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Suspected Id Reaction Versus Viral Exanthem in an Infant With Contact Dermatitis and Bacterial Abscess: A Case Report

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Abstract

Diaper dermatitis is a common dermatologic pathology in infants and children. Skin breakdown from constant irritation and inflammation can predispose children to further skin disease by allowing pathogens to bypass the skin barrier. Id reactions (autoeczematization) are secondary skin hypersensitivity eruptions on the body, remote from a primary site of infection or inflammation. This case presents a 10-month-old girl who developed multiple concurrent dermatologic processes over a one-month period. Her cutaneous findings included persistent candidal diaper dermatitis, a left gluteal abscess, scaly plaques on the chest and abdomen, and a vesiculopapular eruption involving the face, hands, and feet, including the palms and soles. An additional finding of SARS-CoV-2 on admission raises the question of whether the cause of the vesiculopapular rash is a viral exanthem or an id reaction.

Categories: Pediatrics, Allergy/Immunology, Dermatology
Keywords: autoeczematization, bacterial abscess, diaper dermatitis, id reaction, palms and soles rash, pediatric dermatoses, vesiculopapular rash, viral exanthem

Introduction

Diaper dermatitis is the most common dermatologic condition in infants, with ages peaking between nine and 12 months [1]. It is an inflammatory skin eruption within the diaper area. Two common types of diaper dermatitis include candidal diaper dermatitis and irritant contact dermatitis. Friction and prolonged exposure to urine and feces in the perineal region are the classical scenario for diaper dermatitis. Additionally, inflammation and constant irritation can lead to a breakdown of the skin barrier and increase susceptibility to pathogens such as *Candida albicans* (*C. albicans*) and *Staphylococcus aureus* (*S. aureus*)[2]. Candidal diaper dermatitis has been shown in the past to trigger secondary skin hypersensitivity eruptions at a distant site known as an id reaction [3].

Id reactions, otherwise known as autoeczematization, are secondary inflammatory eruptions on the body, remote from a primary site of infection or inflammation. They regularly present as a vesiculopapular rash, usually on the legs, feet, arms, or trunk [3]. The pathophysiology is presumed to stem from a T-cell-mediated hypersensitivity response [3]. The reaction is triggered when primary damage or infection exposes normally hidden keratinocyte antigens and prompts release of pro-inflammatory cytokines (such as TNF-α and IFN-γ) by T-cells. Id reactions can present days to weeks after the onset of a primary stimulus. Superficial fungal infections are the most common primary triggers for id reactions, but bacterial, viral, and parasitic infections have been reported in the past [4].

Similar to id reactions, viral exanthems are dermatological eruptions secondary to an immune response from a primary trigger. The underlying triggers in viral exanthems are viral agents such as measles, rubella, and SARS-CoV-2 [4, 5]. COVID-19 viral exanthems can resemble id reactions in their presentation and distribution. They are oftentimes associated with fever, but fever does not reliably differentiate the cause, and positive SARS-CoV-2 findings do not establish a definitive cause for dermatological eruptions [5].

This case presents a 10-month-old girl who developed multiple concurrent dermatologic processes over a one-month period. Her cutaneous findings included persistent candidal diaper dermatitis, a left gluteal abscess, scaly plaques on the chest and abdomen, and a vesiculopapular eruption involving the face, hands, and feet, including the palms and soles. An additional finding of SARS-CoV-2 on admission raises the question of whether the cause of the vesiculopapular rash is a viral exanthem or an id reaction.

Case Presentation

A 10-month-old female patient was brought to the pediatric emergency department by her parents for evaluation of a swollen left buttock and diffuse rash. Parents noted that the left buttock had been swollen for two weeks. The mother had initially noticed an erythematous lesion on the patient's left buttock. The area size of the lesion was noted to be stagnant since its eruption, but the swelling had increased. The parents did

not note any punctum or drainage. The patient was also noticed to be febrile and irritable with poor sleep and appetite.

