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REVIEW

Cutaneous mimickers of child abuse: a primer for pediatricians

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Abstract The annual incidence of child abuse was estimated to be 2.8 million by the national incidence study conducted in the USA in 1993, which is a two-fold increase compared to 1986. Awareness of child abuse has been increasing since the 1960s. Although most victims of child abuse present with cutaneous lesions, many genuine skin diseases may appear as non-accidental injuries which, if not recognized, may lead to misdiagnosis of child abuse. Here, we review the most common cutaneous mimickers of child abuse in order to increase awareness of these disorders and reduce erroneous diagnosis of child abuse.

Keywords Child abuse · Cutaneous · Mimickers

Introduction

Child abuse is defined by the Child Abuse Prevention and Treatment Act as a recent act or failure to act that results in death, serious physical, or emotional harm, sexual abuse or exploitation, or imminent risk of serious harm; involves a child; and is carried out by a parent or caregiver who is responsible for the child's welfare [2]. Child sexual abuse is defined as the employment, use, persuasion, inducement, enticement, or coercion of any child to engage in, or assist any other person to engage in, any sexually explicit conduct or simulation of such conduct for the purpose of producing a visual depiction of such conduct; or the rape, molestation, prostitution, or other form of sexual exploitation of children, or incest with children [2]. Awareness of child abuse has been increasing since the 1960s [39]. The annual incidence of child abuse was estimated to be 2.8 million by the national incidence study conducted in the USA in 1993, which is twofold increase compared to 1986 [1]. In 2006, an estimated 3.6 million children were the subject of an investigation by child protective services agencies [4]. An abused child has approximately a 50% chance of being abused again and has an increased risk of dying if the abuser is not caught and stopped after the first presentation. Such figures indicate that the early diagnosis of child abuse is of great importance [48, 50]. Despite advancements in diagnosing child abuse, mistakes in diagnosis still occur. Because skin lesions are one of the most common presentations of child abuse, the findings of unexplained skin changes are alarming to healthcare workers, and if not correctly identified as cutaneous mimickers of child abuse, a false diagnosis of child abuse may—and do—result [22]. Such misdiagnoses can lead to serious consequences to the child, the family, and the falsely accused [19]. Irrefutable physical findings of sexual abuse occur in less than 10% of all cases [38]. Thus, the medical history, in addition to a thorough medical examination, takes on an importance of enormous proportions in both physical and sexual maltreatment cases [56]. Although skin diseases are the most common mimickers of child abuse, other non-dermatologic conditions (such as osteogenesis imperfecta) may also take on this role. There are many reviews that have tackled the subject of cutaneous manifestation of child abuse, but only few have discussed cutaneous mimickers of child abuse. This review will be limited to the most important cutaneous mimickers of child abuse, which can be classified into

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mimickers of physical abuse and mimickers of sexual abuse (Table 1). We hope that this review will increase the awareness of healthcare workers of different specialties of these presentations and decrease the incidence of the bitter experience of false accusations of child abuse.

Mimickers of physical abuse

Linear eruptions

Because of their linearity, most linear eruptions can raise the suspicion of child abuse as many of them occur particularly in children. Pediatricians should be aware that not all linear skin lesions are externally induced and that genuine skin diseases may present in linear fashion.

Inflammatory linear verrucous epidermal nevus Inflammatory linear verrucous epidermal nevus (ILVEN) is a relatively rare linear psoriasiform papules and plaques with the majority of cases appearing before the age of 5 years (Fig. 1). This condition is more common in females. It most commonly affects the extremities and occasionally the trunk and is usually unilateral. In addition to its linearity, ILVEN is red and itchy. Misdiagnosis of ILVEN as child abuse has been reported before [53].

Allergic contact dermatitis Allergic contact dermatitis (ACD) is a delayed-type hypersensitivity reaction that is elicited when the skin comes in contact with an allergen to which an individual has previously been sensitized. Acute ACD usually presents with a well-demarcated pruritic eczematous eruption with or without blistering. Lesions are typically limited to the site of contact with the allergen. In children, acute ACD to henna tattoos, commonly applied in festivals and parties, can induce an angry looking linear dermatitis (Fig. 2). The medical history and pattern are usually confirmative. There have been a few reports of

Table 1 Classification of cutaneous mimickers of child abuse

Mimickers of physical abuse	Mimickers of sexual abuse
Linear eruptions	Lichen sclerosus et atrophicus
Inflammatory linear verrucous epidermal nevus	Anogenital warts
Allergic contact dermatitis	Perianal streptococcal cellulitis and streptococcal vulvovaginitis
Stretch marks	Genital herpes zoster
Phytophotodermatitis	Vulvitis circumscripta plasmacellularis
Non-linear eruptions	Perianal and vulvar Crohn's disease
Mongolian spots	
Hemangiomas	
Henoch-Schönlein Purpura	
Urticaria pigmentosa	
Dermatitis artefacta	
X-linked icthyosis	
Bullous impetigo	
Congenital blistering diseases	
Acquired blistering diseases	
Neuroblastoma	

