desire not to make the diagnosis of child abuse or neglect
- Failure in getting past history
- Too much reliance on others' information
- Over- or under-interpretation of PE or other medical findings
- Failure to consider conditions mistaken for abuse
- Over/under interpretation of parent or child behavior
- Hurry to diagnose
- Ignorance about normative data
- Faulty lab techniques

Assessing for Child Abuse

- History
- Physical exam
 - Recognizing patterns of injury
 - Bruises
 - Burns
 - Fractures
 - Head injury
- Reporting and documentation

Assessing the Safety of the Child and Family: Three Core Principles

1. Assessing the Risk of Harm to the Child
 - Injury severity, ability to protect, developmental level, home environment
2. Assessing Parent or Caregiver of the Injured Child or Child at Risk
 - Explanation for injury, their affect, attitude toward child and staff about condition, any caregiver impairments
3. Assessing Behavioral Indicators of Child Abuse and Neglect
 - Emotional response and behaviors, interaction with parent and staff, any extreme or changes in behaviors

Social History: Some Practical Points



- There is no stereotype for an abusive family
- No screening tool is 100% sensitive and specific
- History can be non-linear and obtained while taking other medical history
- Start from a supportive viewpoint
- Be objective and descriptive about your concerns
- Access a social worker even before you think you need one!!

Suspicious Stories: The Dirty Dozen

1. Child fell from low height
2. Child fell onto furniture, floor, object
3. Unexpectedly found dead
4. Child choked, shaken to dislodge object
5. Child turned blue, shaken to revive
6. Sudden seizure activity or stopped breathing

Suspicious Stories: The Dirty Dozen

7. Resuscitation efforts caused injuries
8. Traumatic event day or more prior
9. Tripped or slipped carrying child
10. Child left alone for short time
11. Child fell down stairs
12. Sibling did it.

Ten History “Red Flags” for NAT

1. Injury unexplained by history
2. Absent, changing, or an evolving history
3. Delay in seeking medical care
4. Unusual affect of caregiver
5. Triggering event causing loss of control in caregiver
6. Unrealistic expectations of child
7. Crisis or stress in child’s environment
8. Social or physical isolation of child or the family, caregivers
9. Pattern of increasing severity or escalation of event over time
10. Prior history of abuse of caregiver as child

Overview and General Approach

Challenges in the diagnosis of child abuse

- Difficult to distinguish intentional (abusive) from accidental injury
- Non-pattern injury may not itself be diagnostic
- History is often absent or incomplete



Bruises

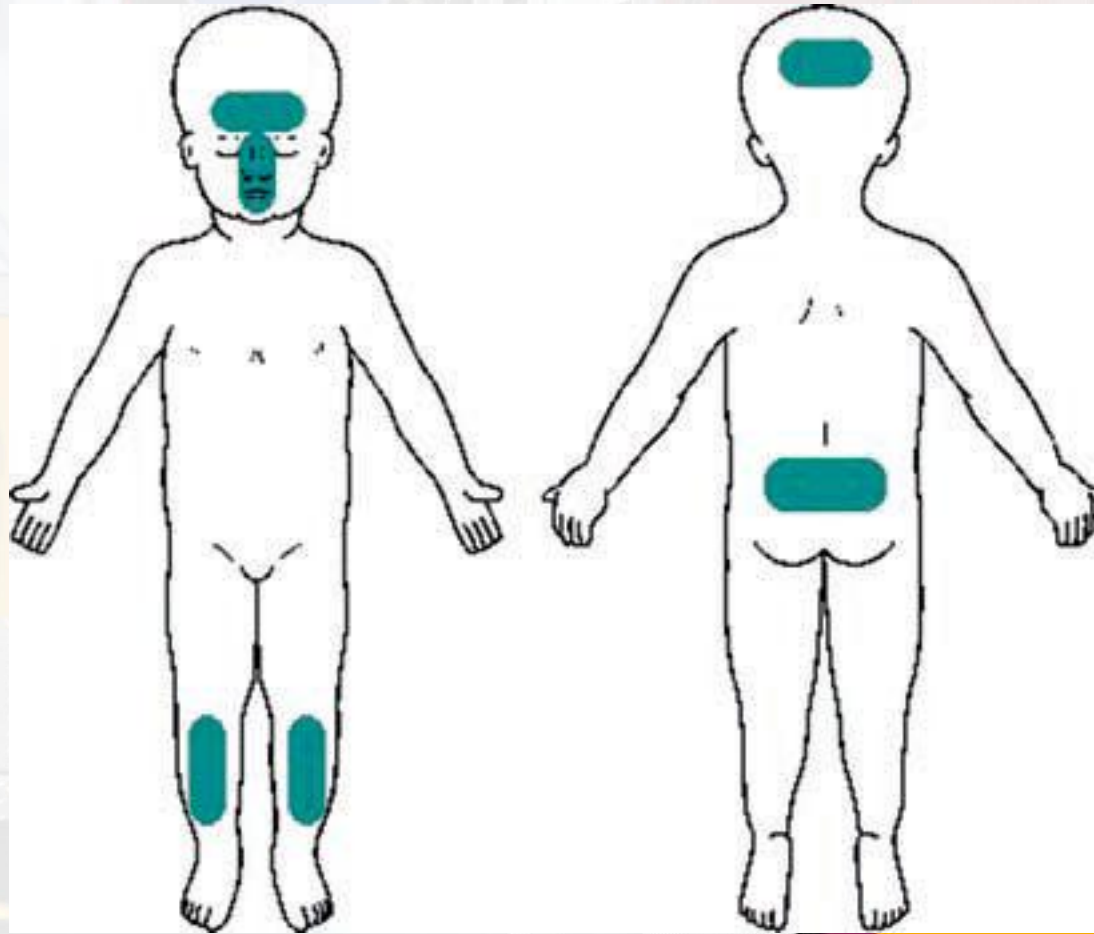
- Injuries to skin are the most common presentation of physical abuse
 - Bruises are the most common form of injury, and often the earliest signs of physical abuse
 - May be a warning sign for future or concurrent serious injury

