Bruising and Physical Child Abuse

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Bruising is one of the earliest, most common, and easily recognizable signs of physical child abuse and can signal escalating interpersonal violence within a household. Early detection of abuse through recognition of bruising coupled with appropriate intervention may help to prevent future and potentially more severe physical assaults. This article provides an overview of precise terminology and definitions, contusion pathology, development and appearance of bruises, characteristics of bruises suspicious for abuse, photographic documentation, techniques to help visualize bruising, conditions that may be confused with abusive bruising, and the difficulties encountered when attempting to estimate the age of bruises.

Clin Ped Emerg Med 7:153-160 © 2006 Elsevier Inc. All rights reserved.

KEYWORDS bruising, contusion, physical child abuse

Bruises are a very much neglected branch of injuries.” These words were originally delivered in a 1938 address to the Medico-Legal Society of Great Britain by Sir Bernard Spilsbury [1,2]. More than half a century later in 1991, Langlois and Gresham [3] quoted these same words and observed that “little has changed since then.” Remarkably, in 2006, the words of Sir Spilsbury continue to be true; bruises remain a very much neglected branch of injuries.

Bruising is one of the earliest, most common, and easily recognizable signs of physical child abuse [4] and can signal escalating interpersonal violence within a household. Early detection of abuse through recognition of bruising coupled with appropriate intervention can help to prevent future and potentially more severe physical assaults. Bruising is also an occurrence of accidental injury and results from normal childhood activity. It is important to note that bleeding beneath an intact skin surface can occur from medical conditions and an absence of bruising does not mean that an abusive injury did not occur. Differentiating between inflicted and noninflicted injury mechanisms can be complex and challenging, especially in cases of mobile children. The age and developmental status of a child in combination with the number and the location of bruises are important factors in determining whether a bruise resulted from an accidental or inflicted mechanism. Appropriate identification of injury etiology is critical to ensure the safety of the child.

Pathogenesis of Contusions and Factors Affecting the Development and Appearance of a Bruise

A contusion, or bruise, may be defined as bleeding beneath the intact skin at the site of blunt impact trauma. The use of the term contusion should be limited to those circumstances in which an examiner has concluded that blunt impact occurred at the site of discoloration. A contusion differs from an ecchymosis in pathogenesis, and these terms should not be used interchangeably. An ecchymosis may be defined as blood that has dissected through tissue planes to become visible externally. An ecchymosis may be visible in an area that was never subjected to trauma. A
classic example of an ecchymosis that becomes visible in an area free of blunt trauma is the Battle sign—the area of discoloration over the mastoid process that is associated with basilar skull fractures involving the middle fossae. Another example of ecchymosis is the development of bilateral periorbital ecchymoses (often referred to as “raccoon eyes”). A contusion is a form of hematoma, but not all hematomas are contusions. A hematoma may be defined as blood that has extravasated from the vascular system into the body. A hematoma may or may not be associated with trauma. Hematomas may develop in the presence of natural disease processes in the absence of trauma. Physicians working in the field of child physical abuse must remember that each and every word within a medical record may become part of a criminal court proceeding. These physicians are cautioned to be precise and accurate in terminology; loose use of terms and medical slang should be avoided.

The skin is generally composed of 3 main layers: epidermis, dermis, and subcutaneous tissues [3]. The epidermis is a compact and firm outer layer that is not easily damaged by crushing forces. The dermis is the middle layer composed of a superficial capillary network and a fibrous structure that is capable of stretching under force and returning to its original form without damage. The subcutaneous tissues comprise the innermost layer, which is rich in capillaries and fat and may be easily deformed. The capillary networks of the 2 inner layers of the skin are the structures most affected during injury [2,3] with the majority of hemorrhage occurring in the subcutaneous tissue [3]. Blood leaks into the perivascular tissues when damage occurs to blood vessels either through impact or a pressure increase that exceeds the injury threshold of the vessel wall. This extravasation without the “loss of the integrity of the skin surface” [5] is known as bruising or contusion and may be evident as discoloration. Petechiae represent blood that has extravasated from the tiniest branches of the vascular system; they are characterized by pinpoint or pinhead-size hemorrhages beneath intact overlying skin or mucous membranes. Petechiae may range up to 2 mm in diameter [6].