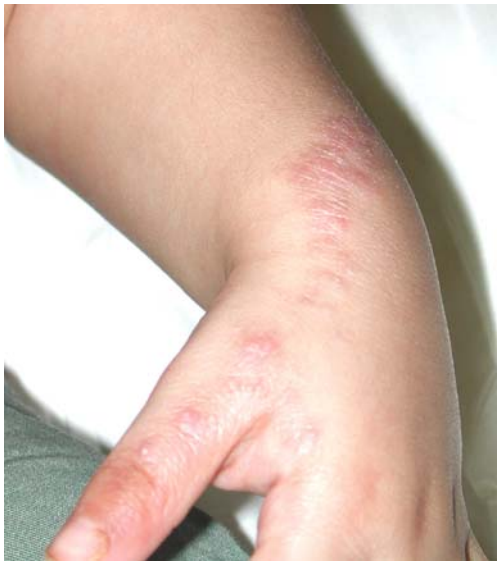

Fig. 1 Inflammatory linear verrucous epidermal nevus. Well-defined linear erythematous scaly papules involving the dorsal aspect of the hand

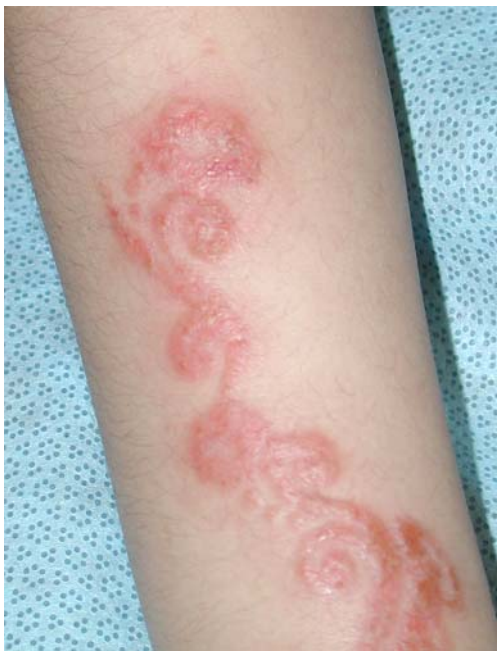

Fig. 2 Allergic contact dermatitis. Well-defined erythematous angry-looking plaques with vesicles due to henna tattoo

ACD misdiagnosed as child abuse [31, 59]. Paraphenylenediamine (PPD) is the culprit allergen, and hair dyes are contraindicated because they contain PPD or cross-reactants.

Stretch marks Stretch marks are commonly seen in adolescents undergoing rapid linear growth and are seen in many physiological states, including normal puberty and pregnancy; however, they are rarely indicative of endocrine abnormalities [32]. Because of their linearity and appearance, they can be mistaken for physical abuse, particularly whipping marks (Fig. 3) [14, 33]. The atrophic appearance, horizontal orientation, and the classic location on the lower back, abdomen, gluteal region, upper thighs, and breasts differentiate them from non-accidental injuries [33].

Phytophotodermatitis Phytophotodermatitis refers to sun-induced inflammation and hyperpigmentation due to psoralens, which is commonly found in many plants, including citrus fruits [26]. It is commonly seen in children squeezing oranges and limes in sunny climates during the holidays, and it presents as linear brown burn-like blistering erythema followed by hyperpigmentation (Fig. 4) [26]. The erythema and vesicles, which are commonly linear, can even occur in the shape of hands and thus might be misdiagnosed as inflected burns or hand slaps [12, 26].

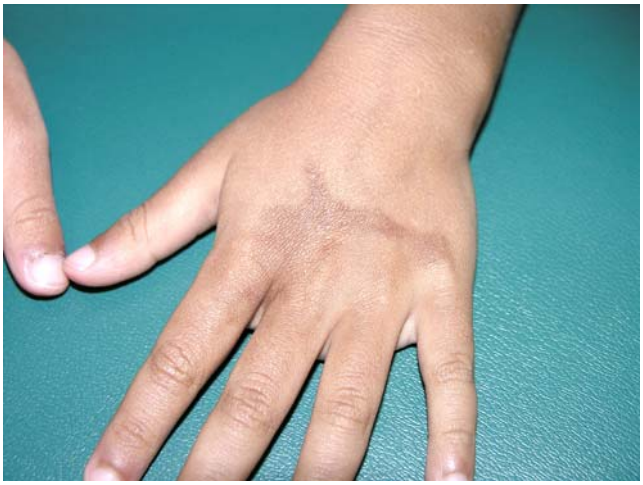

Fig. 4 Phytophotodermatitis. Well-demarcated linear dark-brown hyperpigmentation due to psoralens in citrus fruit

Non-linear eruptions

Mongolian spots Mongolian spots are ill-defined grey to greenish-bluish patches that are usually present at birth or develop within the first few weeks of life. They commonly involve the lumbosacral area or the inner aspect of buttocks. Because of their color, Mongolian spots can be mistaken for bruises, especially when they are located on atypical sites (Figs. 5 and 6) [47]. Unlike bruises, they are not tender and do not evolve over time [42]. They usually fade in early childhood but can persist indefinitely.

