

Physical abuse: specifics of clinical diagnosis

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Physical abuse or nonaccidental trauma is one of the most common types of child abuse. The yearly incidence in the United States of injuries inflicted by parents or caretakers is generally 1200 new cases per million.¹ At least 4000 children die each year from physical abuse. Approximately 10% of children younger than 5 years of age seen by emergency room physicians for trauma have injuries that were inflicted.² A review of the diagnostic acumen necessary for the recognition of inflicted injuries is of paramount importance to dentists as well as physicians.

Histories Given for Inflicted Injuries

Although many child abuse diagnoses can be based on physical findings alone, the history of how the injury occurred becomes helpful when a child presents with multiple, nondescript injuries.³ The following histories are diagnostic or extremely suspicious for nonaccidental trauma (Table 1).

Eyewitness History

When a child readily states that a particular parent or caretaker injured him, the history is likely true. When one parent or caretaker accuses the other of injuring a child, the story is usually accurate, if the parents are not engaged in a custody dispute. Partial confessions by a parent or caretaker are not uncommon and are diagnostic as complete confessions. For example, a parent or caretaker may admit causing

one of the injuries but not the others, or may state that intentions to injure were present but action on these impulses did not occur.

Unexplained Injury

Some parents or caretakers deny knowing that their child had any of the injuries discovered. Other parents or caretakers have noticed the physical findings, but can offer no explanation as to how the injury happened. They hope others believe that the injury was spontaneous. When pressed, they may become evasive or offer a vague explanation. These explanations are self-incriminating. Most nonabusive parents know exactly how, where, and when their child was hurt. They also show a complete willingness to discuss the accident in detail.

Implausible History

Many parents offer an explanation for the injury, but one which is implausible and inconsistent with common sense and medical judgment. If the parents offer a blatantly phony history, diagnosis is rather easy. Occasionally, a minor accident is described, yet the injuries are major (e.g., a child reportedly has fallen onto a thick carpet, but has multiple body bruises). Occasionally, the behavior described as leading to the accident is impossible for the child's developmental level (e.g., a 10-month-old child who allegedly climbed into a tub and turned on scalding water).

Alleged Self-Inflicted Injury

An alleged self-inflicted injury in a small baby is most serious. These children can be reinjured seriously or killed if the correct diagnosis is not established. In general, the child who cannot crawl cannot cause a self-inflicted accident. Fractures at this age

TABLE 1. Histories Offered for Inflicted Injuries

Eyewitness History
Unexplained Injury
Implausible History
Alleged Self-Inflicted Injury
Delay in Seeking Medical Care

almost universally are inflicted. Absurd stories should be considered highly unlikely and acted upon accordingly. Histories implying that the child is masochistic should always raise questions (e.g., the child who hurts himself badly during a temper tantrum or repeatedly pokes the inside of the mouth with an eating utensil).

Delay in Seeking Medical Care

Most nonabusive parents seek immediate care when their child is injured. In contrast, some abused children are not presented for care for a considerable length of time, even when there is a major injury. Commonly in the abusive situation, the adult who was with the child at the time of the injury does not accompany the child to the health care facility.

Inflicted Bruises

Inflicted bruises occur at typical sites and/or fit recognizable patterns (e.g., human hand marks, human bite marks, strap marks, or bizarre shapes). The dating of bruises usually conforms to the guidelines in Table 2.⁴ Bruises of different vintages point to multiple beatings.

Typical Sites

Inflicted bruises are so common at certain body sites that discovering them there is pathognomonic (Table 3). Bruises that predominate on the buttocks, lower back, and lateral thighs almost always are related to punishment (i.e., paddling). Likewise, genital or inner thigh bruises usually are inflicted for toileting mishaps. Injuries to the penis may include pinch marks, cuts, abrasions, or amputation.⁵ Injuries to the genital area also should raise the question of sexual abuse, especially when found in girls.