The color, shape, and location of a bruise changes as hemoglobin is broken down and resorbed. The time that it takes for a bruise to appear is dependent on many factors, including: type of injuring force, depth of the injury [7], diffusion of the blood through the damaged tissue [6], and the type(s) of tissue injured. The skin varies in relative tissue composition and thickness throughout the body to meet the functional requirements of the different body parts. As a consequence of the skin’s structural differences, some body regions bruise more readily, whereas others require the application of greater force for bruising to result [2]. The extent of injury associated with a bruise may not be apparent from the appearance of the overlying skin [8]. A superficial bruise may discolor the skin immediately, whereas deep bruising may take days to appear [3,5,8] or may never become apparent externally. The biochemical processes that occur in the skin and underlying tissue during the stages of repair result in changes in the appearance of the injury, which is the reason photographic documentation is critical.

Bruising may be caused by brief sudden contact with a blunt object or continually applied pressure. Direct blunt impact injuries may result from the body moving toward the blunt object (eg, a fall into a piece of furniture) or the blunt object moving toward the body (eg, being struck with an object). Pinching or gripping at the body with the hand or an implement is an example of applications of continual pressure that may also result in characteristic bruising [6,9].

Factors affecting the development of a bruise include properties of the impacting object (or surface), force of impact, and properties of the body region impacted, including vascularization of the tissue bed at the impact site, tightness of the skin, presence or absence of tissue planes, presence of underlying bone such as in the area of the iliac crest and the zygomatic arch, the state of the coagulation system of the patient (eg, has disseminated intravascular coagulation developed?), and medications that may affect the patient’s clotting cascade and ability to form a clot. A severe bruising force may crush and tear subcutaneous fat, fascia, muscle, blood vessels, nerves, and periosteum, or these tissues may be gradually compressed as local swelling occurs [8].

Bruising may be more readily apparent in regions in which there is greater vascularization and locations where the tissue is loose compared to areas where the skin is more strongly supported [9]. The presence or absence of multiple tissue planes may influence the area and size of bruising as the tissue planes may allow the blood to track to sites remote from the initial impact [6]. In addition, there will be differences in the development of a bruise depending upon the duration of impact. If there is a rapid application of force, then the applied pressure is brief allowing immediate extravasation of blood, which may be evident externally in the form of a bruise. If there is an application of pressure without forceful impact—if the same amount of force is applied more slowly, then there may be no rupture of blood vessels, and thus an absence of bruising [2].

**Characteristic Bruising Patterns**

Distinctive bruising patterns result from different injury mechanisms. *Grip/grabmarks*: Bruises from a continually or forcefully applied grip are often relatively round and may coincide with 2 to 4 fingertips. Frequently, a thumb bruise may also be noted on the opposite side. *Closed-fisted punch*: Punches generally result a series of 2 to 3 bruises that are relatively round, with each bruise corresponding to a knuckle on the hand of the assailant. This bruising pattern is sometimes observed on the abdomen of children.
who have suffered physical abuse. However, it should be remembered that more than 40% of children dying from abusive blunt abdominal trauma have no contusions visible on the external abdominal wall [10]. **Slap or impact with solid cylindrical object:** Tramline bruising is a common pattern characterized by parallel linear bruises with regions of sparing between them. This specific bruising pattern is created when a relatively light object impacts the skin surface rapidly. A classic example is the pattern left on a cheek from an open-handed slap mark (Figure 1). The pattern often consists of 3 parallel linear contusions with central sparing. The width of the central sparing roughly corresponds to the width of the fingers. This pattern of linear contusions with central sparing develops as the tissues along the edge of the impact site undergo the greatest deformation. The impacts from the individual fingers are of insufficient force to cause an underlying crushing injury [6]. **Other objects or household implements:** Often during an assault, the pattern of either the impacting object or something lying between the impacting object and the skin, such as the textile pattern of the clothing, is imprinted into the skin resulting in a pattern bruise. Such patterned bruising may also occur intradermally. Patterned bruises in the shape of instruments may be diagnostic of physical abuse [4,11,12]. Belts and electrical cords are common examples of household instruments that leave distinctive patterns. [4,11,12] **Bites:** The typical bite mark (Figure 2) is a series of aligned contusions in a round or oval ring-shape consisting of 2 arches [13].

