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Diaper Rash in infant

(Literature Review)

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بسم الله الرحمن الرحيم

وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ وَسَتُرَدُّونَ إِلَى عَالِمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنَبِّئُكُمْ بِمَا كُنْتُمْ تَعْمَلُونَ

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Abstract:

Diaper dermatitis is a common cutaneous condition characterized by an acute inflammatory eruption of the skin in the diaper area of an infant. Although this condition is relatively common, it can cause considerable pain and stress for infants and can be troublesome for their caregivers. For an extended period, the disease was thought to be caused by ammonia; however, a number of factors such as friction, wetness, inappropriate skin care, microorganisms, antibiotics, and nutritional defects are important. Diaper dermatitis commonly affects the lower parts of abdomen, thighs, and diaper area. Skin-folding region involvement is typical for the disease. At the early stages of the disease, only dryness is observed. At later stages, erythematous maceration and edema can be seen. Secondary candidal and bacterial infections can complicate the dermatitis. In the differential diagnosis of the disease; allergic contact dermatitis, intertrigo, psoriasis, atopic and seborrheic dermatitis, and the other diseases should be taken into consideration. Etiological causes of the disease should be determined and eliminated primarily. Families have to be informed about the importance of a clean and dry diaper area and the frequency of diaper change. The use of extra-absorbing disposable diapers has decreased the incidence of the disease. In the cleaning of the area, soap and alcohol containing products should be avoided. In some cases corticosteroids and antifungal agents can be administered. If necessary, anti-bacterial agents can also be beneficial.

Objectives

This article discusses common and rare causes of diaper rash, differential diagnosis suggests an approach to the infant or toddler with diaper rash, describes helpful treatments for diaper rash.

Keywords: diaper candidiasis , diaper dermatitis ,diaper rash ,newborn skin care

Introduction

Diaper dermatitis is a term used by clinicians to describe any of the various cutaneous eruptions appearing in the diaper area; however, it is important to determine the exact cause of a rash in this region because it may provide clues to the diagnosis of a more significant systemic disease or local infection. While most rashes in the diaper area are simple cases of irritant contact dermatitis responsive to topical treatments and parental education on proper diapering practices, it is important to recognize that rashes of the diaper area may be the direct result of diaper use, reflect exacerbation of a more diffuse dermatologic condition by the diaper, or be related to a condition that has coincidently manifested in the diaper area but is otherwise unrelated. Pediatricians and parents report diaper dermatitis to be one of the most common skin diseases that affect almost every child at some point during the early months and years of their life [1]

Epidemiology

Diaper dermatitis is probably the most common cutaneous disorder of infancy and early childhood. Because most diaper rash is treated conservatively at home, the exact prevalence is unknown, but in a study conducted in the US among infants has been estimated to be 7% to 35%, with a peak in incidence between ages 9 and 12 months. In Iraq, a high prevalence of diaper rash was reported in regions of low socioeconomic status . One major explanation for the association between income, occupation and child health is that families with a high income are able to purchase disposable diapers and use them exclusively in the diaper care practice. While mothers with low income may afford the single unit pack diapers, they infrequently change the baby leading to prolonged exposure to urine and feces. Mothers with low income have also been seen to use cloth diapers which are not efficient in keeping the baby’s skin dry.

Etiology

It was widely believed that ammonia is the prominent factor for diaper dermatitis. Ammonia occurs by fragmentation of urea in urine with the aid of bacterial enzymes. It was determined that the amount of ammonia in the skin and the morning's first diaper of infants is same for affected and unaffected infants. Erythema can be observed when ammonia is applied only to the damaged skin. All of these show that the main factor of diaper dermatitis is not limited to ammonia. There are many factors on diaper dermatitis etiology other than ammonia. The primary cause of diaper dermatitis is prolonged and increased exposure to wetness against the skin.[2]

