Chapter 15

CHILD ABUSE

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Inflicted Scald Burn. Partial thickness burn on the lower extremity with sharp demarcation is suspicious for intentional injury. (Photo contributor: Kathi Makoroff, MD.)

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Physical Abuse
CUTANEOUS FINDINGS

Clinical Summary

Bruises are the most common manifestation of child physical abuse. Children younger than 6 months and those that are not yet "mobile" rarely have any bruising from accidental injury. In older children, bruising to the abdomen, ear, neck, cheek, buttocks, or genitals is also less likely to be the result of accidental injury. Child abuse should also be strongly considered when a bruise takes the shape of an object (belt, cord, hand).

Certain clues may assist in differentiating abusive from accidental burns, but, often, doubt remains even after careful evaluation. With an immersion burn, the child is held into or under hot liquid and the burn margins are usually distinct. A "splash" pattern, conversely, will occur when a child attempts to get out of the way of the hot liquid; the burn margins are less distinct and there may be additional adjacent small burns. Contact burns usually have distinct and recognizable shapes but it is sometimes difficult to determine how the burn occurred. A child who has multiple contact burns or burns to areas that are unlikely to come in contact with the hot object accidentally should be evaluated for abuse.

While certain findings (bite marks, patterned bruises) are very specific for abuse, cutaneous findings are not sensitive for predicting other injuries such as fractures, brain injury, or abdominal injury. The absence of bruising should not preclude screening for other injuries.

Management and Disposition

With the exception of significant burns, abusive cutaneous injuries rarely require significant treatment. Rather, children with concerning cutaneous findings should be screened for other abusive injuries and medical mimics of abuse. Order neuroimaging (CT or MR) for children less than 6 months of age, skeletal survey for children less than 2 years old, and hepatic transaminases (alanine transferase [AST]/aspartate aminotransferase [ALT]) for children less than 5 years old. Order prothrombin time/partial thromboplastin time (PT/PTT) and complete blood count (CBC) for children with concerning bruises or other findings that could indicate a coagulopathy and consider hematology consultation for other coagulopathy testing.

If a human bite is suspected, photo document and swab for potential DNA analysis. Run a moistened swab followed by a new dry swab over the area and clearly follow and document chain of evidence. If available, consult with a forensic dentist.

Report suspected abuse to the legally mandated child protection agency before the child is discharged from the emergency department (ED). In the United States, medical professionals have a legal mandate to report in cases concerning for child abuse. When available, consult with the Child Abuse Team.

FIGURE 15.1 ■ **Loop Marks.** Subtle loop and linear marks are seen on the thigh and buttock of this child. (Photo contributor: Robert A. Shapiro, MD.)

FIGURE 15.2 ■ **Loop Marks.** Loop and linear marks signify use of a cord or other similar object. (Photo contributor: Alan B. Storrow, MD.)

Pearls

1. Use the distance between the maxillary canines to determine if the biter was someone with primary teeth (child) or secondary teeth (adult). Most adults have greater than 29 mm distance.
2. Do not use the color or appearance of a bruise to estimate its age. Despite a widely cited dating schema, there is no evidence to support this.
3. Cigarettes can burn as hot as 400 to 700°C. Inflicted cigarette burns are therefore usually ulcerated and full-thickness, rarely superficial.
4. Burn mimics to consider include impetigo, phytophotodermatitis, and contact dermatitis. Bruise mimics to consider include hemophilia, von Willebrand disease, Henoch-Schönlein purpura (HSP), and idiopathic thrombocytopenic purpura (ITP).
5. Place a millimeter ruler or a coin in the field when photographing injuries, and photograph at a 90 degree angle to the plane of the finding.
6. Genital bruising is always concerning for child abuse. Physical abuse as well as sexual abuse should be considered.

FIGURE 15.3 ■ **Belt Pattern.** This patterned bruise was inflicted by a woven belt. (Photo contributor: Daniel M. Lindberg, MD.)

FIGURE 15.5 ■ **Adult Bite Marks.** This adult bite mark demonstrates evidence of suction (hickey) within the bite mark itself. The size of the facing arches indicates an adult bite. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.4 ■ **Buttocks Bruising.** Forceful spanking can cause buttocks bruising and longitudinal bruises parallel to the gluteal fold. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.6 ■ **Adult Bite Marks.** This bite mark on a child's arm is consistent with an adult bite. While marks from individual teeth are not visible, facing arches of appropriate size are indicative of a bite mark. (Photo contributor: Megan McGraw, MD.)

FIGURE 15.7 ■ **Child Bite.** This bite mark, with a maxillary intercanine distance less than 29 mm, is more consistent with a child biter. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.9 ■ **Child Bite.** Distinct impressions of teeth are seen in this injury with the outlines of the upper and lower oral arches. Note the size of the mother's mouth in relation to the size of the bite on the neck, making the adult an unlikely source. (Photo contributor: Kevin J. Knoop, MD, MS.)

FIGURE 15.8 ■ **Child Bites.** Multiple bite marks were inflicted on this child's face by another child. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.10 ■ **Ligature Bruise.** This child survived beating and attempted strangulation that resulted in circumferential, linear neck abrasions and occipital ecchymosis. (Photo contributor: Barbara R. Craig, MD.)

FIGURE 15.11 ■ **Ligature Bruise.** This bruises around the neck of this child represent ligature marks. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.12 ■ **Folk Remedies: Coining.** This child has linear petechiae along her spine from the Southeast Asian practice of coining (Cheut Sah or Cao Gio) where a coin is rubbed along the skin to heal illness. This practice is neither painful nor dangerous and is not abusive. Another folk remedy, cupping or moxibustion (not shown), produces circular bruising when a match is used to create a vacuum inside a glass placed on the skin. (Photo contributor: Charles Schubert, MD.)

FIGURE 15.13 ■ **Folk Remedies: Cupping.** Circular "burns" from the practice of "cupping" result when warm cups are placed on the skin to draw out illness. (Reproduced with permission from American Academy of Pediatrics. Visual Diagnosis of Child Abuse. 3rd ed. Elk Grove Village, IL: American Academy of Pediatrics; 1994.)

FIGURE 15.14 ■ **Henoch-Schönlein Purpura (HSP).** This child has palpable purpura on the extensor surfaces of the legs. HSP should be considered whenever there is symmetric ecchymosis along the extensor surfaces of the extremities and buttocks. Migratory arthritis and abdominal pain may be present. (Photo contributor: Ralph A. Gruppo, MD.)

FIGURE 15.15 ■ **Dermal Melanosis (Mongolian Spots).** These blue-gray congenital marks are more common in darker-skinned children. Frequently found on the buttocks or low back, they can be seen anywhere. They are distinguished from bruising because they fail to resolve in days or weeks. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.16 ■ **Pattern Burn.** Multiple contact burns on the chest and abdomen from a curling iron. Accidental curling iron burns occur, but this number of injuries is very concerning for abuse. (Photo contributor: Robert A. Shapiro, MD.)

FIGURE 15.17 ■ **Pattern Burn.** This child was held against a heater grate. The pattern indicates that the child's leg was flexed at the time of injury. (Photo contributor: David W. Munter, MD.)

FIGURE 15.18 ■ **Immersion Burn.** Immersion burns are often associated with toilet-training accidents. This girl was plunged into hot water after soiling herself. She shows sparing of the buttocks, which contacted the surface of the bathtub and avoided being burned. (Reproduced with permission from American Academy of Pediatrics. Visual Diagnosis of Child Abuse. 3rd ed. Elk Grove Village, IL: American Academy of Pediatrics; 1994.)

FIGURE 15.19 ■ **Immersion Burn.** A child's extremities may also be immersed. Burns in a "stocking" or "glove" pattern are concerning for an immersion mechanism. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.20 ■ **Splash Burn.** This toddler pulled a cup of hot liquid on to her. Note the "flowing" pattern that starts on her face and extends down her arm with burn depth decreasing as the liquid flows and cools. Also characteristic are "skip" areas of skin that are not affected. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.21 ■ **Laxative "Burn."** Laxatives can cause skin irritation or sloughing, and often results in a diamond-shaped pattern. Blistering can also occur. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.22 ■ **Scald Burn with Sparing.** Superficial and partial-thickness burns were noted on the patient's anterior surface only. The areas of abdominal sparing indicate that the victim was flexed and curled at the time of injury. The child's caretaker, the mother's boyfriend, admitted to holding the child under a running hot-water tap. Partial-thickness burns on the penis and medial thighs are indicative of pooling of the liquid in those areas, resulting in a time-dependent injury. (Photo contributor: William S. Smock, MD.)

FIGURE 15.23 ■ **Cigarette Burn—Inflicted.** Cigarette burns are circular injuries with a diameter of about 8 mm. Children who accidentally run into a lit cigarette often have burns to the face or distal extremities. Accidental burns may be less distinct or deep compared with inflicted burns. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.24 ■ **Cigarette Burn—Inflicted.** This child suffered an inflicted cigarette burn to the ear. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.25 ■ **Impetigo.** These circular lesions of impetigo may be confused for healing cigarette burns. (Photo contributor: Michael J. Nowicki, MD.)

Clinical Summary

Abusive head trauma (AHT) (formerly shaken baby syndrome) is an important cause of morbidity and mortality from child physical abuse. Subdural hematoma is the most common finding. Skull fractures and/or cerebral edema can also be present. Retinal hemorrhages do not have to be present to make the diagnosis of AHT. Retinal hemorrhages that are numerous, multilayered, and extend to the periphery have only been described in infants and children with significant trauma including AHT. Fewer hemorrhages clustered around the posterior pole of the retina have been described with less severe trauma and in critically ill children with no concern for abuse and are, therefore, less specific. Retinal examinations without dilation, or by nonspecialists, are limited. All children with traumatic brain injury and concern for abuse should be examined by an ophthalmologist with pediatric experience.

Management and Disposition

Infants and children with head injury should be treated as medically appropriate. Subdural hemorrhages can be seen in infants and children with nonspecific (fussy, vomiting, less active) or no symptoms. Therefore, have a low threshold for ordering neuroimaging in an infant or child who has other concerning signs of abuse (bruising, fractures).

In the absence of major trauma, subdural hematomas are very concerning for abuse, and should trigger a thorough search for other abusive injuries, coagulopathy, or a history of abuse. A report of suspected child abuse should be made to children's services if there is a concern for AHT.

Pearls

1. A history that a short fall or other minor injury caused a significant intracranial injury should be highly suspected.
2. Infants and children with AHT may have no external signs of trauma and nonspecific or no neurologic deficits.
3. Minor skull fractures can occur accidentally and are impossible to date.
4. CT can identify significant soft tissue injury that is missed on physical examination.
5. Significant retinal hemorrhages are exceedingly rare if neuroimaging is negative. Dedicated retinal exam may be omitted if traumatic brain injury is absent.

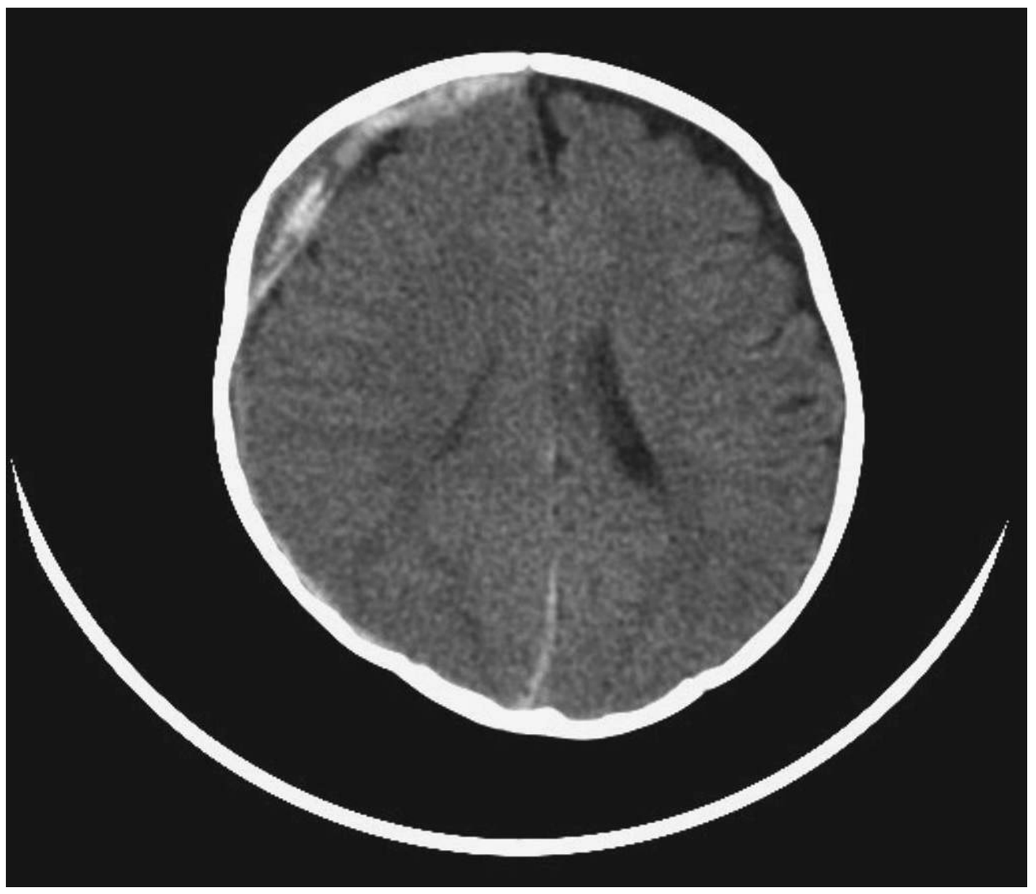

FIGURE 15.26 ■ **Acute Subdural Hematoma.** There is a crescent-shaped, hyperdense collection, indicating an acute subdural hematoma over the right cerebral hemisphere. In addition, the right side of the brain demonstrates mass effect. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

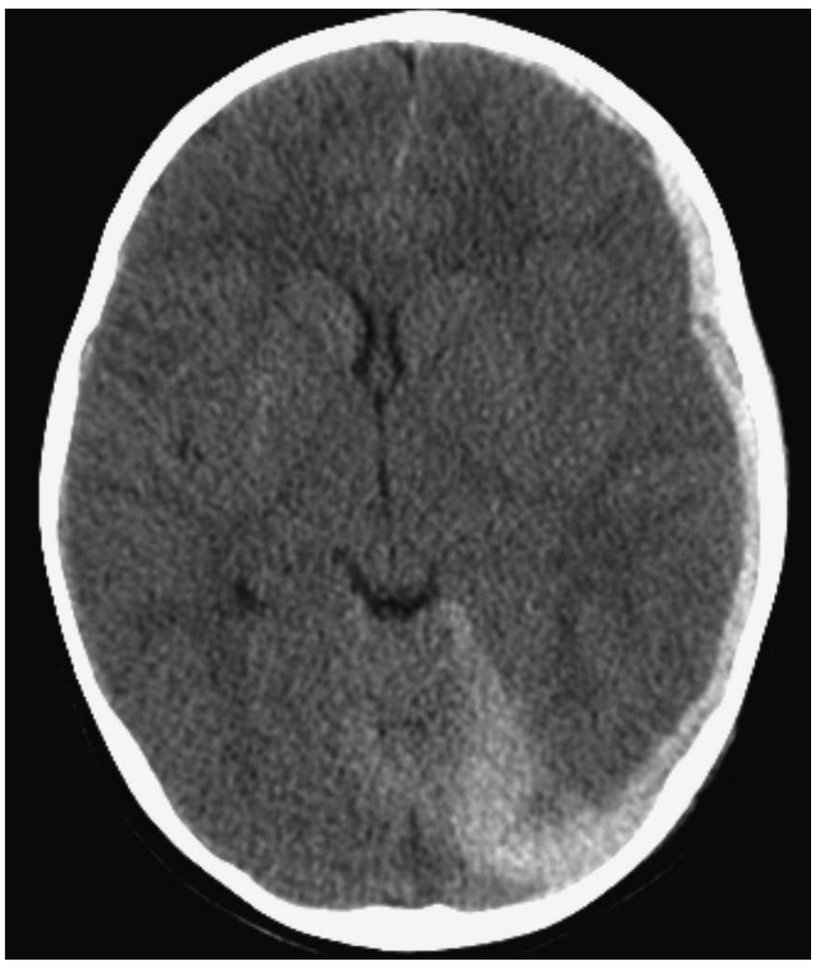

FIGURE 15.27 ■ **Left Subdural Hematoma.** There is a thin hyperdense collection that extends along the entire left hemisphere as well as along the tentorium indicating an acute subdural. (Photo contributor: Marguerite Care, MD.)