Bruise Locations

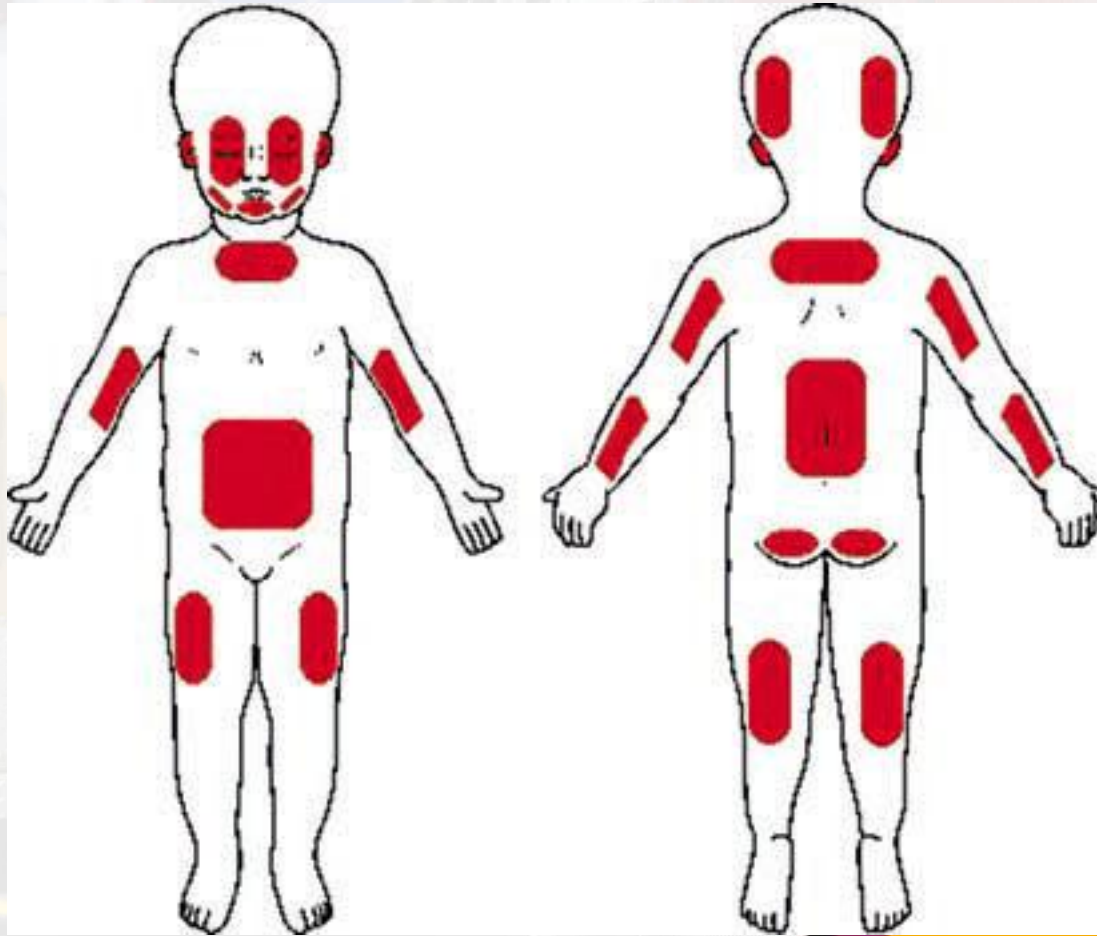
ACCIDENTAL	ABUSE
Shins	Upper anterior thighs
Elbows	Trunk (torso, chest, back)
Lower arms	Upper arms
Forehead	Face and ears
Underneath Chin	Neck and cheeks
Ankles	Hands and feet
Hips	Buttocks and anus
	Genitalia (penis, scrotum, and labia)



