REVIEW

Ceramide-dominant moisturising cream for targeted periwound care in ageing skin

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Abstract
Age-related changes in skin barrier integrity increase vulnerability to skin damage and breakdown, often leading to conditions such as xerosis, marked by excessive dryness and itching/pruritus, and chronic wounds like venous leg ulcers (VLUs), which are characterised by compromised periwound skin and delayed healing. Regular use of moisturising creams, especially those containing ceramides as a dominant ingredient can help support and restore skin barrier integrity. While scientific evidence is limited regarding the role of ceramide-dominant moisturisers in supporting an optimal microenvironment for wound healing, a recent case study involving an 88-year-old woman who presented with a VLU on her left lower leg, exhibiting extensive slough, inflamed wound margins, maceration and significant periwound skin breakdown extending beyond the wound edge, demonstrated successful wound healing. Initial wound care further compromised the periwound skin, leaving it dry, fragile and vulnerable. Introduction of a ceramide-dominant moisturising cream applied adjunctively to the periwound area over a four-week period resulted in noticeable improvement in protecting the dry and fragile periwound skin by maintaining a favourable microenvironment for efficient wound healing. However, further research is needed to clarify the benefits of ceramide-dominant moisturisers in wound and periwound skincare.

Keywords ceramide-dominant moisturiser, compromised skin barrier, periwound skin management, venous leg ulcer.

For referencing Livingstone SL, et al. Ceramide-dominant moisturising cream for targeted periwound care in ageing skin. Wound Practice and Research 2026;34(3):121-125.

DOI https://doi.org/10.33235/wpr.34.3.121-125

Submitted 12 September 2025, Accepted 11 December 2025

Introduction
Healthy intact skin is strong, flexible and resilient, and it represents the first line of defence against harsh environmental conditions, common irritants and allergens, infections and trauma.[1] Intact skin has a well-balanced internal surveillance mechanism with an exceptional ability to preserve its structural and functional barrier integrity[2] through maintaining its hydration, a mildly acidic skin surface pH, and a beneficial microbiome.[3] Likewise, at its optimum, healthy intact skin has the capacity to rapidly repair and restore its barrier integrity following damage.[4] As people age, the skin experiences many structural and functional changes due to a combination of intrinsic (natural ageing) and extrinsic (environmental) factors.[5] These structural and functional skin changes[5] include increased dryness, elevated skin surface pH, reduced levels of natural moisturising factor, poorer water-holding capacity and reduced levels of the skin's epidermal lipids – ceramides, cholesterol and free fatty acids – within the epidermal outermost layer, the *stratum corneum* (SC). All these changes are linked to an increase in skin barrier damage and breakdown.[6] Overall, ageing skin becomes thinner, drier and more fragile, and is usually associated with impaired barrier integrity.[6] Skin ageing is associated with increased susceptibility to a wide range of age-related skin conditions including xerosis, which is characterised by excessively dry, rough, and flaky skin, and chronic wounds, such as venous leg ulcers (VLUs) that fail to heal within the expected timeframe.[7]

If not managed properly, VLUs are usually characterised by chronicity caused by an impaired or delayed healing process. Furthermore, the skin surrounding a wound, within 4cm from the wound edge, known as periwound skin, is particularly vulnerable. Although the periwound skin may appear healthy, complications frequently occur, resulting in poor wound healing outcomes. There are several wound-related factors including exposure to exudate and irritants, infection, inadequate moisture balance, poor dressing adherence or allergic reactions that may result in periwound skin damage. Periwound skin damage is likely to contribute to impaired and delayed healing, wound deterioration and increased wound size, increased infection risk, pain and

discomfort, reduced quality of life, increased treatment time and associated treatment costs.[7] Although this area of study is still emerging, there is some evidence that periwound care and protection with topical skin cleansers and moisturisers may help improve healing time and reduce complications and recurrence.[8] For example, it is likely that adjunctive treatment with ceramide-dominant topical formulations[9,10] at the optimal 3:1:1 molar ratio of lipids (ceramides:cholesterol:free fatty acids)[11] may help improve dry skin conditions and periwound/wound-associated skin barrier issues. These ceramide-dominant moisturising formulations[9,10] can help with dryness, dehydration, fragility and compromised protective barrier by reducing transepidermal water loss, promoting hydration and barrier repair, and strengthening the skin's natural barrier.[9,10] However, data regarding the effectiveness of ceramide-containing moisturising formulations, including ceramide-dominant ones, on periwound skin integrity issues associated with ulcerated wounds in aged individuals remains limited. Here we describe a spontaneous case study that adds some 'bite-sized' yet valuable insights into the clinical management of periwound skin by using a ceramide-dominant moisturiser QV DERMCARE Cream, alongside appropriate wound dressings and compression.

