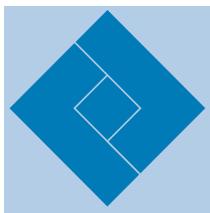


OSTOMY CARE



MASD Part 3: Peristomal Moisture–Associated Dermatitis and Periwound Moisture–Associated Dermatitis

A Consensus

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Moisture-associated skin damage (MASD) occurs when excessive moisture in urine, stool, and wound exudate leads to inflammation of the skin, with or without erosion or secondary cutaneous infection. This article, produced by a panel of clinical experts who met to discuss moisture as an etiologic factor in skin damage, focuses on peristomal moisture-associated dermatitis and periwound moisture-associated dermatitis. The principles outlined here address assessment, prevention, and treatment of MASD affecting the peristomal or periwound skin.

■ Introduction

This article, the third in a series from experts focusing on moisture as a common etiology for skin damage, specifically addresses 2 forms of moisture-associated skin damage (MASD), peristomal moisture-associated dermatitis and periwound moisture-associated dermatitis. Two previous articles have addressed incontinence-associated dermatitis (IAD) and intertriginous dermatitis (ITD), as well as shared etiologies among all 4 common forms of MASD.^{1,2} MASD is defined as inflammation and erosion of the skin caused by prolonged exposure to various sources of moisture and its contents, including urine, stool, perspiration, wound exudate, mucus, or saliva. The specific etiologies of the 4 forms of MASD discussed in these articles differ: peristomal moisture-associated dermatitis and IAD occur with exposure to urine or stool, periwound moisture-associated dermatitis from wound effluent, and ITD from perspiration in skin folds. However, injuries from any of these moisture sources may result in inflammation, erosion, and potential secondary infection. The expert panel calls on clinicians to focus on skin at high risk for MASD, both peristomal and periwound tissue as the focus of this article, and to prevent damage caused by unmanaged excessive moisture.

■ Peristomal Moisture–Associated Dermatitis

Peristomal moisture-associated dermatitis is defined as inflammation and erosion of skin related to moisture that begins at the stoma/skin junction and can extend outward in a 4-in radius. This discussion of the etiology of peristomal moisture-associated dermatitis will focus on the body's own moisture sources: stool, urine, and perspiration, as well as external water sources. The complicating

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factor in the development and treatment of peristomal moisture-associated dermatitis is the requirement of maintaining the seal of the ostomy pouching system on the peristomal skin in the presence of skin damage. Moisture exuding from the eroded skin can cause the seal of the pouching system to detach from the skin allowing contact with the stoma effluent, further damaging the skin and causing pouch failure. Pouch failure, defined as the partial or full detachment of the pouching system from the peristomal skin, is catastrophic for the person with an ostomy causing urine or stool to leak onto skin and clothing, resulting in soiling, odor, and social embarrassment, negatively affecting health-related quality of life.

■ Etiology and Pathophysiology

The etiology of peristomal moisture-associated dermatitis is multifactorial: the principal cause is prolonged exposure of the peristomal skin to urine or stool, although perspiration, an external water source (eg, bathing, swimming), or wound drainage also may act as causal factors. In order to protect the skin around the stoma and adhere the pouching system, the peristomal area is covered with a solid skin barrier, designed to provide a barrier between the stoma output (stool or urine) and the skin.^{3,4} The main ingredient in most skin barriers is hydrocolloids. Hydrocolloids absorb moisture from the skin as well as stoma effluent. If the amount of moisture in contact with the skin barrier is significant, the barrier absorbs the moisture,⁴ eroding the barrier, eliminating its protective function, and allowing stool or urine to come into contact with the peristomal skin. Erosion of the solid skin barrier depends on the amount, moisture content, and composition (eg, enzymes, bacteria) of the stoma effluent, skin moisture levels (eg, perspiration, humidity), and the type of skin barrier (regular or extended wear). Failure of the skin barrier can allow the stoma effluent to contact the skin around the stoma and cause peristomal moisture-associated dermatitis.

Perspiration under and around the pouching system seal also may contribute to peristomal moisture-associated dermatitis because it occludes the skin leading to hyperhydration and increased transepidermal water loss (TEWL).⁴ While some perspiration is absorbed by the skin barrier, excessive sweating can supersede its absorptive capacity. In addition, obesity may contribute to the production of perspiration due to an increase in TEWL. A retrospective analysis of patients with ostomies in Korea found that a high body mass index (BMI) was associated with a higher incidence of irritant contact dermatitis, 11.9% in those with a BMI < 23 versus 19.4% in those with a BMI ≥ 25.⁵ Nybaek and associates⁶ reported a BMI over 30 was directly associated with having a peristomal skin complication. Our clinical experience further supports that obese patients often have a higher rate of peristomal moisture-associated dermatitis.

Unique to this form of MASD is an external water source as an etiologic factor. Prolonged exposure to water can cause failure of the water-resistant adhesive on the outer portion of the solid skin barrier, leading to pouch seal failure and exposure of the peristomal skin to the stoma effluent. Prolonged exposure to external water sources may necessitate frequent pouching system changes, which, according to the panel's clinical observations, can result in mechanical stripping of overhydrated skin.