Accidental Bruising Patterns



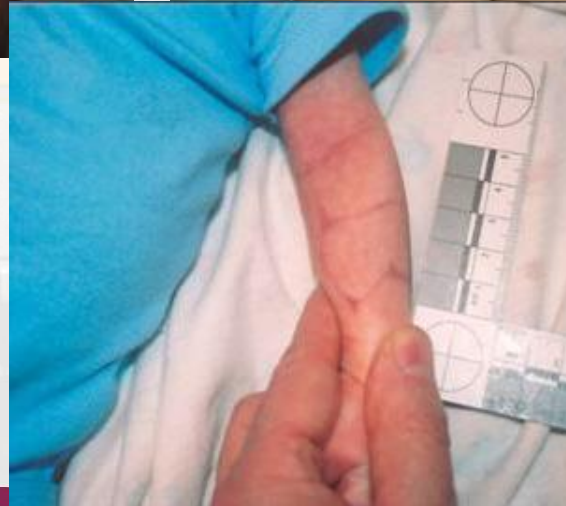
Abusive Bruising Patterns



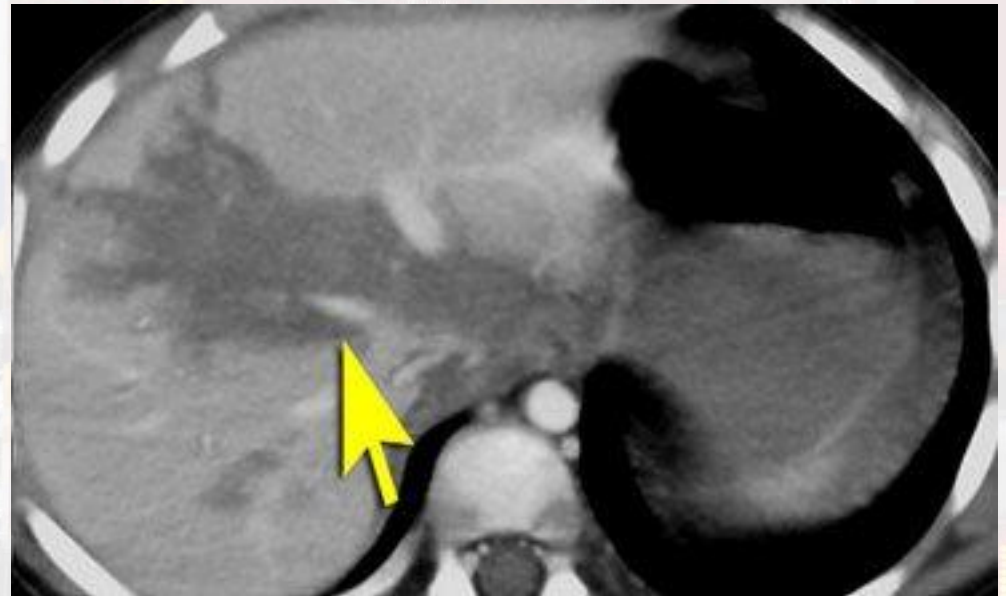
Bruising in unusual or multiple places



Bruises with recognizable patterns



Minor bruise in high risk age and location

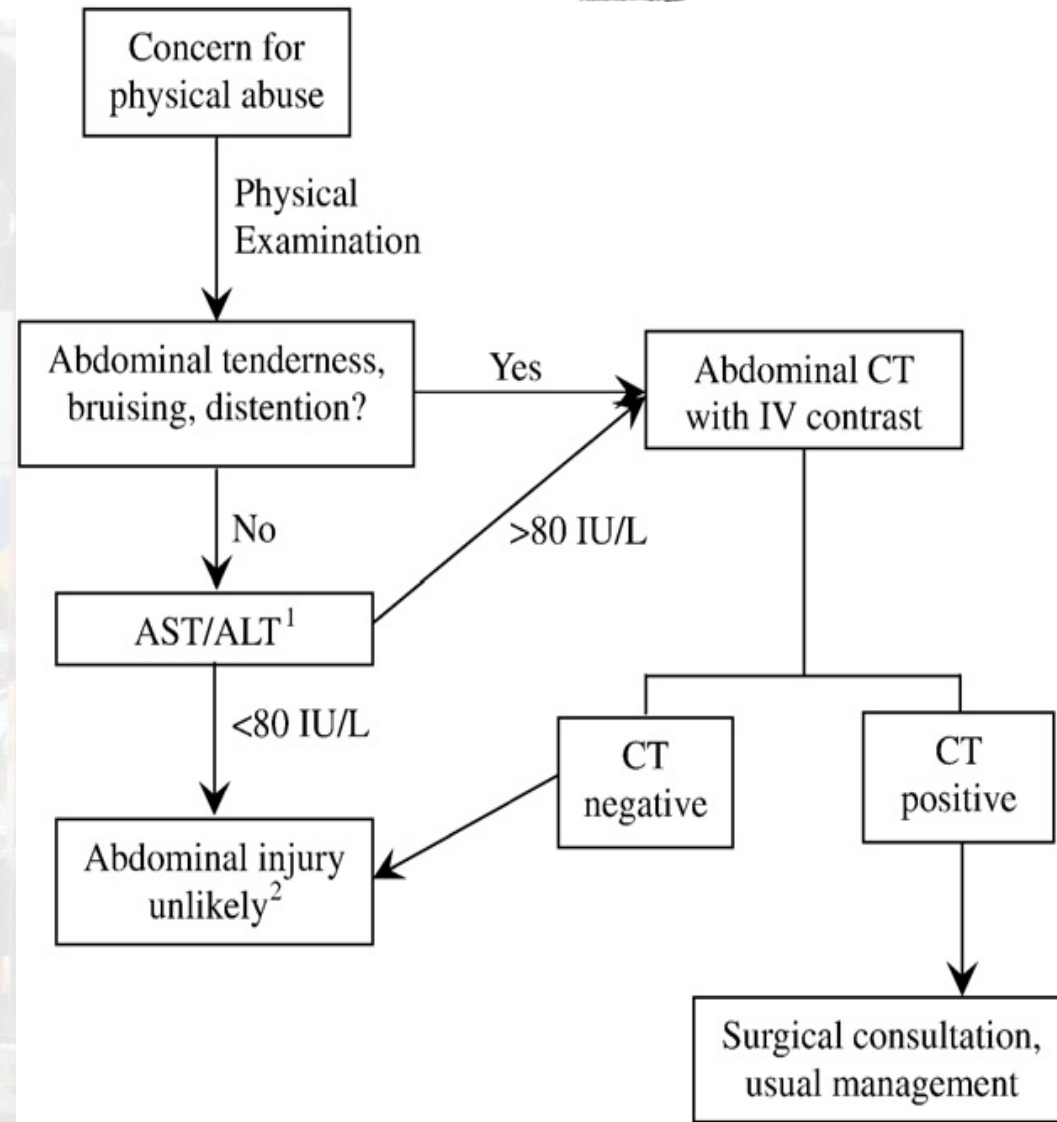


Liver Laceration

Suggested approach to screening for abusive abdominal injury.