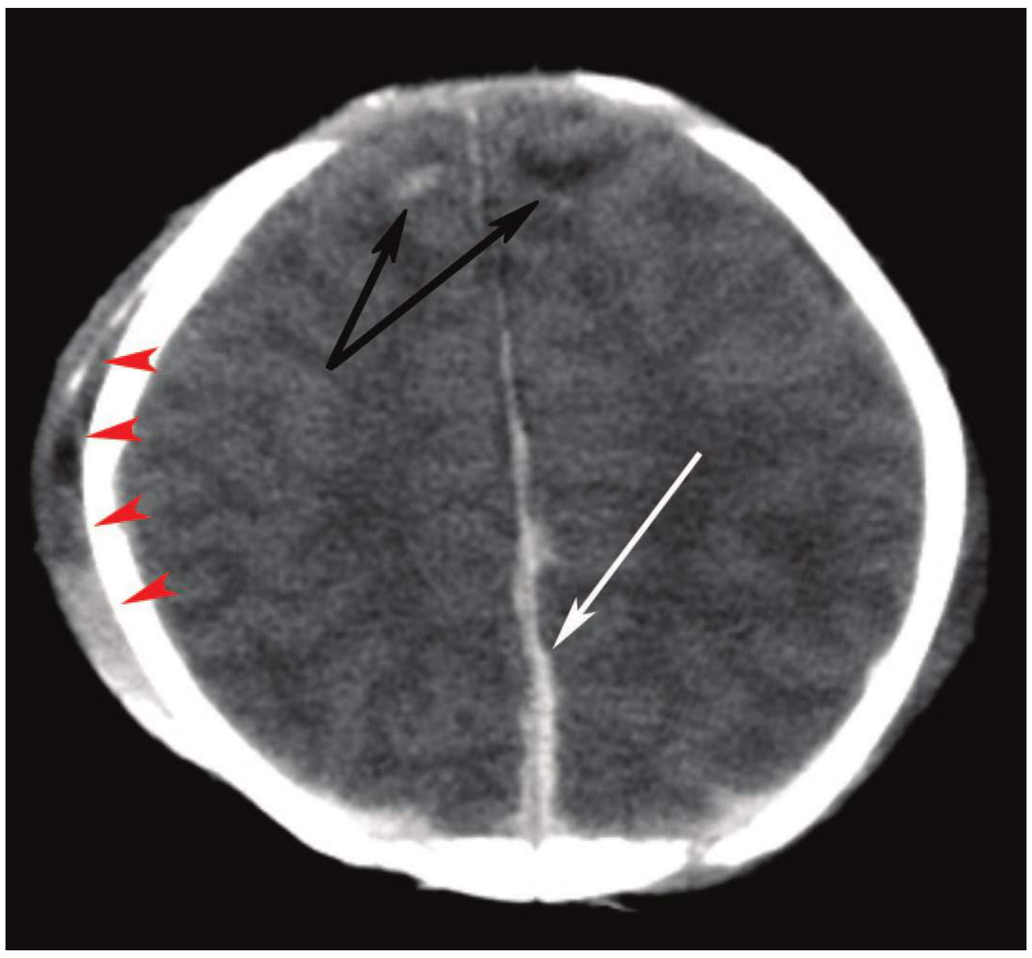

FIGURE 15.28 ■ **Subdural Hematoma and Extra-Axial Swelling.** This image shows intrahemispheric acute subdural blood (large arrows) and subtle contusions (black arrows) of the frontal lobes. Extracranial soft tissue swelling (arrow heads) is also present; sometimes this is visible on CT but not on physical examination. (Photo contributor: Marguerite Care, MD.)

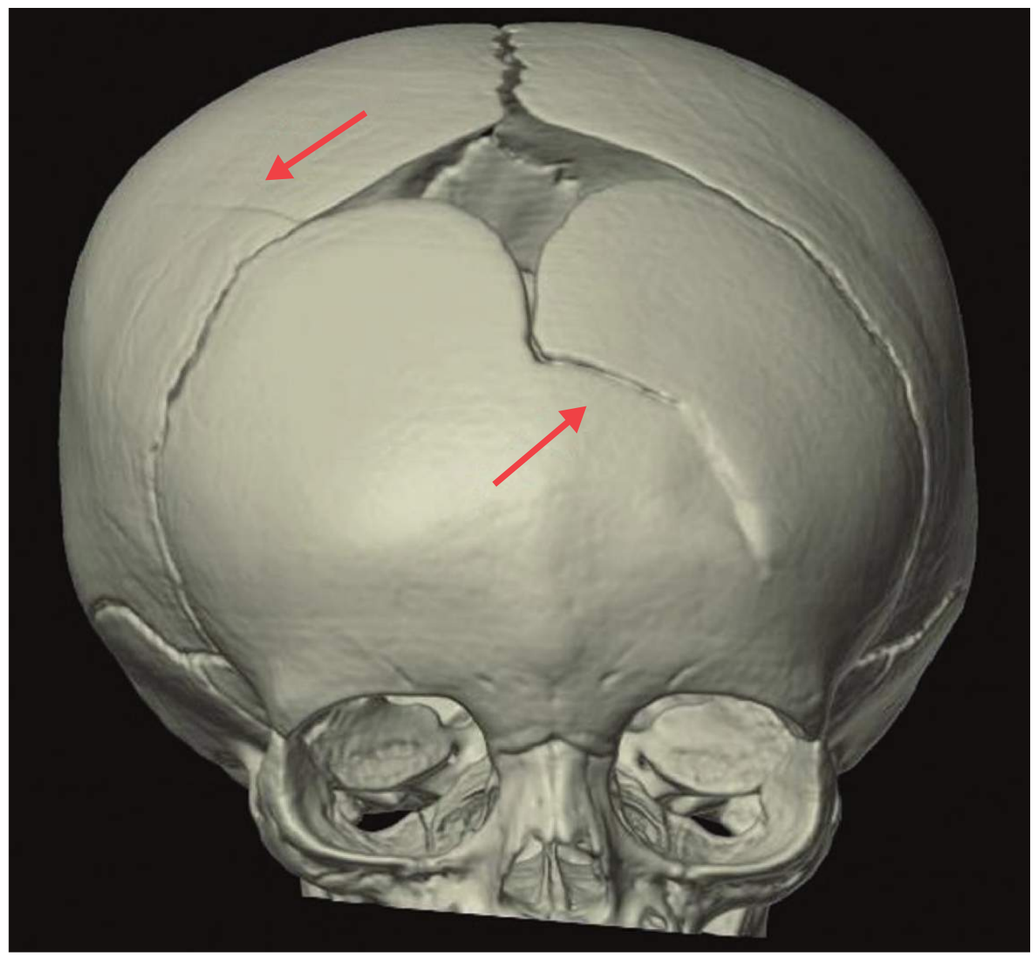

FIGURE 15.30 ■ **Vertex Skull Fracture.** This infant was accidentally dropped on her head. The 3D reconstructed image shows two fractures that originated from the anterior fontanelle. It is possible that two distinct fractures resulted from a single impact to the vertex of the head. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

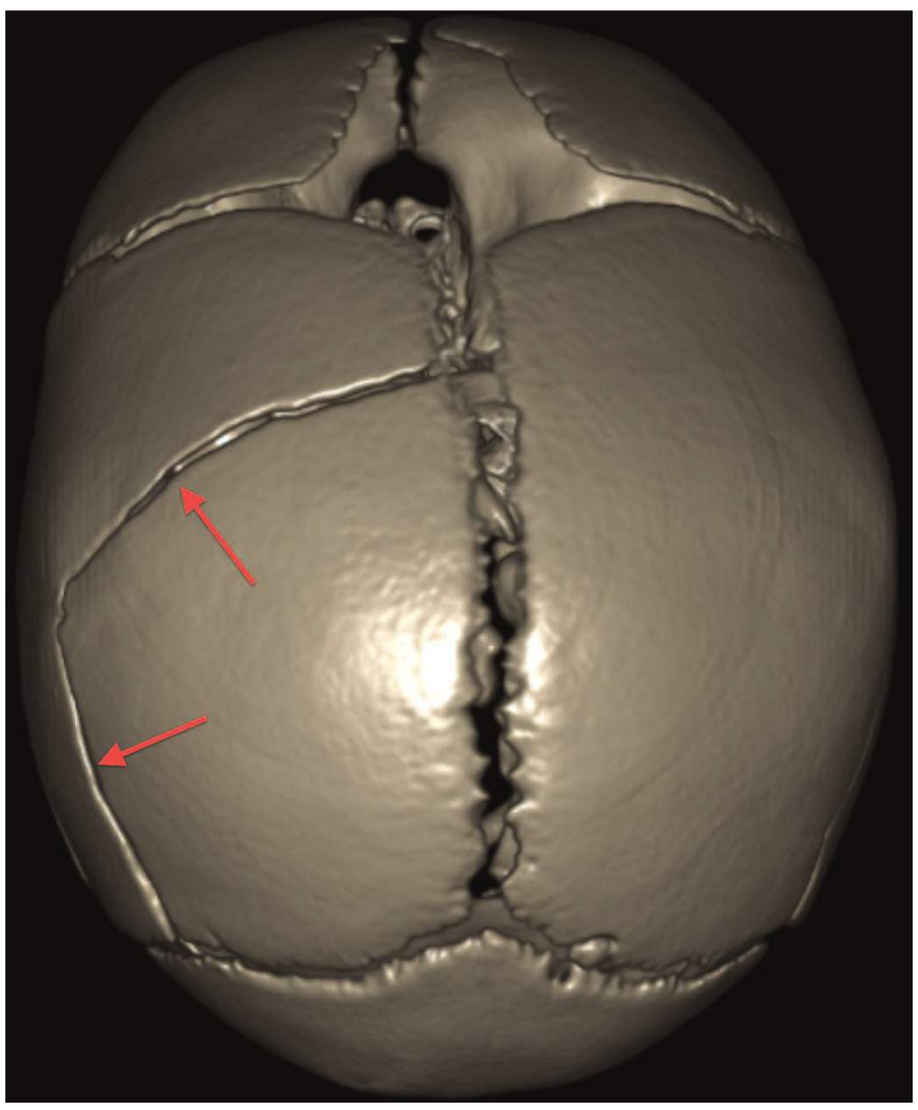

FIGURE 15.29 ■ **Skull Fracture.** This 3D reconstructed image shows a left parietal skull fracture (arrows). Skull fracture can result from inflicted or accidental mechanisms. (Photo contributor: Marguerite Care, MD.)

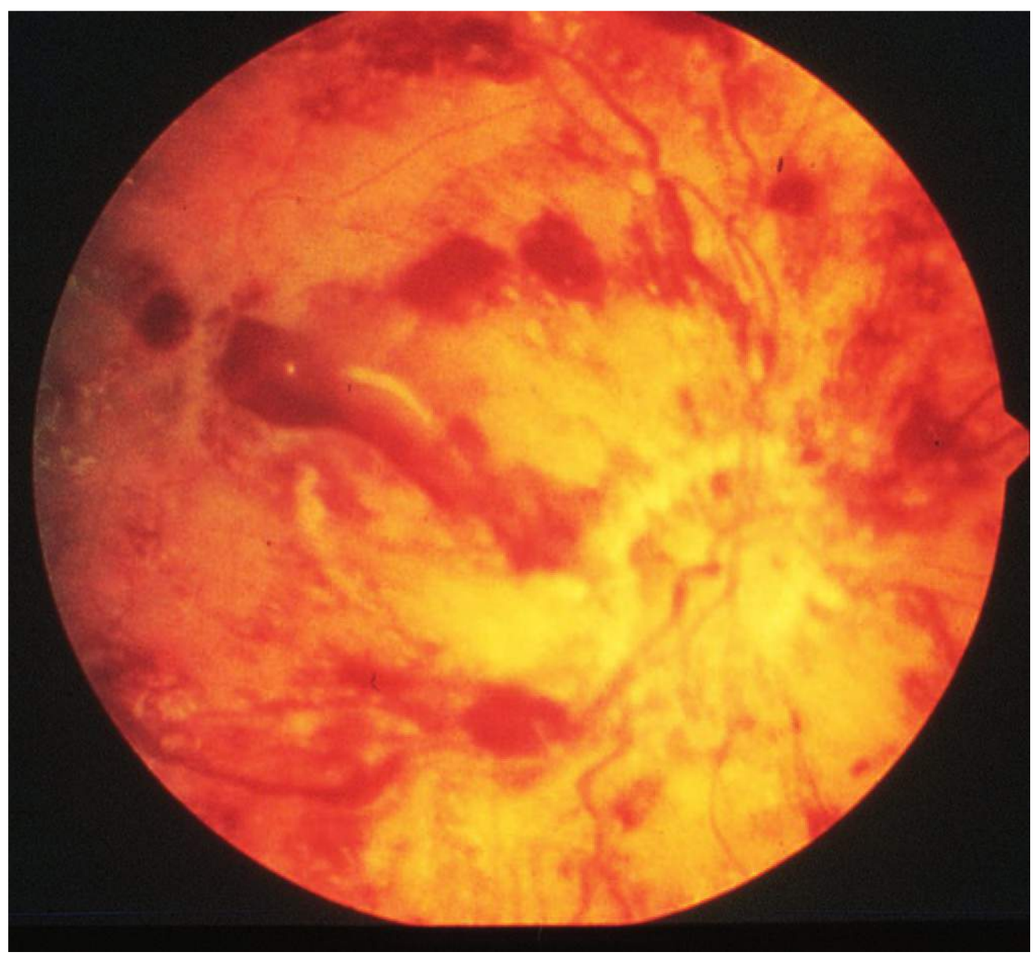

FIGURE 15.31 ■ **Retinal Hemorrhages.** Multiple retinal hemorrhages (too numerous to count) are present in this image. A pediatric or general ophthalmologist can obtain a more complete view of the retina with dilated direct ophthalmoscopy and should be consulted to evaluate for retinal hemorrhages. (Photo contributor: Rees W. Sheppard, MD.)

