Differential Diagnosis of Diaper Dermatitis

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Bernard Cohen, MD[1]

Abstract

Mild diaper dermatitis often occurs in children before toilet training is complete, particularly from 9 to 12 months of age, and the most common presentation is an irritant contact dermatitis. Diaper dermatitis may account for up to 25% of dermatology visits to health care providers during the first year of life. Fortunately, since the introduction of hypoallergenic, superabsorbent modern disposable diapers, the incidence and severity of irritant and allergic contact dermatitis has decreased dramatically. Diaper dermatitis broadly refers to skin disorders that occur in the diaper area, such as skin eruptions triggered by diapers, rashes exacerbated by the diaper, and other events that occur in the diaper area. A number of skin conditions that can occur anywhere on the skin may present with distinctive findings in the diaper area. The following discussion will review the most common triggers of diaper dermatitis and contact irritant dermatitis, while focusing on the skin conditions that may be associated or overlap clinically with contact dermatitis.

Keywords

dermatitis, diaper dermatitis, diaper rash, erythema, skin disease, contact dermatitis, irritant contact dermatitis, allergic contact dermatitis, seborrheic dermatitis, infected contact dermatitis, bullous dermatoses, diaper candidiasis, newborn skin care, diapers, methylisothiazolinone, pediatrics

Mild diaper dermatitis often occurs in children before toilet training is complete, particularly from 9 to 12 months of age, and the most common presentation is an irritant contact dermatitis.[1-4] Diaper dermatitis may account for up to 25% of dermatology visits to health care providers during the first year of life.[1-4]

Different Types of Diaper Dermatoses

Diaper dermatitis broadly refers to skin disorders that occur in the diaper area. They can include skin eruptions triggered by wearing diapers or incontinence, rashes exacerbated by the diaper and excreta that occur in the diaper area, and primary skin eruptions that have a propensity to develop in the diaper area and intertriginous areas or places in the body where the skin touches or rubs together. The following discussion will review the most common triggers of diaper and contact irritant dermatitis, while focusing on the skin conditions that may be associated or overlap clinically with contact dermatitis.

Irritant Contact Dermatitis

Irritant contact dermatitis is the most common skin eruption seen in the diaper area and is caused by skin rubbing against a wet, soiled diaper or another part of the skin. This process can lead to chafing, or well-defined red scaly patches that appear on the anterior thighs, scrotum, vulvae, suprapubic area, or buttocks with sparing of the skin creases (Figure 1).

Figure 1. Healthy newborn who developed a diaper dermatitis with involvement of the skin prominences and sparing of the skin folds.

[1]Johns Hopkins Children's Center, Baltimore, MD, USA

Table 1. Persistent Diaper Dermatitis May Be Associated With the Following Symptoms.

Symptom	Definition
Erythema	Redness
Erosions	Areas of the skin where a portion of the epidermis is lost
Papules	Bumps up to 1 cm
Plaques	Elevated inflammatory lesions over 1 cm
Granulatomous nodules	Papules and nodules associated with chronic inflammation
Autoeczematous or Id reaction	Spreading of the dermatitis outside of the primary diaper area site
Secondary bacterial or fungal infections	Can include *Staphylococcus, Streptococcus, Candida*

Figure 2. A 4-month-old boy who developed symmetric, discrete papules within a contact irritant dermatitis following a week of diarrhea.

Although ammonia from urine was initially thought to be a primary cause of irritant diaper dermatitis, recent studies have implicated feces as the principle culprit along with contributing factors such as chemical irritants, increased pH, superhydrated skin, and inherited defects in barrier function.[1-4] Courses of oral antibiotics, episodes of viral gastroenteritis, and other conditions associated with increasing stool volume and pH (eg, cystic fibrosis and other disorders associated with malabsorption/malnutrition or hepatitis) may trigger more severe irritant dermatitis (Table 1 and Figure 2).[4]

In order to effectively treat irritant contact diaper dermatitis, it is important to determine the predisposing factors. Management should include the following:

- Check diapers at 2- to 3-hour intervals to minimize exposure to irritants
- Gently cleanse the area with warm water, cotton balls, or baby wipes when the diaper is soiled to remove irritants, avoiding excessive washing and the use of potentially irritating soaps and cleansers
- Use gentle diaper wipes that do not contain alcohol, fragrance, irritants, or sensitizers (only if the skin is intact)
- Apply a thick ointment-based emollient after cleansing following each diaper change to protect the diaper area
- Avoid combination products that couple barrier ointments with antibiotics, antifungal agents, and topical steroids to prevent the risk of adverse events from overuse of topical steroids[5]