Approximately one month prior to presentation, the patient developed a diaper rash while traveling in Morocco. She was evaluated by a pediatrician and treated for candidal diaper dermatitis with topical nystatin and an analgesic without significant improvement. On presentation in the emergency department, her diaper rash was still prominent and erythematous. The day prior to presentation, the parents discovered a new diffuse skin rash on the patient involving the torso, face, and extremities with involvement of the palms and soles.

The eruptions were pruritic but did not appear to significantly bother the patient. There were no similar symptoms among family members or friends with whom the patient had been in close contact. There was no reported conjunctival injection, cough, oral mucosal findings, rhinorrhea, or nasal congestion.

On presentation, the patient was febrile at 38°C but was otherwise well-appearing, well-hydrated, and in no acute distress. Integumentary examination demonstrated a fluctuant, erythematous, warm, and mildly tender mass over the lateral left buttock (Figure *1*). As shown in Figures *2*-*3*, a diffuse, blanching, papulovesicular eruption was present on the face, chest, and extremities with palm and sole involvement. Well-demarcated scaly plaques were also noted on the abdomen and chest (Figure *4*); the parents attributed these findings to adhesive tape that was placed prior to her visit. The diaper area demonstrated erythematous dermatitis with skinfold involvement (Figure *5*). Neurologic, HEENT, cardiopulmonary, abdominal, and lymphatic examinations were unremarkable.