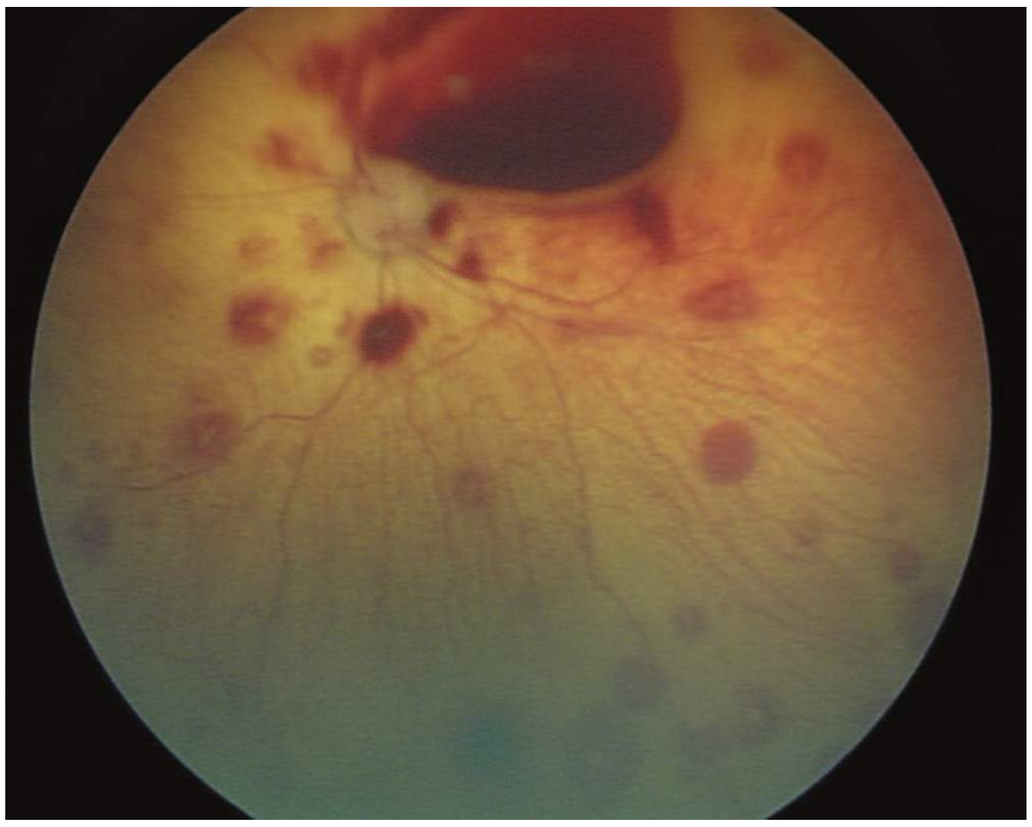

FIGURE 15.32 ■ **Retinal Hemorrhages.** Multiple discreet subhyaloid hemorrhages are seen. (Photo contributor: John D. Baker, MD, and Massie Research Laboratories, Inc.)

FIGURE 15.34 ■ **Hair Pulling Subgaleal Injury.** This child has a large posterior subgaleal hemorrhage without associated skull fracture. It resulted from abusive hair yanking. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

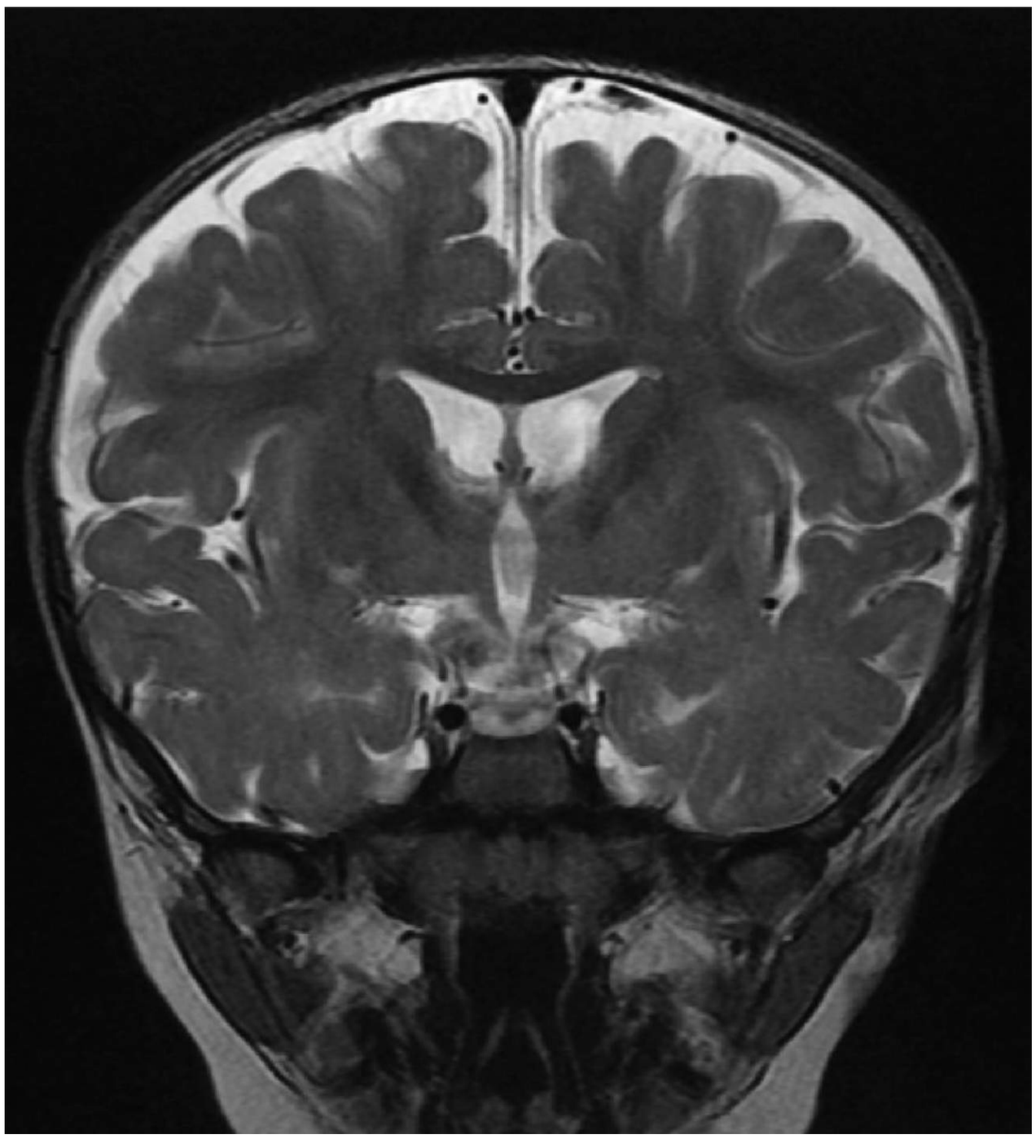

FIGURE 15.33 ■ **Benign Extra-Axial Fluid.** This coronal T2-weighted MRI shows enlarged subarachnoid spaces (vessels running through). This can be a common finding in children with macrocraina. The enlarged spaces can be confused for subdural collections which will then raise the concern of abusive head injury. (Photo contributor: Marguerite Care, MD.)

Clinical Summary

Because crying and feeding difficulties can serve as the trigger for physical abuse, the face is frequently the site of the most forensically significant, even if subtle, signs of abuse. Carefully examine the oral cavity, ears, and fontanel of all children with concern for abuse. Force-feeding or forceful insertion of utensils or fingers into a child's mouth can result in injury to lips, frenula, or palate, as well as deeper oropharyngeal injury. Accidental oropharyngeal injuries are commonly caused in older children by toothbrushes, lollipops, or popsicle sticks, but these findings are concerning for abuse in children who are not yet ambulatory.

Management and Disposition

Most abusive facial injuries are minor or self-limited, and are most important as an indication for further screening for other occult injuries, especially AHT. Bruising to the ear is very concerning for abuse, as are injuries to the labial or lingular frenula, or palate in children who are not yet walking. All injuries concerning for abuse should be photographed and carefully documented in the medical record.

Children with abusive oropharyngeal injuries should be evaluated as other children with accidental oropharyngeal injuries, with low threshold to image (MRA or CTA) to identify vascular injury or deep space infection or abscess.

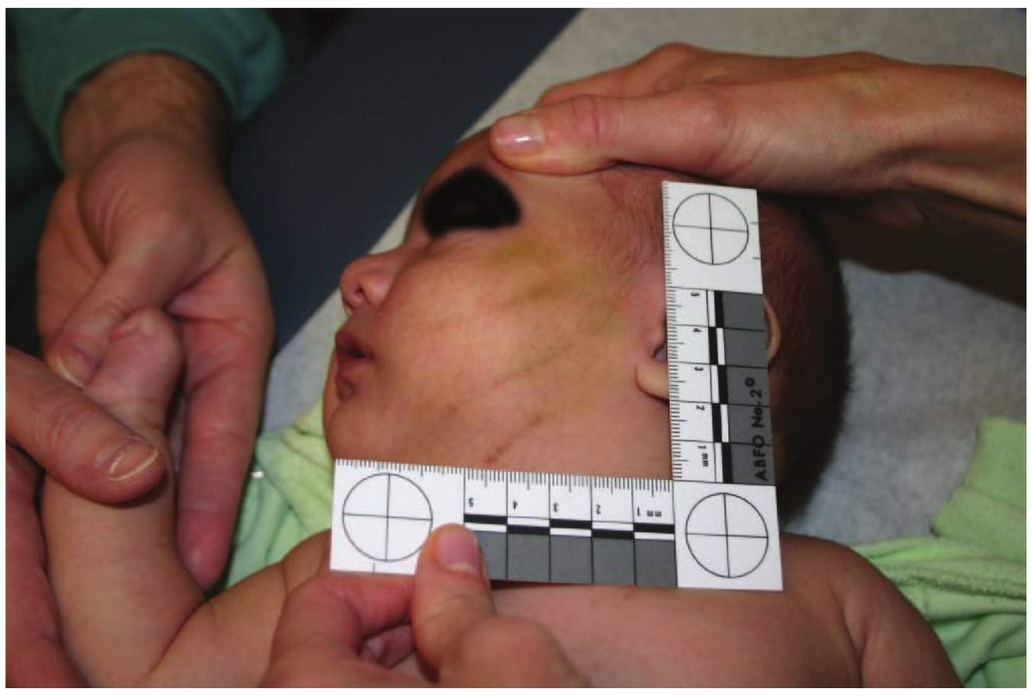

FIGURE 15.35 ■ **Hand-Print Bruise.** Note that the bruises run between and around the fingers, creating parallel lines of bruising. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.36 ■ **Pinna Bruise.** Any bruising to the ear is concerning for abuse and should trigger a thorough evaluation for other abusive injuries. It is important to examine the entire ear. In this case, there is bruising to the posterior part of the pinna. (Photo contributor: Robert A. Shapiro, MD.)

FIGURE 15.37 ■ **Pinna Bruise.** Any bruising to the ear is concerning for abuse and should trigger a thorough evaluation for other abusive injuries. (Photo contributor: Daniel M. Lindberg, MD.)

Pearls

1. Identification of injury to the oral cavity in children with other concerns for abuse should substantially increase the level of concern for abuse.
2. The physical examination of a fussy infant or any patient with injuries should include a good look at the mouth and ears.

FIGURE 15.38 ■ **Forehead Hematoma with Eye Bruising.** This child with hemophilia demonstrates the tendency of blood from a forehead hematoma to track downward with gravity and become visible in the periorbital region. In some cases, evidence of the forehead injury may be subtle. (Photo contributor: Ralph A. Gruppo, MD.)

FIGURE 15.39 ■ **Gag Ligature.** This child had a sock stuffed into his mouth and tied around his head. The bruises in the corners of the child's mouth are indicative of gagging. (Photo contributor: Robert A. Shapiro, MD.)

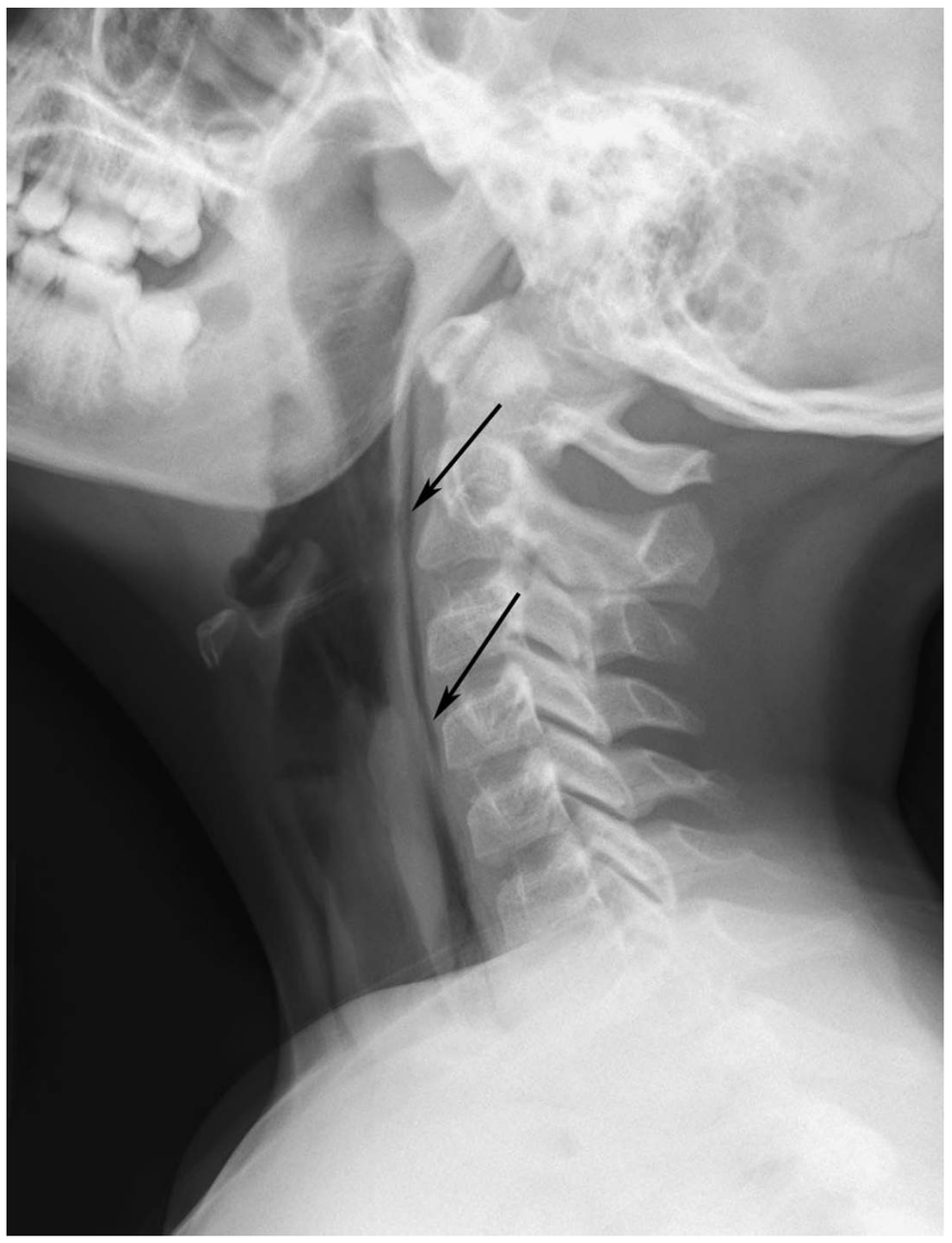

FIGURE 15.40 ■ **Oropharyngeal Injury.** Fingers, utensils, or other objects can perforate the oropharynx when shoved into the mouth of young children in the course of feeding or in an attempt to pacify an infant. This should trigger a thorough evaluation for other abusive injuries. This x-ray demonstrates retropharyngeal air (arrows) indicating oropharyngeal perforation. (Photo contributor: Marguerite Care, MD.)

FIGURE 15.41 ■ **Labial Frenulum Tear.** Injuries of the labial or lingular frenula are concerning for abuse, especially in nonmobile children. The frenula should be specifically examined when there are other concerns for abuse, especially in infants. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.42 ■ **Lip Injury.** This subtle injury was identified in a child with facial bruising attributed to a short fall. Ultimately, several abusive injuries were identified and the child's mother was found to have struck the child with a blunt object. (Photo contributor: Daniel M. Lindberg, MD.)

FIGURE 15.43 ■ **Dental Injury.** This school-aged child had multiple abusive injuries, including this chipped tooth (left, lower incisor) from blunt trauma. (Photo contributor: Kathi L. Makoroff, MD.)

Clinical Summary

Radiographic signs remain among the most specific and well-supported indicators of an abusive mechanism for injury. Signs of fracture healing can be used to determine the age of an injury, and can therefore be used to help determine the perpetrator of abuse, or establish that a child has been injured on multiple occasions. Signs of fracture healing, including periosteal reaction, callous formation, or remodeling are first seen approximately 7 to 10 days from the time of the injury.

The fractures that are most specific for abuse include rib fractures in children of any age, especially at the posterior portion of the rib, classic metaphyseal fractures, fractures of multiple ages, fractures of the hands and/or feet, and fractures of the scapula, spinous processes, or sternum.