Bruises on the cheek are usually secondary to being

slapped. Accidental falls rarely cause bruises to the soft tissues of the cheek, but instead involve the skin overlying bony prominences such as the forehead or cheekbone. The outlines of fingers can be evident. Bruises on the earlobe usually are due to being pinched. Children who are pinched or pulled by the earlobe usually have a matching bruise on each surface. A child occasionally will suffer a ruptured eardrum from a blow to the ear. Bruises of the upper lip, labial frenum, and floor of the mouth in a child too young to sit up by himself and inadvertently fall forward usually are caused by impatient, forced feedings or by forcing a pacifier or bottle into the child's mouth. Bruises of the labial frenum may remain hidden unless the lip is carefully everted. A history of inconsolable crying often can be obtained in these cases.

Bruises or cuts on the neck almost always are due to being choked or strangled by a human hand, cord, dog collar, or other such instrument. Accidents to this site are extremely rare and should be looked upon with suspicion. Choke marks may be attributed to a resuscitation attempt when in truth they are due to lifting a child off the ground by the neck while slapping him in the face or battering him against a wall. Resuscitative attempts do not leave bruises on the face or neck.

Human Hand Marks

The human hand can leave various types of pressure bruises (Table 4). The most common types are grab marks or squeeze marks, oval-shaped bruises that resemble fingerprints. Grab marks usually are due to being held during violent shaking. The most common site is the upper arm or shoulder. Grab marks of the lower extremities also are common until the child learns to walk. Grab-mark bruises can occur on the cheeks if an adult squeezes a child's face in an attempt to get food or medicine into his mouth. This action leaves a thumb mark bruise on one cheek and 2-4 finger-mark bruises on the other cheek.

Linear grab marks are caused by pressure from the entire finger. The outline or the entire hand print sometimes is seen on the back or at other sites. The hand leaves outline bruises when capillaries at the edge of the injury are stretched enough to rupture. In slap marks to the cheek, 2 or 3 parallel linear bruises at finger-width spacing will be seen to run through

TABLE 2. Dating Bruises

Age	Color
0-2 days	Swollen, tender
0-5 days	Red, blue, purple
5-7 days	Green
7-10 days	Yellow
10-14 days	Brown
(or longer)	
2-4 weeks	Cleared

TABLE 3. Typical Sites for Inflicted Bruises

Buttocks and Lower back (Paddling)
Genitals and Inner Thighs
Cheek (Slap Marks)
Earlobe (Pinch Marks)
Upper Lip and Frenum (Forced Feeding)
Neck (Choke Marks)

TABLE 4. Human Hand Marks

Grab Marks or Finger-Tip Bruises
Linear Marks or Finger-Edge Bruises
Hand Prints
Slap Marks
Pinch Marks

a more diffuse bruise. The hand also can leave pinch marks, 2 crescent-shaped bruises facing each other. The shape of the pinch-mark bruise primarily is due to the fingernails.

Strap Marks

Strap marks are 1-2 inches wide, sharp-bordered rectangular bruises of various lengths, sometimes covering a curved body surface. These often are caused by a belt. Sometimes the eyelets or buckle of the belt can be discerned. Lash marks are narrow, straight-edged bruises or scratches caused by a thrashing with a tree branch or switch. Loop marks are secondary to being struck with a doubled-over lamp cord, rope, or fan belt. The distal end of the loop strikes with the most force, commonly breaking the skin and leaving loop-shaped scars.⁶

Bizarre Marks

Bizarre-shaped bruises with sharp borders nearly always are inflicted. When a blunt instrument is used in punishment, the resulting bruise or welt will resemble it in shape. The wide assortment of instruments used to abuse children suggests that the caretaker who loses his temper grabs whatever object is handy.⁷ Circumferential tie marks on the ankles or wrists can be caused when a child is restrained. If a narrow rope or cord is used, the child will be left with circumferential cuts. If a strap or piece of sheeting is used to restrain a child about the wrists or ankles, a friction burn or rope burn may result, usually presenting as a large blister that encircles the extremity. Rope burns also have been seen about the thighs from tying the child to a potty seat. Gag marks may be seen as abrasions that appear near the corner of the mouth. Children may be gagged because of screaming or yelling.

Accidental Bruises

A thorough knowledge of common and unusual accidental bruising will help in recognizing inflicted injuries. Understanding unusual customs or practices that leave bruises is also helpful. Lastly, it is important to remember that all bluish discolorations of the skin are not bruises.