**Bruises Resulting From Physical Child Abuse**

An absent, vague, or implausible history is often associated with cutaneous injuries resulting from physical abuse [4,15,16]. Frequently, bruising is an incidental finding, unrelated to the reason why the patient presents for medical care. All children, especially infants and

**Literature Related to Normal Bruising Prevalence and Location**

Several investigators [14,15] have evaluated the prevalence and distribution of bruising in infants and young children to help document and define normal bruising. Sugar et al [14] examined 973 children less than 36 months of age presenting for well-child care visits for the presence of bruises. Cases of child abuse were excluded. The study found that bruising was extremely rare in infants younger than 6 months and distinctly uncommon in preambulatory infants younger than 9 months; only 2 (0.6%) of 366 children younger than 6 months had bruises and 8 (1.7%) of 473 children younger than 9 months had bruises. In addition, the presence of bruising was correlated with the developmental stage of the child and ability to ambulate upright. Only 2.2% of precruisers (children with no upright ambulation) had bruises compared with 17.8% of children who were cruising (walking with support) and 51.9% of walkers (ability to take 2 or more independent steps). Overall, 93% of the bruises identified were located over bony prominences. The anterior tibia and knee were found to be the most frequent bruising sites followed by the forehead and scalp. No bruises were found on the chin, buttocks, or hands of any child [14].

Carpenter [15] similarly evaluated children presenting at well-child visits for bruising to define normal prevalence and distribution, but focused on infants 6 to 12 months of age. A total of 177 children were examined, and the site, shape, and color of each bruise were recorded. A total of 32 bruises were observed on 22 infants (12%). Twenty-five of the bruises were noted on the face and head, of which 16 were on the forehead. The remaining 7 bruises were observed on the shins. In all cases, bruises were located over bony prominences on the front of the body. Again, a significant correlation was found between increased bruising and mobility [15].

**Figure 1** Open handed slap mark with tramline bruising.

**Figure 2** Bite mark.
young children, who present to the emergency department for any symptom, should be undressed, and the skin should be carefully examined. All cutaneous injuries should be documented for location, size, pattern, and color, as well as the presence of pain and swelling.

A child presenting with bruising to multiple planes or body surfaces (e.g., left and right side), without a plausible explanation, should be concerning for abuse. This distribution indicates that the body has sustained forces severe enough to cause bruising from multiple directions. This pattern of injury does not typically result from minor household accidents. Pierce et al. [16] observed that stair falls involving multiple contacts between the body and the stair surface resulted in 2 or fewer bruises. If bruises are present on multiple planes, typically, the injuries on one plane result from an initial impact between the body and an object or hand, and the injuries on the opposite plane result from a secondary impact between the body and another object. For example, if a child is struck by an assailant and the force of the strike causes the child to impact with a piece of furniture, then bruises may appear on the plane of the body on which the child was initially struck and on the plane of the body that impacted the furniture.

Subtle differences in bruising location within a given body region may raise concerns and affect the plausibility of the stated injury mechanism. In addition, studies indicate that the distribution of bruises may be indicative of injury etiology [17-19]. In infants and young children, bruises to the head (with the exception of the forehead), neck, ears, and torso including chest, abdomen, genitourinary region, back, and buttocks typically result from accidental injury mechanisms [11,18-21]. Therefore, bruising on infants or young children in these regions, without an appropriate history, should be concerning for abuse and appropriate medical evaluation and testing should follow.

Bruising to the pinna and helix (Figure 3) is rarely accidental and is concerning for inflicted injury, especially if present bilaterally. Unilateral, nonaccidental ear injury is predominantly left-sided resulting from blows by a right-handed assailant [22]. Ear bruising may be subtle [23] and children should be examined carefully for such injuries. Feldman [24] described 4 pediatric cases, each with petechial hemorrhages on the top of the pinnae resulting from abuse. It is believed that the apex of the ear is folded on itself and crimped against the head by a blow resulting in capillary injury. The auricular injuries in each case exemplify bruising conforming to the anatomical lines of stress rather than the shape of the injuring object [24]. When a young child presents with bruising to the head or face without a documented and plausible trauma history, head imaging should be strongly considered. Ear bruising may be an indication of increased morbidity and mortality [25]. Tinnitus syndrome, characterized by distinct unilateral ear bruising, radiographic evidence of ipsilateral cerebral edema with obliteration of the basilar cisterns, and hemorrhagic retinopathy, results from rotational acceleration produced by blunt trauma to the ear. This triad of injuries is concerning for child abuse [26].