Moisturisers containing ceramides help promote a healthy skin barrier in older people with dry skin

Currently, there is a notable lack of established skincare protocols for managing periwound skin, especially within the ageing population. This gap highlights a pressing need to better address the skincare requirements of older adults, particularly those living with chronic wounds, such as VLUs and associated damage to the surrounding skin. Additionally, there is insufficient evidence to support the use of ceramide-based and/or ceramide-dominant moisturising creams in improving periwound skin integrity specifically in older individuals with VLUs. However, there are clinical studies[11–13] that have demonstrated that pH-balanced[14] non-irritating moisturisers and certain skin cleansers containing ceramides[11–13,15] are effective in managing dry skin conditions including eczema.[11–16] These formulations work by enhancing skin hydration, reducing transepidermal water loss and protecting the skin from irritants and allergens. Research from multiple sources[11–16] supports the use of ceramide-containing and/or ceramide-dominant cleansers and moisturisers to replenish lipid levels, restore the skin's barrier integrity, and significantly alleviate dryness in a range of skin conditions including eczema,[10–16] as well as in ageing skin.[12]

In the mid-1990s,[17,18] research demonstrated that a topical formulation containing the three primary lipids of the SC – ceramides, cholesterol, and free fatty acids – could significantly enhance skin barrier recovery. When applied in an optimal molar ratio of 3:1:1 (ceramides:cholesterol:free fatty acids), these lipid mixtures were shown to accelerate the repair of the SC, suggesting a crucial role for balanced lipid replacement in restoring barrier function after disruption.[17,18] In 2021, it was reported that the beneficial impact of a ceramide-dominant moisturising cream, QV DERMCARE Cream, and skin cleanser, QV DERMCARE Cleanser on restoring the skin barrier is likely attributed to their thoughtfully formulated blend of ingredients. Both formulations, moisturising cream and skin cleanser include a blend of humectants (that attract and retain moisture from the air or deeper skin layers), occlusives (that form a protective layer on the skin's surface to seal in moisture and prevent water loss), and emollients (to help soften, smooth and protect the skin by filling the gaps between skin cells), along with specific compounds known to support the repair of a compromised epidermal barrier. Notably, they each contain skin-identical ceramides EOP and NP, cholesterol, and linoleic acid derived from safflower oil, combined in a 3:1:1 (ceramides:cholesterol:free fatty acids) molar ratio.[10] This specific ratio is critical for enhancing skin barrier function and ameliorating the signs and symptoms of moderate eczema in adults over 28 days compared to placebo[10] – as studies have shown that incorrect proportions can actually hinder the repair process.[18] Additionally, a ceramide-dominant, physiologic lipid-based barrier repair emulsion has been shown to be effective in managing dry skin conditions and alleviating the burning and itching associated with various dermatological disorders, including eczema and irritant contact dermatitis. This formulation contains ceramides, cholesterol, and free fatty acids in a 3:1:1 molar ratio, which is considered optimal for supporting skin barrier restoration.[16]

A 4-week randomised, investigator-blinded, split-leg study in 53 women showed that a ceramide-based cleanser and moisturiser improved skin hydration, reduced xerosis symptoms, and increased SC lipid levels, with effects lasting 48 hours post-withdrawal.[19] Another study described a 28-day trial on patients aged 60+ with senile xerosis (dry, flaky skin in older adults, often accompanied by itching, burning, and a feeling of tightness), dividing them into two main cohorts and one test group. Group 1 applied a test moisturiser (urea 5%, ceramide NP and lactate) to one forearm, leaving the other untreated. Group 2 compared the test moisturiser with a control moisturiser (soft white paraffin/petrolatum and liquid paraffin). The test moisturiser significantly improved and sustained skin barrier function, supporting its use as first-line treatment for xerotic skin in older adults.[20] Furthermore, a double-blind, split-body clinical trial involving 34 participants aged 20 to 89 years with eczema evaluated the effects of a ceramide-containing cream compared to a paraffin-based moisturiser applied to the forearms and lower legs over a 4-week period. Results demonstrated that across all adult age groups the ceramide formulation led to greater improvements in skin hydration and lipid content. Additionally, enhancements in lipid bilayer organisation, SC barrier integrity, and protection against dryness and irritation were more pronounced with the ceramide-based cream than with the paraffin-based moisturiser.[21]

Based on the available research, it is clear that managing

dry skin and related itching effectively depends largely on evidence-based skincare approaches, such as using gentle cleansers and moisturisers that contain ceramides and other moisturising ingredients. These formulations support the skin's barrier function, helping to alleviate symptoms and enhance skin health overall. However, further studies are needed to determine whether these strategies are equally effective for managing dry and itchy skin in the periwound area surrounding wounds.