Friction

Friction between the skin and clothes is an important trigger cause but not sufficient to be the sole factor.[3] Friction damages epidermal barrier functions and then penetration of irritants become easier. This hypothesis is supported by the predilection of diaper dermatitis in closest contact areas with the diaper such as the convex surfaces of the genitalia, the thighs, the buttocks and the waistline. [4]

Wetness

Increased skin hydration occurs in diaper areas. This hydration makes skin surface more fragile and therefore the risk of friction increases. Protective barrier function is damaged due to friction, making the skin more susceptible to microorganisms.[5]

Urine and feces

ammonia is not the primary cause of diaper dermatitis; however, it has an important role as an aggravating factor for the damaged skin. Other urinary degradation products also may play a role in diaper dermatitis etiology. In one study, a sample of urine placed under 37 degrees for 18 hours was applied to newborn skin, and development of dermatitis free of pH and ammoniac concentration was observed.[6] Epidermal permeability function will be affected by urine more severely than water. It is known that feces have an irritant effect on skin. Bacterial enzymes in feces degrade urea and release ammonia. Increased pH levels on diaper area activate fecal proteases and lipases.[7] These enzymes in the diaper area are most important irritant agents

for skin. Severe erythema and deterioration in the integrity of the skin develops after contact with these enzymes

Inappropriate skin care

The use of liquid soap and talcum powder can cause diaper dermatitis. The other important factor behind diaper dermatitis is infrequent diaper change.[8]

Microorganisms

The role of microorganisms in the pathogenesis of diaper dermatitis has been considered; however, any significant difference between the bacterial growth of babies with or without diaper dermatitis has not been demonstratd. Penetration of bacteria increases when stratum corneum is damaged. The role of Candida infection in the pathogenesis is more prominent than with bacterial infection. Several reports indicate that the presence and level of Candida infection is important for the clinical demonstration of diaper dermatitis.

Antibiotics

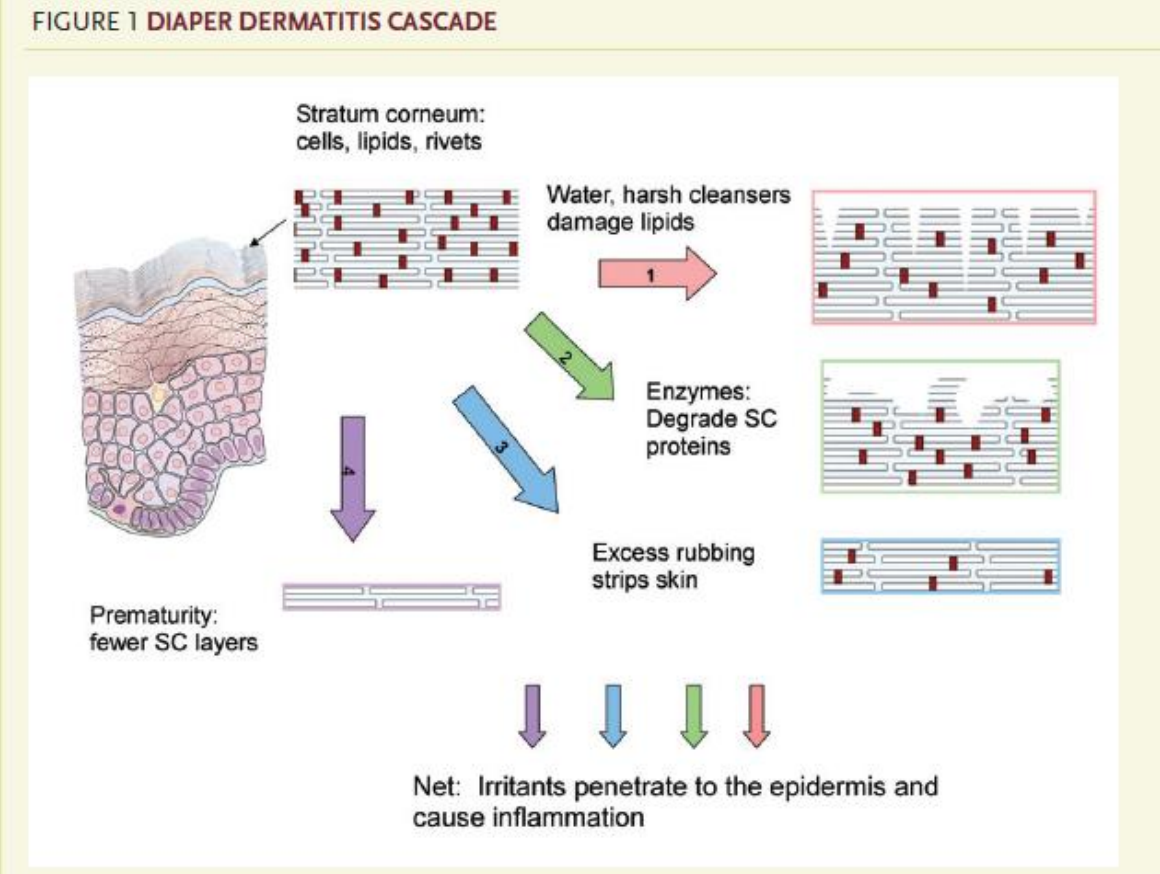
The use of broad-spectrum antibiotics can play a role in the etiology of diaper dermatitis. This condition is related to colonization of Candida infection in the genital area.[9]