Wound exudate can also contribute to overhydration in the peristomal area. When an inflammatory draining wound such as peristomal pyoderma gangrenosum is present, the peristomal skin can be damaged by supersaturation of the skin adjacent to the ulcer.^{7,8}

Additional factors contributing to the etiology of peristomal moisture-associated dermatitis are: occlusion, trauma, age, and pouch wear time. As noted previously, occlusion can become a causal factor if the moisture level trapped under the skin barrier is sufficiently high to compromise the barrier seal. Trauma may result from mechanical stripping of the skin as the adhesive barrier is removed, resulting in physical damage to the epidermis.⁴ Mechanical stripping of the skin denudes the peristomal epidermis resulting in a moist open area that can affect the skin barrier seal possibly leading to stoma effluent damage to the skin. Chronological age may also be a factor; as the consensus panel members have noted, there may be a relationship between increasing age and peristomal skin problems. This may be attributable in part to the thinning of the epidermis with age and the flattening of the rete pegs, which are the epidermal extensions into the dermis to promote anchoring of the 2 skin layers. Pouching system wear time is the amount of time the pouching system maintains an intact predictable seal and protects the peristomal skin.³ Wearing a pouching system beyond the suggested wear time may compromise the seal, allowing the stoma effluent to contact the skin causing skin damage. Optimal wear time should be at least 3 days and is not recommended to exceed 7 days.^{9,10} Richbourg and associates¹¹ found that in the United States, mean wear time for ostomy pouches was 4.8 days, the mean wear time reported by people with colostomies was 4.55 days, for people with ileostomies was 5.01, and 5.02 days for people with urostomies.

The pathophysiology of peristomal moisture-associated dermatitis is multifactorial. Moisture contacts the peristomal skin in the form of stoma effluent, excessive perspiration, or external moisture source such as excessive water immersion. If the moisture is from fecal stoma effluent, intestinal enzymes may digest skin, and the bacteria in the intestinal content may cause a secondary infection.^{12,13} The moisture and enzyme content of the effluent from a fecal stoma vary depending upon stoma location along the intestine: more fluid in the terminal ileum and right colon, semifluid in the midcolon, pasty, and/or solid

in the left colon. Liquid stool contains a higher enzyme content and is more likely to damage the skin than pasty to formed stool that contains less moisture and fewer enzymes. The alkaline nature of the output from a urinary stoma may overhydrate and soften the skin,¹⁴ leading to loss of the epidermal barrier, and in some cases, a buildup of alkaline crystals.^{15,16}

■ Epidemiology

Prevalence and incidence rates of peristomal moisture-related dermatitis are difficult to determine. Reporting in the literature is variable with some reports detailing peristomal skin issues in the immediate postoperative period, variable definitions of peristomal skin conditions, and differing assessment of peristomal skin issues by patients and clinicians.¹⁷ There is a wide range of peristomal complication rates cited in the literature, from 10% to 70%.^{10,16,18-25} A number of studies that examined a spectrum of stoma and/or peristomal complications report that the most frequently observed complication is peristomal skin damage, though again the rates vary significantly. Ratliff¹⁸ used a prospective design to evaluate 89 patients in the first 2 months postoperatively. The results showed that of 42 patients with peristomal complications, 31 had chemical damage to peristomal skin.¹⁸ This is similar to other findings regarding peristomal irritation cited by Ratliff and associates²⁶ with a 69% incidence (24/35), Richbourg and colleagues²⁷ with a self-reporting 76% incidence (26 of 34), and Pearl²⁸ with a 42% incidence of early peristomal skin irritation. The authors noted that the highest complication rate occurred in those who underwent emergency stoma surgery. Park and associates²² undertook a retrospective review of 1616 patients. Among 553 patients with complications, the most common was skin irritation, although the present study cites lower incidence rates: 12% occurring early (within 30 days postoperatively) and 6% occurring later.

In other pertinent findings, Persson and coinvestigators²⁰ evaluated stoma-related complications during the 2 years after discharge and reported that most complications occurred within the first 2 weeks following hospital discharge. The most common complication in their population were skin problems that occurred most often in patients with end ileostomies (60%) and loop ileostomies (73%). Cheung¹⁶ reported a 67% incidence of complications in 316 patients with 322 ostomies. Peristomal skin "excoriation" was reported in 20% of those with ileal conduits, 29% of those with colostomies, and 70% of those with ileostomies. Bass and colleagues²¹ reported that in the first month after surgery, the incidence of peristomal skin complications was 45% among patients who received preoperative education and marking of the stoma site compared to 77% among those who did not receive those services. Bosio and colleagues²⁹ undertook a prospective observational study of 656 patients and reported that peristomal

skin disorders occurred in 52%.²⁹ Colton and associates³⁰ followed 252 subjects with urostomies, ileostomies, and colostomies and found that overall rates of skin problems were 25% (0-2 weeks), 40% (3-6 weeks), 20% (7-12 weeks and 3-6 months), and 15% (6-12 months).