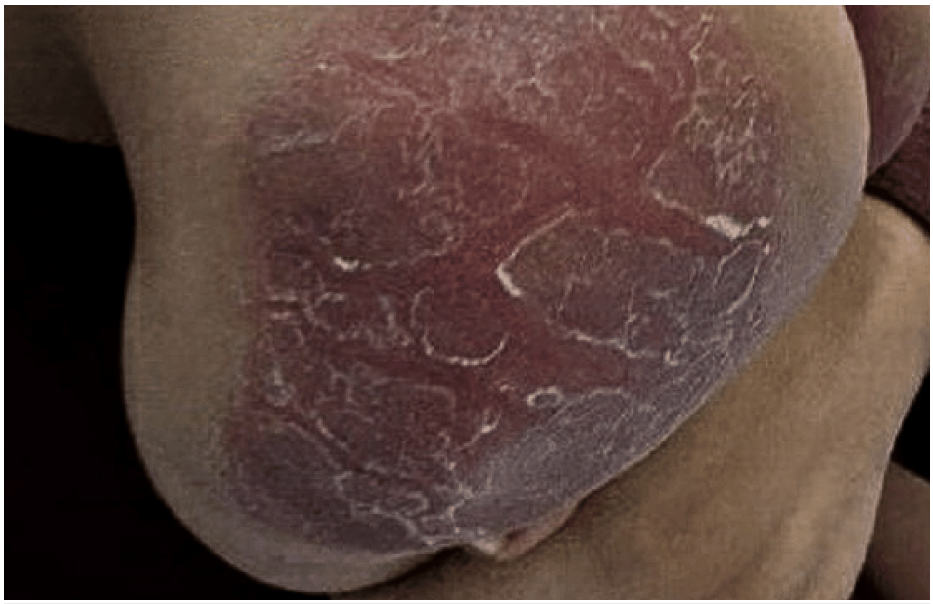


FIGURE 1: Erythematous, scaly, and edematous left gluteal lesion



FIGURE 2: Papulovesicular lesions on soles of feet

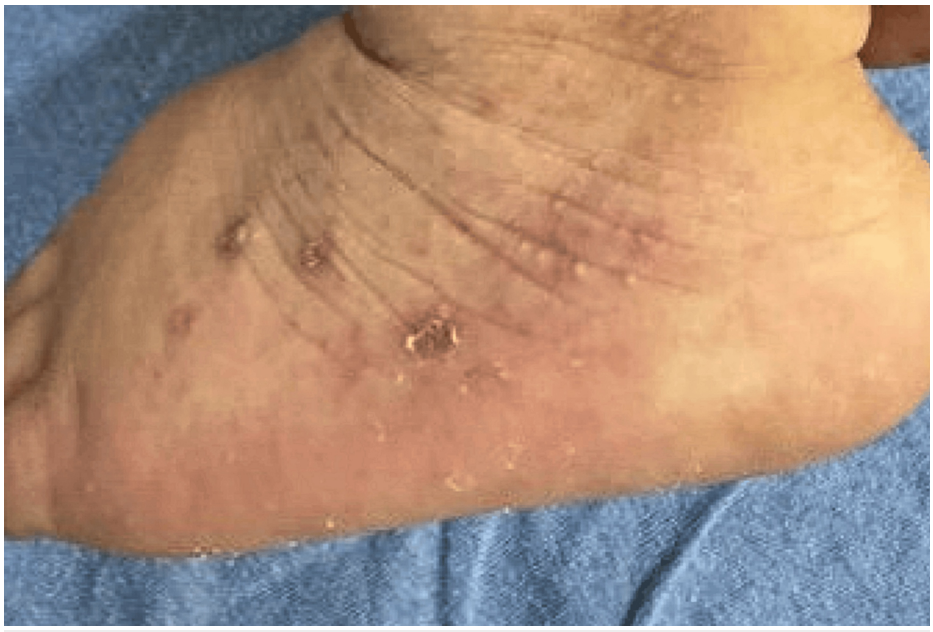


FIGURE 3: Papulovesicular lesions on dorsum of left foot



FIGURE 4: Well-demarcated scaly plaque on abdomen with papulovesicular clusters on chest



FIGURE 5: Erythematous and macerated lesion in the perineal region with skin fold involvement

Laboratory evaluation included a complete blood count (CBC), comprehensive metabolic panel (CMP), and respiratory pathogen polymerase chain reaction (PCR) testing. The CBC demonstrated leukocytosis (white blood cell count of 16.5 × 10^3/μL), a hemoglobin level of 11.1 g/dL, microcytosis (mean corpuscular volume of 74.1 fL), and thrombocytosis (platelet count of 522 × 10^3/μL). The CMP was notable for a mildly decreased bicarbonate concentration of 20 mmol/L, with no elevation in hepatic transaminases. The erythrocyte sedimentation rate was elevated at 22 mm/hr, and the C-reactive protein level was mildly elevated at 5.5 mg/L. Respiratory pathogen PCR testing was positive for SARS-CoV-2 and negative for adenovirus, *Bordetella* species, *Chlamydophila pneumoniae*, human metapneumovirus, influenza A and B, *Mycoplasma pneumoniae*, parainfluenza viruses, respiratory syncytial virus, and rhinovirus/enterovirus. Vaccinations are up to date for her age.

Ultrasound findings showed a large 8.9 cm fluid collection in the left gluteal region (Figure *6*). The lesion was determined to be an abscess and underwent incision and drainage under ketamine sedation. The cavity was drained, copiously irrigated, and packed with gauze. Wound cultures subsequently demonstrated numerous *S. aureus* colonies. Blood cultures were negative. The patient was started on intravenous cefazolin for coverage of methicillin-sensitive *S. aureus* (MSSA) and group A *Streptococcus*.



FIGURE 6: Ultrasound of left buttock with large fluid collection

Per dermatology consultation, the patient was determined to have multiple concurrent dermatologic processes. The well-demarcated abdominal and chest plaques corresponded to areas of prior electrocardiographic lead and adhesive placement and were favored to represent irritant contact dermatitis. The papulovesicular eruption involving the face, torso, and extremities, with palm and sole involvement, was reasoned to be either from a viral exanthem given the positive SARS-CoV-2 test, or an id reaction (autoeczematization). The diaper eruption was consistent with candidal diaper dermatitis and was improving with topical nystatin. Overall management included topical hydrocortisone 2.5% ointment and emollients for the contact dermatitis and papulovesicular eruptions, continued nystatin and barrier care for the diaper dermatitis, and IV cefazolin bridged to oral cephalexin for the left gluteal bacterial abscess. The patient tolerated and did well with treatment. All dermatologic processes improved during the stay, and the patient was discharged after four days to follow up with dermatology outpatient.