Management Disposition

Fractures that raise a reasonable concern for abuse should be reported to child protective services. Rib fractures and metaphyseal fractures, though very specific for abuse, are frequently self-limited and do not require immobilization. Children with inflicted fractures require identification of a safe care environment before discharge.

Pearls

1. The physical examination is not sensitive for bony injury, especially in young infants. Bruising is absent in the majority of abusive fractures.
2. Skeletal survey is mandatory for children less than 24 months old with concern for physical abuse. Skeletal surveys are less likely to be helpful in children older than 60 months (5 years).
3. Radiographic signs of healing (periosteal reaction, callous) are typically seen approximately 7 to 10 days from the time of injury.
4. A follow-up skeletal survey, obtained 10 to 14 days after the initial survey, can identify additional fractures, especially of the ribs, and long bones. Films of the skull are omitted from these follow-up surveys.
5. Suspect abuse when a child has metaphyseal fractures, rib fractures, fractures at different stages of healing, or unsuspected fractures.
6. Toddler's fractures (spiral fractures of the tibia) are nonabusive fractures common in children learning to walk.
7. Many infants with rib fractures will have minor or nonspecific (fussy, decreased appetite) symptoms.

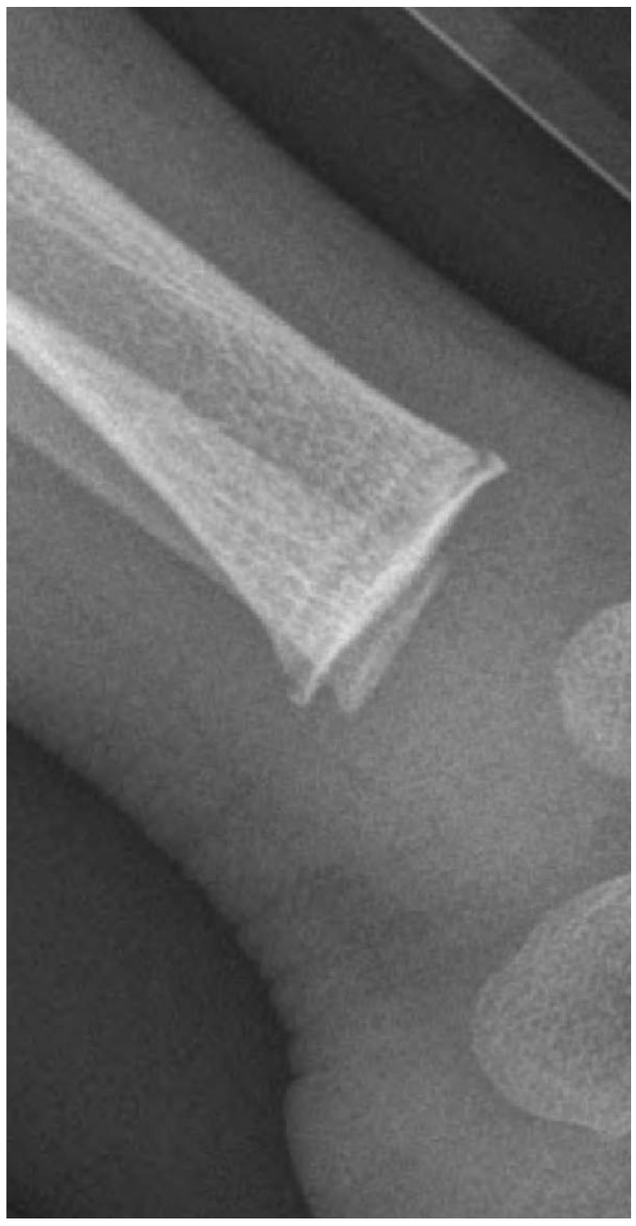

FIGURE 15.44 ■ **Classic Metaphyseal Lesion (CML).** High-detail imaging demonstrates the corner fracture morphology of this metaphyseal fracture. These fractures are rarely symptomatic. (Photo contributor: Marguerite Care, MD.)

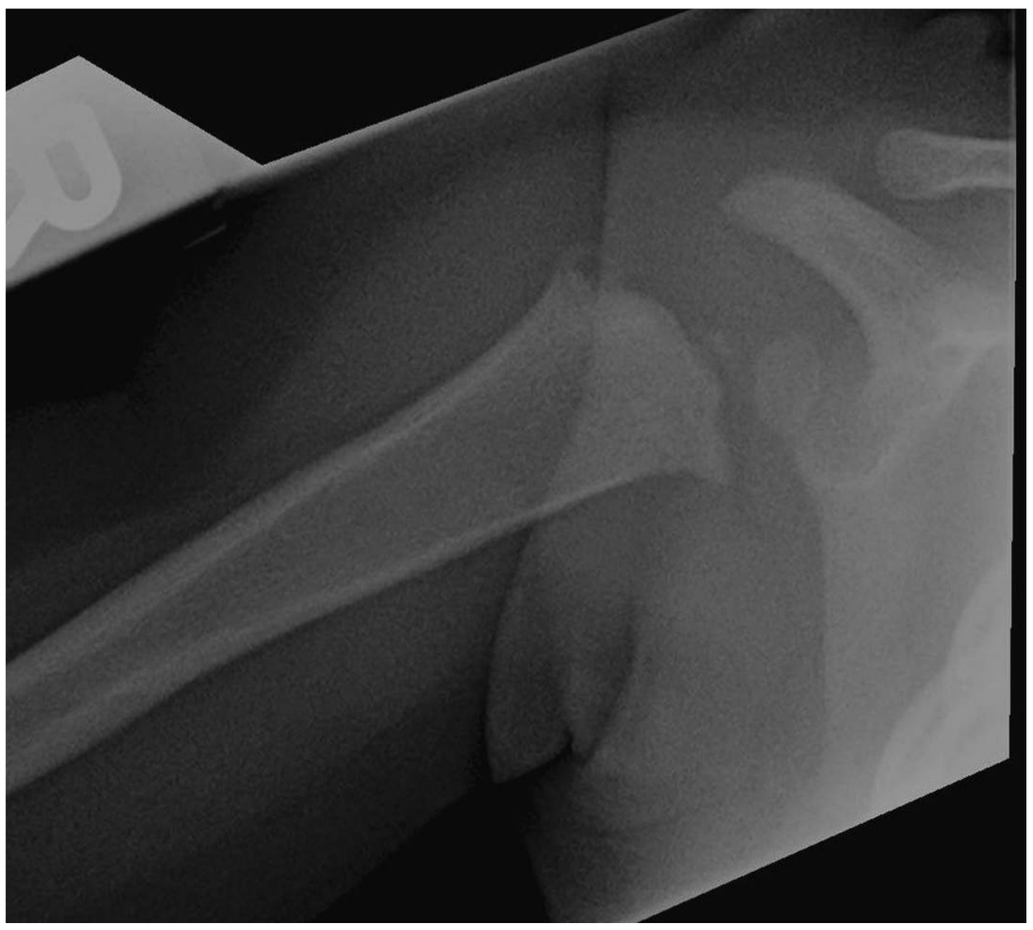

FIGURE 15.45 ■ **Classic Metaphyseal Lesion (CML).** Skeletal survey demonstrates a bucket-handle morphology of this metaphyseal fracture of the proximal humerus. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.46 ■ **Classic Metaphyseal Lesion (CML).** Two views of this metaphyseal fracture (**A**, **B**) demonstrate that the "corner fracture" or "bucket handle" morphology of these fractures is a function of the view obtained, rather than properties intrinsic to the fracture itself. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

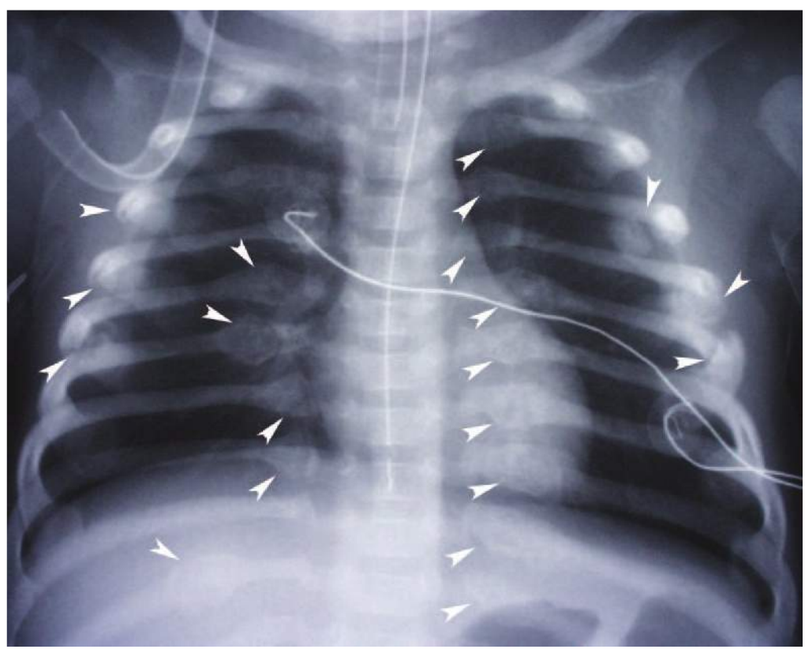

FIGURE 15.47 ■ **Posterior Rib Fractures—Healing.** This A/P chest x-ray demonstrates multiple, bilateral, acute, and healing rib fractures in the posterior portion of the ribs adjacent to the spine (arrowheads). Posterior fractures result from levering of the ribs against the transverse processes of the vertebrae. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

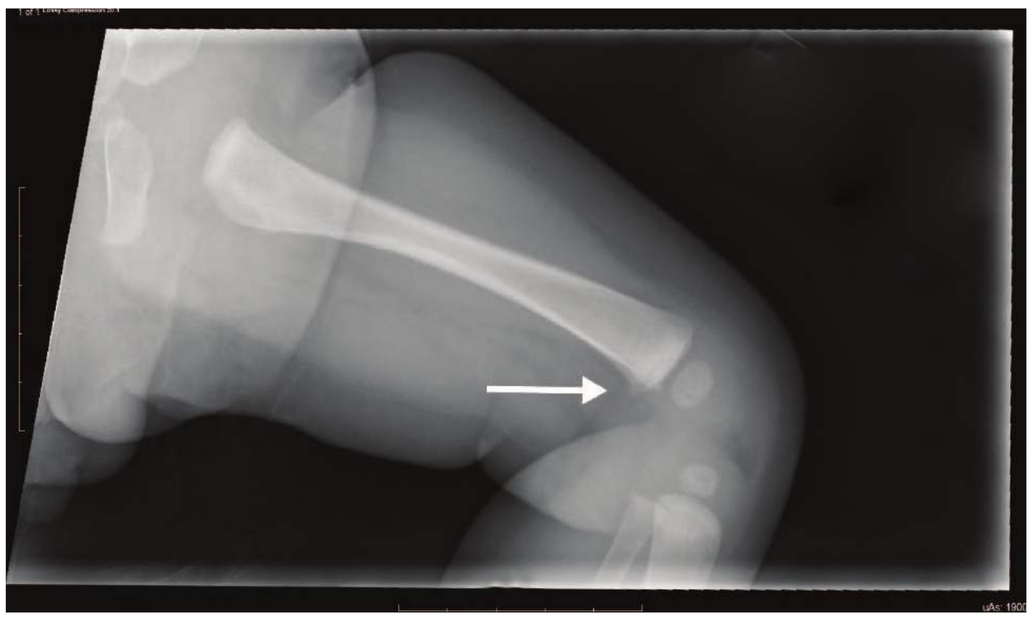

FIGURE 15.48 ■ **Classic Metaphyseal Lesion (CML).** This CML of the distal femur appears as a chip at the posterior corner of the metaphysis. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

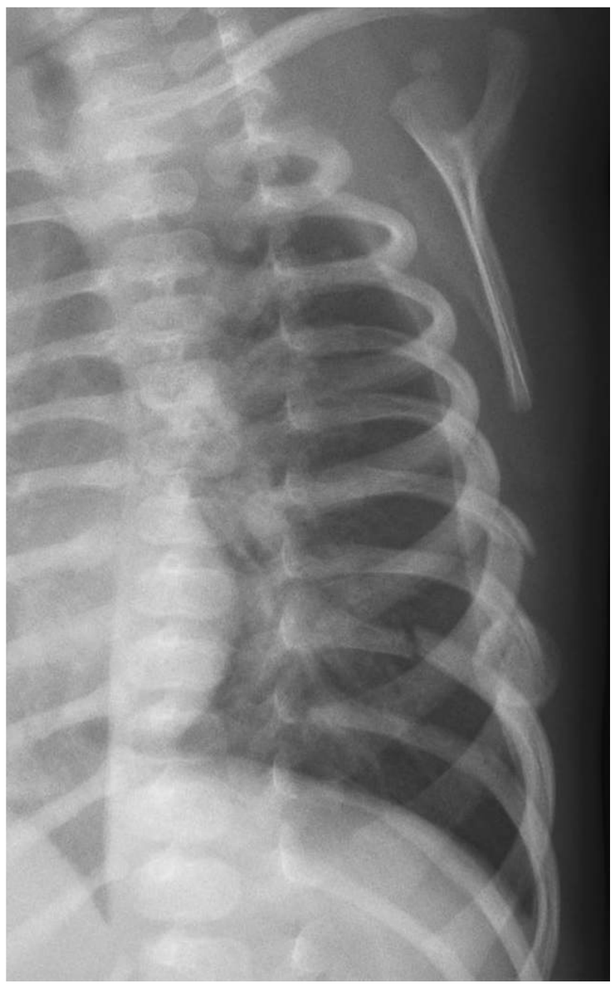

FIGURE 15.49 ■ **Rib Fractures—Acute and Healing.** This oblique radiograph demonstrates acute fractures of ribs 6 and 8 and a healing fracture of rib 7, implying multiple episodes of trauma. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.50 ■ **Blue-Gray Sclera.** This school-aged child has osteogenesis imperfecta and a history of multiple fractures. While some patients demonstrate the classic "robin's egg blue" sclera, a blue-gray tint is more common, and some patients have normal scleral pigmentation. (Photo contributor: Daniel M. Lindberg, MD.)

