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

A Report of 7 Cases

Nicole A. Weitz, BA; Christine T. Lauren, MD; Jessica A. Weiser, MD; Nicole R. LeBoeuf, MD; Marc E. Grossman, MD; Katherine Biagas, MD; Maria C. Garzon, MD; Kimberly D. Morel, MD

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 work-ups 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.

Published online November 19, 2012.
doi:10.1001/jamadermatol.2013.903
pads. The similar clinical findings are described in the chlorhexidine gluconate–impregnated transparent gel matitis surrounding CAC insertion sites dressed with We evaluated 6 additional cases of geometric erosive der-
sions during the following week.

The area was treated with topical antibiotics and non-
gal culture from the erosions yielded negative findings.

bacterial culture, direct fluorescent antibody testing, vi-
tifungal therapy while awaiting culture results. Gram stain,
malfunction, and the patient was treated empirically with
the time of insertion. The CAC was removed owing to
pad and changed approximately once every 4 days from
dressed with a chlorhexidine gluconate–impregnated gel

Our findings are consistent with demographics of ear-
ier reports suggesting that infants are most susceptible
to the irritant effects of dressings containing chlorhexi-
dine gluconate. In a randomized study evaluating the
efficacy 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. 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 erythematosus patches extending to
the edges of the antimicrobial dressings, which were par-
tially or completely covered by mucopurulent drain-
age. 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 dif-
ference 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 glu-
conate–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.

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. 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-

Figure 1. A transparent chlorhexidine gluconate–impregnated gel pad dressing (Tegaderm CHG; 3M) covering a central line on the abdomen of an infant.
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. 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. 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. Such a reaction has never been described in infants receiving full-body chlorhexidine gluconate skin cleansing without occlusive dressings.

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. 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 erosive lesions 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.19,20 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

### Table. Summary of Clinical Features in the Present Case Series

<table>
<thead>
<tr>
<th>Case No./Sex/Age</th>
<th>Site</th>
<th>Duration of CAC Before Dermatitis Discovery, d</th>
<th>Comorbidities</th>
<th>Immunosuppression</th>
<th>BP Support</th>
<th>Wound Care</th>
<th>Wound Outcome/Time, d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/M/6 mo</td>
<td>L groin</td>
<td>12</td>
<td>CHD repair</td>
<td>No</td>
<td>Yes</td>
<td>Topical antibiotics, nonadherent dressings, petroleum jelly, nonadherent dressings</td>
<td>Lesions resolved/7</td>
</tr>
<tr>
<td>2/M/2 y</td>
<td>L groin</td>
<td>30</td>
<td>CHD repair, pulmonary HTN</td>
<td>No</td>
<td>Yes</td>
<td>Topical antibiotics, nonadherent and silver-impregnated dressings</td>
<td>Lesions resolved/10</td>
</tr>
<tr>
<td>3/M/4 mo</td>
<td>L groin</td>
<td>22</td>
<td>CHD, heart Tx, sepsis</td>
<td>Yes</td>
<td>Yes</td>
<td>CAC removed, topical antibiotics, petroleum jelly, nonadherent dressings</td>
<td>Lesions resolved/4</td>
</tr>
<tr>
<td>4/F/2 y</td>
<td>R aspect of neck</td>
<td>17</td>
<td>CHD, heart Tx, Tx rejection</td>
<td>Yes</td>
<td>Yes</td>
<td>Topical antibiotics, nonadherent and silver-impregnated dressings</td>
<td>Lesions resolved/6</td>
</tr>
<tr>
<td>5/F/1 y</td>
<td>R groin</td>
<td>13</td>
<td>CHD, heart Tx, graft failure, stroke, osteomyelitis</td>
<td>Yes</td>
<td>Yes</td>
<td>Topical antibiotics, silicone- and silver-impregnated dressings</td>
<td>Lesions resolved/NS</td>
</tr>
<tr>
<td>6/M/5 mo</td>
<td>L groin</td>
<td>16</td>
<td>CHD, sepsis, DIC</td>
<td>No</td>
<td>Yes</td>
<td>Alcohol and povidone-iodine cleansing, silver-impregnated dressings, transparent dressing</td>
<td>Lesions resolved/NS</td>
</tr>
<tr>
<td>7/M/62 y</td>
<td>L groin, L aspect of neck, R wrist</td>
<td>8</td>
<td>Dermatomyositis and PF after lung Tx, Tx rejection, PNA, renal failure</td>
<td>Yes</td>
<td>Yes</td>
<td>L femoral CAC removed, topical antibiotics, nonadherent dressings, paper tape</td>
<td>Lesions resolved/NS</td>
</tr>
</tbody>
</table>

Abbreviations: BP, blood pressure; CAC, central access catheter; CHD, congenital heart disease; DIC, disseminated intravascular coagulation; HTN, hypertension; L, left; NS, not specified; PF, pulmonary fibrosis; PNA, pneumonia; R, right; Tx, transplant; y, years.

All patients had negative microbiology results for fungal culture, potassium hydroxide test, bacterial Gram stain and culture, herpes simplex virus/varicella zoster virus direct fluorescent antibody test, and viral culture.
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 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.

CONCLUSIONS

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 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.