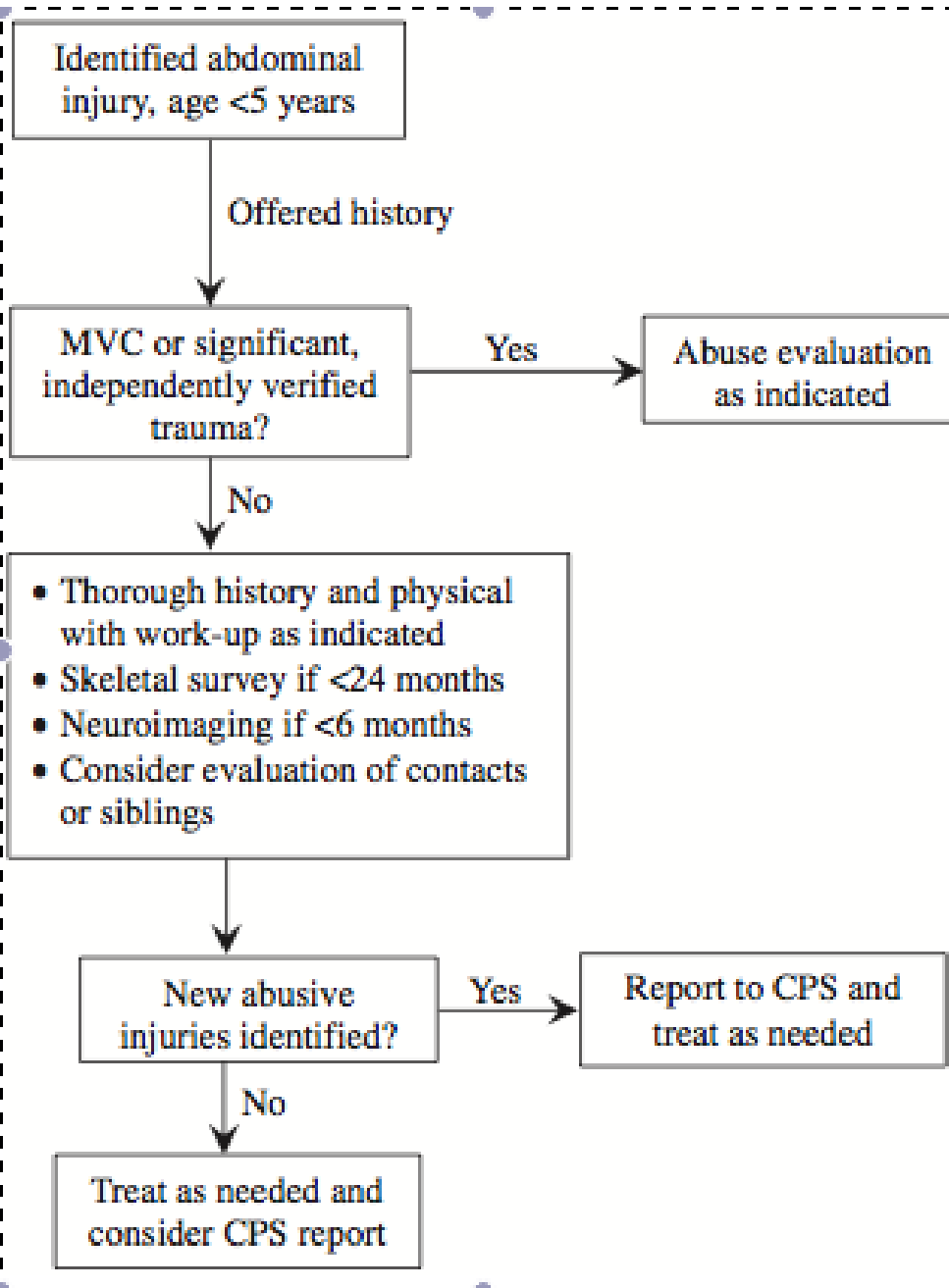
1) Except in cases where definitive testing (CT, MRI, laparotomy, laparoscopy, autopsy) has been obtained or in cases where a child has been in a protective environment for at least several days since the last possibility of physical abuse.

2) **“Abdominal injury unlikely”** is not meant to imply that trauma to the abdomen has not occurred, especially in cases with a history of trauma to the abdomen or with significantly elevated AST or ALT, but without radiographic or other evidence of injury.



- Approach to evaluation and child protective services (CPS) reporting of suspected abusive abdominal injury

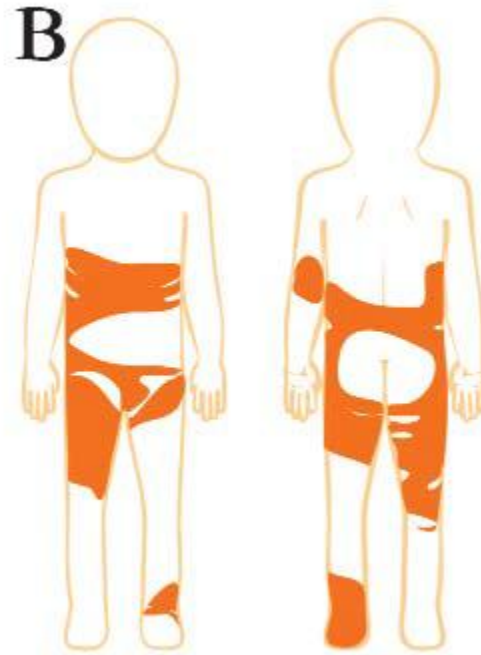
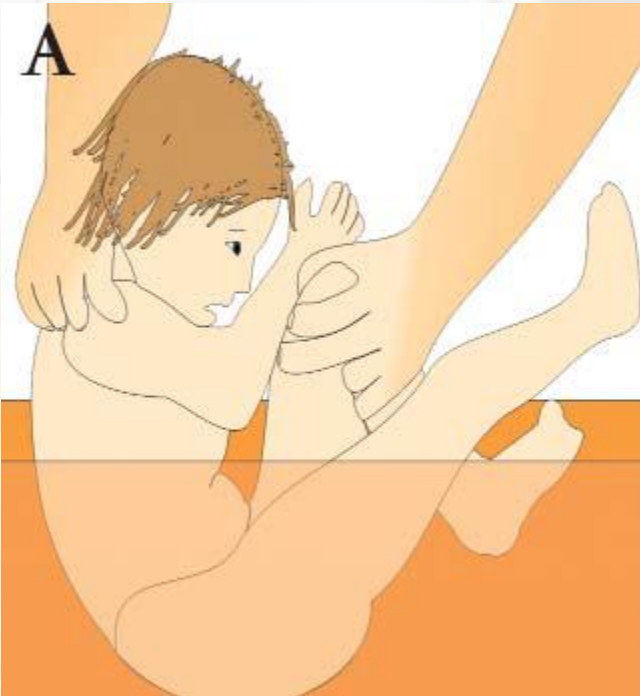
From: Lindberg. Abusive Abdominal Trauma-An Update for the Pediatric Emergency Medicine Physician. Clinical Pediatric Emergency Medicine. Volume 13, Issue 3. 2012



Burns

- There are reliable history and physical exam characteristics for abuse related burns
- Think 'neglect' if delay in care, inadequate or no supervision at the time
- Look for co-morbid abuse injuries in young patients
- Consider what possible trigger mechanism

