

Diaper dermatitis in paediatrics and geriatrics

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Introduction

Diapers enable easier hygiene of infants and toddlers as well as of adult bedridden patients where disposable hygienic aids significantly simplify the hospital and home care. Despite the progress in development of new materials for diaper production, the diaper rash stays one of the most frequent skin problems of the infants' and toddlers' age and a very frequent diagnosis in bedridden patients. Another group threatened by the diaper rash are patients suffering from incontinence. All studies carried out so far agree on the fact that from 15 to 30 % of all people over 60 suffer from urinary incontinence. At least 50 % of diapers-wearing infants and toddlers have symptoms of diaper rash at least once in that period, most often between 9th and 12th month. In older diapers using people the most frequent skin complications are diaper dermatitis and intertriginous mycosis.

Most of such cases are light or medium grave "galls" appearing just on a small diaper area which, if receiving an appropriate treatment and taking regime measures, will disappear in a few weeks. In toddlers, the first symptoms of grave, although rare, sometimes even life-threatening dermatoses of toddlers' age might appear in those areas. That is why it is necessary to observe children with non-healing or repeated dermatitis in the diaper area and be attentive to their development also from the paediatrician's point of view.

Etiopathogenesis

The diaper rash is a non-specific and quite wide term, in its most usual and basic form we should talk about irritant contact dermatitis. As early as at the beginning of the 20th century scientists supposed that the main cause of this (then extraordinarily frequent) infant disease was ammonia released from urine. The microorganism splitting urea in the urine – *Bacterium ammoniagenes* – was discovered. It was not until in the 70s of the last century, by means of epicutaneous tests with much higher ammonia concentration than in the diaper area, it was proven that ammonia does not irritate the skin in this way. Numerous studies in the following decade prove that the diaper rash etiology is much more complex and differs from the original assumption. One of the triggering factors is the long-term **wet skin**, caused by urine in semiocclusive conditions of a relatively hermetic diaper that prevents evaporation of the humidity from the skin surface. The diapers cause a temperature increase of the skin covered by them and also vasodilatation, both of which support the inflammation development. The skin humidity increases also when sweating under the diaper. Wet sore skin is more prone to being damaged by **abrasion and rubbing**. Irritation caused by rubbing and abrasion results from a close contact between the diaper and skin or in areas with skin cover by a contact between skin and skin when moving. Also a prolonged contact of the **skin with stools** in case of diarrhoea or when not changing diapers often enough is significant. The enzymes activated in stools are directly responsible for its irritating potential. If stools and urine are present on the skin at the same time, the faecal urease produces ammonia by cleavage urea in the urine, which leads to the pH increase. Like that faecal protease and lipase are activated resulting in damaging the soaked and macerated epidermis. The pathogenetic role of faecal enzymes is documented in studies which prove a lower rate of diaper rash in breastfed children. Stools of breastfed children have lower pH factor and like that also the activity of faecal proteases is lower. Maceration and damage to the skin leads to its easier permeability for aggressive substances which can be found in unsuitable cosmetic creams and cosmetic soaps. Especially soaps containing **sodium laureth sulfate** (syn. natrium lauryl sulfate) have a high irritation potential and should not be used in such patients. All the above mentioned triggering factors enable the growth of some microorganisms. Such a moist microclimate is perfect for reproduction of above all yeast cells and also, though slightly less, cocci.

Clinical picture

The epidermis is, in the affected area, soaked, shiny, lively red, sometimes resembling a burn as for its character (pict. 1). The clinical picture develops in a form of erythematous or erythematousquamous intertrigo in the groin, genitalia, buttocks areas down to thigh flexors and lower part of abdomen. In the next stage of the illness papulopustules and pustules up to 0.5 – 1.5 cm big which immediately erode and multiple painful festering ulcerations appear, occasionally forming scabs on the edges. The patient smells of ammonia. The illness always stays limited to the diaper-covered areas. It appears most often as a consequence of bad hygiene. It can also be caused by some secondary infections and sometimes a change of intestinal flora when taking antibiotics may contribute to it. In geriatrics we most often meet a clinical unit in incontinent patients (pict. 2) that use diapers, also in people with mobility difficulties, very frequently in patients with diabetes, obesity and in immunocompromised people.

Complications

The most common complication of the diaper rash (but it can also appear individually) is a secondary infection by the yeast microorganism *Candida albicans* (syn. *candidiasis*, *moniliasis*), i.e. Candidosis. In such a case first an eruption of papules/pustules appears in the red areas of genitals and buttocks which later erode (pict. 3, 4). On the edge of the pathological area we can see mostly multiple, maculopapular satellite lesions with collar-like peeling (pict. 5). The area of groins can also be affected. The candida infection usually spreads into other intertriginous areas (neck fold, armpit) and we often find candidosis of the oral cavity (soor) or painful reddish chapped mouth corners with whitish coats (anguli infectiosi).