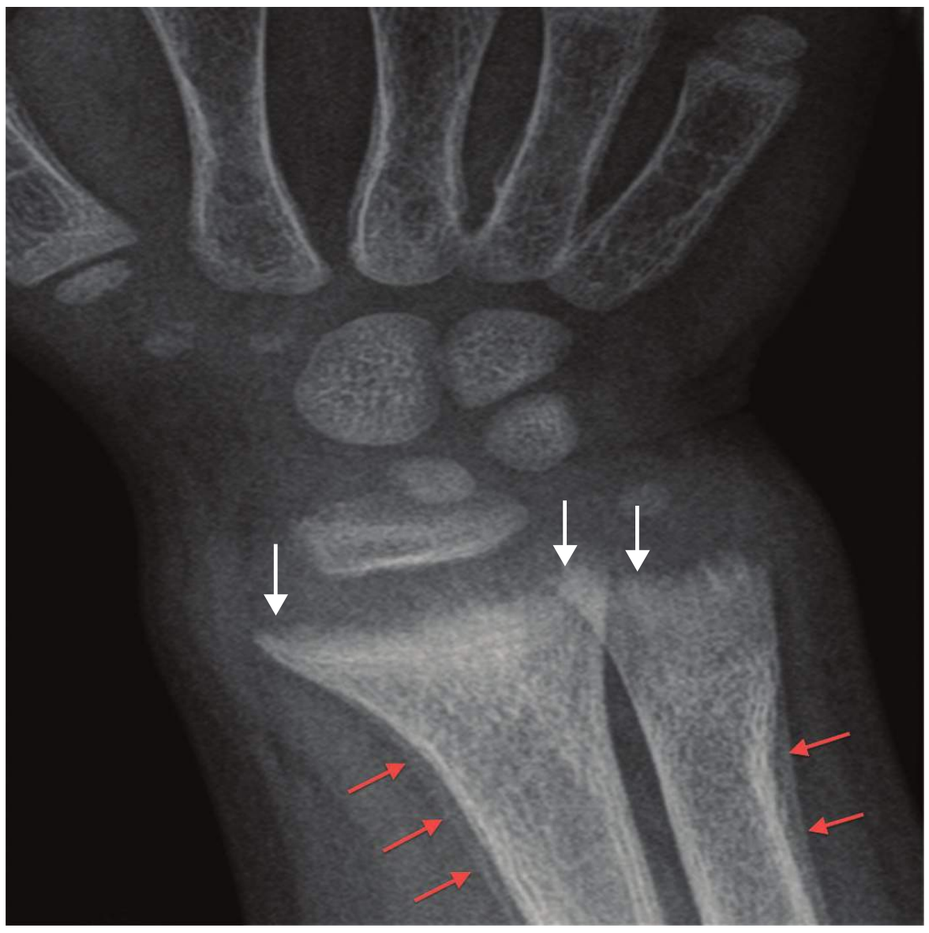

FIGURE 15.51 ■ **Skeletal Changes with Ricketts.** Cupping of the metaphysis (proximal to the growth plate), as shown here in both the radius and ulna, is one of the earliest signs of Rickets or calcium deficiency (open arrows). Periosteal reaction is demonstrated along the shaft of both bones (arrows). (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.52 ■ **Toddler's Fracture.** The toddler's fracture is a commonly seen, nonabusive, spiral fracture of the distal tibia that often presents in children learning to walk, sometimes without a specific history of trauma beyond the normal falls associated with this developmental stage. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.53 ■ **Phalanx Fracture (Second, Third Metacarpal).** Fractures to the phalanges of the fingers or toes are rare in both accidents and abuse. Without a history of significant trauma, identification of these fractures, which may be very subtle, should prompt a thorough evaluation for child abuse. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

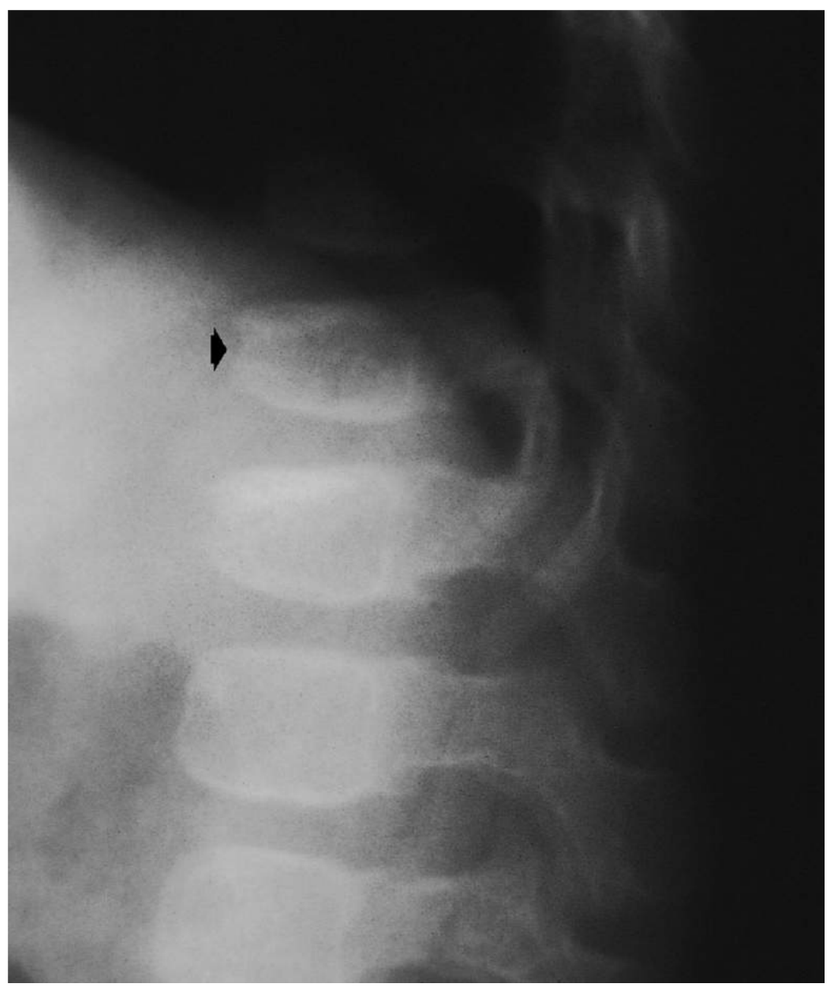

FIGURE 15.54 ■ **Vertebral Fracture.** The wedging of T-12 (arrow) and probably L-1 indicates vertebral compression fractures. These fractures are the result of significant forces applied to the spinal column and are often indicative of child abuse. (Photo contributor: Alan E. Oestreich, MD.)

Clinical Summary

Intra-abdominal and intrathoracic injuries are identified in a small but important fraction of abused children, but can be an important source of morbidity and mortality, and can significantly affect the plausibility of an offered history for other injuries. Clinical signs of abdominal injury (tenderness, bruising, distention, altered bowel sounds), though relatively specific for injury, are relatively insensitive. Hepatic transaminases (AST and ALT) can identify abdominal injuries that are missed by clinical examination alone and should be obtained in all children less than 5 years old with concern for physical abuse. When AST or ALT are more than 80 IU/L, abdominal CT with IV contrast should be obtained to identify intra-abdominal injury.

Significant intra-abdominal injuries are uncommonly the result of short falls or stairway falls, though relatively low-energy injuries with a direct blow to the abdomen (such as a fall onto handlebars) can produce significant injuries.

Most solid-organ injuries in well-appearing children are self-limited, but hollow-viscus injuries, pancreatic injuries, and vascular injuries have high likelihood of deterioration, and require early surgical consultation.

Management and Disposition

Children with identified intra-abdominal or intrathoracic injuries require admission for observation and surgical consultation. The identification of abusive intra-abdominal or intrathoracic injuries should prompt screening for other abusive injuries with a careful physical examination, skeletal survey (for children less than 24 months old), and neuroimaging (for children less than 6 months old or with signs of brain injury).

Pearls

1. Abdominal CT with IV contrast is the first choice for imaging in children with suspicion of abusive abdominal injuries as ultrasound has limited sensitivity.
2. Hollow-viscus injuries, vascular injuries, and pancreatic injuries have a high likelihood for decompensation and require early surgical consultation.
3. Neither a normal ultrasound nor declining liver function tests obviate the need for a CT—if concerned, get a contrast-enhanced CT without delay.
4. Many children with significant abusive abdominal injury will have no bruising on physical examination.

FIGURE 15.55 ■ **Abdominal Bruises.** Abdominal bruising is unlikely in accidental injury and frequently indicates intra-abdominal injury. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.56 ■ **Positive FAST Examination.** This anechoic (dark) fluid in Morrison pouch represented blood in this patient. As with nonabusive trauma, ultrasound is a rapid, noninvasive way to screen for abdominal injury in an unstable patient, but is not sufficiently sensitive to detect smaller abdominal injuries that may, nevertheless, have important forensic significance. (Photo contributor: Jason W. Fischer, MD, MSc.)

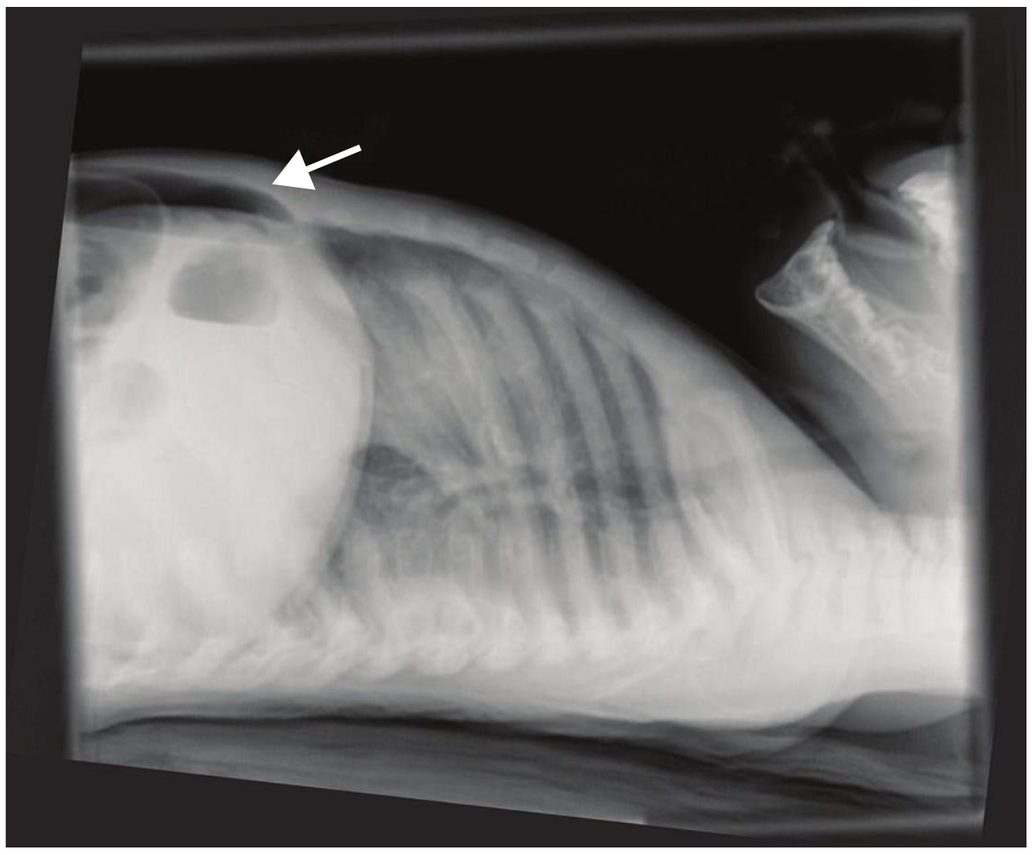

FIGURE 15.57 ■ **Hollow Viscus Perforation.** This lateral chest x-ray demonstrates free air anteriorly, inferior to the diaphragm, suggesting hollow viscus perforation, an injury that, like pancreatic injuries, is overrepresented in abused children. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.59 ■ **Splenic Laceration.** This splenic laceration was identified in a child with abusive head trauma and retinal hemorrhages in the course of an investigation for unexplained anemia. (Photo contributor: Daniel M. Lindberg, MD.)

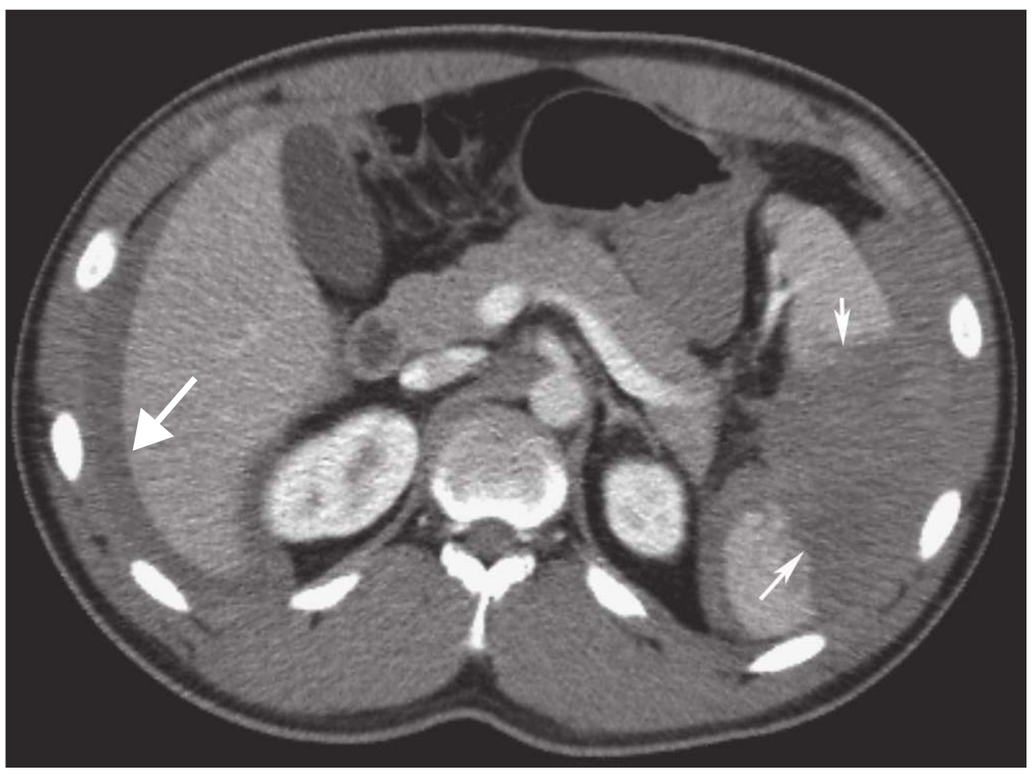

FIGURE 15.58 ■ **Splenic Laceration.** A severe laceration of the spleen is seen. Note the large separation of the splenic parenchyma with fluid density (blood) visible between the sections of the spleen (white arrows) and free fluid within the peritoneum (black arrow). In young children, motor vehicle collisions and abuse account for the large majority of such injuries. (Photo contributor: Marguerite Care, MD.)

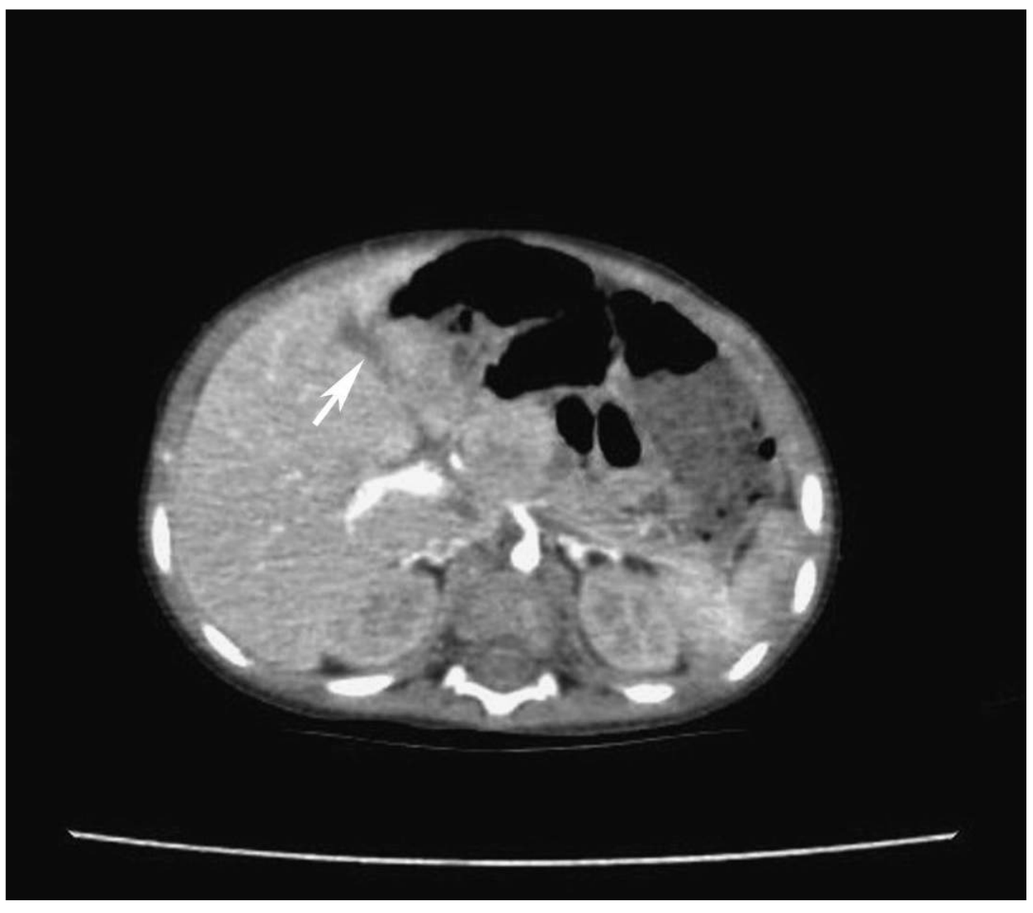

FIGURE 15.60 ■ **Abusive Liver Laceration.** This CT demonstrates a clinically occult hepatic laceration (arrow) identified in a child with other abusive injuries. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

CHILD SEXUAL ABUSE EXAM AND GENITAL FINDINGS

Clinical Summary

The history is often most important to make a diagnosis of sexual abuse. An ED physician may ask questions as necessary for the medical evaluation of the patient. However, forensic interviews should be performed by professionals trained in interviewing children for possible sexual abuse.