Allergic Contact Dermatitis

Although much less common than diaper dermatitis, allergic reactions from fragrances, preservatives, and emulsifiers occur occasionally, known as allergic contact dermatitis.[6] Allergic contact dermatitis usually develops when new products are introduced.[7] It can involve any skin to which the agent is applied, including sites outside the diaper area on the trunk, extremities, and face.[8] There is also often a 1- to 3-week period of sensitization before this type of dermatitis blossoms. Once the trigger is identified, lesions may persist for another 2 to 4 weeks after discontinuation of the culprit. Emollients can help with symptoms; however, a tapering course of topical steroid ointment may be necessary for several weeks, depending on the severity of symptoms (Figure 3).[6]

Figure 3. Acute contact dermatitis was resolved 2 weeks after baby wipes containing methylisothiazolinone were discontinued.

Seborrheic Dermatitis and Psoriasis

Seborrheic dermatitis is a rash characterized by erythema and greasy scales and occurs most commonly on the scalp. It also affects the face, ears, and neck, with the potential to spread into the diaper area.[1,4] Up to 10% of newborns are affected during the first 6 to 9 months of life, with the prevalence dropping quickly after the first birthday.[1,4] Although the cause of the disease is unclear, *Malassezia* species (a common cutaneous yeast) have been implicated, and a number of treatments including ketoconazole and ciclopirax shampoos and creams are directed against these organisms. Other compounds such as zinc pyrithione, selenium sulfide, salicylic acid, and

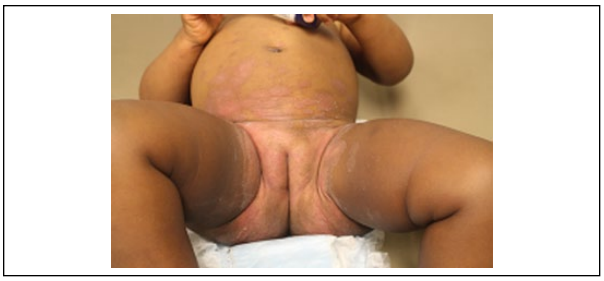

Figure 4. Four-month-old girl with seborrheic dermatitis that spread over the diaper area.

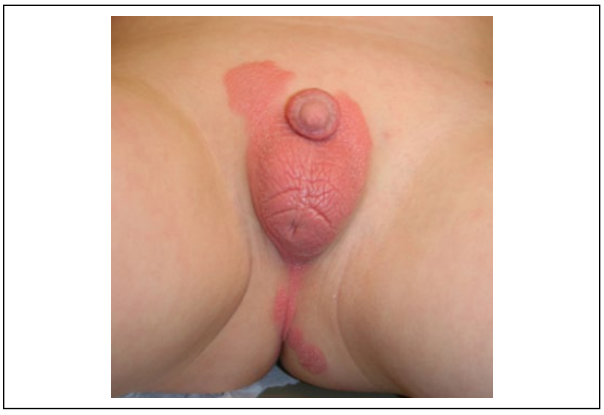

Figure 5. Fourteen-month-old boy with persistent, red scaly plaques involving the genital area, perineum and perianal skin.

coal tar shampoos may also be effective.[1-4] Seborrheic dermatitis may be difficult to distinguish from psoriasis, which presents in a similar distribution with persistent red scaly plaques with well-defined borders. Psoriasis should be considered in infants and children with a recalcitrant eruption that persists beyond the first year of life, particularly when there is a family history of psoriasis (Figures 4 and 5).

Infected Contact Dermatitis

When infections are diagnosed in the diaper area, they most commonly complicate a preexisting contact irritant or allergic dermatitis. The presence of thin-walled pustules (fluid or pus-filled bumps) on a red base may alert a doctor to the possibility of staphylococcal pustulosis, a type of bacterial infection (Figure 6). These lesions often rupture, leaving a red base with surrounding scales and sometimes suggest the presence of bullous impetigo (another bacterial skin infection prominent in newborns).

