



The Past, Present, and Future of Skin Failure

Diane Langemo, PhD, RN, FAAN and Lawrence Charles Parish, MD, MD(Hon)

INTRODUCTION

For the 35th anniversary of *Advances in Skin & Wound Care*, a variety of thought leaders have been invited to share their insight into a range of topics of current interest to the field. In this special installment of *Practice Reflections*, Dr Lawrence Charles Parish provides a preface to the subject of skin failure for the journal's coral anniversary. Following this, Dr Diane Langemo delves deeper into the context surrounding this concept. As part of the historic perspective of this commentary, legacy names for pressure injuries (PIs; eg, decubitus or pressure ulcers) are used.

Skin Failure and the Coral (35th) Anniversary

The concept of skin failure was first promulgated over 3 decades ago by the late Joseph A. Witkowski and myself.¹ For several years, we had been studying the decubitus ulcer, an exercise often bogged down by semantics and ideas that could hardly be proven. For example, we discovered that the convention of turning the patient every 2 hours reflected the lack of understanding of the tissue defect found in the pressure sore, decubitus ulcer, or even torsion stress (further evidenced by the terminology). The dogma had its basis at the onset of World War II, when injured soldiers were sent to recover at the Slade Hospital in Oxford, England. The nursing personnel were overworked, and it took them 2 hours to make rounds; hence, the 2-hour schedule was born.

We traced some of these myths to a little-known report published in 1872.² The author observed that there were two types of "bed-sores:" those found in patients with tertiary syphilis and those who were debilitated. Although these findings were directed toward patients with dementia paralytica, this contribution stimulated us to look further into the cause of the decubitus ulcer. We found the then-current concepts to be unsatisfactory.

In discussions with Terence Ryan who (with his late colleague George Cherry in Oxford) had introduced the concept of organ failure to dermatology, we asked: "Why not apply this to the breakdown of the skin?" From this, the theory of skin failure was born. No longer could the nursing service be blamed for not turning the patient, the dietary service for not adding the necessary nutrients to the diet, or others for being too rough in transporting the patient

to physical therapy. Perhaps a different way of conceptualizing these injuries was possible.

Skin Failure Then and Now: A Historical Perspective

Organs, including the skin, can dysfunction and fail at end of life, during acute critical illness, or with severe trauma. This process of organ compromise is progressive, and the failure of one organ system can and does impact other body systems. Skin, the largest organ of the body, is subject to failure just as the other body organs are.

A few centuries ago, in the 1800s, Charcot described a clinical condition of a butterfly-shaped ulcer occurring over the sacrum a short time prior to death.^{3,4} Charcot labeled this phenomenon the *decubitus ominous*. This phenomenon has intrigued health and wound care professionals for a very long time. Over the last 35 years, this phenomenon has been labeled the Kennedy terminal ulcer, then Trombley-Brennan terminal tissue injuries, and skin failure.

In 1989, Goode and Allman⁵ noted that a pressure ulcer may be a part of a syndrome of multiple organ failure. This occurs during the terminal stages of life, when blood is shunted away from the skin to preserve vital organ function. Other authors have observed that "failure of the skin as a terminal event is understated and underestimated."¹

A 1991 editorial⁶ questioned the ethics of pressure ulcers. The author stated: "The skin is the largest organ of the body. If the heart, lungs, and kidneys are showing signs of failing, isn't it logical that the skin would also show signs of failing? Why is a pressure ulcer considered a sign of inadequate healthcare, when manifestations of heart disease or lung disease or kidney disease are not?" In response to this, Witkowski and Parish published two contributions related to skin failure in 1993 and 1994.^{1,7} Their premise was that a PI that occurred at end of life might not be preventable in individuals with failure of multiple body organs. Specifically, they stated, "If the heart, lungs, and kidneys are failing, is it not logical that the body's cover would also show signs of failure?"