A pubertal female can be examined in the supine position with feet in stirrups. A prepubertal female should be examined in the supine frog-leg position (hips and knees bent; soles of feet touching) and can be examined on the examination table or while sitting on a caregiver's lap. Gentle even labial traction will allow visualization of the vulva and the hymen. Attention should be paid to all areas, but special attention should be given to the hymen and posterior fourchette, the most common sites of injury in cases of sexual abuse. Use the clock-face designation when documenting locations around the hymen. A cotton-tipped applicator can be used in the postpubertal female to unfold and examine the edges of the hymen. The prepubescent hymen is sensitive to touch. A speculum is never used in the examination of a prepubertal girl; the only time a speculum is used in this population is during examination under anesthesia.

A male patient can be examined in the supine position, with care to inspect the penis and scrotum in entirety. The anus can be examined in the prone or lateral decubitus position. A colposcope can be used, if available, to magnify the genital and anal areas to look for injury.

Management and Disposition

When patients with a concern of sexual abuse present to the ED, Social Work should be notified. If sexual abuse is suspected, a report of alleged sexual abuse should be made to child protective services and law enforcement.

All children who are seen in the emergency room for acute sexual assault should receive a complete physical examination including genital and anal examination. Any injuries or skin lesions concerning for injuries on the body should be described in detail with the aid of full body diagrams and, when available, photodocumentation. When performing a genital examination, a chaperone (hospital personnel) should be present at all times.

Evidence collection should be performed if the contact occurred within the last 72 hours (for all males and prepubertal females), and can be considered up to 96 hours in pubertal females, as there is the potential for the recovery of trace forensic evidence.

In most cases, an anxious patient will cooperate fully with the examination if a parent or other support person remains for the examination. Reassurance and distraction techniques are helpful. Sedation is rarely needed and can be ineffective. An examination should never be forced upon an unwilling patient. When an examination is deemed medically necessary (ie, vaginal bleeding without a known source, and the patient is not cooperative), examination under anesthesia should be considered.

Sexual assault can coincide with intentional or covertly administered substance use. Do not begin the evidence collection or genital/anal examination until the patient is coherent and can consent or assent to the process and examination.

Pearls

1. A normal examination does not exclude the diagnosis of sexual abuse, and a normal examination is the most likely finding, even in abused children. Examination findings (genital and anal) specific for sexual abuse are found in only a small percentage of patients who report a history of sexual abuse.
2. The shape and appearance of the prepubertal hymen is variable. Crescentic and annular configurations are most common. Hymens can also be sleeve-like, septate, imperforate (which eventually requires surgical opening), and cribriform (multiple small openings).

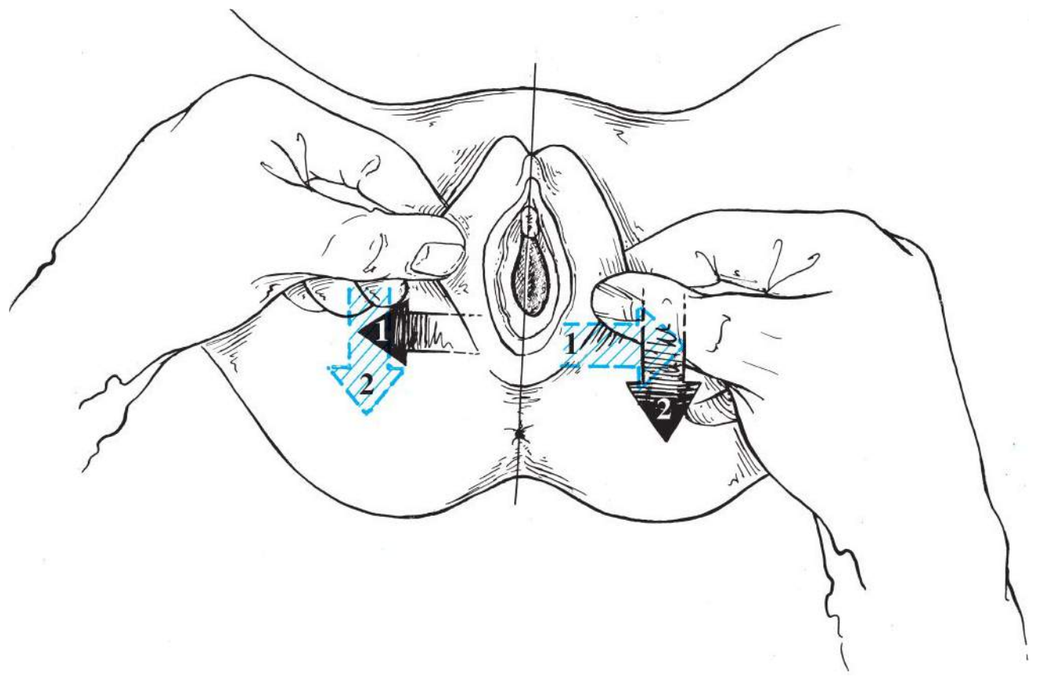

FIGURE 15.61 ■ **Labial Traction Examination Technique.** Position the child in a supine position with her knees out and soles together. Hymenal inspection in prepubertal girls is best accomplished when lateral (**1**) and posterior (**2**) traction to the labia is applied as shown here. (Adapted from Giardino AP et al. A Practical Guide to the Evaluation of Sexual Abuse in the Prepubertal Child. Sage Publications; 1992.)

3. The inner edge of the prepubertal hymen is usually smooth and uninterrupted. Notches at the 3- and 9-o'clock positions are normal. Minor irregularities are most likely insignificant.
4. Presumptive treatment for gonorrhea and chlamydia is not recommended for a **prepubertal** patient because of the very low incidence of infection in these patients and also because of the low risk of ascending infection (infection is a lower-tract disease in prepubertal females) and the need for confirmatory testing.
5. A history of sexual abuse is strongly associated with increased risk of suicidal thinking and suicide and self-harm attempts among older children and adolescents. All patients evaluated for sexual abuse should be carefully assessed for current suicidal or self-harm thoughts.
6. Before the patient is discharged from the ED, it is necessary to also determine what access the alleged perpetrator has to the patient, family, or other individuals and to ensure a safe discharge plan.

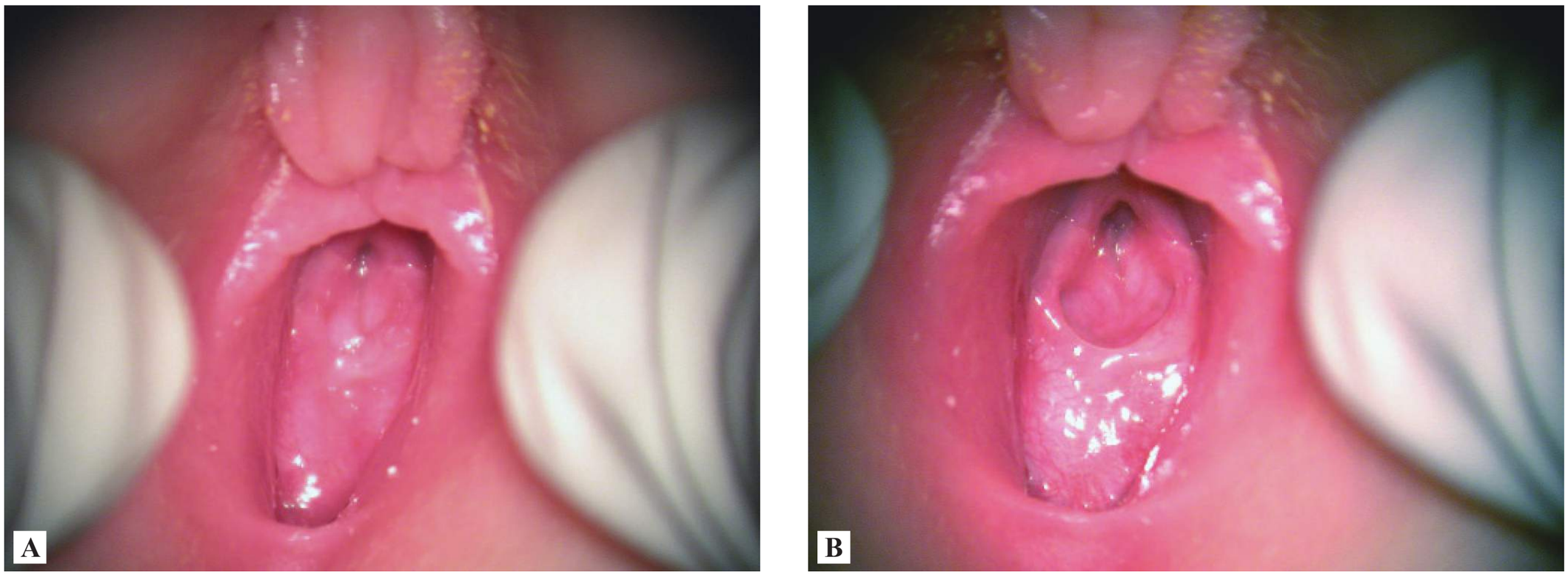

FIGURE 15.62 ■ **Proper Labial Traction Allows Visualization of the Prepubertal Hymen.** (**A**) Lateral labial traction only. The hymenal margins cannot be visualized. (**B**) Lateral, posterior, and caudal labial traction provides complete visualization of the hymenal rim. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

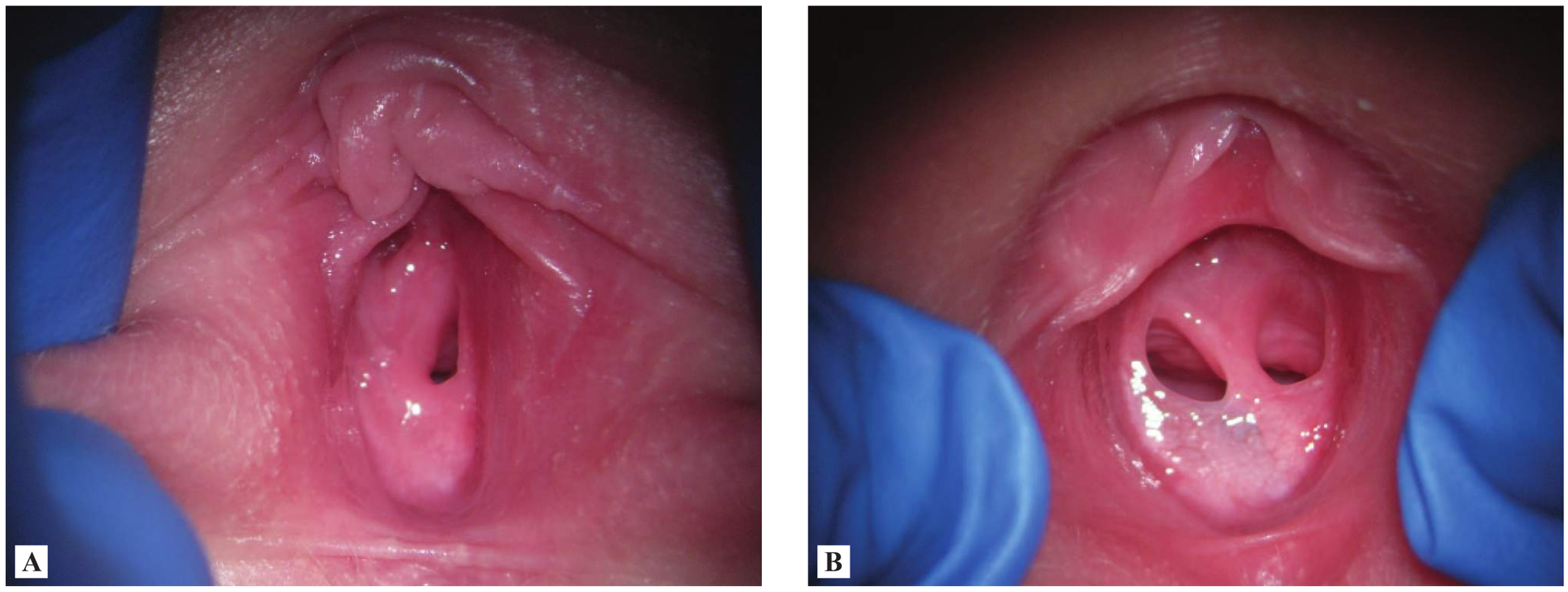

FIGURE 15.63 ■ **Proper Labial Traction Allows Visualization of the Prepubertal Hymen.** The hymen is partially visible in the first photo (**A**). When traction is applied, a hymenal septum is found which creates the appearance of two vaginal openings (**B**). A septum is a normal hymenal variant. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.64 ■ **Normal Estrogenized Newborn Hymen.** Infants often have thickened annular hymens. Maternal estrogens cause this effect. Do not confuse with traumatic swelling. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

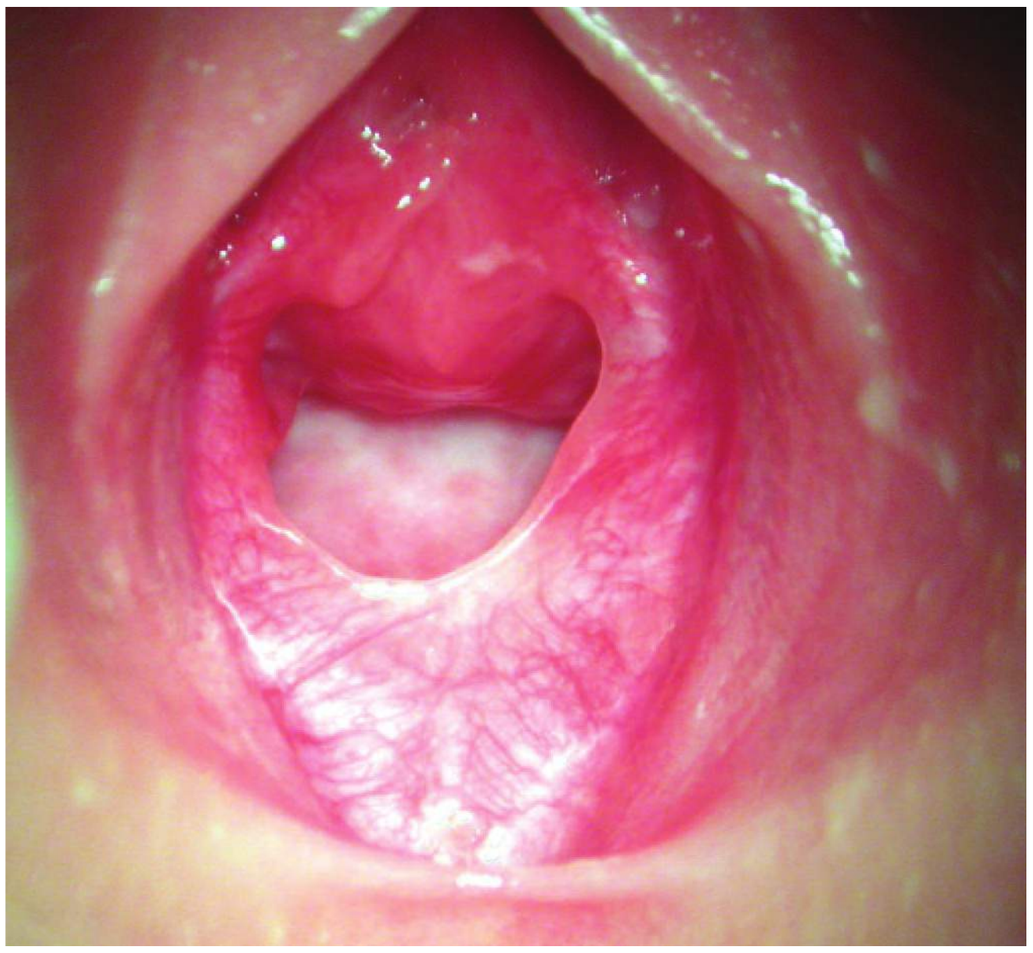

FIGURE 15.66 ■ **Normal Crescentic Hymen.** The hymen is crescentic shaped without any hymen present from the 11- to 1-o'clock position. This is a normal hymen and the most common configuration in prepubertal girls. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.65 ■ **Normal Annular Hymen.** The hymen is doughnut shaped without any defects. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.67 ■ **Normal Hymenal Mound—Crescentic Hymen.** The hymen is crescent shaped, tissue is absent near the urethra between 11- and 1-o'clock position. A nonspecific mound of hymenal tissue is noted at 3-o'clock position. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