Herlufsen and colleagues²³ surveyed and examined 202 community-dwelling adults in Denmark. The mean duration since ostomy surgery was 8 years. Peristomal skin problems were reported in 45% and the disorders persisted for more than 3 months in 76% of those patients. Significantly, only 38% of their participants diagnosed with a skin disorder recognized it as such. Even among patients diagnosed with a severe skin disorder, 56% were unaware of it. Overall, more than 80% of participants with a skin disorder did not seek health care, a finding that demonstrates the need to educate the person with an ostomy. Similar findings were reported by Nybaek and colleagues⁶ in a study of 199 individuals with ostomies. They reported that only 39 of the 90 (43%) diagnosed with a skin complication had noticed abnormality themselves and only 14 (16%) had sought medical assistance to deal with their skin problem.

A number of studies show that approximately half of patients with peristomal complications had an ileostomy.^{16,18,20,28} Persson and colleagues²⁰ and Cheung¹⁶ reported an even higher percentage of skin issues in people with ileostomies. This is not surprising given the fluid and caustic nature of effluent from an ileostomy.

There are marked limitations in determining the overall incidence and prevalence of peristomal skin damage since research studies are few and are often limited by a lack of detailed data as well as by lack of standardized measurements, terminology, and definitions. Often attrition rates, the number of participants assessed at each phase, the frequency of patient assessments, and the scope of patient evaluations are not reported.¹⁹ In a systematic review of studies focused on stomal and/or peristomal complications, Salvadale¹⁹ also pointed out that authors frequently fail to report whether evaluations pertained to all study participants or only to those who recognized a complication and returned for follow-up. This is significant in view of the earlier studies that reflect the lack of awareness of the skin disorder by the majority of the patients.

■ Assessment

With other forms of MASD (periwound moisture-associated, incontinence-associated, and intertriginous dermatitis), treatment initially focuses on the affected skin. In contrast to this approach, the top priority when managing peristomal moisture-associated dermatitis is the determination of the source of the irritant and modification of the pouching system or the use of accessory products in order to prevent further damage.

Visual assessment should focus first on skin color and integrity, followed by location, shape, size, and distribution

TABLE 1.**Assessment Considerations**

Barrier	Abdominal Contour	Stoma	Other Considerations
Type (extended vs standard)	Weight gain or loss	Shape	Observe the method used by the patient to remove and replace the pouching system to determine potential involvement of mechanical stripping, inappropriate technique, or improper use of products Determine whether a change in exercise regimen (eg, swimming and increased perspiration) is affecting solid skin barrier adhesion
Size/shape of aperture	Pregnancy	Location of lumen	
Barrier shape (flat or convex)	Parastomal herniation	Color	
Rigidity (flexible or firm)	Time since surgical procedure	Texture	
Presence/amount of erosion at proximal edge (noted upon removal)	Certain disease states	Integrity	
Presence of moisture on back of barrier (noted upon removal)	Growth of pediatric patients	Type (end and loop)	
	Assess abdomen in supine, sitting, and standing positions to determine if skin creases disrupt pouching system adhesion	Mucocutaneous junction	
		Degree of protrusion (eg, if a stoma is flush with the skin, effluent may seep under the solid skin barrier and cause pouching system failure)	

of skin irritation or maceration. Patients should be queried about products used (skin barrier paste, skin barrier powder, and liquid skin protectant), athletic activities (especially water sports), diet, changes in medical condition, medication adherence or changes, amount and volume of output, pouch emptying practices, solid skin barrier removal practices, and wear time.

Described as a protective platform for the skin,³¹ a solid skin barrier is essential to protecting the skin from the effects of chemical (or mechanical) skin injury. Assessing barrier integrity is a priority; suggested evaluation strategies are outlined in Table 1.

Standardized assessment tools have been developed to assist the WOC nurse to properly evaluate the extent and severity of peristomal skin changes.^{29,32,33} The goal of standardized assessment tools is to enhance accurate clinical description and communication and to minimize assessment variation among health care providers.

Prevention/Treatment

Determining the etiology drives the treatment plan. Prevention and treatment are clearly critical to prevent progression to more severe damage, yet they also affect quality of life because it has been found to be correlated with the severity of peristomal skin damage.¹⁷

A consensus of this working group and of others⁶ is that the majority of peristomal irritant dermatitis occurs from leakage of the stoma effluent under the seal (Figure 1). Therefore, prevention is aimed toward achieving a predictable wear time and maintaining the peristomal skin by using the most appropriate pouching system. Selecting an optimal pouching system in the patient with peristomal moisture-associated dermatitis focuses on the skin barrier.³ The selection of the optimal type of solid skin barrier

based on type of output is critical. High liquid output (urostomy, ileostomy) is best managed with the use of an extended wear barrier, which erodes more slowly in the presence of liquid output. Low-volume, low-moisture effluent such as found in a person with a left-sided colostomy would best be managed with a standard wear skin barrier.