Discussion

This case showcases a diagnostically complex, multifocal dermatological presentation. It also highlights the challenge of distinguishing an id reaction (autoeczematization) from a viral exanthem when both conditions are possible. Over the course of one month, a 10-month-old infant developed persistent candidal diaper dermatitis, a bacterial abscess on the left buttock, irritant contact dermatitis on the chest and abdomen, and an acral vesiculopapular eruption, all in the setting of a SARS-CoV-2 infection. The constellation of varying dermatoses seen in this child raises two main questions: (1) whether cutaneous barrier breakdown from CDD predisposed the patient to a secondary bacterial infection and (2) whether the remote vesiculopapular rash presented as an id reaction to the primary dermatological infection or if it was a viral exanthem of the concurrent SARS-CoV-2 infection.

Diaper dermatitis is the most common skin inflammatory eruption within the diaper area of infants between one and 15 months of age, occurring in about 36 to 75% of infants [6, 7]. Due to its immaturity, infant skin has an increased susceptibility to skin barrier disruption, such as friction from diapers. The diaper-covered skin is subject to excessive humidity, warmth, constant contact with feces and urine, and an altered alkaline pH environment, which increases the activity offecal lipases and proteases, all contributing to the perfect conditions for skin maceration and inflammation [6]. The harsh environment disrupts the structural integrity of the lipid bilayer and stratum corneum of the epidermis, allowing for pathogens to colonize, namely *C. albicans* and *S. aureus*. *C. albicans* is an opportunistic pathogenic yeast that is commonly found in the gut microbiome but also on the skin, particularly near the genitalia [6]. When the environment is favorable, it will colonize the compromised skin, including the inguinal folds, causing a complication of diaper dermatitis. Since the patient was experiencing candidal diaper dermatitis that persisted for over one month despite nystatin use, the continuous skin irritation would prove to be an ideal environment for the second most common pathogen to complicate diaper dermatitis, *S. aureus*, to colonize the nearby skin.

S. aureus has become a predominant organism in the formation of folliculitis, furuncles, and abscesses. As seen in this patient, wound culture of the left buttock abscess showed numerous colonies of *S. aureus*. Against this background of chronic CDD, the abscess was likely a secondary complication of the compromised skin barrier. The proposed mechanism in this case, chronic candidal diaper dermatitis leading to further skin barrier disruption, allowing a secondary *S. aureus* invasion of the surrounding tissue, is

clinically well-supported and biologically plausible [8].

Establishing this localized chain of infection provides a rationale for immune sensitization in the setting of preexisting dermatoses. Understanding this sequence is important in addressing the second key question: whether the acral vesiculopapular eruption represented an id reaction or a COVID-19-associated exanthem.

Id reactions, also known as autoeczematization, are disseminated eczematous reactions that take place days to weeks after a primary stimulus produces antigens against which the body forms an immune response. Id reactions most commonly occur due to superficial fungal infections, but bacterial, viral, and parasitic infections have also been reported. The prevalence of this reactive process is unknown due to the wide variety of etiologies [3]. The pathophysiology of id reactions is thought to involve a T-lymphocyte-mediated hypersensitivity response triggered by exposure to previously hidden keratinocyte antigens and/or the release of pro-inflammatory cytokines following exposure to a primary stimulus [3]. The dermatologic clinical picture can present in varying degrees, including widespread vesicular lesions. Treatment is largely focused on identifying the underlying infection or dermatitis and treating accordingly with topical corticosteroids and emollients for symptomatic relief. Resolution of an id reaction often coincides with resolution of the primary stimulus [9].

