Chlorhexidine Gluconate–Impregnated Central Access Catheter Dressings as a Cause of Erosive Contact Dermatitis

A Report of 7 Cases

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Background: Chlorhexidine gluconate–impregnated dressings have become widely adopted as a means to reduce the risk for catheter-associated bloodstream infections. These dressings release antiseptic under occlusion onto the skin surrounding catheter insertion sites. Although chlorhexidine gluconate is a known cause of contact dermatitis, the phenotypic range of this adverse effect of chlorhexidine gluconate–impregnated dressings in critically ill patients has not been described.

Observations: We report 7 cases of erosive irritant contact dermatitis due to chlorhexidine gluconate–impregnated transparent dressings. Six of these patients were children (age range, 4 months to 2 years); the adult was a critically ill 62-year-old man. Four patients were immunosuppressed after solid organ transplant and all were receiving blood pressure support at the time of this reaction. The insertion sites of femoral catheters were involved in all but 1 case; 3 catheter sites were involved in the adult patient. Results of extensive infectious workups were negative. All lesions resolved with discontinuation of the chlorhexidine gluconate–containing dressings, local wound care, and alternative antimicrobial dressings.

Conclusions: Erosive contact dermatitis is an under-recognized complication of chlorhexidine gluconate–impregnated dressings. Health care providers should be aware of this risk, particularly in young children and immunosuppressed and/or critically ill patients, who may be more susceptible to the irritant effects of these dressings. When the dressings are used, patients should be monitored closely for skin breakdown.


CHLORHEXIDINE GLUCONATE–IMPREGNATED DRESSINGS ARE USED TO REDUCE BLOODSTREAM INFECTIONS ASSOCIATED WITH CENTRAL ACCESS CATHETERS (CACs). Chlorhexidine gluconate is a routinely used antiseptic that is bactericidal against gram-negative and gram-positive organisms. Two dressing formulations, a chlorhexidine-impregnated sponge and a transparent adhesive gel pad containing chlorhexidine gluconate, 2%, have been created. They are designed to release the antiseptic material onto the skin surrounding the CAC insertion site under airtight occlusion. Multiple randomized controlled trials have demonstrated marked reductions in the risk for catheter-related infections with these novel dressings. Thus, many intensive care units (ICUs) have adopted them as routine care applied after CAC insertion.

Although chlorhexidine gluconate–impregnated dressings have been shown to decrease catheter-related bloodstream infections, little has been reported regarding the adverse cutaneous effects resulting from their prolonged use in critically ill patients and young children in particular. Herein we report 7 cases of erosive contact dermatitis due to chlorhexidine gluconate–impregnated gel pad dressings (Tegaderm CHG; 3M) (Figure 1) observed in our ICUs.

REPORT OF CASES

CASE 1

A 6-month-old boy with a history of surgically repaired congenital heart disease required ICU management of pulmonary hypertension and respiratory failure. A
We evaluated 6 additional cases of geometric erosive der- sions during the following week. The area was treated with topical antibiotics and non- adherent dressings, with reepithelialization of the ero- sions.3,12,13 Our findings are consistent with demographics of ear- lier reports suggesting that infants are most susceptible to the irritant effects of dressings containing chlorhexi- dine gluconate. In a randomized study evaluating the effi- cacy and safety of chlorhexidine gluconate–impreg- nated dressings in children, local redness developed in 4 subjects, compared with only 1 control subject; re- moval of the CAC or dressing was not needed, and the erythema resolved with catheter removal.3 All 4 sub- jects were neonates. In another study comparing povi- done-iodine– with chlorhexidine gluconate–containing dressings, 19 of 335 infants who received chlorhexidine gluconate–containing dressings developed severe exu- dative reactions with erythematous patches extending to the edges of the antimicrobial dressings, which were partially or completely covered by mucopurulent drain- age.4 Most episodes (79%) occurred in neonates with a gestational age less than 28 weeks and birth weight less than 1000 g and who were younger than 1 week at the time of CAC insertion. No patient in the povidone- iodine group developed contact dermatitis, and all pa- tients with ICD after the use of chlorhexidine gluconate–containing dressings were switched to povidone-iodine dressings with resolution of the symptoms. Although lower rates of positive findings in catheter tip cultures were seen in the chlorhexidine gluconate group, no differ- ence in the incidence of catheter-related bloodstream infections or bloodstream infections without an identi- fied source was found. These reports suggest that the skin of infants and young children may be more susceptible to irritation by chlorhexidine gluconate than that of older children. Severe ICD in reaction to chlorhexidine gluconate–containing dressings has been reported in adults at a lower rate than in children (5.3 per 1000 catheter insertions), predominantly affecting critically ill pa- tients with multiple-organ failure and skin fragility, as in case 7.2

As a manifestation of the innate immune response, ICD results from the irritant’s perturbation of the skin bar- rier and cytotoxic effects on keratinocytes, inducing a cyto- kine cascade.19 The susceptibility to ICD depends on en- dogenous and exogenous factors that culminate in damage to the integrity of the skin barrier and in release of in-
flammatory cytokines. The patient population described in this report is at greater risk for cutaneous complications given the compromised nature of the skin barrier in pediatric and chronically ill patients and the relative immunodeficiency from the immature nature of the immune systems of young children, iatrogenic immunosuppression, or the combination of the two.15,16 The relative hypoperfusion of the skin in these patients requiring blood pressure support also may have compounded their susceptibility to ICD.