The opening in the skin barrier must be cut to match the size and shape of the stoma. As a newly created stoma changes shape and size for at least 6 weeks following creation, repeated measuring is advised to ensure that the barrier aperture conforms to both the size and shape of the stoma. A cut-to-fit barrier is recommended up to 6 weeks postoperatively until the stoma size stabilizes. It is also recommended for ongoing use when the stoma is irregularly



FIGURE 1. Flush stoma with lumen at skin level resulting in undermining of the skin barrier, with resultant moisture-associated skin damage (Photo: Janice C. Colwell).

shaped in order to ensure a snug peristomal aperture. Moldable solid skin barriers can also be fit to conform to the stoma shape.

The use of a convex barrier should be considered in several situations: (1) when the stoma lumen is not above skin level (Figure 2) and (2) when the area around the stoma demonstrates creases or folds in the sitting or standing positions. Convexity, a rounded outward protrusion of the skin barrier, can apply peristomal pressure to push the stoma lumen above the skin barrier edge, allowing the stoma output to drain into the pouch. In cases of creases and folds, convexity can stabilize the peristomal area, preventing the undermining of the seal and resultant leakage.

In some cases, accessory products can be considered to enhance the seal: skin barrier paste, skin barrier strips or rings, skin barrier powder, liquid skin protectants, and belts. Custom-made convex barriers are also an option for difficult cases.³

Prevention efforts are often hampered by limited opportunities for patient education. The increased incidence of laparoscopic ostomy surgery, with decreased hospital stays, results in less time for patients to learn proper pouching techniques and skin care practices.²⁶ If peristomal MASD develops, close surveillance is needed to gauge the effectiveness of the interventions and to monitor for complications.²⁶

Treatment initially focuses on altering the pouching system in order to prevent further exposure to irritants. Achieving success is challenging because patients often fail to recognize effluent leakage that harms the skin. We recommend advising the patient to establish a pouch change schedule, to continually monitor the skin barrier seal for undermining or erosion, and to seek treatment if the skin becomes irritated.

Healing irritated skin can be done using several techniques, but topical therapies are limited to products that

will allow the adhesive seal to be secured. Skin barrier powder can be dusted over the moist skin (skin barrier powder contains hydrocolloids that can absorb the moisture) and facilitate a seal of the solid skin barrier to the skin. Some experts suggest the use of a polymer acrylate liquid skin protectant over the powder as a sealant. An astringent may be applied prior to pouch placement to dry the peristomal skin. In cases of severe irritation, a steroid spray may be used to diminish the inflammatory process.²⁴

If there is evidence of mechanical trauma, patients should be instructed on techniques to gently remove (push/pull) the solid skin barrier. They should also be queried to determine appropriate wear time and should be discouraged from unnecessary pouch changes.

If liquid stool is compromising adhesion, we advise patients to assess their diet and make modifications that thicken output such as adding foods containing starch and limiting fluids. Antidiarrheal medication, which decreases intestinal transit time and increases absorption, may result in thickened output. Wear time should be explored as many people attempt to extend wear time at the expense of effluent pooling on the skin.

Wound exudate may be the primary moisture source in peristomal pyoderma gangrenosum or abscesses. In addition to assessing for wound etiology, the clinician may recommend the use of absorptive products based upon exudate volume, such as alginate, hydrofiber, foam, or thin hydrocolloid dressings.

Peristomal candidiasis, which results from a proliferation of a *Candida* organism, is associated with excessive moisture on the peristomal skin. Peristomal candidiasis appears as a pustule and is generally encountered under the adhesive seal of the pouching system; erythema, maceration, itching, and burning may also be present.¹⁰ Treatment involves identifying and correcting the moisture source, then applying a topical antifungal (generally a powder) that will not interfere with adhesion of the solid skin barrier.²⁴ Depending upon the severity of the candidiasis and the response to topical therapy, oral antifungal therapy may be indicated.

■ Pseudoverrucous Lesions and Peristomal Pyoderma Gangrenosum

Pseudoverrucous lesions may occur when the peristomal skin suffers from chronic irritation from moisture (Figure 3).²⁴ These thickened epidermal projections are more likely to develop in urostomy patients with alkaline urine but have been described around fecal diversions as well.³⁴ The first intervention is ensuring an appropriate skin barrier seal around the stoma preventing stoma output from irritating the peristomal skin. Treatment in the person with a urostomy and alkaline urine may involve application of acidic solutions (acetic acid), use of an antireflux pouch, use of an acidic skin barrier such as a Colly-Seel, or acidification



FIGURE 2. Retracted stoma causing moisture-related skin damage from effluent in contact with skin (Photo: Janice C. Colwell).