Skin failure came to the forefront once again in wound care with my work in 2003⁸ and 2006.⁹ In 2004, at a wound care conference presentation on skin failure and palliative wound care, I initially proposed a working definition of skin failure. In 2006, this definition was published in a comprehensive, systematic review of the seven articles

Diane Langemo, PhD, RN, FAAN, is Distinguished Professor Emeritus, College of Nursing, University of North Dakota; and President, Langemo & Associates, Grand Forks, North Dakota. Lawrence Charles Parish, MD, MD(Hon), is Clinical Professor of Dermatology and Cutaneous Biology and Director of the Jefferson Center for International Dermatology, Sidney Kimmel Medical College at Thomas Jefferson University, Philadelphia, Pennsylvania. This article is considered expert opinion and was not subject to peer review.

on skin failure from the literature at that time. Skin failure was defined as “an event in which the skin and underlying tissue die due to hypoperfusion that occurs concurrent with severe dysfunction or failure of other organ systems.”⁹ The physiologic hierarchy of the body functions to shunt blood away from the skin to maintain perfusion and nutrients as well as waste removal from vital organs.⁵

Physiologic consequences of acute skin failure (ASF) include hemodynamic changes, impaired thermoregulatory control, and metabolic complications.¹⁰

An expert panel on SCALE (Skin Changes At Life’s End) was convened and chaired by Drs Diane Krasner and R. Gary Sibbald in 2008 to develop consensus statements on the subject.¹¹ One observation from this conference was: “Skin changes at life’s end are a reflection of compromised skin (reduced soft tissue perfusion, decreased tolerance to external insults, and impaired removal of metabolic wastes).”¹¹

In 2017, Levine¹² expanded on my definition in his publication, where he noted skin failure was “the state in which tissue tolerance is so compromised that cells can no longer survive in zones of physiologic impairment such as hypoxia, local mechanical stress, impaired delivery of nutrients, and buildup of toxic metabolic byproducts.” He reported that his definition was intended to be a unifying concept that included PIs, wounds at end of life, wounds in acute illness, and multiorgan failure.¹²

Acute and Chronic Skin Failure. Skin failure can be acute or chronic or occur at end of life. Acute skin failure occurs when the skin and underlying tissue die because of hypoperfusion concurrent with a critical illness.⁹ It arises concurrently with acute illness as a result of hemodynamic instability and/or compromise of major organ systems.^{9,12,13} Several factors associated with ASF are elucidated in the scientific literature, including sepsis and septic shock, multiorgan failure and multiorgan dysfunction syndrome, poor tissue perfusion, diabetes, prolonged hypotension, use of vasopressors, severe anemia, prolonged mechanical ventilation, and impaired nutrition.^{12–17} Skin, being the largest organ of the body, obviously has multiple functions. Therefore, it is only natural that there can be multiple causes of skin failure.

Chronic skin failure occurs when the skin and underlying tissues die because of hypoperfusion concurrent with an ongoing, chronic disease state.⁹ In contrast with ASF, it occurs as a progressive decline over time in the presence of chronic illness. Patients with chronic skin failure are usually older and are confronted multiple predisposing comorbidities.⁹

End-stage skin failure occurs when the skin and underlying tissues die because of hypoperfusion concurrent with the end of life.⁹ As organs decompensate and fail in the final weeks and days of life, multiple, large, and unusual presentations of skin failure can be seen.⁹ Skin failure,

which manifests externally, is visible and aesthetically displeasing, even precipitating a more emotional response. In contrast, internal organs that are failing are not visible. This makes the appearance of skin failure more upsetting to patients and their loved ones as well as healthcare providers.

Skin Failure versus PI. It is crucial to differentiate skin failure and PI. As noted above, Levine included PI as part of skin failure. Another investigator¹² also included PI in his definition: “[ASF is a] pressure-related injury concurrent with acute illness as manifested by hemodynamic instability and/or major organ system compromise.” Not all wound care professionals support this position. Others in the wound care arena and I adhere to the position that a PI has the etiology of pressure and/or shear and that pressure is not a necessary component of skin failure. In 2012, White-Chu and I¹⁸ were quoted as saying that “Skin failure occurs without the presence of pressure and/or shear, whereas pressure, shear, or both are responsible for pressure ulcer development.”