Among known exogenous risk factors for ICD are the concentration and potency of the irritant, duration and site of skin exposure, occlusion over the application site, and ambient temperature and humidity.16,17 The reported erosive dermatoses can be attributed to the occlusive nature of the dressings, the continual skin exposure, and the local concentrations of chlorhexidine above the reference range achieved on the skin surface.4 Such a reaction has never been described in infants receiving full-body chlorhexidine gluconate skin cleansing without occlusive dressings.18

In most of the cases reported herein, the insertion sites of femoral catheters were involved, affecting the groin and proximal thigh. The susceptibility to ICD varies with the region of skin exposed, with the thigh being the most vulnerable.17 In case 5, the patient had an identical dressing on the arm without any evidence of irritation, underscoring the importance of the body site as a factor for
The development of ICD. The site of skin exposure is only one factor contributing to the risk for ICD, and 2 patients had erosive lesions at other sites. Case 4 had an erosive lesion on the neck, another intertriginous site. Her young age and immunosuppression after a heart transplant also may have contributed to a lower threshold for this reaction. Case 7 developed erosions at the sites of his 3 CACs, including the groin, neck, and wrist. This patient may have been particularly susceptible to the irritant effects of CHG because he also developed these lesions after the shortest interval after catheter placement among the other patients described (8 days).

Because the patients most likely to be exposed to chlorhexidine gluconate–containing dressings are severely ill and often immunocompromised, they are most vulnerable not only to the irritant sequelae of this exposure but also to infectious processes that could mimic ICD. All cultures and other microbiological evaluations from the sites in our patients yielded negative results. However, these crucial investigations should not be overlooked when managing erosive or ulcerative lesions at the site of a CAC. Many of our patients received systemic broad-spectrum antimicrobial coverage at the time of presentation; for those who did not, however, such coverage was added while awaiting culture results.

The management of erosive ICD hinges on the recognition and removal of the chemical or the physical irritant and wound care. In all the patients described, discontinuation of chlorhexidine gluconate treatment under occlusion was recommended. Alternative antimicrobial dressings were used with clinical improvement in the lesions in 5 of 7 patients. In 2 cases, the CACs were removed owing to malfunction of the catheters involved. In all cases, the erosions and ulcerations resolved during the following 1 to 2 weeks with appropriate wound care.

We infer that these cases represent ICD rather than ACD because of the erosive nature of the lesions, the occlusive nature of the dressings, and the occurrence of these reactions in infants, in whom ACD is rare. In addition, this reaction occurred at some but not all sites of application in patients with multiple chlorhexidine gluconate–containing dressings. No patient demonstrated evidence of pruritus, including the adult, although the severity of these patients’ conditions likely prevented them from manifesting this symptom. None of the cases involved the use of tinted chlorhexidine, with which prior cases of ACD have been reported. No patient developed erosions at other sites, including sites of other adhesives, and cases 6 and 7 improved while using the clear acrylic dressings without chlorhexidine gluconate, supporting our suspicion that chlorhexidine gluconate may be the component causing this reaction. Given the critical conditions of these patients and the erosive nature of the expected reactions, certain confirmatory tests, such as repeated open-application testing or patch testing, were not performed.

Given the known variability in the presentation of ICD, the cases presented herein probably represent more severe irritant reactions to chlorhexidine gluconate–impregnated dressings. We cannot determine whether these presentations represent the severe end of the same
Erosive contact dermatitis at the site of CACs can pose a significant danger to patients because it has the potential to provide a larger portal for entry to infection than the catheter alone. One should consider whether central access is crucial for life-sustaining measures and, if so, what lengths are appropriate to maintain a clean, well-protected CAC insertion site. Intensive care units must evaluate the risks and benefits of infection control protocols in each patient with care, particularly in infants or young children and immunosuppressed patients, who may be most susceptible to the irritant effects of occlusive CHG dressings. When these dressings are used to prevent CAC infections, providers should monitor skin closely for the development of erosive contact reactions.

Accepted for Publication: August 25, 2012.

Published Online: November 19, 2012. doi:10.1001/jamadermatol.2013.903

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Author Contributions: All the authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Lauren, Weiser, LeBoeuf, and Morel. Acquisition of data: Weitz, Morel, Lauren, Weiser, LeBoeuf, Grossman, Garzon, and Morel. Analysis and interpretation of data: Weitz, Lauren, Weiser, Biagas, Garzon, and Morel. Drafting of the manuscript: Weitz, Lauren, Weiser, LeBoeuf, and Garzon. Critical revision of the manuscript for important intellectual content: Lauren, LeBoeuf, Biagas, Garzon, and Morel. Administrative, technical, or material support: LeBoeuf. Study supervision: Lauren, Grossman, Biagas, and Morel. Conflict of Interest Disclosures: Dr Morel reports receiving grants support from Astellas Pharma US, Inc, and Dr Lauren reports receiving grant support from the National Philoptochos Society. Neither of these disclosures is relevant to the subject of this report.