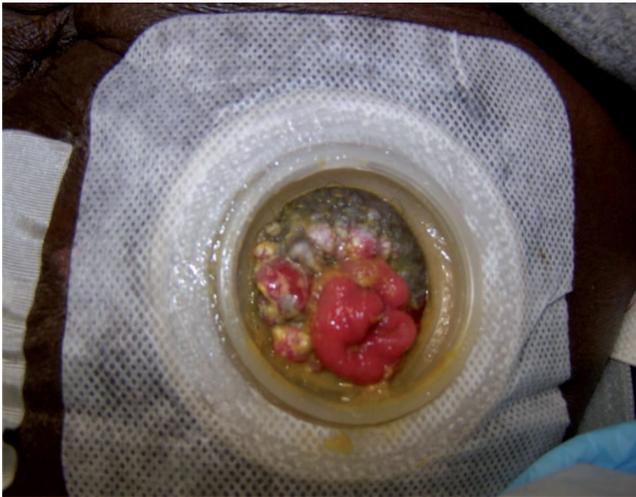


FIGURE 3. Pseudoverrucous lesions caused by prolonged exposure to moisture (Photo: Janice C. Colwell).

of urine with greater fluid intake or intake of cranberry juice or vitamin C.³⁵ Silver nitrate may be applied directly to the lesions to diminish hypertrophic tissue.

The etiology of peristomal pyoderma gangrenosum (Figure 4) is not fully understood, but trauma has been suggested to play a role, such as leakage of effluent or irritation from pouch adhesive.³⁶ Pustules develop into full-thickness ulcers with irregular margins. Management includes reducing the inflammatory process via topical anti-inflammatory or immunomodulator preparations, absorptive dressings to control wound drainage, and in some cases advancing to oral anti-inflammatory medications such as anti-TNF-alpha therapy.^{37,38}

Any therapeutic option must allow the adhesive seal to be secured. Prevention is the key to decreasing the incidence of peristomal moisture-associated dermatitis: choosing the best fit of the pouching system skin barrier, educating the patient on consistent peristomal skin assessment, and providing patients ongoing access to an ostomy nurse specialist. There is also a need to refine data collection to help determine those patients at risk for the development of skin issues and to develop evidence-based interventions for treatment of MASD in patients with ostomies.

■ Periwound Moisture-Associated Dermatitis

Exudate is created by the normal inflammatory process of wound healing. However, when high volumes of exudate occur, it poses clinical difficulties and healing may be affected as the overhydrated skin becomes macerated,³⁹ potentially leading to skin breakdown. There is no evidence that moist wound healing causes maceration.⁴⁰ Generally, in acute wounds, exudate promotes the healing process. Dressings that rely on absorbency and moisture vapor transmission rate (MVTR) as a method to handle fluid may



FIGURE 4. Peristomal pyoderma gangrenosum (Photo: Janice C. Colwell).

pose a lower risk of maceration. In addition to volume, the composition of exudate is hypothesized to influence its impact on wound healing and the periwound skin. Clear, nonviscous exudate is more likely to pass through a dressing and be lost by MVTR. In contrast, viscous exudate is less likely to be lost by MVTR and more likely to leak onto the periwound skin.⁷

Maceration is characterized by pale, white or gray wrinkled skin⁴¹; darker pigmented skin may present as hypopigmented. The etiology and pathophysiology of periwound moisture-associated dermatitis are not well understood. Factors that increase the risk for periwound maceration include the amount of exudate and presence of heparin-binding proteins, bacteria and associated toxins, histamine produced by specific bacteria, proteolytic enzymes such as the matrix metalloproteinases (MMPs), and inflammatory cytokines (interleukin-1) in the wound exudate.⁴²

The clear, serous exudate of acute wounds is rich in growth factors such as platelet-derived growth factor, fibroblast growth factor, and epithelial growth factor, which promote fibroblast, keratinocyte, and endothelial cell proliferation.⁴³⁻⁴⁵ It also has an abundance of leukocytes and nutrients which promote cell proliferation and autolysis of injured tissue.^{46,47} Although serous exudate contains some metalloproteinases (MMPs), they are primarily inactive.^{48,49} However, in chronic wounds, concentration of the proteolytic enzymes (MMPs) in the exudate are increased, which can damage the periwound skin, reducing its barrier function and increasing the chance of maceration.⁸

When periwound skin is initially exposed to exudate, the stratum corneum absorbs the fluid and swells. Greater moisture exposure saturates the lower layers of the epidermis, which reduces the protective epidermal function (as a barrier to water), and increases the likelihood of maceration.^{7,8} The exudate may contain cellular debris and enzymes, which can be damaging to the skin.⁵⁰ There is also a corresponding decrease in TEWL.⁸ Overhydrated skin delays healing, increases infection risk, increases

friction risk, and can result in wound enlargement.^{51,52} Maceration can ultimately preclude cell migration across the surface of the wound.⁵³

The literature defines periwound skin as the tissue within 4 cm of the edge of the wound.^{52,54} However, clinical cases of more extensive periwound MASD have been noted. For instance, with a large draining wound or fistula, there could be a larger perimeter of tissue at risk for periwound moisture-associated dermatitis.