Differential diagnosis

In the diaper area bacterial infections are very frequent; a perianal sharply circumscribed soaked erythema can be found being usually caused by a streptococcal infection, or these can be lesions of small papules /pustules and pimples being caused by gram-negative rods – stool bacteria. In the neonatal and infant ages bullous **impetigo** is much more common in the diaper area (pict. 6). The reason may be the *S. aureus* strains producing epidemic toxins – exfoliatin A or B. On the skin we can find soft blisters or lumps or shallow erosions after removing them, on the edges there are rests of torn blister covers. The impetigo spreads quickly due to the increased temperature below the diapers which enables the bacteria to reproduce quickly, and due to rubbing the diaper against the skin when moving.

In adult patients a mycotic lesion in the form of **Tinea cruris** seu **inguinalis** can appear in the diaper area. The illness is most often caused by dermatophytes *Epidermophyton floccosum* or *Trichophyton rubrum*. It is often an infection transmitted from foot skin and nails supported above all by humidity and poor hygiene, the most common conditions in immobile patients (pict. 7).

Another lesion that can appear in the diaper area is **Erythrasma**. It is an illness caused by the gram-positive rod *Corynebacterium minutissimum*. In the clinical picture we can see sharply circumscribed maculas of brownish red colour merging into lesions or areas with satellite maculas on the border, sometimes light scaling, affecting intertriginous areas, especially groins (pict.8).

Intertrigo (dermatitis intertriginosa, diaper rash) also quite often appears especially in obese people. That is caused by mechanical rubbing of skin against skin or diapers, combined with external influences (perspiration, urine, stool) in skin folds, mostly in groins. Clinically, these are sharply circumscribed red, often suppurating areas that burn and hurt. There is often a secondary infection and yeast infection (pict.9).

In places suffering from a long-term contact of the skin with the bed, which is often the sacral region and diaper area, **Decubitus (pressure sore)** appears. It is a conditioned ischemic necrosis in immobile people, confined to bed. First suppurating erythema appears and then dry necrosis lesions and ulcers develop which merge into the adipose tissue or muscle (pict.10).

Another characteristic clinical unit is **Dermatitis seborrhoica** which first affects the fold areas in groins or “infant skin folds” under diapers (intertriginous form of seborrheic dermatitis) spreading to the genital and hypogastric regions. Seborrheic symptoms in the hair, neck fold, retroauricular, in umbilicus and axillary regions are typical, which assures us of the correct diagnosis.

If sharply circumscribed large persistent merging erythematous lesions with yellowish white scaling deposits appear in the wide diaper region, resistant to common treatment, we speak of the so-called **Diaper Psoriasis**. This usually appears between the 8th month and 3rd year of a child’s age, it spreads gradually via smaller nummular lesions to the chest around the diaper and as a rule doesn’t go away until the child stops using diapers. It is probable that the diaper psoriasis is either a marker of an increased predisposition to the classical psoriasis or directly its first symptom, its localization being given by a permanent traumatization of the epidermal-dermal system by diapers (Koebner phenomenon).

Perianal and perigenital virus infections in infants and toddlers originating usually from repeated swimming pool visits are more and more common. These are above all **Mollusca contagiosa** and **Condylomata accuminata**. The problem here is not establishing the diagnosis; it is rather the length and the low success rate of the treatment.

It is necessary to mention, as for the present epidemiological situation, the increasing number of newborns with early **Syphilis congenita** caused by spirocheta *Treponema pallidum*. Although it is a multiple organ impairment, condylomata lata – highly infectious symptoms similar to warts – are mostly found in perigenital and perianal areas and are a characteristic symptom of this disease of newborns.

Also serious, sometimes life-threatening dermatoses, skin symptoms of which can appear in the diaper region, must be mentioned. **Acrodermatitis enteropathica** is an autosomally recessive hereditary disease conditioned by zinc resorption disorder. The first symptoms are usually eruption of vesicles and pustules on an inflammatory background, located around body orifices in the anogenital area and on the face as well. At the same time the infant suffers from diarrhoea and does not put on weight. The laboratory report states a lowered zinc level (pict. 11).

Therapy

The first step in the treatment is the correct diagnosis. Regarding the number of different “rashes” in the diaper area it is not easy. The base of the treatment in case of a classical diaper rash is **regimen** and **hygienic** measures.