Pattern of abuse related burns



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Forced Immersion Pattern

Accidental Burns



Pulled boiling water off counter

Reached for hot curling iron



Inflicted Burns

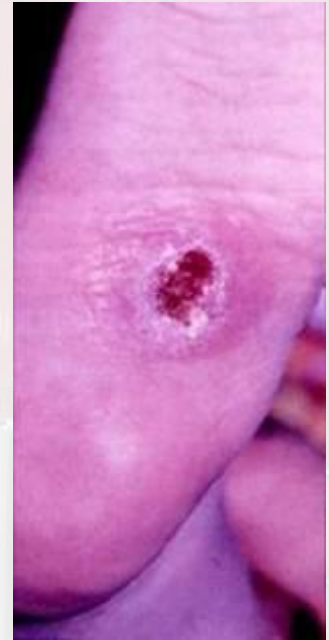


Figure 1. A portable heat source makes the fingers of the left hand to the red forearm (A). The burn is circumferential and involves all aspects of the left hand/ forearm (B).



Bruises and Burns: Pitfalls

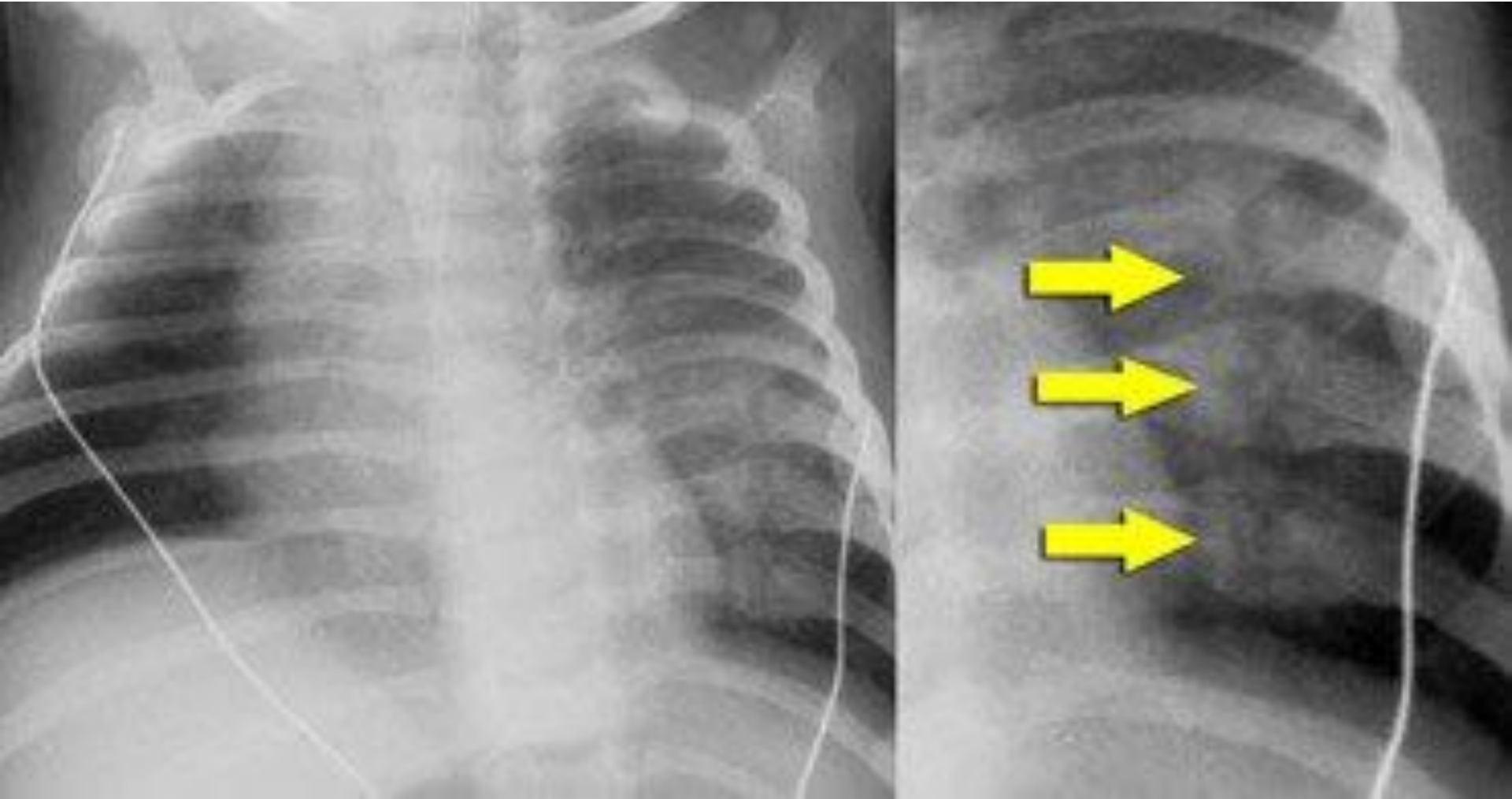
- It's a challenging diagnosis
 - It is often difficult to distinguish accidental from intentional injury
 - Non-pattern injury may not be itself diagnostic
 - History is often absent or incomplete
- Pitfalls:
 - Avoid exact dating of bruises
 - Don't forget differential for mimics and bleeding or coagulation disorders
 - Don't be pressured to determine who did what and when
 - TAKE PHOTOS IF POSSIBLE!