Hemangiomas Hemangiomas are the most common tumors in infancy, with the majority of lesions noticed within the first few weeks of life. They are more common in girls and premature infants and may occur on the skin or mucosal surfaces [46]. They can be superficial, deep, or mixed, with the latter being the most common [23]. Superficial hemangiomas are bright red in color with a finely lobulated surface. Deep hemangiomas are warm blue-purple masses with minimal or no overlying skin changes. Because of

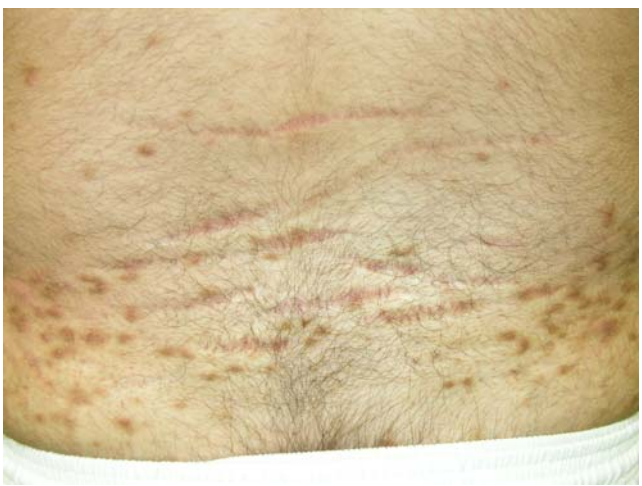

Fig. 3 Stretch marks. Reddish, horizontally oriented, atrophic plaques involving the lower back

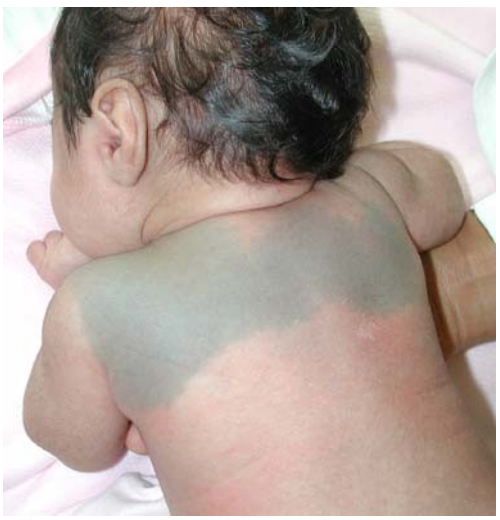

Fig. 5 Mongolian spot. Ill-defined bluish-greenish patch on the upper back

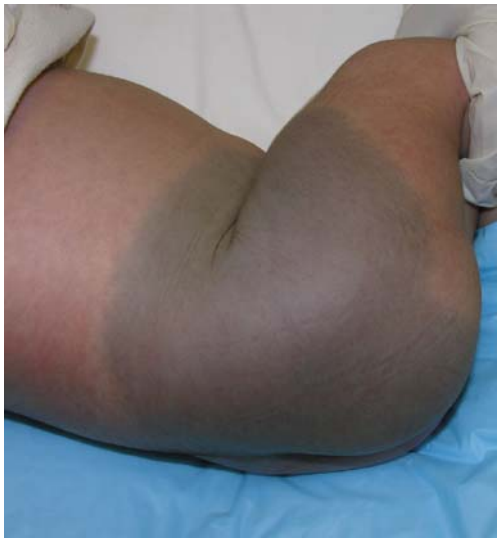

Fig. 6 Mongolian spot. A bluish-greenish patch involving the right thigh

their red color and liability to ulcerate, hemangiomas can be mistaken for physical abuse when located on lips (Fig. 7) and for sexual abuse when located on perianal area (Fig. 8). There have been many reports of such occurrences [8, 43, 62].

Henoch-Schönlein purpura Henoch–Schönlein purpura (HSP), also know as anaphylactoid purpura or allergic vasculitis, is the most common vasculitic disease in children, with an equal prevalence in boys and girls. It presents as erythematous, urticarial papules that rapidly evolve into palpable purpura. The eruption might be preceded by fever or accompanied by headache, myalgias or arthralgias, and abdominal pain. There is usually a typical symmetrical distribution around the buttocks, extensors of extremities, and distal legs, although any area of the body may be involved, including the face (Fig. 9)