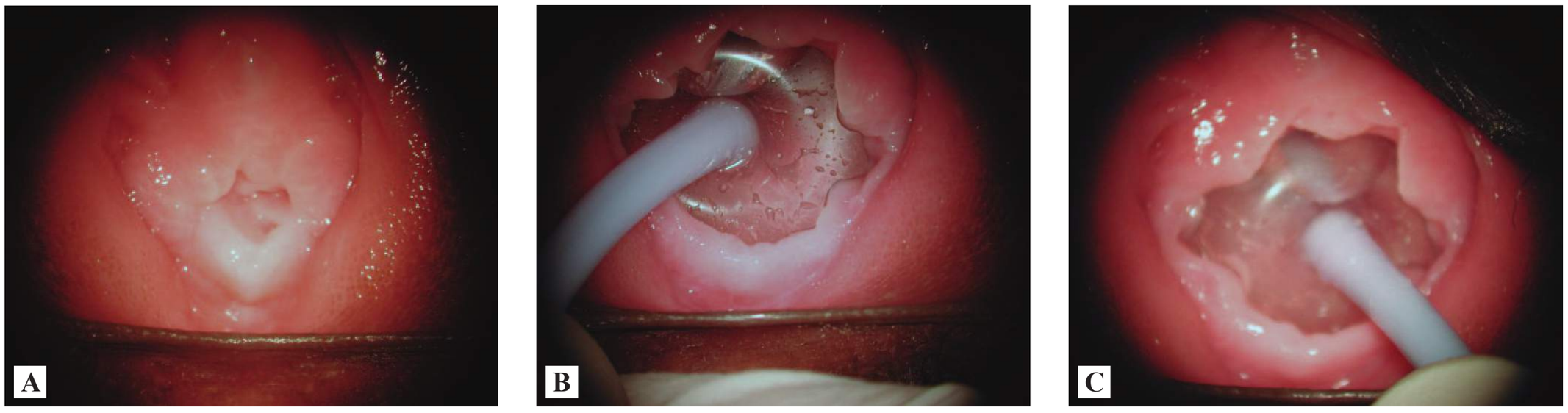

FIGURE 15.68 ■ **Foley Catheter Technique to Better Visualize the Adolescent Hymen.** In addition to using a cotton-tipped applicator (**A**). A Foley catheter can be inserted into the adolescent vagina, filled a mixture of air and water and gently retracted (**B**). Side-to-side displacement of the catheter exposes different hymenal sections for inspection (**C**). (Photo contributor: Cincinnati Children's Hospital Medical Center.)

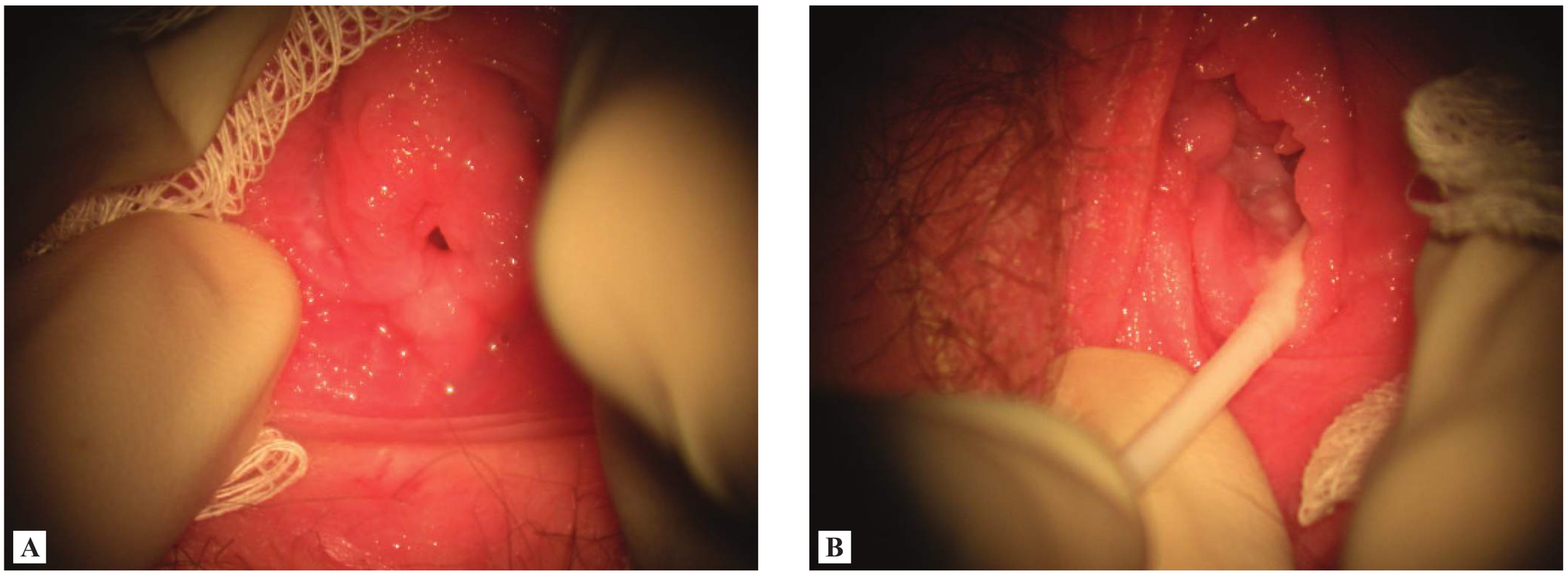

FIGURE 15.69 ■ **Cotton Swab Technique.** These images (**A**, **B**, **C**) show how a cotton-tipped applicator is used to ensure that all parts of the hymen are visualized during the examination of a pubertal patient. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.70 ■ **Hymenal Septum.** This picture shows a common hymenal variant—hymenal septum. A septum that extends into the vagina must be excluded either by examination (demonstrating that a cotton-tipped applicator can pass behind the septum) or with an ultrasound. (Photo contributor: Kathi L. Makoroff, MD.)

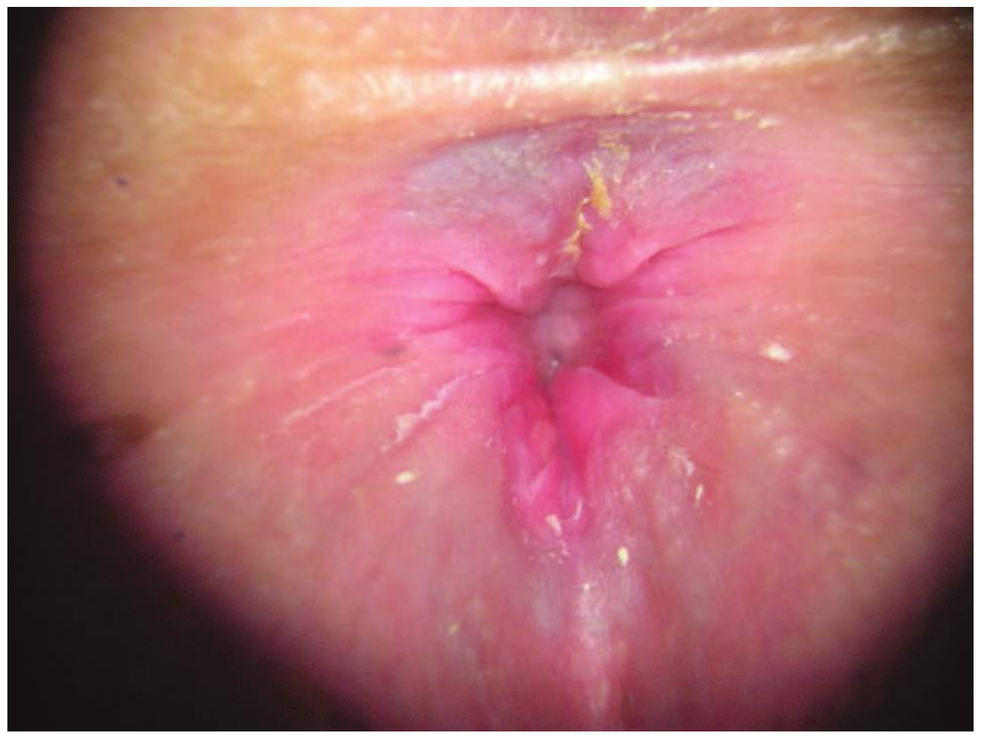

FIGURE 15.71 ■ **Normal Anal Dilation.** A relaxed external sphincter causes anal dilation in all children. Stool in the rectal vault contributes to dilation. This is not a finding of sexual abuse. Other conditions that can cause anal dilatation include chemical sedation, death, or a prolonged period of hypoxia. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

INJURIES AND FINDINGS INDICATIVE OF GENITAL OR ANAL TRAUMA

Clinical Summary

Most physical examinations in cases of sexual abuse or assault will be normal. Findings specific for acute trauma, although not necessarily diagnostic of sexual abuse or assault, include bruising, lacerations, and abrasions. Most of these injuries will heal quickly, usually within a few days, and will heal completely without scarring. Nonacute examination findings caused by trauma can be difficult to diagnose and should be interpreted by a qualified child abuse expert.

Sexually transmitted infections diagnosed in a prepubertal child may indicate sexual abuse. Neisseria gonorrhoeae, Chlamydia trachomatis, Trichomonas, and syphilis are almost always transmitted by intimate sexual contact (intimate contact with infected secretions or lesions) unless acquired perinatally. Human immunodeficiency virus (unless acquired perinatally) and hepatitis are transmitted by intimate sexual contact or contact with infected blood. Condylomata acumintata (human papillomavirus or genital warts) and herpes simplex virus may be transmitted to the prepubertal child through sexual or nonsexual contact.

Management and Disposition

Victims of an acute sexual assault may have genital and/or anal bleeding. Patients who have active genital and/or anal bleeding need immediate attention and evaluation.

Also see "The Child Sexual Abuse Examination."

Pearls

1. It is not necessary to measure the vaginal opening of prepubertal girls. The size of the opening is dependant on examination technique and degree of patient relaxation. There is no consensus of normal size opening among experts.
2. Eyelash lice are pubic lice, and sexual abuse must be considered.
3. Rectal abuse often causes no visible trauma. Superficial anal fissures can be common findings in children; consider abusive trauma, however, if deep fissures are present.

FIGURE 15.73 ■ **Posterior Fourchette Laceration.** A laceration is present in the posterior fourchette, after sexual assault. This is a common location for injury after sexual assault/abuse. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.72 ■ **Hymenal Bruise.** The hymen has bruising from 3- to 5-o'clock position after an acute sexual assault. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

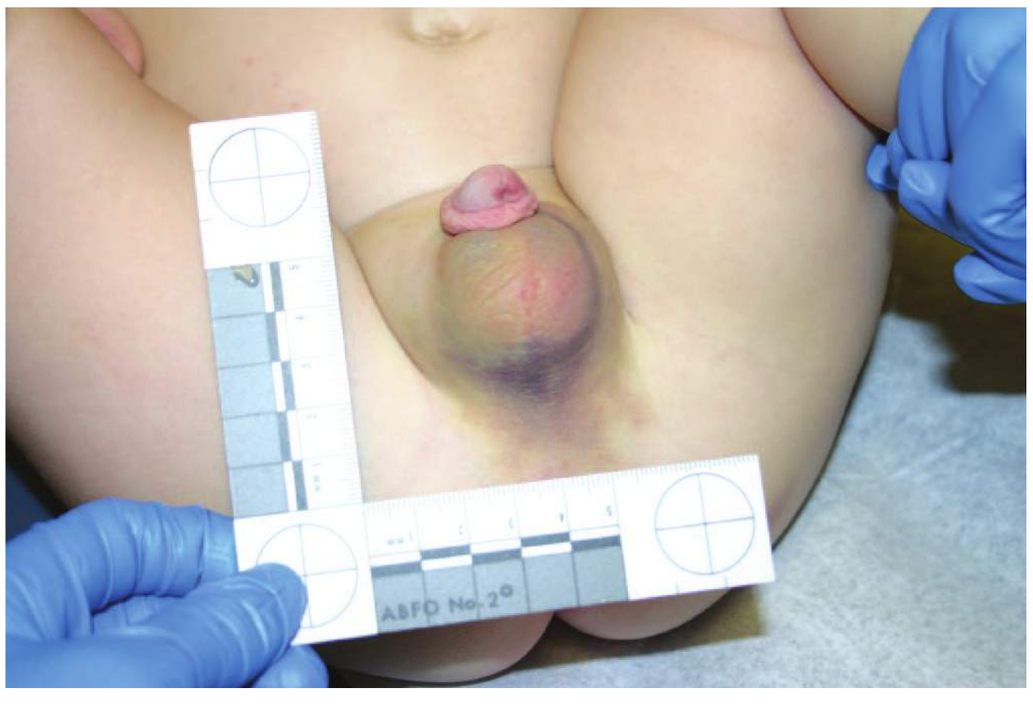

FIGURE 15.74 ■ **Scrotal Bruise.** Bruising to the scrotum is present as well as an abrasion to the tip of the penis. Physical abuse as well as sexual abuse should be considered when genital injury is noted. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.75 ■ **Penile Abrasion.** Abrasion to the underside of the penis illustrates that it is important to examine all parts of the genitalia. (Photo contributor: Daniel M. Lindberg, MD.)

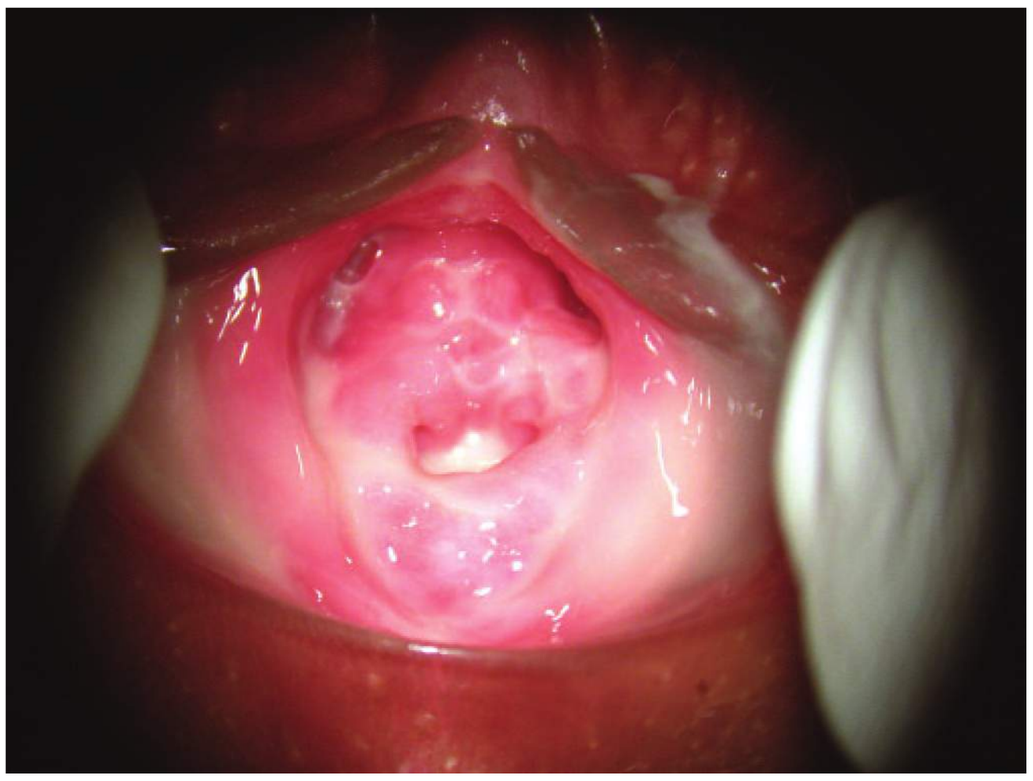

FIGURE 15.77 ■ **Vaginal Discharge—Neisseria gonorrhoeae.** Vaginal discharge in a prepubertal child may be an indication of an STI even when a history of abuse is denied. All children with vaginal discharge should be cultured for N gonorrhoeae and Chlamydia. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.76 ■ **Acute Deep Perianal Lacerations and Bruising.** An acute rectal laceration is visible at 8-o'clock position with bruising on the right side of the perianal area. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.78 ■ **Condyloma Accuminata.** Several small warts are visible in the perineum in this young child. (Photo contributor: Hope K. Haefner, MD.)