Nutritional defects

Zinc and biotin deficiency can lead to diaper dermatitis.

Physiology Of Infant Skin

To understand the development of diaper dermatitis in an infant, it is important to appreciate the differences in skin between adults, full-term infants and premature infants. Human skin consists of three major layers–the stratum corneum, epidermis and dermis. The epidermal barrier is a function of the outermost epidermal layers of the stratum corneum and is in direct contact with the environment. It is the main barrier to water loss and permeation by outside agents. In utero, the maturation of the epidermal barrier of the skin occurs as gestational age increases. [11], The skin of premature infants is less developed than that of full-term infants and lacks the fully functional barrier properties of the stratum corneum. With decreasing gestational ages and a deficiency in the



stratum corneum, premature infants are known to have increased transepidermal water loss (TEWL), which can lead to significant issues such as dehydration,[12] thermal instability and electrolyte imbalances .Because the stratum corneum is thinner and less effective in premature infants than in adults or full-term infants, these infants may have an increased risk of infection and systemic toxicity due topical absorption of substances on the skin. [13]. This

makes premature infants especially sensitive to the development of diaper dermatitis. The presence of a fully functional barrier in the stratum corneum and an acid mantle approaching that of an adult helps protect the skin of the infant from irritants and microbes that can cause diaper dermatitis.[14][15]

Clinical Presentation

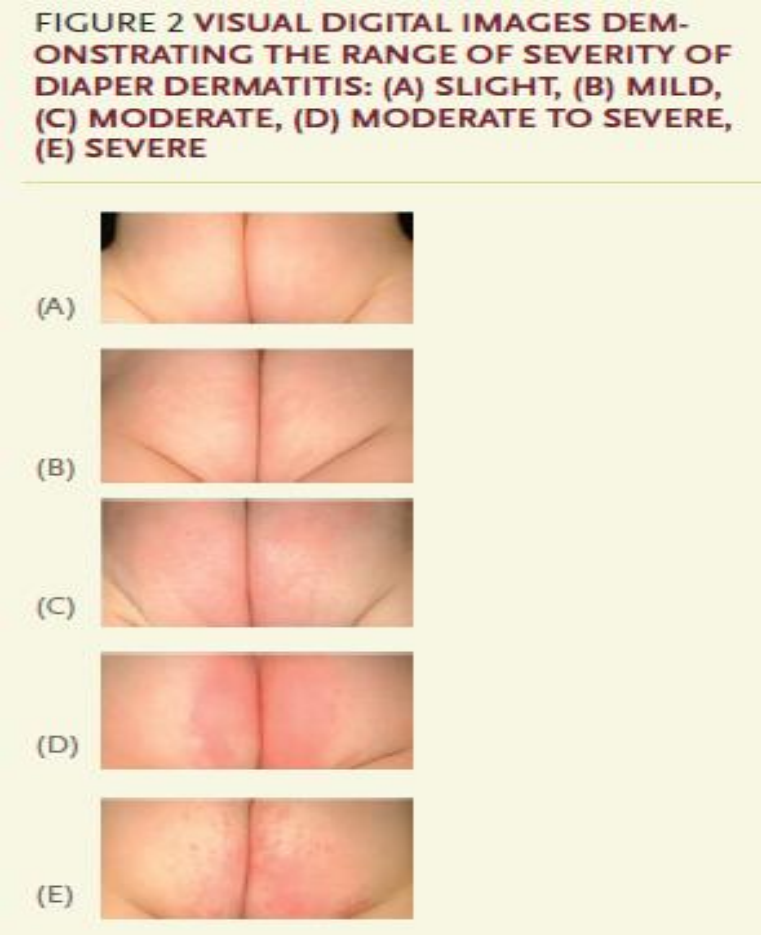
frictional dermatitis : is the most widespread form of mild diaper dermatitis commonly affecting most infants at some point in time. It presents in areas where friction from the diaper is most prevalent, including the inner surface of the thighs, buttocks, abdomen, and the surface of the genital areas [16].