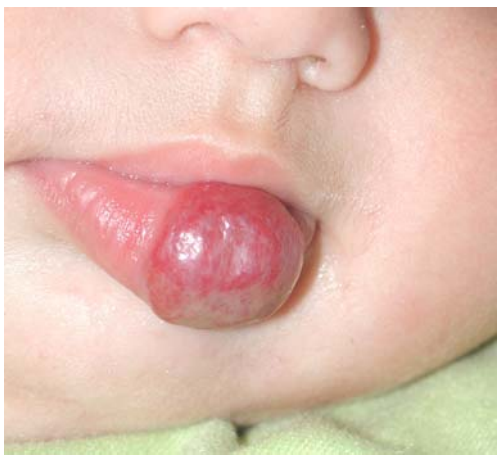

Fig. 7 Hemangioma. A mixed (superficial and deep) hemangioma on the lower lip

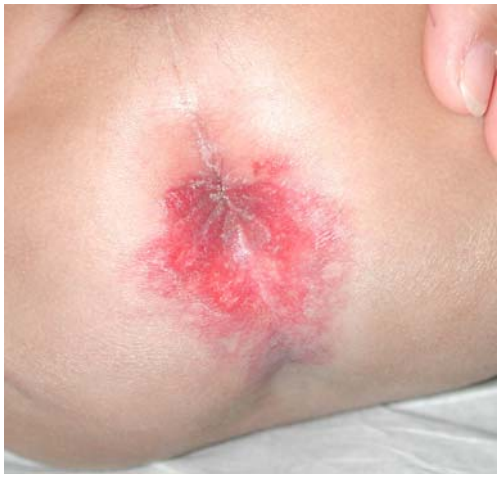

Fig. 8 Hemangioma. Ill-defined erythematous superficial ulcerating hemangioma involving the perianal area

[16]. Because HSP presents with edema and erythema, it can be mistaken for child abuse, especially early in its course [10, 16]. Individual lesions usually fade within 5–7 days, but recurrence is possible.

Urticaria pigmentosa Mastocytosis is a spectrum of diseases with tissue mast cell proliferation. It can present at birth or develop any time thereafter. Urticaria pigmentosa (UP), the most common type seen in children, is usually limited to skin involvement. It is characterized by ill-defined tan-brown papules and plaques that urticate on pressure or friction during handling or bathing the child, which is referred to as Darier's sign (Fig. 10). Lesions may even blister or get bruised and, therefore, can be misdiagnosed as inflected injuries [25, 32]. Urticaria pigmentosa usually resolves or improves spontaneously in late adolescence.

Dermatitis artefacta Dermatitis artefacta (DA) is a factitious disorder characterized by intentional self-induced skin injury that can take various forms and shapes. Patients usually induce lesions to get emotional and psychological support, escape responsibilities, or collect disability insurance. It is most commonly seen in adolescent girls. The bizarre presentation and unconvincing history may lead to erroneous accusation by the patient or the medical team to family members. A thorough history and examination usually leads to the correct diagnosis. Lesions are usually seen on accessible sites, predominantly on the dominant side of the body, although they may occur anywhere (Fig. 11). Lesions usually have geometric patterns or angulated borders surrounded by completely healthy skin. Histopathology might be useful but is not always revealing. Preventing the patient from inducing lesions, by occlusive dressings or casting, usually leads to healing of the lesions, which is a helpful diagnostic tool to confirm the diagnosis.

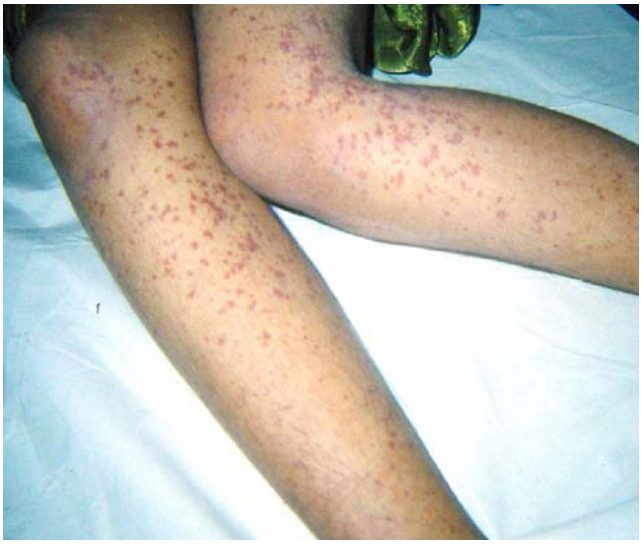

Fig. 9 Henoch–Schönlein purpura. Multiple purpuras symmetrically involving the legs

X-linked ichthyosis This is an X-linked recessive disorder (OMIM 308100) caused by steroid sulfatase (STS) deficiency secondary to mutation in the gene encoding STS located on the distal portion of the short arm of the X chromosome. It affects only boys with females being carriers for the disease. Almost 90% of patients present within the first weeks of life with mild erythroderma and generalized peeling with large, translucent scales. Later during infancy, typical large, polygonal, dirty-looking, dark-brown adherent scales develop. The distribution is symmetrical on extremities, trunk, and neck, with a sparing of the palms, soles, and face except for the preauricular area (Fig. 12). Parents of X-linked ichthyosis (XLI) children frequently face blame for uncleanness and negligence by school officials. We had frequent requests for medical reports from parents of children with XLI to prove that their children had a skin disease that gave them the "dirty" appearance. Topical keratolytics can dramatically improve the appearance, and their use should be encouraged.