Genitourinary bruising may occur from straddle injuries as a result of bicycle and playground accidents or falls [27,28]. In such situations, the highly vascularized tissue is compressed against the underlying osseous tissue [27], and the majority of wounds are superficial [29]. Nonpenetrating straddle injury mechanisms typically result in minor trauma to the external genitalia; this includes superficial lacerations to the scrotum or penis in boys and lacerations or abrasions of the labia in girls [27], with the labia minora being the most frequently injured structure [29]. Accidental straddle injuries may occur either anterior or posterior to the posterior hymenal border. However, more injuries occur anteriorly because the tissues are more likely to be compressed by the bony prominence [29]. Minor injuries to the posterior fourchette have been documented in children presenting with a history of nonpenetrating straddle injury [27,30]. Hymenal trauma is associated with a history of penetrating injury [30] and is concerning for abuse [27].

Bruising to the penis can be seen in cases of physical abuse, especially in situations surrounding toilet training. The caregiver may inflict injuries as a result of unrealistic expectations. If bruising to the penis occurs from an accidental situation such as becoming caught in a zipper or slammed in the toilet seat, the appropriate history should be available. Genital bruising accompanied by a vague or absent history is concerning for an abusive injury.

Strangulation may cause petechiae or bruising along the neck and/or cephalad petechiae including the mucous membranes and the periorbital regions. Subconjunctival hemorrhages may also be seen. Ligatures may cause linear bruising over the wrists and lower extremities. These marks may not be bilateral or completely circumferential.

Forceful hair pulling results in the scalp being lifted off of the calvarium. When this occurs, a large hemorrhage...
can result which tracks down over the forehead and face, and appears as widespread bruising over these areas. The discoloration often evolves over a few days. In addition, loss of clumps of hair is often seen and may be mistaken for tinea capitis.

If a bite mark is present or suspected, it is important to collect trace evidence as well as photographic documentation; it is often possible for an expert to determine the identity of the specific biter. Procedures for collection of trace evidence should be developed after consultation with the local crime laboratory for advice based on methods and services available at that particular laboratory. Some agencies suggest the “double swab” technique in which the skin surface is first swabbed with a sterile cotton-tipped applicator moistened with sterile saline. This first swab is followed by a dry swab. Both swabs should be allowed to completely air-dry before being placed in individual envelopes that are then sealed with tape. Chain of custody, with written documentation thereof, must be maintained for all evidence collected. Information necessary for the chain of custody form includes the names of persons collecting or receiving evidence, the type of evidence collected or received, and the date of receipt. If possible, a forensic dentist should be consulted at the earliest stages of the evaluation. The forensic dentist can help with identification of the bite type, pattern variations, identification of the biter, and may perform additional types of photographic documentation.

**Photo Documentation**

It is important that skin findings are well documented from the earliest stages of medical care, especially if there is concern for abuse. Quality photographs provide critical documentation and may be helpful later for legal purposes. A 35-mm or high-resolution digital camera may be used. Photographs taken in either format will become part of the patient’s permanent medical and legal record. Images must be stored in a secured medium and certified as being the original image.

When nongenital injuries are photographed, the first picture should be of the victim’s face (an identification label with patient number may be included) and other photographs should follow in a systematic order [31]. A minimum of 2 photographs of each cutaneous finding are recommended. The first photograph should be an orientation photograph that shows the injury in the context of the body region involved as well as the anatomical orientation of the injury. The second photograph should be a close-up of the injury with a scale in the picture. In some jurisdictions, it may be standard practice to take a third photograph. This third photograph is a close-up image taken without a scale to show that nothing is being concealed [32,33]. Many forensic examiners use a standard L-shaped scale recommended by the American Board of Forensic Odontology. The scale should be placed in close proximity to and in the same plane as the injury being photographed [34] to avoid perspective distortion, which may alter the size or contour of the wound pattern relative to the scale [35]. If an American Board of Forensic Odontology ruler is not used, a circular scale, such as a coin, may be used to document size. Photographs should be taken in the film plane meaning the camera is positioned parallel to the injury, with the lens at a 90° angle relative to the injury.

