Physical abuse: medical findings and differential diagnosis

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16th November 2016
Definition of physical abuse:

“Physical abuse of a child is that which results in actual or potential physical harm from an interaction or lack of an interaction, which is reasonably within the control of a parent or care giver”  (WHO, 2016)

• Physical abuse
• Abusive Head injuries
Incidence:

Younger children are at the highest risk with children under a year accounting for 41% of child fatalities.

Extrapolating this to South Africa using our an annual birth rate, 550 many cases would be anticipated. Teddy Bear Clinic has dealt with about 10 cases per year.

No accurate statistics available in South Africa.

- Lack of medical education.
- Inadequate medical instigations.
- Lack of willingness to get involved.
- Lack of support from police, courts, social services.
- Sympathy for the parents.
- Unable to face the idea?
- Vague information from other specialists.
- Passing the buck.
- TIME ????
Overlap of Child Maltreatment and Domestic Violence

- Approximately One Million Children Maltreated
- 30-60%
- Approximately Two Million Women Abused
Signs of Child Abuse

The following are a few of the physical and behavioral signs of child abuse and neglect. Please note that the listed signs of child abuse in each category may pertain to more than one type of abuse or neglect.

**Physical Signs of Child Abuse**
1. Unexplained burns, cuts, bruises or welts in the shape of an object.
2. Bite marks.
3. Anti-social behavior.
4. Problems in school.
5. Fear of adults.

**Sexual Signs of Child Abuse**
1. Inappropriate interest or knowledge of sexual acts.
2. Nightmares and bed wetting.
3. Draastic changes in appetite.
4. Overcompliance or excessive aggression.
5. Fear of a particular person or family member.

**Emotional Signs of Child Abuse**
1. Apathy
2. Depression
3. Hostility or stress
4. Lack of concentration
5. Eating disorders

**Signs of Neglect**
1. Unsuitable clothing for weather.
2. Dirty or unbathe
3. Extreme hunger.
4. Apparent lack of supervision.

For a more extensive list of the signs of child abuse, call the Childhelp National Child Abuse Hotline:
1-800-4-A-CHILD (1-800-422-4453)
Suspicious behavior includes:

• Delay between the time of the injury and when help was sought
• An inappropriate degree of concern for the severity of the injury
  • Poor parent-child interaction.
• The behavior of the child e.g. fearfulness
• Repeated visits for accidents or injuries, repeated fractures or ingestions.
INDICATORS OF NON ACCIDENTAL INJURY

Be alerted by one or more of the following -

A history:

- Not compatible with the degree or nature of the injury
- Developmentally impossible
- Vague as to how or when it occurred
- Changes when repeated to different people
- Changes when parents are interviewed separately
- The child may say something if interviewed alone to support your suspicions.

None are diagnostic or exclude abuse if absent.
Bruises in unusual sites

- Surface marks which show the imprints of the instrument used to inflict the injury
- Old scars in a child with acute injuries
  - Symmetrical burns
- Burns which reflect the instrument used to make them
Pathognomonic findings:

~ Oral injuries (internal and external)
  ~ Fractured ribs-Posterior ribs
  ~ Bone fractures-Metaphyseal area/growth plate and epiphyseal fractures
~ Multiple or wide complex fractures of the skull
  ~ Fractures sternum, scapular
~ NB!!! Unpresented fractures
Bruises:

Abnormal bruising suggestive of abuse but does not exclude bleeding disorders include clustering of bruises, unusual sites (such as ear, face, neck, trunk, genitalia, and bruises on a child that is not yet mobile)
Differential diagnosis of external injuries:

1. Mongolian spots
2. Haemangiomas (capillary overgrowth)
3. Eczema
4. Phyto photodermatitis – cutaneous phototoxic eruptions
5. Erythema multiforme – sensitivity reaction which produces multishaped red lesions
6. ITP – Idiopathic thrombocytopenic purpura
7. Haemophilia
8. Malignancy – leukaemia
   most common childhood malignancy
9. Ehlers – Danlos syndrome
10. Folk healing process eg coining, cupping
11. Osteogenesis imperfecta (OI) type 1
Differential diagnosis of burns:

1. Hypersensitivity / allergic reactions with blistering
2. Friction blisters
3. Impetigo (circular lesions may be mistaken for cigarette burns)
4. Phyto photodermatitis (sun exposed skin develops redness and erosions)
5. Dermatitis herperiforms: immune mediated skin condition (which produces blisters that can erode)
6. Folk healing practices: cupping, moxibustion (application of heated incense to skin)
Examination of physical abuse:

Growth parameters: underweight and stunted growth parameters could indicate neglect, nutritional causes, liver or renal dysfunction, chronic illness.

A full medical examination, with special attention to the neurological exam and developmental maturation.
Intra Abdominal injuries:
Abusive head injury

Coup contrecoup injuries: Coup occurs at site of impact and contrecoup occurs on the opposite side. Associated with brain contusion and bleeds.
Abusive head injuries:

In 1946, a Radiologist, Caffey, found an association between intracranial and intraocular haemorrhages, in the absence of external trauma to the head. He later went onto describe shaken baby syndrome (AHI) as a triad:
long bone fractures/ metaphyseal fractures, occult fractures and posterior rib fractures 30-70%

(65-90%) Retinal haemorrhages

Intracranial bleeds (chronic subdural bleeds)
Non accidental brain injury applies specifically to damage to the brain and has a variety of mechanisms including:

1. Traumatic encephalopathy sustained as a result of deliberate impact which may be acceleration or deceleration
2. Head compression
3. Penetrating head injury
4. Repetitive rotational injury referred to as “shaken baby syndrome”
5. Rotation and impact injury referred to as “shaken impact syndrome”
6. Whiplash injury referred to as “cervico-medullary syndrome”
Mechanisms of injury:

Infants are at particular risk for brain injury because of a number of developmental factors:

~ The infant’s head is relatively large and heavy compared to the body size

~ The neck is relatively weak with poor head control

~ The extra-cerebral space is relatively large causing the brain to float in the CSF allowing the brain to continue moving when the skull stops moving.