■ Assessment

Assessment for periwound maceration should begin with identifying those individuals who are at increased risk, including the elderly, the immunocompromised, those with skin diseases (such as eczema or psoriasis), or those who have experienced environmental damage (such as ultraviolet radiation from the sun), those with a disease related to an underlying pathology (such as lipodermatosclerosis seen with venous ulcer disease), or those with a congenital disorder (such as epidermolysis bullosa).⁵⁵ It is also important to recognize that assessment of periwound inflammation may vary depending on skin pigmentation and color. Redness (erythema) may be masked in persons



FIGURE 5. A venous leg ulcer, often heavily exudative, is challenging to manage, and infection can further increase the amount of exudate (Photo: Catherine R. Ratliff).



FIGURE 6. Periwound maceration can be dependent on the location of the wound such as in lower extremities with reduced blood flow (eg, heel ulcer); here maceration is apparent at the base of the wound (Photo: Catherine R. Ratliff).

with darker skin tones. At sites of inflammation, all shades of skin may show postinflammatory hypopigmentation or hyperpigmentation.⁵⁵ It may also be difficult to distinguish periwound maceration from some conditions such as fungal infections, but it is important to do so since the treatment of the periwound skin will vary based on the etiology. Additional factors of periwound maceration may also result from inadequate wound exudate management (Figure 5), traumatic injury caused by inappropriate tape or dressing removal, or infrequent dressing changes.⁵⁵ The location of the wound may also determine the risk for MASD. A wound on an extremity is often dependent and wound exudate may pool to the dependent portion resulting in periwound maceration in only 1 part of the wound (Figure 6).

■ Prevention/Treatment

Managing periwound MASD can be described as a balancing act, avoiding both excessive dryness and excessive moisture in the wound and periwound skin. Although certain wounds, such as full-thickness burns, diabetic foot ulcers, venous leg ulcers, pressure ulcers, and fungating malignant tumors, are most commonly associated with an

increased risk for periwound maceration, it can develop in any wound that is exudating, or around drains or tubes. Exudate volume will increase, along with the risk of periwound moisture-associated dermatitis, if the wound becomes infected.

Liquid Acrylates, Ointments, Windowed Dressings, and External Collection Devices

General guidelines for managing excessive exudate include using a more absorbent dressing, changing the dressing more frequently, using a liquid acrylate skin protectant on the periwound tissue, using a pouching system, or using an antifungal powder or ointment if indicated.⁵⁶ When choosing among types of skin protectants, many clinicians are guided by the acronym LOWE (Liquid Acrylates, Ointments, Windowed Dressings, and External Collection Devices), which refers to (1) liquid film-forming acrylate, (2) ointments, (3) windowed dressings, and (4) external collection devices.⁵⁰

Gray and Weir⁴² reviewed evidence on the prevention and management of periwound maceration and found a reduced risk of maceration with application of a no sting barrier film or a petrolatum- or zinc-based skin protectant. They found little available evidence for other current management practices.

Liquid polymer acrylates (liquid skin protectants) are composed of polymers and contain solvents that evaporate after application, leaving a film that protects periwound skin from moisture. Schuren and colleagues⁵⁷ performed a meta-analysis of 8 earlier studies to determine whether liquid acrylate can prevent periwound maceration. Four of the studies compared the barrier film to other treatments (zinc oxide-based or petrolatum-based skin protectants) and 4 compared the barrier film to placebo.⁵⁸⁻⁶⁵ Compared to placebo, the liquid acrylate film was significantly more effective in preventing maceration ($P < .0001$). No differences were found when the liquid acrylate was compared to zinc oxide- or petrolatum-based skin protectants.

Ointment- or cream-based skin protectants often contain zinc oxide, a white powder that is mixed with the cream or ointment base. Though it offers good protection against irritants, it does not avoid maceration and offers poor skin hydration. Dimethicone is silicone-based oil that is also used as a skin protectant. It offers variable protection against irritants (particularly at lower-dose formulations), modest protection against maceration, and good skin hydration. Petrolatum is a blend of castor seed oil and hydrogenated castor oil. It offers good protection against irritants, avoids maceration, and results in modest skin hydration.⁶⁶ Both zinc oxide and petrolatum ointments have been used to protect the periwound area. Although they are effective in preventing exudate contact with the periwound skin, they can interfere with dressing adhesion and absorption. In addition, they can be messy and may be difficult to remove.⁵¹

Windowed dressings are adhesive dressings (hydrocolloids, solid skin barriers, or films) prepared with an opening resembling a window pane, so that effluent can be managed with an absorbent dressing while protecting the periwound skin from exposure to excessive exudate. A window dressing enables longer-term use of the barrier, which does not require frequent changing, while allowing monitoring of the underlying skin. It's possible, however, that the dressing may lift, roll, or trap exudate and allow bacterial proliferation; therefore, careful assessment is needed with each dressing change.⁵¹

External collection devices are used for wounds with large amounts of exudate or around leaking tubes or drains.^{67,68} If a wound drains more than 200 to 500 mL daily, a pouching system may be indicated to collect and measure the volume of drainage and to protect the periwound skin.³¹ A pouch with access to the wound such as a detachable window should be considered in order to provide access to the wound for assessment and care. A well-fitted pouching system allows for accurate exudate measurement, reduces the need for frequent dressing changes, limits spread of potential contamination, increases patient comfort, and protects periwound skin.⁶⁹