If the injury is a bite mark, the documentation sequence is modified as follows for the preservation and collection of genetic evidence on the wound: initial photograph (to demonstrate the untampered appearance, location, and orientation), salivary trace evidence collection, and comprehensive photo documentation. All photographs should be taken with the bite mark parallel to the film plane and in the orientation in which the bite was inflicted. If the bite marks are located on curved surfaces of the body, each arch may have to be photographed separately to keep the wound parallel to the film plane and prevent distortion [35]. Adequate lighting should be used for all photographs. A ring flash may help to decrease washout that occurs with a regular electronic flash.

**Techniques to Help Visualize Bruising**

When light strikes human skin, it is either reflected, transmitted to deeper layers, scattered, or absorbed [36]. Different wavelengths of light vary in ability to penetrate human skin [37], and the various biologic components that comprise the skin have varying absorptive and fluorescent properties. “The spectrum of normal skin is dominated by the summed absorbances of hemoglobin and melanin, with small contributions from fibrous protein, collagen, and fat” [36]. When a bruise is present, there are increased amounts of hemoglobin at the injury site followed by biocompositional changes resulting from the healing process. These changes affect the absorbance and fluorescence curves of the skin. Using alternative light sources, which deliver wavelengths of light outside of the visible spectrum of 400 to 700 nm, can aid in better visualizing trauma, patterned injury, and disease. This is due, in part, to differences in the degrees of absorption and fluorescence by the different biologic components in the illuminated region [36]. Wavelengths from 10 to 400 nm are defined as ultraviolet (UV) and those greater than 700 nm are defined as infrared (IR). Ultraviolet radiation penetrates human skin only a few microns into the epidermal tissue. This shallow penetration results in less scatter of the reflected rays and a great degree of definition of surface detail; the shorter the wavelength, the greater the resolution [37]. Infrared light has deeper penetration of up to 3 mm and allows injuries below the surface of the skin to be visualized [33,34].
Because UV and IR wavelengths are outside the visible spectrum, it is impossible to see the details of an injury as they appear in UV or IR radiation with the unaided eye [33]. Photographic techniques with specialized film and filters sensitive to the UV and IR wavelengths may be used to capture an image of the injury, which can then be seen with the unaided eye. However, these reflective UV and IR photography techniques have limitations in emergency department settings and for use with children; specifically, high cost, specialized and fragile equipment for multiple users, and requiring children to hold still due to long exposure times.

Ultraviolet illumination is another technique that may help to visualize regions of abnormality on the skin and may be better suited for pediatric emergency care. With this technique, a source of incident radiation stimulates electrons to higher energy levels. As the electrons return to stable orbit, energy is released, often in the form of light, which is known as fluorescence. When induced with incident radiation, many biologic compounds exhibit fluorescence and have characteristic absorption spectra [38]. Vogeley et al [39] used a Wood’s lamp as a source of UV illumination and a digital camera to improve bruise detection. With the accessibility of a Wood’s lamp in most pediatric facilities, and the elimination of the specialized filters, lenses, and films required by reflective photography, UV illumination is a more pragmatic and less expensive technique for the clinical setting. In addition, use of a digital camera eliminated the need for low lighting conditions, long exposure times associated with the 35-mm format, and, ultimately, the requirement for children to be still for extended periods. The UV illumination in this study allowed enhanced visualization of faint bruises and those that were not otherwise visible [39]. Further work and studies with children are needed in this area.

Ultraviolet and IR lighting techniques are not used routinely in the documentation of contusions in most medical examiner offices. Evidence visualized via these methods may not be admissible in court unless it has been shown to be scientifically recognized and clinically accepted by the scientific/medical community. Acceptance may include publication in a peer-reviewed journal. To date, the best technique for documentation of contusions remains the complete and accurate examination and documentation of findings using good light in a controlled environment such as the medical examiner office or the hospital exam room. All findings should be documented in multiple formats, including photographic, diagrammatic, and written forms.

**Conditions That May Be Confused With Abusive Bruising**

Some common conditions including Mongolian spots, cultural remedies, phytophotodermatitis, and bleeding disorders may be confused with contusions in children. These conditions do not preclude abuse, but should be considered in children presenting with areas of discoloration and no other injuries on physical exam or imaging.

Mongolian spots are areas of blue or blue-black discoloration usually located on the lower back or buttocks. They are also common in the more superior midline of the back, sometimes noted over the thoracic or cervical region, and may be present just about anywhere on the body. They are seen more commonly in African-American and Asian children, and usually fade by 5 years of age. If an examiner is unsure whether a particular area of coloration is a Mongolian spot versus a contusion, reexamination after 10 days or so will resolve the issue. A bruise will show fading in 1 to 2 weeks time, whereas Mongolian spots remain relatively unchanged in the short-term. Indeed, some people retain them into adulthood.