FIGURE 15.79 ■ **Perianal Condyloma Accuminata.** Several perianal warts are visible. Warts can be transmitted sexually and nonsexually. Workup should include an evaluation (examination, forensic interview) for sexual abuse and testing for other STIs. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.80 ■ **Perianal Condyloma Accuminata.** Extensive perianal warts are visible. The diagnosis of genital or anal warts does not automatically mean that they were sexually transmitted (see above). (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.81 ■ **Perianal Condyloma Lata (Secondary Syphilis).** Perianal condyloma lata are visible around the rectum. This should not be confused with condyloma accuminata. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

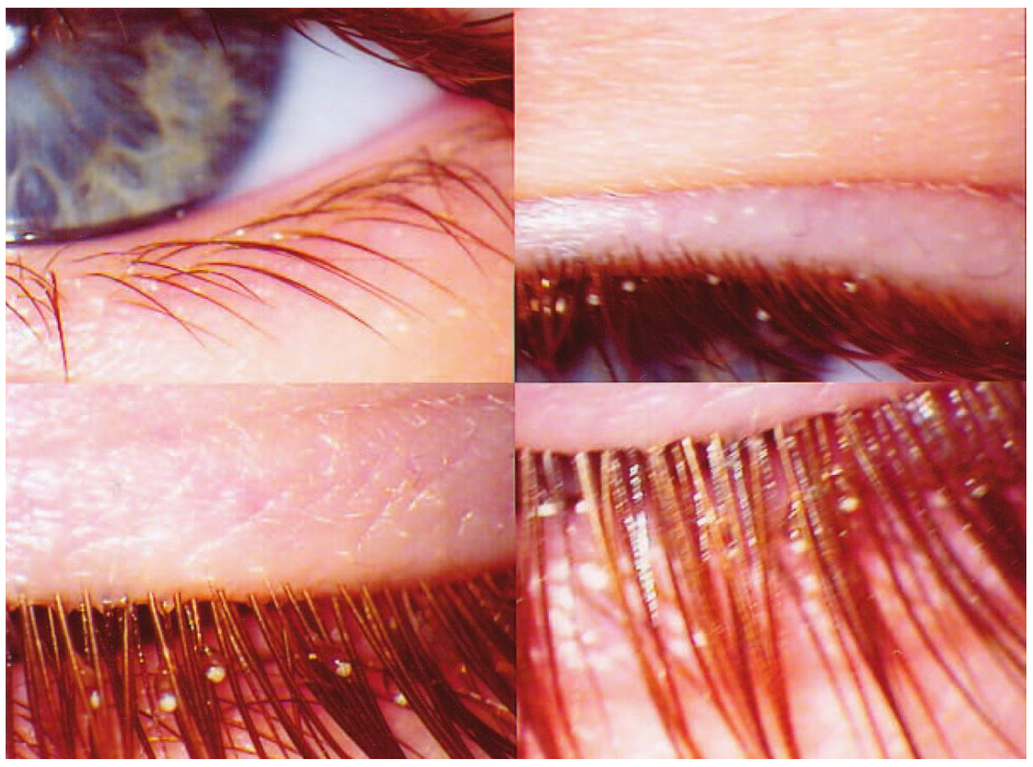

FIGURE 15.82 ■ **Nits.** Nits (the larval form of the louse) from Pthirus pubis are seen firmly adherent to the eyelashes in this child. Sexual abuse should be strongly considered; these are not from head hair. (Photo contributor: Robert A. Shapiro, MD.)

Clinical Summary

Genital injury can result from a fall (straddle) onto an object. A straddle injury usually causes damage to the external genitalia with unilateral bruising and swelling of labia and periurethral tissues. Occasional penetrating trauma to the hymen with internal injury can be seen. The history and the type of object involved are important historical elements. Always obtain a detailed history from the child (if developmentally appropriate) separately from the accompanying parent/adult. Factors that increase concern of possible sexual abuse include no history of injury, injury in a nonambulatory child, vaginal, or hymenal injury without history of penetrating trauma, history inconsistent with physical findings, and/or additional nongenital trauma.

Management and Disposition

Check for urethral injury. Treatment is usually symptomatic. Sitz baths and antibacterial ointment promote healing and minimize discomfort. If the child has difficulty voiding, encouraged voiding in a bath with a few inches of warm water to reduce dysuria. If severe injuries occur, surgical repair may be necessary with consultation with pediatric gynecology or surgery.

Pearls

1. Straddle injuries usually present with a clear mechanism of injury and a physical examination that supports the history.
2. Straddle injuries do not typically involve the hymen or internal vaginal mucosa.

FIGURE 15.83 ■ **Straddle Injury.** This young child fell on to a pool edge sustaining a hematoma to the left labia majora (**A**, **B**). The remainder of her examination, including her hymen, was normal. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.84 ■ **Straddle Injury.** Bruising to the left labia majora and clitoral hood following a fall onto a bicycle bar. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.85 ■ **Straddle Injury.** Ecchymosis, swelling, and contusion of the perineum in a 3-year-old female child who tripped and fell on a large plastic toy. (Photo contributor: James Mensching, MD.)

MIMICS OF TRAUMA: TOILET SEAT INJURIES

Clinical Summary

Acute bruising to the glans and corona of the penis can occur if the toilet seat falls onto the penis during voiding, trapping the penis between the seat and toilet bowl. This injury is not uncommon in boys of about 3 years of age whose height and development set the stage for this injury.

Management and Disposition

No specific treatment is needed unless the child is unable to void. Consult urology if the child cannot void. Consider sexual abuse in any child with a genital injury.

FIGURE 15.86 ■ **Toilet Seat Injuries.** This toddler presented with a straightforward history of the toilet bowel falling onto his penis while voiding. He was able to void without difficulty. (Photo contributor: Kevin J. Knoop, MD, MS.)

Pearl

1. Genital injuries are suspicious of sexual abuse if no appropriate history of accidental trauma is given.

FIGURE 15.87 ■ **Toilet Seat Injuries.** The toilet seat fell onto this toddler's penis and caused bruising to the penis. Discharge is appropriate if the child can void without difficulty. (Photo contributor: Charles J. Schubert.)

Clinical Summary

Urethral prolapse is a condition that only occurs in females, usually in school-aged children. Patients will present with painless bleeding and, on exam, will have what appears as swelling, but is actually the prolapsed portion of the urethra. Urethral prolapse is commonly mistaken for vaginal injury. The etiology is unknown but estrogen deficiency is thought to be a contributing factor. Other risk factors include increased intra-abdominal pressure that results from coughing or constipation and anatomic defects. Urethral prolapse is more common in African American girls.

FIGURE 15.88 ■ **Urethral Prolapse.** A round reddish-purple donut-shaped mass is seen in this child's introitus. Careful examination reveals that the mass originates from the urethra. The hymen is normal. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

Management and Disposition

Medical treatment includes sitz bath and topical estrogen cream. A referral to urology should also be made, as well as reviewing with the family indications for emergent return including increased pain or bleeding, which are signs of strangulation. Surgical repair may be needed when conservative treatment fails or when the prolapse is necrotic.

Pearls

1. Urethral prolapse often presents with painless bleeding in school-aged girls.
2. An examination using good labial traction (see section "The child sexual abuse examination") will demonstrate the prolapse originating from the urethra.

FIGURE 15.89 ■ **Urethral Prolapse.** A round donut-shaped mass consistent with urethral prolapse is seen in this school-aged child. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

MIMICS OF ERYTHEMA/BRUISING: LICHEN SCLEROSIS

Clinical Summary

Lichen sclerosis atrophicus (LSA) is found often in older women but occasionally in prepubertal girls. Findings include thin hypopigmented (as white or yellow plaques) and easily friable skin in the genital and anal areas that can bleed even without trauma; itching and pain can also occur. The hemorrhagic form of LSA includes subepithelial hemorrhagic lesions to the affected skin, which can be mistaken for trauma. The exact cause is unknown but thought to involve a genetic susceptibility, autoimmune dysfunction, and state of hypoestrogenism.

Management and Disposition

Treatment consists of high potency corticosteroids and referral to dermatology or pediatric gynecology.

Pearls

1. The hemorrhagic form of LSA can be mistaken for trauma.
2. Surrounding hypopigmented skin can be a clue to the diagnosis

FIGURE 15.90 ■ **Lichen Sclerosis.** This image shows both the hypopigmentation (white plaque area) and the multiple hemorrhagic areas characteristic of lichen sclerosis. (Photo contributor: Kathi L. Makoroff, MD.)

FIGURE 15.91 ■ **Lichen Sclerosis.** This close-up image shows the hypopigmentation (white plaque area) and the differentiation between it and the surrounding normal skin. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.92 ■ **Lichen Sclerosis.** Hemorrhagic lichen sclerosis atrophicus. The perineum surrounding the vagina and anus is hypopigmented in an hourglass configuration. The hemorrhagic lesions are not traumatic in etiology. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

MIMICS OF ERYTHEMA/BRUISING: LABIAL ADHESIONS

Clinical Summary

Adhesions of the labia minora occur in young girls and may persist until puberty. A thin translucent line is seen where the labia meet. Involvement is often limited to the posterior portion of the labia, but some children have more extensive adhesions that completely obscure the introitus.

Management and Disposition

Estrogen cream (Premarin) can be prescribed and applied gently over the adhesions twice daily for 2 to 4 weeks. Recurrence is not uncommon.

Pearls

1. Adhesions may be congenital or acquired.
2. It is postulated that vulvar irritation from sexual abuse may cause labial adhesions but supporting evidence is lacking.
3. Adhesions distort the vaginal anatomy and make identification of the hymen difficult.
4. Adhesions may be mistaken for scars.

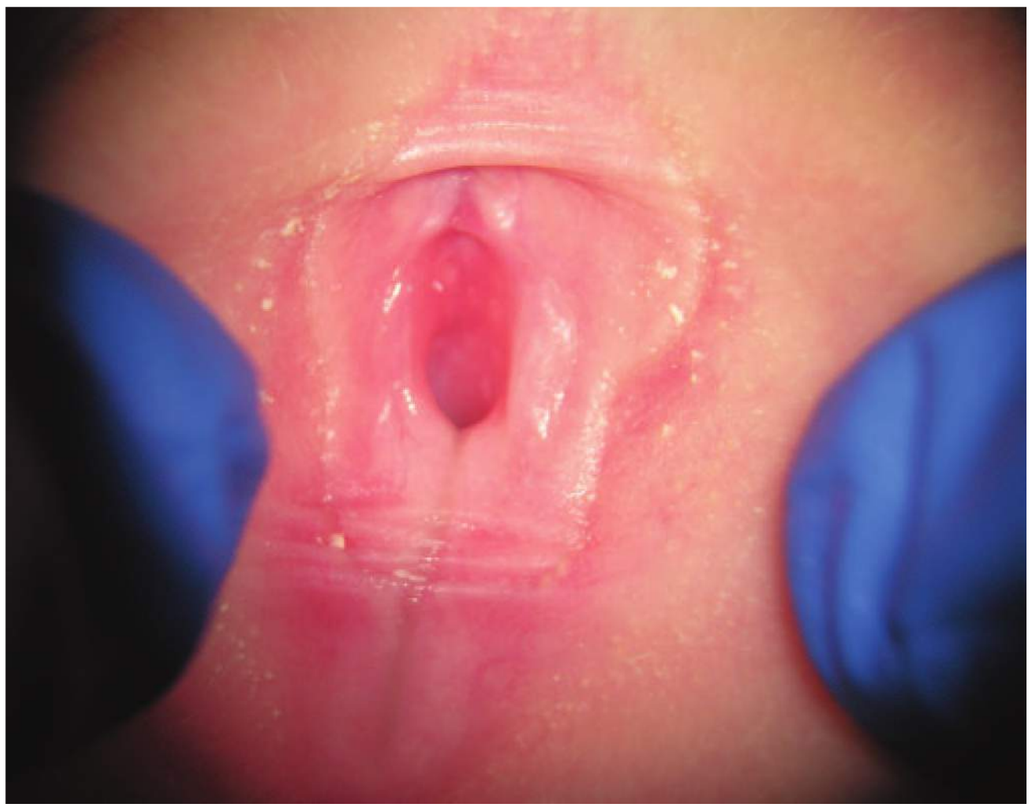

FIGURE 15.93 ■ **Labial Adhesions.** Labial adhesions obscure the hymen in this prepubertal girl. (Photo contributor: Cincinnati Children's Hospital Medical Center.)

FIGURE 15.94 ■ **Labial Adhesions.** Labial adhesions obscure the hymen in this prepubertal girl. (Photo contributor: Larry B. Mellick, MD.)

MIMICS OF ERYTHEMA/BRUISING: PERIANAL STREPTOCOCCAL DISEASE

Clinical Summary

Perianal streptococcal dermatitis/disease is an infectious disease caused by group A β-hemolytic streptococci. Signs and symptoms include perianal as well as vulvovaginal or penile erythematous rash. Itching, pain, anal fissures, blood-streaked stools, rectal bleeding, anal discharge, and vaginal discharge can also be seen. Systematic symptoms (fever, pharyngitis) are absent but can precede the onset of the rash.

Management and Disposition

A bacterial culture for group A streptococci of the perianal and/or vulvovaginal or penile regions should be obtained by rubbing a dry swab over the affected areas. Treatment is with oral penicillin or amoxicillin. Erythromycin is used in patients who are penicillin allergic. Treatment should be 14 to 21 days.

Pearls

1. This can be confused for sexual abuse because of the overlap in clinical presentation: redness, pain, and/or bleeding without a recognized etiology.

FIGURE 15.95 ■ **Perianal Streptococcal Infection.** Intense erythema around the anus consistent with perianal streptococcal infection. (Photo contributor: Raymond C. Baker, MD.)

FIGURE 15.96 ■ **Perianal Streptococcal Infection.** Intense erythema around the anus consistent with perianal streptococcal infection. (Photo contributor: Kevin J. Knoop, MD, MS.)

Clinical Summary

Venous pooling refers to the purple discoloration of the perianal tissues caused by collection of venous blood in the external hemorrhoidal plexus. Venous blood pools in this plexus when a patient is immobile, causing the veins to become distended and visible. It can often be eliminated by getting the patient up and mobilized and then reexamining the patient immediately in the prone or lateral decubitus position.

Management and Disposition

No treatment, other than proper diagnosis and reassurance, is needed.

Pearls

1. The plexus can be visible as a circle of discoloration around the anus or as a linear discoloration.

FIGURE 15.97 ■ **Venous Pooling**. Circumferential venous pooling is noted on this examination. Surrounding venous pooling may be mistaken for bruising. There are no other findings. (Photo contributor: Kathi L. Makoroff, MD.)