Ceramide-containing moisturiser for periwound skin management – a case study

While scientific evidence is limited regarding the role of ceramide-dominant moisturisers in supporting an optimal microenvironment for wound healing, a recent case study involving an 88-year-old woman with a VLU showed successful healing outcomes, highlighting a potential area for future research. An 88-year-old woman presented with a VLU on the left lateral lower leg, which developed following trauma from a door several weeks prior (Figures 1A–B). Over time, VLU became increasingly complex, necessitating thorough dermatologist's assessment (Figure 1C) and tailored management. During the dermatologist's assessment, the large silver-impregnated antimicrobial dressing previously covering the ulcerated wound bed and surrounding skin/periwound skin was carefully removed. The entire lower leg was carefully cleansed multiple times to remove all traces of silver from the wound bed and surrounding skin, reducing the risk of irritation. However, the intensive repeated cleansing led to dryness of the surrounding skin. A ceramide-dominant moisturiser QV DERMCARE Cream was applied to the skin surrounding the ulcer to form a protective barrier and help maintain moisture in the dry, fragile periwound area. After moisturising the surrounding dry skin, a new

INITIAL PRESENTATION TO DERMATOLOGY CLINIC AND ASSESSMENT:

An 88-year old woman presented to her dermatologist with a venous leg ulcer on her left lateral lower leg. The ulcer formed following an injury caused by a door a few weeks prior **(A–B)**. Cellulitis developed and the patient was put on two rounds of antibiotic treatment. A community nursing provider initially refused to apply compression therapy pending confirmation of no thrombosis. A Doppler ultrasound was conducted the day before the patient visited her dermatologist, confirming the absence of deep vein thrombosis. Additionally, a Doppler sound of the aorta and left leg arteries showed only mild peripheral vascular disease. On physical examination, pedal pulses were palpable and capillary refill was less than 2 seconds, indicating adequate peripheral perfusion.

INITIAL WOUND CARE AND ASSOCIATED COMPLICATIONS:

During the dermatologist's initial assessment **(C)** it was observed that the wound had been dressed with a large, uncut piece of a silver-impregnated antimicrobial dressing covering the ulcerated wound bed and surrounding skin. Clinical signs included significant slough within the wound bed, inflamed wound edges, maceration and breakdown of surrounding tissue. The dressing was removed and the entire lower leg was cleansed with chlorhexidine wash, focusing on removing silver residue from healthy skin to avoid undesirable skin irritation. The wound bed was irrigated with saline, followed by a wound irrigation solution to disrupt biofilm and support subsequent wound debridement. Unfortunately, repetitive and aggressive removal of silver residue left the surrounding skin dry, fragile and compromised.

OPTIMISED WOUND DRESSING STRATEGY AND MANAGEMENT OF PERIWOUND SKIN:

A ceramide-dominant moisturiser QV DERMCARE Cream, was applied around the ulcerated area, not within the wound bed, to create a protective barrier and help the dry and fragile periwound skin retain moisture while allowing the wound margins to remain stable. A silver-impregnated antimicrobial dressing was then trimmed to size and placed only over the ulcerated wound bed. A secondary dressing was used to minimise additional maceration, and to maintain moisture balance and adhere gently to surrounding intact skin. Compression was applied in the form of a double layer of an elasticated tubular bandage to support venous return and reduce oedema. This regimen was followed for four weeks **(D–G)**, with dressing changes conducted on alternate weeks by the patient's dermatology clinic and by the community nursing provider, respectively.

OUTCOMES:

After two weeks of treatment there was a noticeable improvement in the appearance and texture of the wound and the periwound skin around the ulcer as indicated by the appearance of the red, bumpy tissue (wound granulation) in the wound bed **(D–E)**. However, the wound had not yet fully healed. After four weeks of treatment **(G)**, the wound had healed and no longer required dressings. No signs of infection or further skin breakdown was observed. The patient no longer needed to attend wound clinic reviews. In addition, after eight weeks **(H)** and beyond (after fourteen weeks) **(I)** the surrounding skin around the ulcer wound bed appeared completely repaired.