It is true, however, that a PI and skin failure can occur concurrently in an individual.⁹ “Experts agree that the occurrence of a [PI] differs from an ulcer due to ASF.”¹³ Interestingly, a 2014 survey of 505 individuals responding to the statement “the concept of skin failure does not include pressure injuries” yielded only 39.62% who agreed. These respondents did agree with the current definition of skin failure and that it can be acute, chronic, or end of life.¹⁹ Confusion indeed exists in differentiating skin failure and PI. One writer²⁰ went so far as to say that in some studies “ASF may have been erroneously labeled as PI; however, ASF does not require factors necessary for PI development such as mechanical stress.” Another investigator agreed with this in a 2016 publication.²¹

Skin Failure Research. Although skin failure has been discussed in the published literature for some time, a paucity of scientific literature exists to validate this phenomenon, particularly the related diagnoses and conditions.²² A 2012 prospective, descriptive study²³ identified characteristics associated with skin failure in 29 critically ill adults. All participants were diagnosed with failure of the skin and at least one other organ system; 90% had failure of more than one organ system other than skin. Failure of the renal and respiratory systems was most common (89.7%, respectively).

A retrospective case-control study¹³ of 450 ICU patients sought to differentiate between PI and ASF in critically ill individuals. The researchers identified arterial disease, being mechanically ventilated for longer than 72 hours, respiratory failure, liver failure, and severe sepsis/septic shock as significant and independent predictors of ASF. The authors also noted that patients with peripheral arterial disease were almost four times more likely to develop skin failure.¹³

A follow-up retrospective case-control study was done with main and validation analyses.¹³ The random samples included 100 cases with a hospital-acquired PI and 300 controls without a hospital-acquired PI. The 11 significant and independently related variables to ASF included renal failure, respiratory failure, arterial disease, impaired nutrition, sepsis, septic shock, mechanical ventilation, vascular surgery, orthopedic surgery, peripheral necrosis, and general surgery. The researchers reported that the final model supported previous research and is consistent with the definition of ASF.¹³

A recent scoping review was done to map the use of the term *skin failure* in hopes of enhancing understanding of how it is used in clinical practice.²⁴ The authors identified 180 articles that met the inclusion criteria focused on identifying and synthesizing literature on unavoidable skin injuries appearing at end of life. Four themes were identified: (1) four names for the same problem, namely, skin failure, SCALE, KTU, and Trombley-Brennan; (2) knowledge gaps exist on the pathophysiology of the KTU as it currently is based on hypotheses; (3) differences exist between the KTU and the other injuries; and (4) gaps also exist in care approaches.²⁴

Another scoping review conducted in 2019 identified that knowledge on the KTU is limited, no validated assessment tool is available, and the KTU may be misclassified as a PI.²⁵

One assessment scale was reported in the literature based on a retrospective study of 52 acute care patients who experienced ASF prior to death. Sixteen experienced skin breakdown at typical locations on the body for a PI, whereas 36 had skin breakdown at atypical locations. Via regression analyses, 83.7% were correctly identified as probable skin failure via five variables: serum albumin less than 3.5 mg/dL, impaired blood flow, presence of sepsis/multiorgan dysfunction, vasopressor/inotrope use, and mechanical ventilation. The scale was felt to be useful in recognizing and diagnosing skin failure, although further testing is necessary.²⁶

CONCLUSIONS

There is consensus among wound care professionals that skin failure is an observable clinical phenomenon. There is also agreement that skin failure is not a PI, although both clinical phenomena can occur in the same patient. Failure of the skin (considered a nonvital organ by some) can indeed have vital consequences for the individual. Diagnostic technology is unavailable for the most part, but assessment continues to advance.