~ There is physiological laxity of the meninges allowing for less tethering and therefore greater movement of the brain.

~ The white matter of the brain has greater water content than the grey matter which will predispose to a shearing injury with tangential accelerations.
[ RULE OF 9’S ]

ANTERIOR

INFANT

POSTERIOR

PALMAR METHOD
(Patient’s palm)
**Shaken baby syndrome**

A baby’s head can weigh one-fourth of its total body weight, and because the neck muscles are still weak, any violent shakes will cause the head to fling out of control. The impact on the brain can be up to 30 times the force of gravity and cause permanent or fatal damage to the baby. Because damage is internal, signs of danger may not be seen until it’s too late.

1. **Blood vessels** that lead from the brain to the dura membrane are most susceptible to tearing since the subdural space between the brain and the skull is greater for babies. Such hemorrhaging is what doctors detect in CAT scans.

2. **Nerves** inside the brain may sever. If this happens, the brain will swell, cutting off oxygen to the brain. In surviving babies, blindness and brain damage may also occur.

3. **The brain stem** is where vital sensors are located. If this is severed or damaged, the baby will experience respiratory problems and vomiting.

4. **The optic nerve** is often damaged, which causes retinal bleeding.

**A traumatic shake**

Shaking a baby is much like the effects of holding a bowling ball upright in your hand and shaking it back and forth. Like a baby’s neck, the wrist would not support the force, allowing the bowling ball to swing back and forth. For the baby’s delicate brain, this would be like an earthquake.

Source: Sally Smith, M.D. All Children’s Hospital
Hyper acute Cervico-medullary injury

Occurs due to severe flexion extension of the neck with damage to the brainstem. Post mortems show localized axonal damage at the cranio cervical junction, the corticospinal tracts, and possibly thrombosis of the vertebral arteries. These infants present with apnoea leading to ischaemic brain damage and very little subdural bleeding.

If the infants survives an MRI of the cervical cord as well as the brain is essential.
Axonal injuries on PM
Differential diagnosis of intracranial bleeds:

1. Accidental trauma eg MVA
2. Coagulation disorders
3. Vascular malformations-aneurysms
4. Glutanic aciduria type 1: rare (1/30 000 births) amino acid inborn error of metabolism. Presents with acute encephalopathy and chronic subdural bleeds
5. “Caido di mollera” – folk healing practice for sunken fontanelle (child held upside down by ankles and shaken)
6. Meningitis, epilepsy
Paramacular fold with traumatic retinoschisis-Non impact head injuries
Haemorrhagic retinopathy
Differential diagnosis of fractures:

**Metaphyseal Lesions**

- Corner Fracture Pattern
  - Tangential View
- Bucket-Handle Fracture Pattern
  - Beam Angulation View
Differential diagnosis of skeletal fractures

1. Normal variants of bone structure
2. Congenital syphilis – periosteal elevation
3. Rickets and other mineralization deficits
4. Osteogenesis imperfecta
5. Prematurity
6. Birth injuries
Osteogenesis imperfecta

- Triangular-shaped face with broad forehead
- Whites of eyes look blue, purple or gray
- Brittle teeth
- Barrel-shaped rib cage
- Short, small body; deformed bones
Physical Examination

- Clinical presentation depends on phenotype
- Silence classification has 4 types based on clinical and radiologic features
- Dentinogenesis imperfecta is denoted as subtype B, whereas OI without dentinogenesis imperfecta is denoted as subtype A
-4 types are identified:
  - Incidence: (all types) 1/20,000
  - Bruise easily
  - Family hx of hearing impairment
  - Short stature
  - Blue sclera
  - Mild to moderate bone fragility (presents with # at birth)
Type I - most commonly occurring (80% of patients)
- AD inheritance
Type II – death by age 1 month (perinatal)
- multiple # at birth
Type III - rare
- severe bone fragility, osteopenia, triangular faces, lax ligaments, skeletal deformity and abnormal appearance of teeth
Type IV – most difficult to distinguish from NAI
- Most bones appear normal when the 1st # occurs
- Mild to moderate bone fragility with osteopenia
- Wormian bones
Wormian bones are a subset of the small intrasutural bones that lie between the cranial sutures formed by the bones of the skull vault. The title is reserved for bones typically found around the lambdoid suture.
Diagnostic considerations:

**Accidental injuries VS. NAI**

1. Current and future safety of child
2. Well being of the child


Among child abuse fatalities, head injuries is the most common cause of death
Lasting effects of abuse: Bruce Perry & Ronnie Pollard 1997
CHILDREN WHO ARE ABUSED ARE

- 25% More likely to experience teen pregnancy.
- More likely to be arrested as juveniles. 59%
- 30% More likely to commit a violent crime.
- More likely to experience delinquency & drug use. 25%
1/3 Die
1/3 severely disabled
1/3 seem fine at discharged but on follow up most have a deficit.
(L.Jacklin)

Therefore careful long term follow up and support is needed.
Court preparation and adequate documentation