Figure 1. Details of the case study.

silver-impregnated antimicrobial dressing was then cut to fit and applied directly over the ulcerated area only. To support moisture balance and protect the surrounding skin, a secondary dressing was applied. This dressing was chosen for its ability to minimise further maceration while adhering gently to healthy tissue. Compression was applied in the form of a double layer of an elasticated tubular bandage to support venous return and reduce oedema. After two weeks of treatment there was a noticeable improvement in the appearance and texture of the wound and the periwound skin around the ulcer (Figure 1D–E). After four weeks of treatment (Figure 1F–G), the wound had healed and no longer required dressings. In addition, after eight weeks (Figure 1H) and beyond (after fourteen weeks) (Figure 1I) the surrounding skin around the ulcer wound bed appeared completely repaired.

Conclusions and future directions

Skincare management for VLUs and related periwound skin remains an area of unmet clinical need. However, incorporating ceramide-containing and/or ceramide-dominant moisturisers could offer an effective solution. These products should be integrated into clinical guidelines and patient education as a routine part of comprehensive care. For example, incorporating the ceramide-dominant moisturiser, QV DERMCARE Cream, with the optimal 3:1:1 ratio of lipids (ceramides:cholesterol:free fatty acids)[10,11] in VLU management is likely to provide notable benefits including: (1) protecting periwound skin; (2) promoting barrier repair by supplying natural moisturising factor components, and essential skin lipids including ceramides, cholesterol and free fatty acids at an optimal ratio to accelerate barrier recovery[11] after cutaneous insults; and (3) allowing the wound margins to remain stable, thus leading to successful wound closure in a timely and proper manner. After the wound had healed, the patient continued to use the ceramide-dominant moisturiser, QV DERMCARE Cream, to strengthen the skin barrier and to support and protect the skin integrity, thus minimising the chance of future skin damage and injury recurrence. This spontaneous case study (Figure 1A–I) illustrates that adjunctive use of a ceramide-dominant moisturiser, QV DERMCARE Cream, may significantly contribute to the management of VLUs when applied in conjunction with appropriate wound dressings and compression therapy.

Recently, it was indicated that “with good wound care and compression therapy, VLU usually heals within 6 months”, but also that there was “an average healing time of 6–12 months for VLU,” and a high rate of recurrence within 6 months.[22] The wound and surrounding skin need to be in the best condition to promote wound healing, as well as to achieve desirable wound healing outcomes in an uncomplicated and timely manner. This seems to place this spontaneous case study within the best case results. In the future, it would be highly valuable to conduct randomised, blinded clinical trials comparing the effectiveness of a ceramide-dominant moisturising cream, such as QV DERMCARE Cream or similar formulations, with that of a non-ceramide moisturising cream. Such studies could help determine whether VLUs in elderly individuals can heal just as effectively with non-ceramide-based moisturisers, when used in conjunction with appropriate wound dressings and compression therapy. For now, skincare management for VLUs and associated periwound skin conditions remains an unmet need, which could be effectively addressed through the use of ceramide-containing and/or ceramide-dominant moisturisers. These should be included in clinical guidelines and patient education as a standard component of care.

Acknowledgements

Authors would like to thank the patient for consenting to the publication of information and photographs for this review.

Author contribution

SLL and CM conceptualised and designed the case study, collected, analysed and interpreted the data and photographs, and drafted the clinical report. SLL, CM and JC supervised the case study but have no association with the manufacturer of QV DERMCARE Cream. SDP provided educational support with regards to product features and benefits. DM contributed the literature review, prepared original manuscript, designed figures, reviewed and edited the manuscript. JPT, TC and FS contributed to writing and editing the manuscript. ML contributed to the writing and editing manuscript, and supervised the manuscript preparation. All authors have read and agreed to the published version of the manuscript.

Informed consent statement

The patient signed written informed consent to participate in the case study and for publication of relevant photographs and case study details.

Conflict of interest

Dalibor Mijaljica, Joshua P Townley, Simona Della Primavera, Tim Collins, Fabrizio Spada, and Mikayla Lai are employed by Ego Pharmaceuticals Pty Ltd, a leading manufacturer of skincare products including QV DERMCARE Eczema Daily Cream with Ceramides (QV DERMCARE Cream). The authors have no other conflicts of interest to declare.

Ethics statement

An ethics statement is not applicable.

Funding

The authors received no specific funding for this work.

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