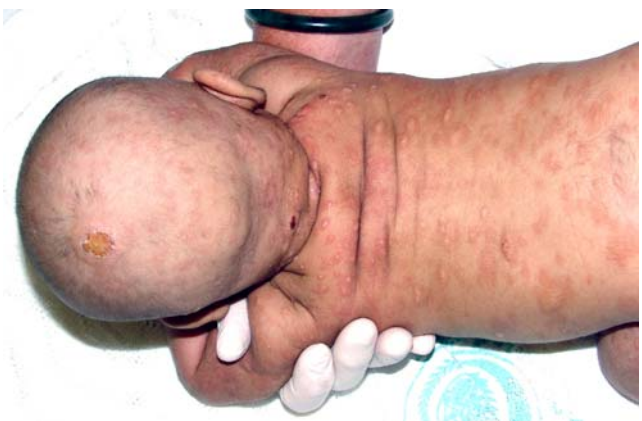

Fig. 10 Urticaria pigmentosa. Multiple ill-defined brown papules and plaques involving the whole back and scalp

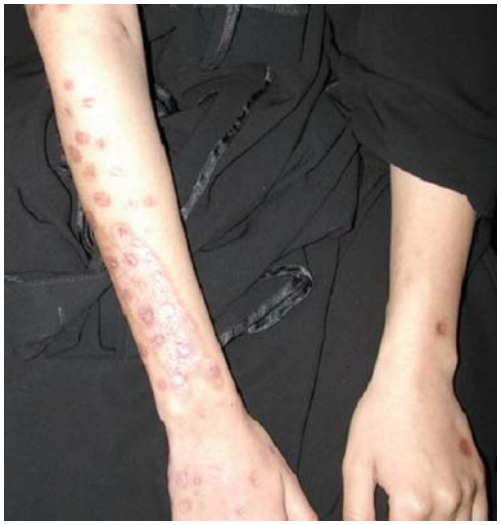

Fig. 11 Dermatitis artefacta. Self-induced multiple well-defined, round-to-oval scars on the forearms in an adolescent girl

Bullous impetigo Bullous impetigo (BI) is a relatively common, highly contagious, superficial skin infection caused by specific strains of *Staphylococcus aureus*. It affects young children, most commonly neonates and infants. It usually starts as small vesicles on the face, trunk, buttocks, perineum, or extremities that rapidly enlarge to flaccid bullae which evolve into erosions and crusts that heal without scarring (Fig. 13) [62]. Because of their appearance, BI can be confused with cigarette burns [47, 62]. The variable sizes, the uniphasic appearance, and the typical sites of involvement rule out the latter possibility.

Congenital blistering diseases Epidermolysis bullosa (EB) is a rare inherited mechanobullous skin disease with a defective loose attachment of the epidermis to the dermis. There are many types and subtypes [63], but all are characterized by easy blistering with minimal friction and trauma [63]. Blisters can be linear and hemorrhagic with a potential for scarring, depending on the type (Fig. 14). Blisters mostly occur on friction-prone areas, mainly on extremities. Because of this appearance, EB can be mistaken for physical abuse [21, 63].

Acquired blistering diseases Chronic bullous disease of childhood (CBDC) is a form of linear IgA bullous dermatosis that occurs in children and remits spontaneously around puberty [15]. It is a rare disease, but still considered the most common acquired autoimmune blistering disease in children [15]. It is characterized by annular erythema and blisters forming "clusters of jewels" on genitalia, the lower abdomen, thighs, and periorally (Fig. 15) [15]. Epidermol-

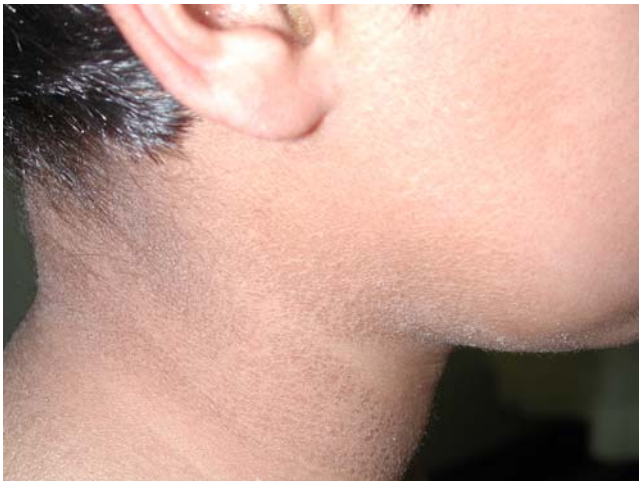

Fig. 12 X-linked icthyosis. Dirty-looking, dark-brown, polygonal scales on the neck

ysis bullosa acquisita (EBA) is a rare, acquired, bullous disease due to autoimmunity to type VII collagen. The disease has been reported mainly in adults but can occur in children. It is characterized by the development of blisters on trauma-prone areas, such as elbows, knees, and dorsa of the hands, which heal with atrophic scarring, milia, and pigmentary changes (Fig. 16). It is usually chronic and refractory to various treatment modalities. Bullous pemphigoid is the most common autoimmune blistering disease in adults, and it may occur rarely in children. The distribution is usually symmetrical and predominates on flexural areas. When any of these diseases occur in children, the blisters can be mistaken for physical and sexual abuse, depending on their location [15]. The latter is more likely when anogenital involvement occurs [44].