Bright red patches or plaques with erosions and satellite pustules (red lesions that have a tendency to expand to other areas of the skin) are typical of secondary candidiasis (yeast infection). In addition to treating the primary contact dermatitis, topical or oral antibiotics and/or antifungal agents may be needed to address a secondary infection. Oral antibiotics should be avoided unless absolutely indicated, since they may cause loose stools or diarrhea that may enhance the underlying diaper dermatitis (Figure 7).

Last, Tinea infections are superficial fungal infections caused by 3 genera of fungi collectively known as dermatophytes. These infections are commonly named

Figure 6. Staphylococcal pustulosis in a 3-month-old boy.

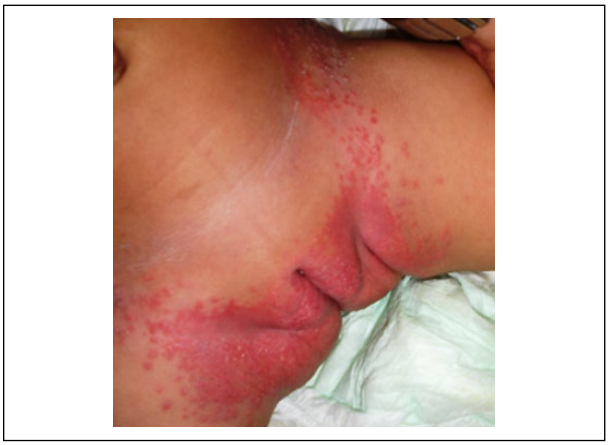

Figure 7. Image of diaper candidiasis.

Figure 8. Image of an itchy, red, scaly annular plaque.

Table 2. Types of Infections and Infestations of the Diaper Area.

Type	Image Description	Definition
Herpes simplex virus (HSV)	Figure 9. A healthy 7-month-old girl with a history of atopic dermatitis under good control developed clusters of uniform 2 to 3 mm vesicles, some with central crusting extending from the right groin to knee. Viral culture grew HSV type 1.	A virus that causes the formation of clusters of uniform, 3 to 4 mm vesicles and pustules, fever, and increased fussiness.[9] HSV involving the diaper area usually follows accidental inoculation from parents, caretakers, siblings, and other close contacts.
Enterovirus	Figure 10. Widespread, symmetric clusters of 2 to 4 mm red papules, many with central purpuric crusts that developed on this afebrile healthy 10-month-old on the arms, legs, diaper area, and around the mouth. Enteroviral polymerase chain reaction from the nasopharynx was positive.	Gastrointestinal viruses that cause symmetric, widespread clusters of red papules often with central crusts around the mouth and diaper area and on the extremities. Children who may have had a history of transient low-grade fever and loose stools, Coxsackie A6 enterovirus infection is epidemic now.[10]
Molluscum	Figure 11. Irritated pearly papules, some with surrounding erythema persisted for months in the diaper area of a 9-month-old boy.	A virus that causes clusters of 2 to 4 mm pearly papules often organized in a linear pattern. Most children will develop an immunologic reaction and resolution of lesions within 2 years.[11]
Warts	Figure 12. Perianal warts developed in a 6-month-old boy at 3 months of age and resolved without treatment a year later. His mother was noted to have flat genital warts at the time of delivery.	HPV virus that may affect any skin and mucous membrane site. Vertical transmission (from mom to baby) is the most common source of infection in the diaper area in healthy newborns and infants, with an incubation period of up to 3 years.[12-14]
Zoster	Figure 13. A 3-year-old boy developed an itchy blistering rash on the right half of the shaft of the penis.	A herpes virus that can result in shingles at any site on the body (clusters of uniform 2 to 4 mm vesicles), including the diaper area. Perinatal chicken pox and chicken pox infection during the first 4 to 5 months of life may increase the risk of zoster during the first 2 years.[15]
Scabies	Figure 14. Inflammatory nodules and burrows are a common finding in newborns and infants with scabies. The child's lesions started on his right flank and disseminated to the trunk and intertriginous areas.	Scabies during the first year of life can present with highly inflammatory nodules in the diaper area, which are burrows that harbor the female mite and tend to be elongated linear and/or "j" shaped 4 to 6 mm edematous red papules.
Streptococcal infection	Figure 15. (a) A 4-year-old boy developed a persistent, well demarcated, itchy, burning, perianal patch. A bacterial culture grouped Group A hemolytic Strep, and he was treated with a 3-week course of oral penicillin with clearing of the rash and symptoms. (b) Similar findings were noted in a 2-year-old girl with a red, weepy vaginitis.	Perianal streptococcal dermatitis is caused by *Streptococcus pyogenes* and leads to persistent localized erythema, itching and burning that may be worse following defecation.[16]