It presents as mild redness in the affected area and resolves fairly quickly on its own with frequent diaper changes and with good diaper hygiene .

Irritant contact diaper dermatitis: the most common cause of diaper dermatitis, is commonly found in the gluteal crease, buttocks, perianal and the pubic areas. *Irritant contact diaper dermatitis can range in severity from*

- mild case, with mild localized erythema and minimal scaling, to a
- moderate case, with increased erythema as well as papules noted to the affected area, and finally to a more
- severe case where the skin in the diaper area is noted to have papules, pustules and skin breakdown with open areas (see Figure 2).

Diaper dermatitis complicated with the presence of *Candida albicans* presents as a beefy, red, raised-edge skin rash with pinpoint satellite lesions, which often extend into the folds of the skin in the diaper area . Whenever diaper dermatitis fails to respond to treatment, candida diaper dermatitis should be considered as an alternate cause of the presenting rash . [17]



Differential Diagnoses

There are a wide variety of conditions that can present as an inflamed area of skin in the diaper area. A wider range of differential diagnoses should be considered when diaper dermatitis fails to respond to basic treatment approaches or when there are additional symptoms that require further investigation.

Allergic Contact Dermatitis

Allergic contact dermatitis was considered uncommon in children under two years old due to their immature immune system. This disease can develop due to some agents applied to the skin, such as paraben, lanolin, or neomycin, and the elastic bands around the edges of cloth diapers. The lesions usually begin with vesicle formation. Later, the vesicles rupture, and eczematous lesions occur. Also, flexural involvement is important for allergic contact dermatitis.[19]

Intertrigo

Intertrigo refers to the well-defined redness of the folds. Heat, humidity and sweat retention are the triggering factors. Secondary candidal infection may cause satellite papules and pustules.[20]

Candidal Diaper Dermatitis

Candidal infection is the most common complication of diaper dermatitis.3 Satellite papules and pustules are accompanied by erythematous and well-defined plaques. Inguinal folds are impaired as opposed to irritant contact dermatitis. A broad-spectrum antibiotic therapy or diarrhea can be found in the medical history. Oral mucosal involvement is also noted in these infants. The diagnosis can be confirmed with smear and culture.

Psoriasis

A rare clinical manifestation of psoriasis is diaper dermatitis. There are erythematous and sharply demarcated plaques in inguinal folds and buttocks. Scaling is not observed on psoriasis plaques due to humidity of diaper area. Along with the difficulty of its diagnosis, observing psoriatic plaque and nail involvement elsewhere may suggest the diagnosis. Clinical response to treatment is slower than with other diseases.[21]

Fig. 3 Well-demarcated bright red erythema in the diaper area due to inverse psoriasis.

