PedsCases Podcast Scripts

This is a text version of a podcast from Pedscases.com on “Physical Abuse of Children.” These podcasts are designed to give medical students an overview of key topics in pediatrics. The audio versions are accessible on iTunes or at www.pedcases.com/podcasts.

Physical Abuse of Children

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Introduction

Recognizing, reporting, and managing child abuse is the responsibility of all physicians, regardless of their specialty. This podcast is intended to make you more comfortable in dealing with child abuse and recognizing the physician's role in these cases.

Child abuse is rarely a clear-cut case. Often there are aspects of the history and/or the injuries themselves that lead health professionals to be concerned that they may have been inflicted rather than sustained in an accidental manner.

Health professionals do not need to be *sure* a child has been abused to report to the appropriate Children Services Authority. Rather, health professionals simply need to have reasonable and probable cause to believe a child is in need of protective services.

The following podcast will review injuries concerning for physical child abuse including: bruising, fractures, burns, and head trauma (aka shaken baby syndrome).

Bruises

When considering bruises in the context of child abuse, one must consider: the developmental capabilities of the child, the proposed mechanism, and the pattern of the bruise. Interestingly enough, the colour of the bruise yields very little if any meaningful information.

Developmental capabilities will yield significant information about the likelihood of a bruise being sustained via inflicted or accidental trauma. For example "if you are not cruising, you are not bruising". Hence, an infant should not sustain any bruises given they do not have the developmental abilities to bump into anything or fall from

standing to sustain a significant bruise. Any bruising on an infant should raise suspicion of inflicted trauma.

Similarly, a toddler who was able to walk independently would commonly have bruises to the shins, forehead, and other prominent areas on the body such as knees and elbows. One would not expect, however, bruises on the posterior surface of the body such as the back, buttocks or back of the legs without a clear and plausible explanation.

Bruises that are bilateral and/or have a pattern to them are concerning for inflicted trauma, especially linear bruises that might reflect the instrument being used to strike the child. In addition, bruises appearing over the abdomen reflect a significant amount of force as the belly is not adjacent to bony surfaces and is an unusual area to see bruises of an accidental nature apart from MVAs without a clear and plausible explanation.

Studies have demonstrated that the colour of the bruise is fairly meaningless in terms of when the bruise was sustained. Bruises that were sustained at the same time can have varied appearances and colours. The only little bit of information that can be gleaned is if the bruise is yellow in colour it is at least 18 hours old as it takes this amount of time for the red blood cells to breakdown into bilirubin.

If a child seems to have bruises not in keeping with the history, it is crucial to consider the differential diagnosis which might include: bleeding diatheses such as hemophilia or ITP, collagen vascular diseases such as Ehlers-Danlos, or leukemia. Minimum investigations should include: CBC, and PT, PTT. If an underlying bleeding problem is suspected, a pediatric hematologist should be consulted.

Fractures

Fractures are common presentations to emergency departments and doctors' offices. This chapter will review when you should be concerned that the fracture may have been inflicted.

The first crucial piece of information is whether the mechanism that is described by the caregivers explains the fracture. Second, is the explanation consistent over time and by all witnesses? Third, is the explanation within the developmental capabilities of the child? And finally, could this child have an underlying bone disorder that makes the bones more susceptible to breaking?

The developmental capabilities of the child will lend significant information as to whether the fracture is suspicious for child abuse or not. For instance, a 2 week old infant should not be able to "roll" of a couch and sustain a skull fracture as rolling would not be expected at that age. Further, an infant should not be able to sustain a spiral fracture as they are unable to exert a planting and twisting motion on their femur

independently. However, if a five year old is described to have some sort of planting and twisting mechanism to explain their fracture, this would make sense. Remember, not all spiral fractures are suspicious, but they do require a twisting mechanism in the history.

Fractures that are highly correlated with abuse include: spiral fractures in infants, acromium fractures, sternum fractures, scapula fractures, vertebral fracture, classic metaphyseal fractures, and posterior rib fractures. These are all correlative with abuse as it is difficult to describe an accidental mechanism that would result in fractures in these locations unless extraordinary circumstances are described.