for the body part affected, including tinea corporis (general skin), tinea cruris (groin), and tinea pedis (feet).[4] Tinea corporis can also present with a localized eruption in the diaper area and manifests as a slowly expanding itchy dermatitis annular, or ring-like plaque. Unlike most cases of contact dermatitis, tinea infections usually present with a single or asymmetric eruption (Figure 8).

Overall, the early treatment of contact dermatitis typically reduces the risk of secondary infection, but when infection is suspected, a Gram stain, potassium hydroxide preparation, and appropriate cultures can help confirm the clinical diagnosis. Topical antifungal and/or antibiotic agents may be used for a short period of time; however, when infection is spreading quickly in an otherwise healthy child, oral antibiotics or antifungals can be administered. Signs of cellulitis or deep-seated infection may warrant further evaluation especially in ill-appearing infants.

Infections and Infestations

A variety of infections and infestations can affect the diaper area, which can often mimic diaper rash. These include viruses, bacteria, and fungi and other infectious organisms. Many of these infections involve other areas of the skin; however, they sometimes are inadvertently inoculated to the diaper area, and they present with distinctive clinical findings (Table 2 and Figures 9-15).

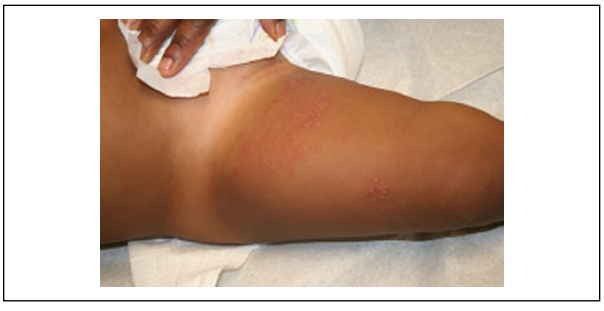

Figure 9.

Other Conditions

Physicians may encounter other skin conditions in the diaper area that do not meet the criteria mentioned above. In these cases, they may want to consider the differential diagnoses explored in this section, such as

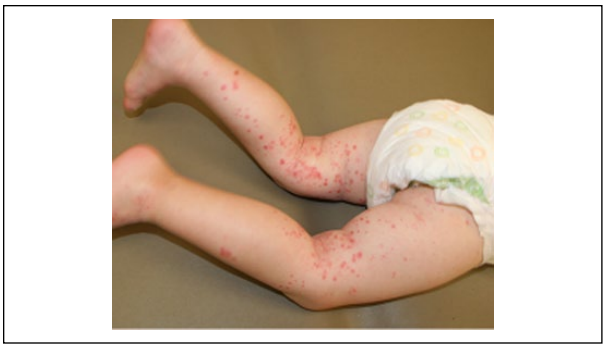

Figure 10.

Figure 11.

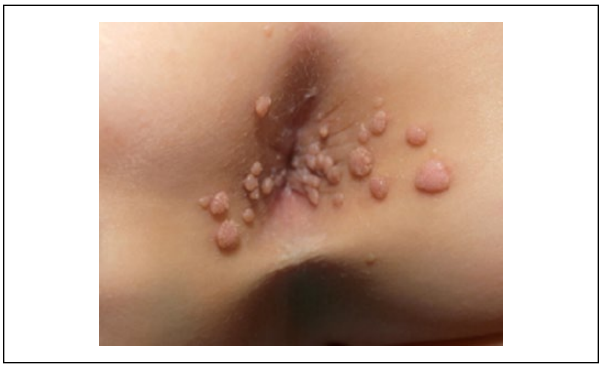

Figure 12.

bullous dermatoses, tumors, and other inflammatory dermatoses.

Primary Bullous Dermatoses

These diseases are characterized by the formation of vesicles and bullae in the skin and mucous membranes.[17,18] Hereditary mechanobullous diseases like epidermolysis bullosa typically present in the newborn or early infancy with blisters and erosions of the skin and mucous membranes in areas prone to trauma (including the hands,

Figure 13.