Similar to id reactions, viral exanthems are cutaneous eruptions that result from an immune response to an underlying infectious trigger; the underlying infectious trigger in this case being a viral etiology. The most common viral exanthems are secondary to varicella-zoster infection or enterovirus infections, including coxsackie virus [10]. Although COVID-19 viral exanthems are less common, they have been seen in pediatric cases [5]. In a 2021 study of 577 children and adolescents with severe acute COVID-19, Feldstein et al. reported mucocutaneous manifestations in 10.2% of patients [11,12]. Presentation of COVID-19 viral exanthem can often involve a pruritic maculopapular exanthem that appears concomitantly with other symptoms, namely fever, and resolves within 10 days [5]. A review by Dondi et al. noted that of the 47 studies containing information about pediatric COVID-19 cases involving rash, urticaria, and other mucocutaneous lesions, 0.5-15% of those with rash typically presented with a maculopapular appearance [12]. The exact mechanism of viral exanthems varies by the virus, but most involve an immune-mediated cutaneous response to a systemic viral infection, including COVID-19. The exact pathogenesis of these COVID-19-related vesicular lesions is still being researched, but the proposed mechanisms consider viral RNA fragment expression by keratinocytes, cross-reactivity between viral and skin antigens, and possible epitope spreading [13]. Most viral exanthems are self-limited and resolve as the viral infection clears. As with id reactions, the symptoms may be relieved with topical corticosteroids and emollients.

Importantly, neither entity can be confirmed histologically, so skin biopsy would not have resolved the question in this case. Both id reactions and viral exanthems are clinical diagnoses grounded in history, morphology, distribution, and the temporal relationship to the primary trigger. The histopathology of viral exanthems is nonspecific, overlapping with other interface dermatoses, while id reactions show a nonspecific spongiotic pattern that overlaps with atopic, contact, and other eczematous dermatoses [14,15]. Biopsy is therefore reserved for atypical, necrotic, or refractory eruptions, or when a serious mimicker must be excluded, none of which applied to this acral eruption.

With several possible triggers present at once, it was difficult to determine whether the papulovesicular eruption was an id reaction to the prior fungal and bacterial infections or a viral exanthem related to concurrent SARS-CoV-2 infection. Additionally, the fever experienced by the patient corresponds to the viral infection; however, it is reasonable to consider that it may be secondary to the large bacterial abscess. Despite the uncertainty of the origin of the remote vesiculopapular rash, the management and expected resolution for this patient's symptoms should remain the same.

Conclusions

This report describes a diagnostically complex case of multiple concurrent dermatologic processes in an infant. Careful evaluation of lesion morphology, distribution, clinical history, and microbiological findings helped characterize the various cutaneous processes, including the persistent candidal diaper dermatitis, left gluteal abscess, scaly plaques, and papulovesicular eruption. Although the papulovesicular eruption was suspected to represent either an id reaction secondary to the underlying skin inflammation and infection or a viral exanthem in the setting of SARS-CoV-2 infection, its true etiology remained uncertain.

The various, complex dermatoses seen in this patient highlight the importance of noting the etiology of each process while also exploring whether there could be an overarching diagnosis that relates them. In this case, management and improvement remained similar despite the differing explanations, and the timelines coincided such that the actual etiology could not be determined. However, improvement with simultaneous treatments does not establish the eruption's true cause or demonstrate that alternative diagnoses would require equivalent management. In future cases with similarly complex findings, exploring the individual diagnoses and potential linking diagnoses may lead to differences in management that would better suit the patient's needs.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Markus Brown, Samantha Tadian

Acquisition, analysis, or interpretation of data: Markus Brown, Samantha Tadian, Josephine Ngama, Aidan R. Davis, Jayashree Rao

Drafting of the manuscript: Markus Brown, Samantha Tadian, Aidan R. Davis

Critical review of the manuscript for important intellectual content: Markus Brown, Samantha Tadian, Josephine Ngama, Jayashree Rao

Supervision: Markus Brown, Samantha Tadian, Aidan R. Davis

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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Markus Brown and Samantha Tadian contributed equally to the work and should be considered co-first authors.

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