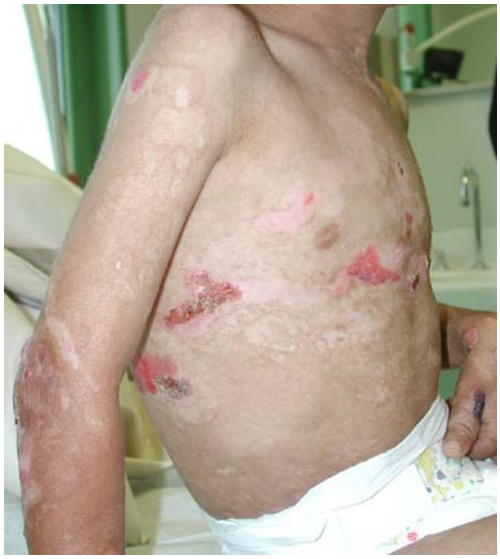

Fig. 14 Epidermolysis bullosa dystrophica. Multiple hemorrhagic bullae and ulcers with hyper- and hypopigmentation

Neuroblastoma Neuroblastoma (NB) is one of the most common solid tumors of early childhood. It arises from precursors of the sympathetic nervous system, most commonly in the adrenal medulla. The tumor metastasizes in about 60% of patients to cortical bone, bone marrow, lymph nodes, and liver [18]. Patients with localized disease are generally asymptomatic, but those with metastasis present with systemic symptoms such as fever and bone pain [61]. Metastasis to periorbital bones results in ecchymotic orbital proptosis known as "raccoon eyes". Because raccoon eyes is a sign that classically occurs with basal skull fractures, when it happens in a patient with NB, it can be falsely suspected as child abuse [9, 28, 34].

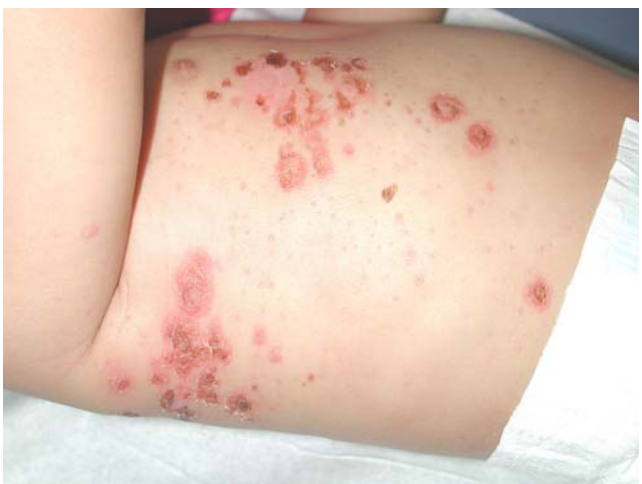

Fig. 13 Bullous impetigo. Crusted erythematous erosions with few flaccid bullae on an erythematous base

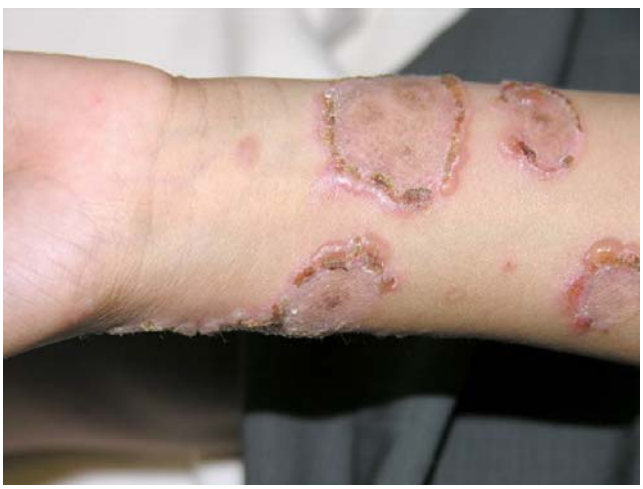

Fig. 15 Chronic bullous disease of childhood. Annular bullae forming "clusters of jewels"

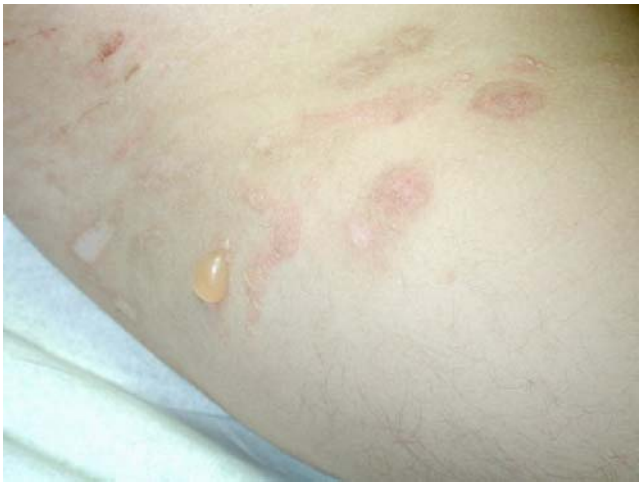

Fig. 16 Epidermolysis bullosa acquisita. Multiple linear erythematous erosions and bullae with hypo- and hyperpigmentation