Overview of Absorptive Dressings

The clinician should make a deliberate and individualized choice of dressing type since moisture-interactive mechanisms vary. An effective dressing should protect the wound, absorb exudate, preserve a moist wound base, and remove excess exudate. The last point is especially important in the context of this article; if a limited-absorption dressing is used on a heavily exuding wound, MASD can develop or exacerbate. The type of dressing may change over time as exudate volume increases or decreases. For example, when treating diabetic foot or pressure ulcers, exudate levels are often greatest during the early healing process.⁷⁰ Wear time is an equally important consideration; increased exudate levels require shorter dressing wear times as well as a dressing designed for greater absorption capacity. An effective dressing should also be easily removed in order to prevent mechanical stripping or irritation of the periwound skin, which renders it more vulnerable to MASD.⁷¹

Some dressings absorb moisture and hold it within the structure of the fiber above the wound to prevent it from damaging the periwound skin. Simple saline gauze dressings remain a common treatment choice.⁷¹⁻⁷⁴ However, frequent changes may be required and the moist gauze may paradoxically increase the risk of periwound skin damage when the gauze is saturated.⁷⁵ Staff should be educated not to reinforce leaking dressings as this may trap the exudate onto intact skin, causing MASD. Although analyses differ regarding the clinical efficacy of more recently developed dressings versus traditional saline gauze dressings,^{76,77} patients report more pain with gauze

dressings compared to alginate, foam, and hydrocolloid dressings.^{78–81}

Alginates and Hydrofiber

Alginates and hydrofiber may be classified as fiber-gel dressings. They absorb exudate and form a gel that conforms to the shape of the wound via an ion exchange mechanism.⁵⁶ Such dressings may be advisable for the treatment of moderately to heavily exuding wounds.⁸²

Daniels and coinvestigators⁸³ examined a composite dressing, which combined hydrocolloid, hydrofiber, and foam-film technologies, in a trial that included assessment of periwound skin among 11 subjects with venous ulcers. Results were compared to the choice of topical therapy used prior to the trial: alginate in 3 subjects, gel in 4, foam dressing in 3, and various dressings in 3. No evidence of periwound maceration was observed at baseline assessment. After the 5-week trial, 10 (13%) of the 75 dressing changes exhibited evidence of periwound skin maceration using the composite dressing.

Foams

Foam dressings, made from polymers, pull fluid away from the wound bed. They have an absorbent, porous, hydrophilic polyurethane center and a hydrophobic, semiocclusive outer layer.⁸⁴ Optimally, the foam dressing should wick fluid unidirectionally, just above the area of drainage.⁷⁵ Foams are used for moderately to heavily exuding wounds. Banks and colleagues⁸⁵ compared a polyurethane foam dressing to a hydrocellular foam dressing in treating leg ulcers, pressure ulcers, and other wounds with moderate to heavy exudate. Over half of the subjects from each group experienced no change in periwound skin; in addition, 37% ($n = 11$) of those using the polyurethane foam and 29% ($n = 9$) of those using the hydrocellular foam dressing experienced improvements in periwound skin ($P = \text{NS}$).

Vanscheidt and colleagues⁸⁶ analyzed results of a foam composite dressing and a hydrocellular foam dressing in patients with venous leg ulcers. Periwound maceration occurred in 22% of those managed with the foam composite dressing and in 27% managed with the hydrocellular foam dressing ($P = \text{NS}$). At 12 weeks, the foam composite dressing performed significantly better, with 55% of patients having healed or markedly improved periwound skin compared to 37% of patients using hydrocellular foam ($P = .03$).

Another randomized trial compared a polyurethane foam dressing to a hydrocellular dressing to assess absorbency of the dressings in subjects with leg ulcers, pressure ulcers, and other wounds. There were no statistically significant differences in surrounding skin conditions between the 2 dressings. Although not the primary end point, periwound maceration was reported in 10 subjects managed with polyurethane dressings and none of the subjects managed with hydrocellular dressings.⁸⁷

Hydrocolloids

Hydrocolloid dressings are generally described as occlusive and are useful for wounds with minimal exudate.⁷⁵ This type of adhesive dressing, which forms a gel on the wound surface, should be changed as clinically indicated to avoid periwound MASD.⁸⁸ A prospective, randomized controlled trial compared use of a nonadherent lipidocolloid dressing with a hydrocolloid dressing. The primary outcome of this study was venous leg ulcer wound surface area, but periwound maceration was measured as a secondary outcome. At 2 months there was inflammation of periwound tissue in 51% (24/47) of subjects using the lipidocolloid dressing and in 36% (16/44) of those using the hydrocolloid dressing.⁸⁹