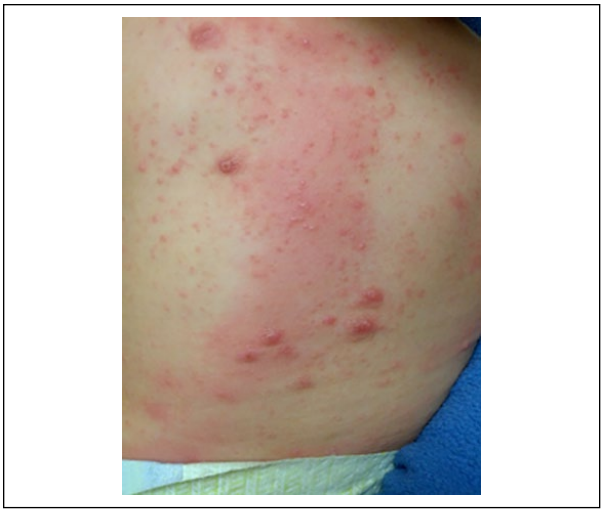

Figure 14.

Figure 15a.

Figure 15b.

feet, elbows, knees, and periorificial skin particularly the diaper area).[18] These disorders are usually categorized based on severity of skin separation, and there is much variability in expression of clinical findings in each group. Family history, demonstration of a Nikolsky sign (a phenomenon where the top layers of the skin slip away from the lower layers when rubbed together), and genetic evaluation can be useful in defining a specific diagnosis.

Although unusual, autoimmune bullous disease may present with disseminated blisters and erosions much like those in epidermolysis bullosa. Blistering in one of the more common variants of epidermolysis bullosa- and linear IgA bullous dermatosis of childhood tend to develop on the lower abdomen and diaper area in young children.[17] Diagnosis can be confirmed by characteristic histologic findings. Lesions in the diaper area may be exacerbated by contact irritant or allergic dermatitis, but can be effectively treated with oral dapsone.[17]

Tumors

Beyond infections, there are a few different types of malformations that can occur in the diaper area. Infantile hemangiomas are the most common vascular tumor of infancy and early childhood, usually appearing during the first 2 to 4 weeks of life. Most infantile hemangiomas present with 1 to 4 cm round to oval papules and nodules, but some may become quite large and/or develop in a segmental pattern that can be associated with genitourinary, gastrointestinal, skeletal, and neurologic abnormalities.[19]

Perianal pyramidal protrusion typically presents on the perineum anterior to the anus as a shark fin–like skin protuberance that may vary in size and configuration.[20] The lesions are usually asymptomatic and occur most commonly in infant girls following an episode of diarrhea or constipation.

Langerhans cell histiocytosis should be considered in infants and children who present with papules, nodules with or without ulceration, as well as vesicles and erosions in the groin and other intertriginous areas.[21]

Additional Types of Inflammatory Dermatoses

Lichen sclerosus is a skin condition that leads to thin, white, and patchy skin of the genital area.[22] In the diaper area, pruritus (itchiness) is the most common complaint, while perianal lesions may cause painful defecation and constipation. Although there may be an increased risk of leukoplakia and squamous cell carcinoma in adults, this is not the case in children.[22]

Symptoms of Crohn's disease, a type of inflammatory bowel disease that is rare among infants, can manifest in the diaper area. Perianal fissuring (painful tear or crack) and ulcerations (open sores of the skin) as well as persistent papules, nodules, plaques, and woody induration (becoming firm or tense) of the vulvar and scrotal skin should trigger an evaluation for Crohn's disease, particularly in the distal colon.[23]

Importance of Differential Diagnosis

Differential diagnoses in the diaper area can range from common conditions, such as irritant contact dermatitis, to more rare disorders, such as Crohn's disease. Since the introduction of hypoallergenic, superabsorbent modern disposable diapers, the incidence and severity of irritant and allergic contact dermatitis has decreased dramatically. Moreover, while some conditions are specific to the diaper area, a number of skin conditions that can occur anywhere on the skin may present with distinctive findings in the diaper area. Thus, given the volume of skin conditions that present in the diaper area, it is important for parents and doctors to understand the underlying causes of contact, allergic, and inflammatory dermatoses to promote overall infant skin health.

Declaration of Conflicting Interests

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