Fractures

TABLE 4 Weighted Proportions of Fractures Attributable to Abuse, According to Age and Bone, in the 2003 KID

	0-11 mo		12-23 mo		24-35 mo		0-36 mo	
	No. of Fractures	Proportion From Abuse, %	No. of Fractures	Proportion From Abuse, %	No. of Fractures	Proportion From Abuse, %	No. of Fractures	Proportion From Abuse, %
Ribs	809	69.4	96	28.5	96	27.6	1001	61.4
Radius/ulna	261	62.1	103	19.8	293	4.7	657	29.8
Tibia/fibula	493	58.0	192	16.1	384	4.7	1069	31.1
Humerus	518	43.1	545	6.8	2108	1.6	3172	9.3
Femur	1257	30.5	761	4.8	2008	2.5	4026	11.7
Clavicle	227	28.1	65	16.7	95	6.0	388	20.7
Skull	3363	17.1	948	8.6	1575	3.7	5886	12.1

From: Leventhal et al. Pediatrics 2008;122;599



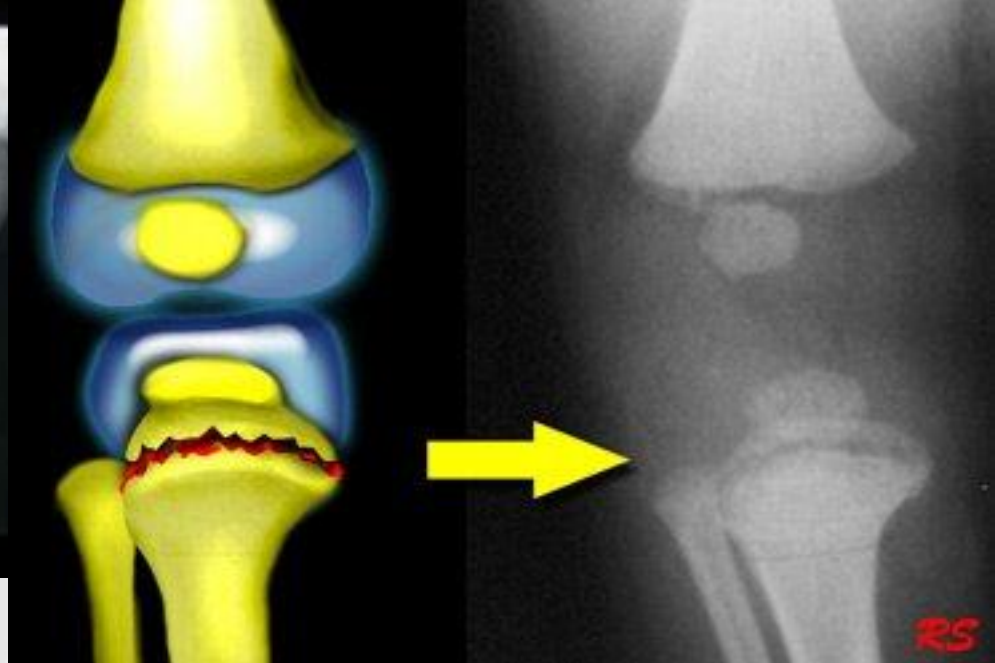
Multiple old posterior rib fractures



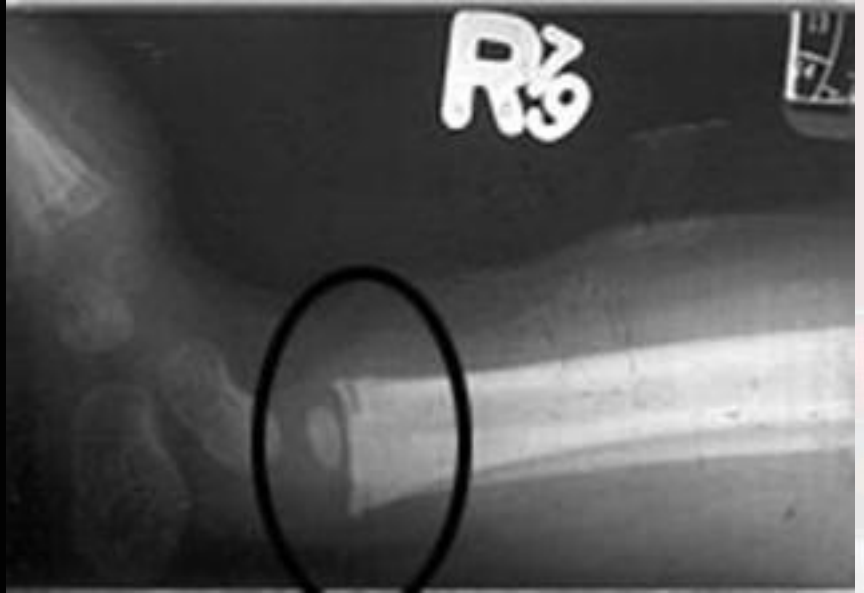
- Diaphyseal fractures
 - Non-specific
 - Age
 - Story