To date, much has been done to explicate skin failure as a concept and as a clinical phenomenon. Much, however, remains to be done. A gap remains in the understanding of the physiologic aspects of skin failure as well as the evidence for it. Current research is primarily limited to descriptive and correlational studies of current patient populations exhibiting the syndrome as well as retrospective reviews. Experimental research is obviously not an option. ●

REFERENCES

1. Witkowski JA, Parish LC. Skin failure and the pressure ulcer. *Decubitus* 1993;6(5):4.
2. Shaw TC. On so-called bed-sore in the insane. *St. Bartholomew's Hospital Reports*. 1872;8:130-3.
3. Levine JM. Historical perspective on pressure ulcers: the decubitus ominous of Jean-Martin Charcot. *J Am Geriatr Soc* 2005;53(7):1248-51.
4. Charcot JM. *Lectures on the Diseases of the Nervous System*. Translated by G. Sigerson. London, UK: The New Sydenham Society; 1877.
5. Goode PS, Allman RM. The prevention and management of pressure ulcers. *Med Clin N Am* 1989;74:1511-24.
6. LaPuma J. The ethics of pressure ulcers. *Decubitus* 1991;4(2):43-4.
7. Witkowski JA, Parish LC. Reply to Hoffman's Letter Nov.'93. *Decubitus* 1994;7(1):8.
8. Langemo DK. Skin: this organ fails too. Presented at the Clinical Symposium on Skin and Wound Care; Phoenix, AZ; October 1-3, 2004.
9. Langemo DK, Brown G. Skin fails too: acute, chronic and end-stage skin failure. *Adv Skin Wound Care* 2006;19(4):206-11.
10. Inamadar AC, Palit A. Acute skin failure: concept, causes, consequences and care. *Int J Dermatol Venerol Leprol* 2005;71(6):379-85.
11. Sibbald RG, Krasner DL, Lutz JB, et al. Skin Changes of Life's End (SCALE): a preliminary consensus statement. *WCET J* 2008;28(4):15-22.
12. Levine JM. Skin failure: an emerging concept. *JAMDA* 2017;17(7):666-9.
13. Delmore B, Cox J, Rolnitzky OL, Chu A, Stolfi A. Differentiating a pressure ulcer from acute skin failure in the adult critical care patient. *Adv Wound Care* 2015;28(11):514-24.
14. Cox J. Predictors of pressure ulcers in adult critical care patients. *Am J Crit Care* 2011;20:364-74.
15. Jensen GL, Wheeler D. A new approach to defining and diagnosing malnutrition in adult critical illness. *Curr Opin Crit Care* 2012;18:206-11.
16. Aronovitch SA. Intraoperatively acquired pressure ulcers: are there common risk factors? *Ostomy Wound Manage* 2007;53(2):57-69.
17. Delmore B, Lebovits S. Pressure ulcer risk in cardiovascular patients—what's the common thread? *WCET J* 2010;30:34-7.
18. White-Chu EF, Langemo DK. Skin failure: identifying and managing an unrecognized condition. *Ann Long Term Care* 2012;7:28-32.
19. Sibbald RG, Ayello EA. Terminal ulcers, SCALE, skin failure, and unavoidable pressure injuries: results of the 2019 terminology survey. *Adv Skin Wound Care* 2020;3:137-45.
20. Dalgleish L, Campbell J, Finlayson K, Coyer F. Acute skin failure in the critically ill adult population: a systematic review. *Adv Skin Wound Care* 2020;2:76-83.
21. Olshansky K. Organ failure, hypoperfusion, and pressure ulcers are not the same as skin failure: a case for a new definition. *Adv Skin Wound Care* 2016;29(4):150.
22. Delmore B, Cox J, Smith D, Chu AS, Rolnitzky L. Acute skin failure in the critical care patient. *Adv Skin Wound Care* 2020;33(4):192-201.
23. Curry K, Kutash M, Chambers T, Evans A, Holt M, Purcell S. A prospective, descriptive study of characteristics associated with skin failure in critically ill adults. *Ostomy Wound Manage* 2012;58(5):36-43.
24. Dalgleish L, Campbell J, Finlayson K, et al. Understanding skin failure: a scoping review. *Adv Skin Wound Care* 2021;34:542-50.
25. Latimer S, Shaw, Hunt T, Mackrell K, Gillespie B. Kennedy terminal ulcers. *J Hosp Palliat* 2019;21(4):257-64.
26. Hill R, Peterson A. Skin Failure Clinical Indicator Scale: proposal of a tool for distinguishing skin failure from a pressure injury. *Wounds* 2020;32(10):272-8.