Dating of fractures is a rough science at best. If a fracture has callus it is at least 5-7 days old, if there is no callus it is less than 5-7 days. If there are multiple fractures some with and without callus it is presumed that they represent injuries of different ages and hence multiple events.

Fractures have a differential diagnosis. The majority of times fractures are the result of accidents. Also in the differential are inflicted injuries, and metabolic bone disease. In children with fragile bones the X-rays clearly demonstrate poor mineralization. One of the most common genetic reasons for fragile bones is oseogenesis imperfecta. There are numerous types of OI ranging from fatal forms to very mild forms. Some forms are accompanied by other manifestations including: hearing loss, abnormal dentition, wormian bones, and blue sclera. These manifestations should be sought out in any history of a child with a suspicious fracture. If the clinician is suspicious that a metabolic bone disease is present consultation with a metabolics or genetic specialist is warranted.

One of the most common reasons for fragile/poorly mineralized bones is simply a lack of weight bearing such as children with spastic quadriplegia that are wheelchair bound. This, however, does not rule out the possibility of inflicted injury in this population, but a mechanism such as an awkward transfer may result in a fracture.

In young children under 2 years who demonstrate a suspicious fracture, a skeletal survey should be considered to rule out any other occult fractures. A complimentary test to demonstrate acute fractures would be a bone scan that may be better able to demonstrate acute fractures such as rib fractures for instance but is very poor for demonstrating fractures of the axial skeleton such as skull fractures. In older children, a good clinical exam is often all that is warranted as they can verbalize painful areas and display an abnormal gait or disuse of a limb. This will avoid the radiation exposure. Remember: children heal quickly and often completely, a normal skeletal survey or bone scan does not eliminate the chance the child may have sustained a fracture months or years ago; it is a snapshot of the recent past only.

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Burns

Burns are common accidental injuries in children especially scald burns. Once again, as with bruises and fractures, the key piece of the history is whether the story make sense when the patient presents. If the story goes that the child climbed into a scalding tub of water on their own: first of all, is the child developmentally capable of doing so? And does the severity and distribution of the burn make sense?

The degree of burn depends on three variables: the temperature of the water, the length of time the child was exposed to the water, and the thickness of the skin involved. For instance, a burn to the sole of the foot in kids who can walk is often less severe due to the fact it may be right against the tub and have less contact, and also it is thicker and hence frequently demonstrates less severe bums as compared to other areas of the body.

Developmentally, if a child climbs into a hot tub they generally get the heck out of there. The line of demarcation is usually not crisp and involves just one hand or one foot. When a child presents with a glove and stocking distribution with a crisp line of demarcation, the possibility that the child may have been dipped in the water needs to be considered. These events frequently happen around the time of toilet training involving an overwhelmed, frustrated parent. In addition, if a child is trying to escape a hot tub generally you see areas that denote "splash" as the child is frantically trying to get out. A lack of splash and crisp areas of demarcation should raise suspicion of an inflicted injury.

Shaken Baby Syndrome

An infant who has been shaken may show up in the emergency department with variable presentations. These presentations may include: a child with an increasing head circumference, irritability, poor feeding, to a child who is actively seizing, comatose or in full cardiopulmonary arrest. It is not until the child's head is CTed that the etiology for the signs and symptoms become apparent. Many infants who have been shaken are missed as many recover and do not present to health care, or if they do present to physicians, the subtlety of their symptoms is not attributed to a head injury.

The shaken baby syndrome is known by many names. Recently the term "Abusive Head Trauma" is more popular in the child abuse literature. The older term "shaken baby syndrome" describes several features of an infant who has been violently shaken and includes: subdural hematomas, retinal hemorrhages, cerebral edema, and specific fractures which include: posterior rib fractures and classic metaphyseal fractures which are fractures across the growth plates of long bones.