Mimickers of sexual abuse

Lichen sclerosus et atrophicus Lichen sclerosus et atrophicus (LSA) is an idiopathic, uncommon, inflammatory disease that affects mostly women but is also seen in young girls [37, 64]. In adult females, the peak incidence is in the fifth and sixth decade. The second peak occurs in girls between 8 and 13 years of age. Extragenital LSA presents with white, shiny, slightly elevated papules or plaques that evolve within weeks into scar-like atrophy. Genital involvement may manifest as bruises or blisters that may raise suspicion of sexual abuse (Fig. 17) [29, 37, 64]. Lichen sclerosus et atrophicus is the most common skin condition mistaken for sexual abuse. The question for sexual abuse has been raised in about 77% of cases [56]. Although mostly idiopathic, LSA itself can be precipitated by sexual abuse [60]. The hymen is usually not affected in idiopathic LSA in contrast to sexual-abuse-related-LSA [60].

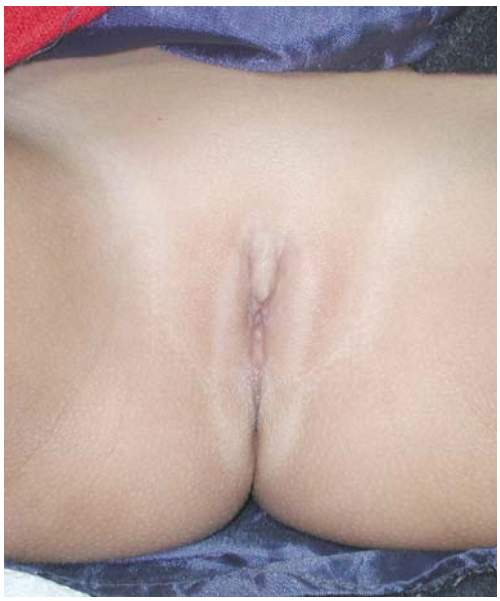

Fig. 17 Lichen sclerosus et atrophicus. Well-defined superficial atrophic hypopigmented plaque involving the labia majora and perineum

Anogenital warts Anogenital warts (AGW) are benign growths caused by more than 25 types of human papilloma virus (HPV), most frequently types 6, 11, 16, and 18, and are one of the most controversial issues in child sexual abuse literature [6, 17, 30, 36, 45, 55]. They are considered to be the commonest sexually transmitted disease in adults [24]. The incidence in children has increased dramatically since 1990 [57]. They usually manifest as skin-colored to whitish discrete, sessile, smooth-surfaced exophytic papillomas between 1 and 3 mm in diameter. Human papilloma virus infections are usually site specific in adults, but less so in children. Antenatal transmission in newborns is well documented [58]. When transmitted vertically, HPV can remain dormant for up to 3 years without causing apparent lesions [13, 30]. Heteroinoculation from the fingers of the caregiver can occur during cleaning the child before toilet training (Fig. 18) [36, 45]. Self-inoculation from the child fingers can occur during self-cleaning in later years [3]. Although sexual abuse as a well-recognized mode of transmission of AGW, the presence of AGW in a child is by no means a certain indicator of sexual abuse, and other benign methods of transmission should always be sought [30, 36, 55]. Polymerase chain reaction studies and serological typing unfortunately have not proven to be useful in proving or disproving sexual abuse [30, 36, 45].

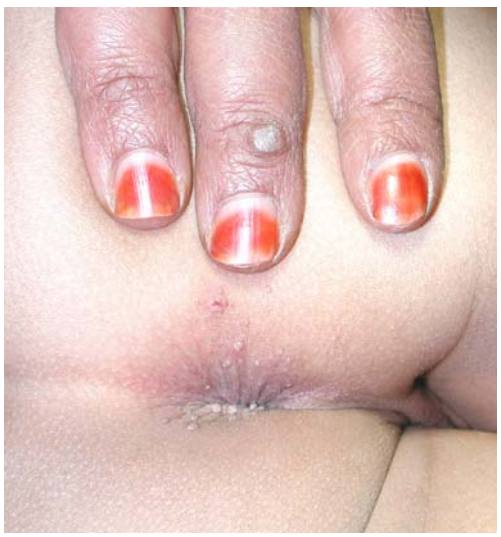

Fig. 18 Perianal warts. Multiple skin-colored warty papules. Note that the mother has a wart on her middle finger

Perianal Streptococcal cellulitis and streptococcal vulvovaginitis Perianal streptococcal cellulitis is caused by *Streptococcus pyogenes* and is characterized by a well-demarcated tender wet perianal erythema (Fig. 19). The child usually presents with painful defecation and constipation [20]. It is more commonly seen in boys, and systemic symptoms are usually absent [20, 65]. In girls, the same organism can cause vulvovaginitis presenting as vaginal discharge, pruritus, erythema, and soreness [23, 35, 41]. Both conditions may be preceded by a pharyngitis and should always be considered in patients with guttate psoriasis as a possible trigger. Due to their appearance, both can be misdiagnosed as child sexual abuse [7, 8, 20, 65].