Most children periodically acquire 1 or 2 bruises during falls or rough activity. The most common site for multiple, easily explained bruises in children of all ages is on the knee and lower leg. These bruises are due to normal falling or bumping into objects while running. Bruises on the forehead are frequent from age 1-2 when the child is accomplishing walking and climbing skills.

While bruises from falling usually are circular with irregular borders, so are grab marks, ring marks, or

blows with a fist. Accidental bruises, however, usually occur on the skin overlying bony prominences (e.g., chin, elbow, forehead, spinous process, greater trochanter, etc.). Nondescript bruises become suspicious as abuse when they occur on the soft parts of the body (e.g., cheek, fleshy part of the arm, buttocks, abdominal wall, etc.). Most falls give one bruise on a single surface. Bruises on multiple body planes usually are inflicted unless there is a history of a tumbling accident. True tumbling accidents also give bruises and abrasions over bony prominences.

Unusual Bruises

Some common ethnic practices can result in bruises that should not be confused with child abuse. The Vietnamese can induce symmetrical, linear bruises from coin rubbing (Cao Gio). For symptoms of fever, chills, or headaches, the back and chest are covered with oil and then massaged in downward strokes with the edge of a coin.⁸

Some teenagers cause multiple petechiae on their chins by sucking on a cup until they create a vacuum and then sliding the cup onto their chin.⁹ Tourniquets also can cause petechiae, especially in children who already have an erythematous rash.

A passionate and prolonged kiss can lead to an area of purpura on the skin. Vigorous sucking on hard candy can leave an area of purpura on the soft palate. Purpura at this site also has been reported with fellatio. Multiple petechiae of the face and neck can occur following vigorous crying, retching, or coughing, due to a sudden increase in superior vena cava pressure. Petechiae and purpura even have been seen in the conjunctiva or mouth as the result of this mechanism.

Pseudobruises

Some skin conditions may be mistaken for bruises. The most common is the Mongolian spot. This birth mark occurs in 95% of Blacks, 81% of Orientals and American Indians, 70% of Chicanos, and 10% of Caucasians.¹⁰ Lasting from 2 to 3 years, they are grayish-blue, do not change color, and have clear-cut margins. Although they commonly occur on the buttocks and back, they can be found anywhere.

Allergic periorbital discoloration is due to long-standing venous congestion from allergic rhinitis and eye allergies. These pseudobruises are usually more brownish than blue, and the discoloration mainly is seen on the lower medial eyelid. The presence of allergies and the duration of the finding points to the correct diagnosis. Hemophilus influenzae can give a bluish cellulitis of the cheek. Afflicted children are sick, run fevers, and their cheek areas are quite tender to palpation.

Inflicted Burns

Approximately 10% of physical abuse cases involve burns.¹¹ Burns from hot solid objects are the easiest to diagnose. These are usually second-degree, without blister formation, and usually involve only one surface of the body. The shape of the burn often resembles its agent and is pathognomonic for child abuse. Abused children often are held against a heating grate or electric hot plate. Cigarette burns give circular, punched-out lesions of uniform size and often are found on the hands or feet. Bullous impetigo should be considered in a differential of burns of this nature.

Hot water burns, normally indicated by blistering, are the most common inflicted burns. Immersion burns occur when a parent holds the thighs against the abdomen and places the buttocks and perineum in scalding liquid as punishment for enuresis or resistance to toilet training. This results in a circular type of burn restricted to the buttocks. With deeper, forced immersions, the burn extends to a level on the thighs and waist. The hands and feet are spared, which is incompatible with falling into a tub or turning the hot water on while in the bathtub. Forcible immersion of a hand or foot as punishment can be suspected when a burn extends well above the wrist or ankle. Scalded skin syndrome should be considered in a differential of scalding burns.

Inflicted Bone Injuries

Most inflicted fractures are due to wrenching or pulling injuries that damage the metaphysis.¹² The classic early finding is a chip fracture where a corner of the metaphysis of a long bone is torn off, along with the epiphysis and periosteum. From 10 to 14 days later, calcification of the subperiosteal bleeding becomes visible at the periphery. Within 4-6 weeks after the injury, the subperiosteal calcification will be solid and start to smooth out and remodel. Inflicted fractures of the shaft are usually spiral rather than transverse. Spiral fractures of the femur of a preambulant child usually are inflicted. The most diagnostic radiograph shows injuries to multiple bones at different stages of healing. Such findings imply repeated assaults.