Dressings With Antimicrobial Activity

Antimicrobial dressings influence exudate production by affecting bioburden in the wound bed. Antimicrobial dressings have been found to be effective when infection has spread despite use of systemic antibiotics when impaired perfusion is limiting the delivery of drug to tissue.^{90,91} One option is silver-impregnated foam dressings. Silver is an effective agent against a wide range of gram-positive, gram-negative, aerobic, and anaerobic bacteria, as well as yeast, fungi, and viruses.^{92–94} Its antimicrobial activity is attributed to its ability to block transport of nutrients into bacterial cell walls and to bind to microbial DNA, inactivating its replication.⁹⁵ Münter and colleagues⁹⁶ found that after 4 weeks significantly more subjects managed with silver-releasing foam dressings maintained or achieved normal periwound skin when compared to local best practice (described as a range of topical therapies ranging from gauze to moist wound-healing products and antimicrobial treatments) (55% vs 42%, $P = .0021$). Additionally, fewer patients using the silver-impregnated dressing developed periwound maceration when compared to local best practices (10.9% vs 16.7%, $P = .0383$). Jørgensen and colleagues⁹⁷ also reported that periwound maceration (measured as a secondary end point) occurred in fewer subjects managed with a silver-releasing foam dressing versus a hydrocellular foam dressing at 1 week (34% vs 55%) and at 4 weeks (37% vs 48%).

Other Modalities

Negative pressure wound therapy (NPWT) is the application of negative pressure through one of several mechanisms to collect wound exudate. NPWT has been shown to reduce the risk of periwound moisture-associated dermatitis by mechanically removing edema and exudates.^{7,70,98} Both selection of the dressing and the negative pressure setting should be determined on the basis of several variables: the exposed structures in the wound, patient age, bacterial load, and treatment goals.⁶⁷ Nevertheless, our clinical experience demonstrates that inappropriate application of NPWT can paradoxically promote MASD.

Leg elevation and compression therapy can increase venous blood return, decrease edema, and exudate production in venous leg ulcers.^{7,70,98} Both compression bandaging and intermittent pneumatic compression therapy (using a device that alternately inflates and deflates to produce compression in the affected area) have been found efficacious^{99,100}; pneumatic compression is often used to supplement compression bandaging. However, our experience reveals that variability in application of compression bandages results in variable effectiveness.

■ Summary

Peristomal and periwound moisture-associated dermatitis occur when the skin adjacent to a wound or abdominal stoma is exposed to effluent from the ostomy or exudate from a wound. Routine assessment is essential and involves the stoma or wound, as well as the peristomal or periwound skin. Consistent prevention efforts and prompt treatment are likewise critical in order to prevent MASD from progressing to erosion or skin breakdown.

KEY POINTS

- ✓ Moisture-associated skin damage (MASD) is defined as inflammation and erosion of the skin caused by prolonged exposure to various sources of moisture and its contents, including urine, stool, perspiration, wound exudate, mucus, or saliva.
- ✓ The forms of MASD discussed in this article are peristomal moisture-associated dermatitis and periwound moisture-associated dermatitis, which involve similar mechanisms and pose the risk of skin breakdown.
- ✓ To prevent MASD, clinicians should be vigilant in both diagnosing and treating early stages of damage in peristomal and periwound skin.

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■ Glossary Terms

Cleansing: a specialized form of washing the skin to remove debris from (1) at-risk areas of skin and (2) the skin of at-risk patients.

Friction: force generated when 2 surfaces rub together; may be produced by rubbing of (1) skin surfaces or (2) skin and incontinence containment device.

Incontinence-associated dermatitis (IAD): inflammation of the skin associated with exposure to leaked urine or stool.

Intertriginous dermatitis (ITD): inflammation of skin folds from skin-on-skin friction caused by moisture trapped in the folds.

Maceration: softening of tissue by soaking until connective fibers can be teased apart.

Moisture-associated skin damage (MASD): inflammation and erosion of the skin caused by prolonged exposure to various sources of moisture and its contents, including urine, stool, perspiration, wound exudate, mucus, or saliva.

Occlusion: reduction or prevention of evaporation which can occur with a device (eg, ostomy pouching systems), thus precluding the drying of the skin.

Peristomal moisture-associated dermatitis: inflammation and erosion of skin related to moisture that begins at the stoma/skin junction and can extend outward in up to a 4-in radius.

Periwound moisture-associated dermatitis: inflammation and erosion of skin adjacent to chronic wounds associated with exposure to exudate or toxins from bacteria in the wound bed.

Washing: cleaning of intact skin, with either water alone (eg, peristomal skin) or a bathing product.

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- Original research reports comparing surgical outcomes for patients who undergo preoperative stoma site marking by a WOC nurse compared to patients who do not.
- Case studies, case series or original research reports focusing on stomal or peristomal complications.
- Case studies, case series or original research reports focusing on other potential sequelae of ostomy surgery including physical manifestations such as low back pain or psychosocial manifestations such as depression, altered sexual function or embarrassment.
- Original research reports confirming or challenging the assertions of the ongoing WOCN Ostomy Consensus Session including ostomy pouch wear time and minimum standards for immediate postoperative education of patient and family.