Genital herpes zoster Herpes zoster (HZ) results from reactivation of latent varicella zoster virus (VZV) from sensory nerve ganglia which can occur at any time after the primary varicella infection [11]. It often begins as a prodrome of severe pain followed by painful eruption of grouped vesicles on an erythematous base within a sensory dermatome. Herpes zoster is reported to involve the sacral nerves in about 4% of children in whom shingles develop [27]. When localized to the groin or genital area (Fig. 20), it may raise suspicion of sexual abuse. This has already been reported [11].

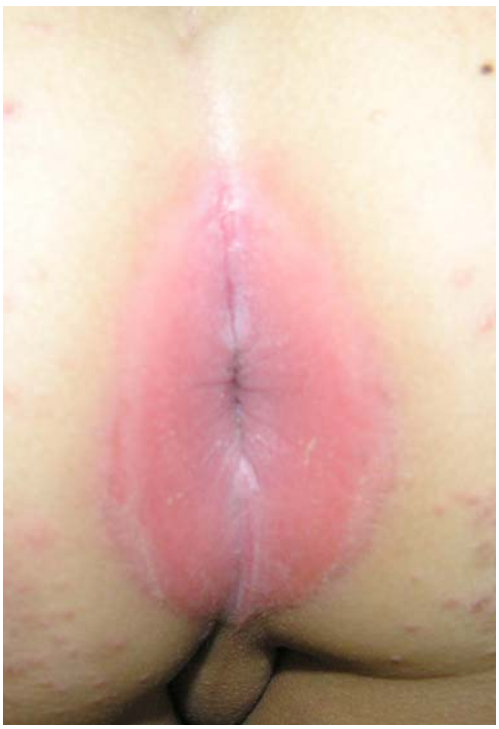

Fig. 19 Perianal streptococcal cellulitis. Well-defined perianal "wet" erythematous plaque

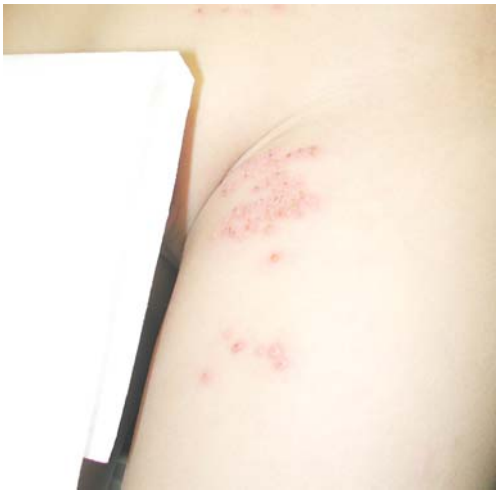

Fig. 20 Genital herpes zoster. Multiple tense umbilical vesicles on erythematous base in the groin

Vulvitis circumscripta plasmacellularis This is a benign condition of the vulva that is most often seen in postmenopausal women [51]. It usually presents with vulvar erythematous patches or plaques [5]. Atrophy, erosions, purpura, and petechiae can be seen [5]. Lesions are often asymptomatic, but patients may complain of pruritus, burning, or pain [5]. The pathogenesis is unknown [5]. Albers et al. reported the occurrence in an 8-year-old girl, which was mistaken for sexual abuse [5].

Perianal and vulvar Crohn disease Crohn disease is a chronic inflammatory bowel disease that may involve any part of the gastrointestinal tract [49]. The perianal region frequently develops fissures, fistulae, and skin tags which, in children, may give rise to suspicion of sexual abuse [40, 49]. Few cases of cutaneous Crohn disease involving genitalia in females younger than 18 years have been reported [52, 54]. Typical genital findings are swelling, fissures, ulcerations, edema, and skin tags [52]. Crohn disease mistaken for child sexual abuse has been reported [49, 54].

Summary

The recognition of child abuse is of great importance, but the avoidance of a false accusation for abuse is even more important. The misdiagnosis of child abuse has serious consequences for the child, the family, and the falsely accused. Therefore, all healthcare providers from different specialties, pediatricians in particular, must be aware of cutaneous child abuse mimickers. Important clues, such as congenital onset and a family history of similar skin diseases, should be carefully searched out. Whenever in

doubt, referral to a dermatologist is recommended to rule out any genuine skin disease. Healthcare workers should be encouraged to report conditions mistaken for child abuse to increase awareness and, hopefully, avoidance.

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