Seborrheic dermatitis

Erythematous plaques with fine, greasy scales in the diaper area generally form at the 3rd or 4th weeks of life.19 The lesions, involving the scalp, ears and face, are helpful in making the diagnosis. Generally, these lesions, which are asymptomatic, respond to topical steroids.[22].

Acrodermatitis enteropathica

Acrodermatitis enteropathica is a rare autosomal recessive disease in which intestinal zinc-binding ligands are absent, leading to zinc deficiency. An erythematous plaque mimicking diaper dermatitis may be a clinical manifestation of acrodermatitis enteropathica. Characteristic clinical symptoms of the disease include periorificial and acral dermatitis**,** alopecia, and diarrhea. Response to zinc supplementation is very good.[23]

Primary HSV infection

Diaper dermatitis may be secondarily affected. Primary HSV infection on diaper area can be manifested by red spots or grouped vesicular skin eruptions. The diagnosis is made by doing a Tzanck smear and ordering a viral culture.3,5 Because of the potential seriousness of the infection, HSV infections should always be considered as a differential diagnosis when an infant presents with skin sloughing, vesicles or blisters.

Bullous impetigo

Bullous impetigo most commonly affects neonates. It is characterized by erythematous blister and surrounding redness in the diaper area.

Bacterial infections

can present in a variety of forms, including impetigo and bacterial folliculitis. Streptococcal and staphylococcal infections account for the highest number of bacterial diaper dermatitis isolates . Impetigo, caused by staphylococcus or streptococcus infection, presents as superficial vesicles or flaccid bullae that eventually develop a honey colored crust [24] .Bacterial folliculitis, often caused by staphylococcus aureus, can manifest as reddened and inflamed pustules or papules at the base of the hair follicle . When a bacterial infection is suspected as the cause of diaper dermatitis that does not resolve, a visit to a health care provider is necessary. A sample should be taken for culture and gram stain to identify the bacteria and determine antibiotic sensitivities [24].

Fig. 4 Bright erythema in the perianal region due to beta hemolytic Streptococci that led to a flare of psoriasis in this infant.

Treatment

The most important step in the treatment of diaper dermatitis is to detect and eliminate the etiologic factors that cause the disorder. In this way, both the treatment of the disease and prevention of recurrence can be provided. Families should be informed about cleaning the diaper area, the frequency of diaper change, and using care products applied in these areas. The diet should be

questioned, as they may have a role in the development of diaper dermatitis. The diaper area should be kept clean and dry by avoiding moisture and friction.

Diapers

The frequency and intensity of diaper dermatitis decrease when using super-absorbent disposable diapers[25]. These diapers can absorb water up to 80 times their own weight. In that way, they protect the diaper area from moisture and friction. They also help to provide the normal pH value of diaper area. One other current application is the breathable disposable diaper with micropores. These diapers simply provide selective permeability against water. Preventing the proliferation of candidal infections in diaper area is another important feature. About a 50% reduction in the frequency of diaper dermatitis was observed with the use of these diapers. Disposable diapers containing the zinc oxide petrolatum and stearyl alcohol compounds seem to reduce the frequency of dermatitis. These compounds are released to the skin in a controlled manner with these diapers.[26]

The most important preventing factor for diaper dermatitis is frequent change of the diapers. Prolonged exposure to urine and feces will cause irritation. It is advised that diaper should be changed every hour for newborns and every 3 to 4 hours for older infanys. If possible the child should be left with no diapers for a certain time, in order to keep the area dry.

Cleaning and Care

Cleaning of the diaper area should be implemented correctly. Cleaners containing soap and alcohol are not suggested. To wash it often disturbs the barrier layer of the skin. Cleaning process should be implemented gently without overdoing the lotions and creams including oil in the water. This process should be repeated after each defecation. Barrier creams should be used after cleaning process. These creams prevent penetration of irritants by repairing lipid layer of the skin. For this purpose, preparations such as zinc oxide, dimethicone, lanolin, and petrolatum can be chosen. Also, soap and alcohol containing products should be avoided. Powders can be used for preventing moisture and decreasing friction. For this purpose, corn flour can be used, but talc powder is not suggested.