Torus or Bucket Fracture



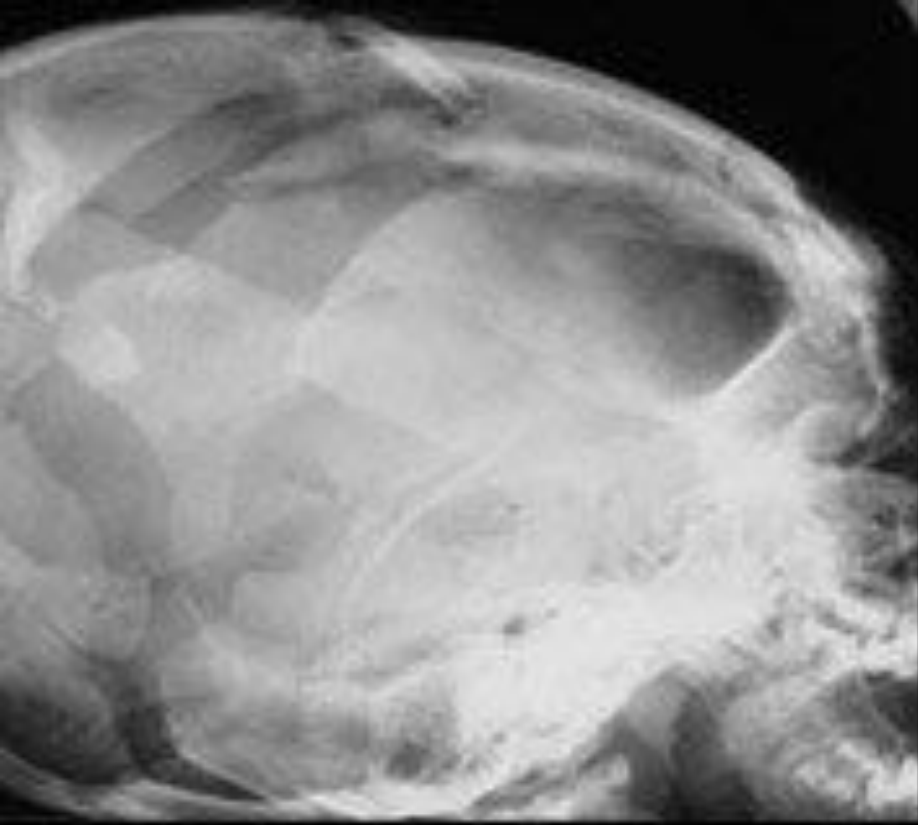
Bucket Handle Fracture



Corner or Chip Fractures



Healing fracture



Skull Fractures

Predictive Value of Historical and Physical Characteristics of Child Abuse

- Burn attributed to a sibling
- Child brought to ER by non related adult
- Unusual affect
- Treatment delay
- Different historical accounts
- Abnormal child response to pain
- Injury pattern inconsistent with history
- Injury inconsistent with developmental age
- “Mirror image” burns
- Perineum, genitalia or buttocks
- Appears older than stated age
- Unrelated injuries



Abusive Head Trauma in Children (aka Shaken baby syndrome)

- Triad of signs:
 - Subdural hematoma
 - Cerebral edema
 - Retinal hemorrhage
- Other signs
 - URI, uncontrolled vomiting, diarrhea, decreased appetite, irritability, lethargy, apnea, seizures
 - history of minor trauma

Abusive Head Trauma

- Further signs/symptoms
 - Increased or decreased muscle tone
 - Poor feeding, suck, swallow
 - Breathing difficulties
 - Enlarged head
 - Inability to move head
 - Poor focus, unequal pupils
 - Absence of smiles and vocalization

Abusive Head Trauma



Subdural Hematoma



Not just confined
to the head

Pointers on Recording

- It didn't happen if it's not in the record
- Notes become a legal document
- Keep statements objective
- Keep emotions out of narrative
- Describe what you see, how people act
- Describe interventions in detail, and if possible what the child looked like prior to intervention

Reporting Abuse and Neglect

- <http://www.healthandwelfare.idaho.gov/Portals/0/Children/AbuseNeglect/CareEnoughReportChildAbuseAndNeglect.pdf>
 - PDF with lots of information on abuse, neglect, reporting. Worth putting up in stations
- Section 16-1619 of Idaho Code
 - Mandatory reporter of observed or suspected abuse, neglect, abandonment
 - Supervisor, 911, CPS
 - Protected under good faith laws

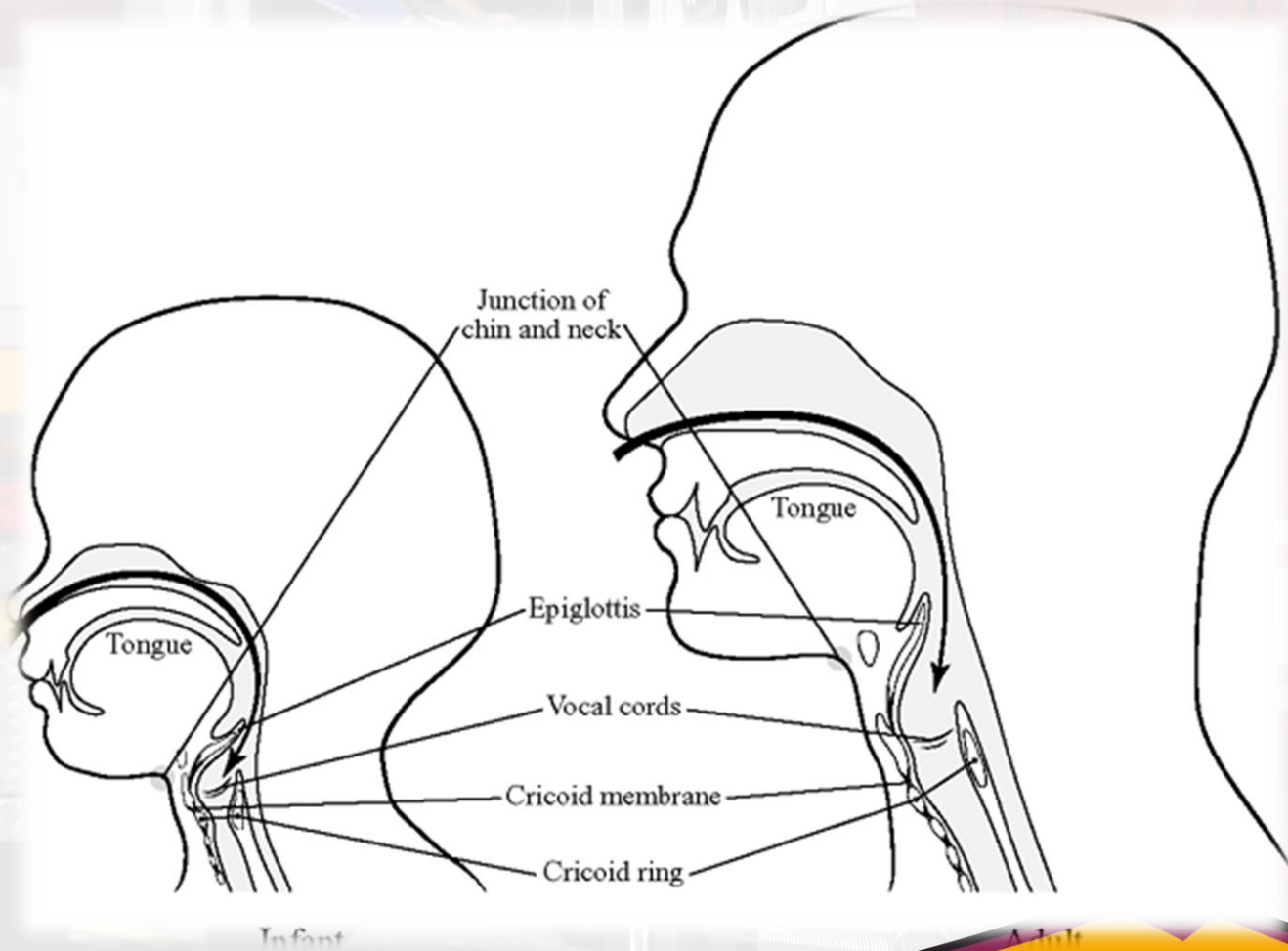
What makes kids different...