It is needed to reduce the humidity of the skin and prevent rubbing in the affected area by using the correct type of diaper and by changing diapers on a regular basis. The frequency of diaper changing depends on patients’ age. A newborn urinates more than 20 times in 24 hours. At this age diapers are recommended to be changed each time before and after breast-feeding, that is at least 12 times a day in the first weeks. This frequency lowers with age and gradually diapers can be changed only after feeding. A one-year-old infant urinates on average only 7 times a day, but the portion of urine is much bigger. The number of diaper changes should not drop below 6 – 7 times in 24 hours. In gerontology incontinent products (pads, diapers, pants) are used more and more for their good absorption effects, but on the other hand they also retain humidity and prevent the skin from airing and perspiration evaporation causing the skin temperature increase and as a result softening of the upper skin layers (maceration). The skin is cracked and bruised, which increases the skin sensitivity to irritation and together with damaging the acidic skin surface ideal conditions for bacteria and moulds are created. The biggest problems are in the anal and genital areas. The products’ producers recommend changing the diapers not later than after 6 – 8 hours, regardless the state of fouling that is 3-4 times in 24 hours.

The main task of the parents and carers, however, is to prevent a longer contact with stools, which is the biggest irritant for the skin. The rhythm of stools must be observed and the diaper changed immediately. Expert authorities have been arguing for twenty years whether it is better for a child’s skin to use disposable diapers or traditional cotton nappies. Regarding the fact that the disposable diapers production technology has improved, they are being preferred at present.

These highly absorbing diapers contain absorbing multilayer acrylate gel material inside that binds fluid, changes it into gel and prevents the contact of urine and skin. The inner side of the diaper is always dry. In the time of acute diaper rash symptoms it is recommended to use diapers one size bigger; first to avoid rubbing of the genital and buttocks convexity against the diaper and also because a bigger-size diaper has got a bigger absorbent core. The traditional cotton nappies are less absorbent and another problem is the necessity of using waterproof pants over the nappies to avoid leakage, which leads to diaper rash. Parents who keep using cotton nappies, either for economic or ecological reasons, have to make sure these are well rinsed of rests of detergents, it is recommended to use just detergents for sensitive toddlers' skin. The nappy softness can be increased by using dryers or ironing the central part of diapers after being folded and piled. Experts do not recommend conditioners when curing inflammations. In a warm environment a child can be let naked as much as possible to air the affected skin and to avoid more wetness and dampness of the affected region.

Special washing detergents are used to wash off rests of urine and stools from the affected skin. The most commonly used soaps contain sodium laureth sulfate which unnecessarily irritates and dries the skin. We prefer then non-irritating medicinal washing gels that do not contain sodium laureth sulfate but ideally contain an antiseptic ingredient (i.g. **Cutosan**). After washing we dry the area gently tapping it with a towel or nappy, not rubbing. It is also possible to dry the lesion with a stream of warm air – by means of a hairdryer. After drying the lesion it is necessary - whenever changing the diaper - to apply a **protective barrier cream**. Many evidence based studies have confirmed that the most efficient skin protection substance is **zinc oxide** in a concentration from 4 to 10 %. The barrier cream containing the zinc oxide has to be applied just in an ultrathin layer. Sometimes it happens that mothers or nurses apply the protective cream incorrectly in a thick layer believing that they will help the patient "more". However, the opposite is true, because like that an occlusive effect is reached and the patient's condition may worsen. Below the thick airtight layer pathogens can reproduce. An ideal "ultrathin" layer may be applied using the modern **protective zinc spray preparations** (e.g. **Cutozinc 4% Spray, Cutozinc 10% Spray**). The galenic form of the spray enables applying a thin layer of the protective cream without having to touch the irritated or often painful skin.

Every diaper rash has to be treated in its early stage. When complications arise, most often candida superinfections, it is necessary to add preparation containing antimycotics. As a galenic form cream-paste is elected, which - due to its galenic character - can dry the lesion even more (e.g. Imazol cream-paste). Again the preparation should be applied only in a thin layer. In such cases the spray protective zinc cream is used whenever changing the nappy during the day and the antimycotic cream-paste in the night. A serious inflammation sometimes has to be relieved even by using a weak corticoid preparation which is applied no more than 2 times a day in 7 days and is always prescribed together with an anti-yeast preparation or topical antibiotics (e.g. Imacort, Fucidin H), together with them we also use zinc barrier sprays. A long-term and frequent use of gentian violet over larger areas is not recommendable regarding the risk of possible absorption through the thin and damaged skin and also because large necrosis (pict. 12) may appear in the treated area. Parents or nurses are always informed that they won't see the first signs of the diaper rash improvement (despite a thorough application of all curing and regime measures) earlier than in a week and the complete healing will take several weeks.

Summary

In the past several years the possibilities of prevention and therapy of diaper dermatitis have improved significantly. There has been a development of the most modern hygienic tools, also new preparations have been launched fulfilling the current requirements for the therapy. Patients' parents and nurses just have to be instructed about applying the adequate preparations, such as non-irritating washing gels and modern forms of zinc barrier preparations. When following the correct procedure of treating the diaper area, it is possible to prevent the diaper dermatitis, or if need be cure it successfully.

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