The subdural hematomas are the result of shearing of the bridging veins that traverse the subdural space on the way to the venus sinuses. This is the result of

the brain moving within the skull cavity and stretching and tearing the bridging veins. The bleeding characteristically appears over the convexities, in faulx cerebri, and the tentorium and is described as a thin rim of bleeding. The cerebral edema is related to a lack of oxygen or direct brain injury. The retinal hemorrhages have a similar etiology as the subdural hematomas and likely relate to shearing injuring at the back of the eye. In young children, the vitreous is tightly adherent to the retina and hence there is a shearing force applied to the retina as the vitreous tugs on the retina. Characteristically, in kids who have been shaken the hemorrhages are multi-layered, extent right to the ora serata, and are too numerous to count. However, less severe hemorrhages are frequently seen.

Accidental injuries that may mimic facets of the shaken baby syndrome or AHT include high speed motor vehicle crashes and falls from greater than two stories. Short falls cannot account for these injuries although this is the frequent explanation supplied by caregivers. In summary, an enormous amount of force is required to see this pattern of bleeding and hence the history provided needs to reflect this severity of force.

Remarkably in many babies who have been shaken there are no outward signs of trauma. The lateral rib fractures are likely the result of chest compression when the children are grasped around the rib cage and shaken and the posterior fractures are related to the levering of the ribs against the transverse process of the vertebra as they are being shaken back and forth.

The morbidity and mortality associated with SBS is far greater than accidental head injuries. Mortality ranges from 12-30% with long-term sequelae in most survivors that may range from learning disabilities to spastic quadriplegia.

The major differential diagnosis in kids suspected of abusive head injury is obviously accidental head injury. Again, the proposed mechanism needs to evaluated with the presenting injuries. An expert in the area of neurosurgery or child maltreatment should be consulted in these cases to ensure a full diagnostic workup is preformed and other possible differential diagnosis entertained.

Role of the Physician

The role of the physician is to diagnosis and treat patients. It is clearly not our mandate to investigate whether a criminal act has taken place. It is our obligation to report suspicious injuries but not to interrogate family members and worse contaminate the work of trained investigators who work for children's services and the police. Physicians need to take a thorough history to explore the etiology of the presenting injuries, consider all possible differential diagnoses, and embark on a treatment plan. Meticulous documentation is necessary in cases where child abuse is in the differential diagnosis.

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Summary

To review the major points of this podcast:

1. Bruises cannot be dated by their color. Suspicious bruises are those that are on posterior surfaces of the body, over the abdomen, or have a pattern that is not explained in the history.
2. Suspicious fractures for inflicted trauma include: spiral fractures in non-ambulatory children such as infants, acromium fractures, scapular fractures, vertebral fractures, posterior rib fractures, CMLs and sternum fractures. These injuries are difficult to sustain via an accidental mechanism and hence extraordinary accidental circumstances would be required to adequately explain them.
3. Scald burns that are bilateral, demonstrate glove and stocking distribution with clear areas of demarcation, with no evidence of splash are extremely concerning for inflicted injury.
4. Severe head injuries generally require severe forces. When a child presents with symptoms of a head injury: ranging from irritability and poor feeding to seizures and cardiopulmonary arrest, the diagnosis of inflicted head injury or shaken baby syndrome should be considered.
5. The physicians' role in child abuse is to recognize patterns of injuries that are associated with child abuse and injuries that are out of keeping with the developmental abilities of the child and the mechanism described by the caregivers. Any health provider is legally and professionally obliged to report suspicious injuries to the appropriate Children Services Authorities.
6. It is the physicians' role to diagnose and treat injuries and report when suspicions of child abuse arise. Leave the investigative piece to those trained in this area.
7. Remember meticulous documentation is crucial in these cases.
8. Other reasons to report a child to Children Services not covered in this Podcast include: exposure to domestic violence, living in an environment that manufactures and distributes elicit drugs such as crystal meth and marijuana, and evidence of neglect.

This is the conclusion of this podcast I hope it has met your learning objectives. Related podcasts include: child sexual abuse and failure to thrive.

References

References available upon request.

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