Coining and cupping are folk remedies using coins with oil or a heated cup applied to the skin for healing purposes. Although these are usually painless procedures, they can cause extravasations of blood into the perivascular tissues that appear as bruises.

Phytophotodermatitis (Figure 4) occurs after contact of the skin with certain vegetables or fruit (eg, celery, limes) and then sunlight. The skin becomes hyperpigmented, which can mimic a bruise. Often, a caretaker will have the agent on his/her hands and touch the child. The resulting lesion will appear as a finger or handprint. A thorough history of contact with these agents is necessary.

Henoch-Schonlein purpura is a form of vasculitis that involves the small blood vessels and commonly occurs in children after an upper-respiratory tract infection or other illness. The purpuric skin rash may appear as bruising and most generally affects the buttocks and lower extremities.

Bleeding disorders such as platelet disorders, idiopathic thrombocytopenic purpura, von Willebrand disease, or leukemia can cause easy bruising. Consequently, children will present with unusual or numerous bruises and little.
Dating Bruises and Associated Misconceptions and Limitations

Often, there is a need to date when a bruise occurred for child protective or legal purposes [40]. Consequently, various techniques have been used in attempts to assess the age of bruises; these are described in an article by Langlois and Gresham [3]. Among these techniques, visual assessment has been a commonly used method to age bruises; however, it is a process that remains notoriously inexact [6,7]. Forensic pathology textbooks and texts focused on physical abuse of children have attempted to describe changes in bruise color over time, and although there does appear to be some evolution of color, there is no clearly predictable order. In addition, most research related to the color evolution of bruises is based on adult cadavers and these findings may not be translatable to living children [7,41]. Some of the inherent difficulties in dating bruises include the amount of bleeding, depth of injury, bruise location, skin color, ambient light at the time of examination, and chronicity of bruising [7].

Stephenson and Bialas [41] photographed accidental bruises of known ages in children. The photographs were reviewed by a blinded observer asked to describe the colors present in the bruise and estimate the age of injury. Age estimations were incorrect in 20 of 44 cases, and accuracy was unrelated to the age of the child, presence of a fracture, or bruising site. The study showed that multiple colors can be present within a single bruise and bruises can change color at very different rates. The study concluded that aging bruises from photographic evidence is imprecise [41]. Bariciak et al [42] investigated whether it was possible to accurately estimate the age of a bruise on direct clinical examination and found physician estimates, despite level of clinical training or experience, to be highly inaccurate within 24 hours of actual age of injury and not much better than chance alone. Munang et al [40] found the practice of relying on color, including yellow, to age bruises to be imprecise and flawed because of inter- and intra-observer variations in describing color. Hughes et al [43] conducted a study to understand the perception threshold for the color yellow and determine how consistently observers perceived the presence of yellow. They found variability in the threshold for the perception of yellow color among the general population and a declining ability to perceive yellow coloration as the observer’s age increased [42].

These studies demonstrate that caution must be used when offering opinions on the age of a bruise. The estimated age (and presence) of a bruise should never be the sole criteria for a diagnosis of child abuse. Instead, the diagnosis should be determined by incorporating the findings of a careful history of the injury, past medical history, family history, associated risk factors, physical examination, and appropriate laboratory testing and imaging [7].

Summary

Bruising is one of the earliest and most common signs of physical child abuse. All infants and young children should have a careful skin examination when presenting for medical care. Multiple factors must be taken into account to distinguish accidental and inflicted etiologies, including bruise location and pattern, additional injuries or medical findings, developmental capabilities of the child, and the plausibility of the stated injury mechanism. Bruises resulting from normal activity generally occur over bony prominences on the front of the body, most commonly on the lower leg and forehead. Bruising is rare in preambulatory infants. Bruises to the torso, head (with the exception of the forehead), neck, ears, and multiple planes of the body are concerning for abuse. Children with disabilities or significant motor delay may have different bruising patterns because of their unsteady gait or assistive devices [44]. Proper written and photographic documentation of cutaneous injuries is critical.

References


The following resources are suggested references for additional information and images to aid in the differential diagnosis of physical child abuse