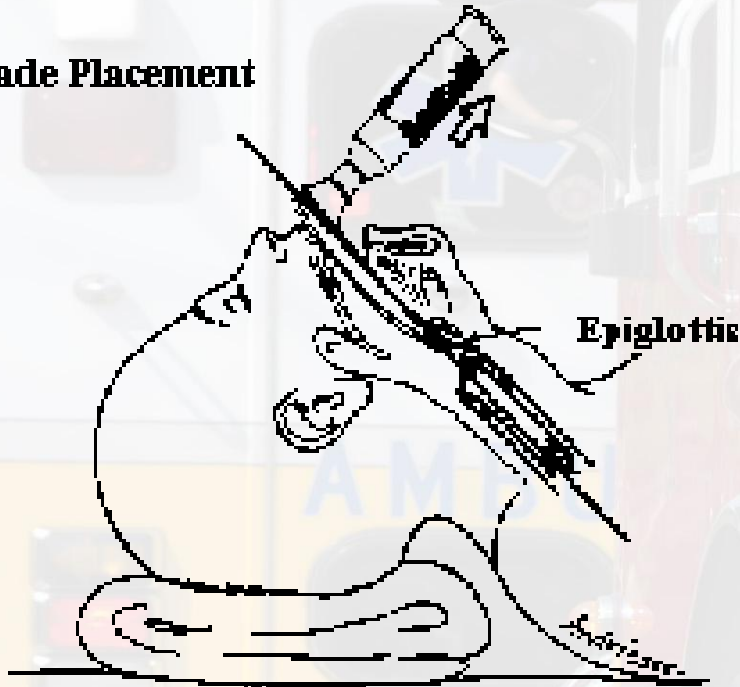
- Despite our best efforts....

Children are not little adults....

Pediatric Airway

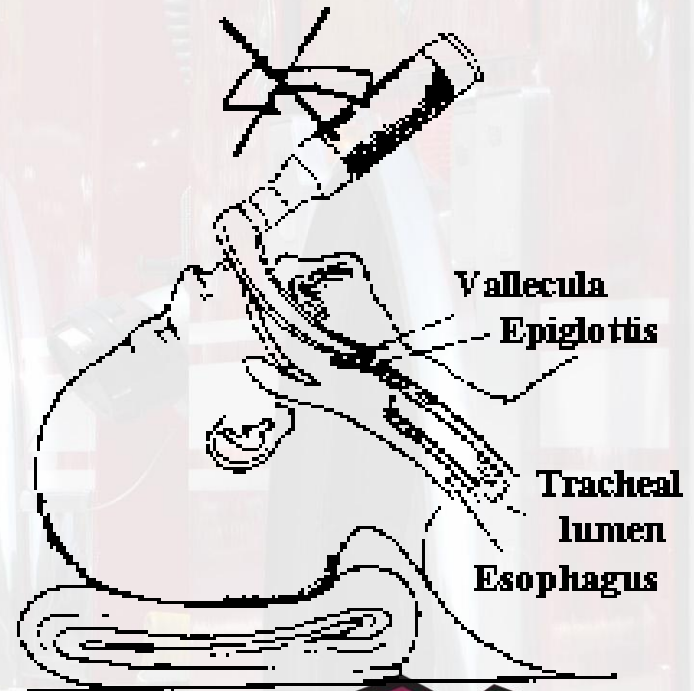


Straight Blade Placement



Miller Blade

Macintosh Blade



Breathing

- Age dependent respiratory rate
- Increased vagal tone
- Smaller tidal volumes
- Lower functional residual capacity
- Higher oxygen metabolism
- Challenging airway

Circulation

- Excellent compensatory mechanism makes blood pressure a poor initial measure
 - Heart rate, pulses, skin color, capillary refill
- Progression from compensatory shock to a decompensated state is swift
 - Altered mental status, cool, pale extremities, weak pulses, mottled skin, poor capillary refill
- Fluid resuscitation is weight based
 - 20 ml/kg isotonic solution

Trauma

- Compared to adults, children are susceptible to multiple and more severe injuries given the same force
 - Force is more widely distributed
 - More significant internal organ damage, often without external signs
 - Larger surface area to body weight ratio
 - Greater risk for heat loss

Anatomical differences in Cervical Spine

- Larger head size and weight compared with the neck and trunk
- Weaker C-spine musculature
- Increased laxity of spinal ligaments
- Immature vertebral joints and ossification centers
- Increased elasticity of the spinal column

Chest Trauma

- More compliant chest wall absorbs and distributes forces
- Fewer rib fractures
- Often masks more serious underlying injuries
- Mediastinum is more mobile
 - Greater displacement
 - Decreased venous return
 - Decreased cardiac output
 - Hypotension
 - Risk for circulatory collapse

Specific Chest Trauma in Kids

- Diaphragmatic injury
- Traumatic asphyxia
- Commotio Cordis

Blunt Abdominal Trauma

- Susceptible to serious intra-abdominal injuries due to anatomy
 - Larger solid organs
 - Less protective subcutaneous fat and musculature
 - More flexible rib cages
 - Smaller torso allowing for wide distribution of forces

Summary Points

- Identification of bruises in children is critical, with abuse high on the differential
- Burns and bruises with identifiable patterns need to be investigated
- Bruises on torso can mask underlying injury
- Fractures must be investigated with consideration of patient's age and developmental state
- Head trauma can present in many ways, with many associated injuries
- In trauma, as in life, children are not just little adults. They have specific physiologic aspects that makes them very different, and need to be treated so in the field