Medical Treatment

In spite of appropriate care and cleaning, various treatments can be implemented in the case of unresponsive diaper dermatitis. Protective barriers Occlusive agents, such as zinc oxide (Lassar's) paste has its proponents, as does petrolatum agents.

Corticosteroids

Corticosteroids can be utilized in unresponsive cases to other treatments; however, low to midpotency steroids may be used in the diaper area.[27] Long term use of topical steroids is not indicated, just as potent topical steroids should be avoided.

Antifungal agents

Candida albicans plays a crucial role in the etiology of diaper dermatitis. In dermatitis which lasts longer than 3 days and in the presence of clinical signs that are suggestive of candidiosis, antifungal agents should be added to the treatment. Nystatin, miconazole, fluconazole, and clotrimazole are topical agents that can be used. The success rate of topical agents is high, and oral antifungal agents are rarely needed.[28]

Antibacterial agents

In the presence of bacterial superinfection or when yellow crusts are observed in patients with atopic dermatitis, antibacterial therapy should be considered. Besides the antibacterial activity, mupirocin is also effective against Candida spp. In the presence of bullous impetigo ,the use of systemic agents may be required.

Complications Of Untreated Diaper Dermatitis

Complications from diaper dermatitis are rare as the condition is easily treatable with good skin care practices, barrier creams and treatment of underlying infections. In rare instances, or if diaper dermatitis is left untreated, complications including increasing pain, increasing severity of skin breakdown and bacterial and fungal super infections can occur . One example is Jacquet's erosive diaper dermatitis, a severe form of diaper dermatitis that can present with severe ulcerations or erosions with elevated borders if irritant diaper dermatitis is left untreated .[29]

A 12-Month-Old Healthy Girl with a New Oral Ulcer and Chronic Diaper Rash

A 12-month-old healthy girl presented with a chronic diaper rash. Physical examination demonstrated crusting of the scalp, erythematous papules with surrounding petechiae on the lower abdomen, and an intraoral palatal ulcer. Further imaging demonstrated bone involvement. Histopathologic examination of involved skin and the intraoral ulcer demonstrated epithelioid histiocytes with “coffee bean-shaped” nuclei, staining positive for CD1a and langerin by immunohistochemistry, consistent with Langerhans cell histiocytosis (LCH). LCH is a disease entity of unknown etiology characterized by histiocytic proliferation that most commonly presents in young children. The cutaneous findings of LCH include a seborrheic dermatitis-like and/or red-brown papular eruption. Intraoral examination is crucial as oral mucosal and maxillofacial skeletal disease can also be seen in LCH. When a child presents with a recalcitrant seborrheic dermatitis-like eruption or chronic diaper rash, the clinician should be alerted to the possibility of LCH. Timely recognition and diagnosis of LCH is important for oncologic referral, evaluation, and treatment.[30]

Conclusion

Diaper dermatitis comprises various skin disorders that result from the skin's being attacked by physical, chemical, enzymatic, and microbial factors in the diaper environment. Diapering is unquestionably an effective and convenient way of localizing an infant's excreta. Unfortunately, infant skin was not designed to cope over long periods of time with the resulting environment, and it is frequently unable to weather this assault. Although the etiology of diaper dermatitis is complex, it is generally believed to involve prolonged contact between wet diapers and the skin, to excessive hydration of the stratum corneum, reduced barrier function, an interaction between skin and irritants in feces and urine and their degradation products, and the resulting changes in pH.

The introduction of disposable diapers with absorbent gelling material in their core (superabsorbent disposables) has opened a new era and brought a welcome change in dealing with this troublesome issue. They provide a better skin environment in terms of lower skin wetness and pH control, and they reduce the mixing and spreading of urine and feces, all of which have been shown to reduce diaper rash frequency and severity.

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