Inflicted Eye Injuries

Inflicted periorbital bruising is more common than serious eye injuries. Children who have been hit about the eyes with an open or closed hand present with massive swelling and bruising of both eyelids. Most periorbital bruises caused by accidents only involve one side. A child can acquire bilateral periorbital bruises from a single accident, or more precisely from strik-

ing a single object. Bilateral periorbital bruises can occur from blood infiltrating from a large bruise on the forehead or from a basilar skull fracture, since blood moves with gravity. However, these children have minimal lid swelling and no lid tenderness. In addition, the onset of the periorbital bruise is delayed 1 or 2 days from the time of the injury. Therefore, these situations should not be confused with the child who has been struck about the head and eyes.

Ocular damage in the battered child syndrome includes acute hyphema, dislocated lens, traumatic cataract, and detached retina.¹³ More than half of these result in permanent impairment of vision affecting 1 or both eyes. Retinal hemorrhages also are indicative of subdural hematomas in children with unexplained central nervous system findings. The differential diagnosis of retinal hemorrhages is direct head trauma, shaking injuries, increased intracranial pressure, hypertension, bleeding disorders, sudden compression of the chest, and gymnastic twirling on a horizontal bar. Retinal hemorrhages usually last 10-14 days.

Inflicted Head Injuries

Inflicted head injuries include subdural hematomas, subarachnoid hemorrhages, scalp bruises, traumatic alopecia, and subgaleal hematomas.

Subdural Hematomas

Subdural hematoma is the most dangerous inflicted injury, often causing serious sequelae or death. More than 95% of serious intracranial injuries during the first year of life are the result of abuse.¹⁴ These children present with irritability, vomiting, a decreased level of consciousness, breathing difficulty and apneic episodes, a bulging fontanelle, and/or convulsions. The classic case of subdural hematoma is associated with skull fractures. These fractures are secondary to a direct blow from the parent's or caretaker's hand or from being thrown against a wall or door. Numerous other bruises often are present.

Inflicted subdural hematomas also can occur without skull fractures, scalp bruises, or scalp swelling. In fact, more than one-half of the cases have no fractures. Evidence clearly points to a violent, whiplash shaking mechanism.¹⁵ Rapid acceleration and deceleration of the head as it is in motion leads to tearing of the bridging cerebral veins with bleeding into the subdural space, usually bilaterally. Most of these cases occur in babies less than 1 year old, who are shaken in an attempt to make them stop crying. The concept of the spontaneous subdural hematoma in young infants must be discarded to prevent further reinjury or death. Likewise, the diagnosis of chronic subdural hematomas secondary to birth trauma must be viewed with skepticism. Subdural hematomas due to birth

injury often will produce acute signs and symptoms with 24-48 hr after delivery.

Accidental Head Injuries From Falls

A recent study of 246 young children who accidentally fell from cribs or beds showed that in 80% there were no physical injuries.¹⁶ Most of the remainder had single bruises or lacerations. Only 1% of the children had skull fractures, and these were single and linear. Another 1% had fractures at other sites, usually the clavicle or humerus. None of the children had subdural hematomas, epidural hematomas, or any serious life-threatening injury.

Inflicted Abdominal Injuries

Intra-abdominal injuries are the second most common cause of death in abused children. Unlike the contents of the chest, the abdominal organs are not protected. Table 5 lists inflicted abdominal injuries in the approximate order of frequency. Most of the injuries are caused by a punch or kick that compresses the organ against the spinal column.

Conclusions

Physical abuse is the most common type of child abuse. Dentists are essential consultants to pediatricians and child protection teams regarding suspicious oral trauma. Likewise, dentists should seek pediatric consultation regarding suspicious bruises or burns at

other sites. By working together, the detection and management of child abuse can be improved.

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TABLE 5. Inflicted Abdominal Injuries

Ruptured liver or spleen	Intestinal perforation
Intramural hematoma of duodenum or proximal jejunum	Pancreatic injury
Ruptured blood vessel	Chylous ascites from injured lymphatic system
Kidney or bladder injury	
Foreign bodies (swallowed or percutaneous)	