

Recurrence of Chronic Ulcers

There is an extraordinarily high rate of recurrence of chronic wounds.^{1,2,3,4} This is due in great part to the very slow strengthening process during the remodeling stage of wound healing.^{5,6,7} By protecting the fragile skin at this stage, the rate of recurrence might be decreased.^{8,9,10,11,12,13}

The remodeling phase is an overlooked and critical stage of wound healing

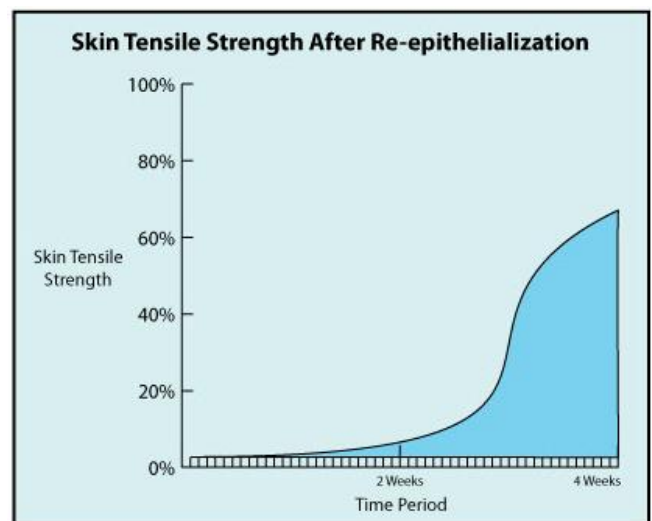
Remodeling is the final phase of wound healing after re-epithelialization. During this phase, the healing wound gains tensile strength as new collagen is formed into increasingly larger bundles with more intermolecular crosslinks.^{14,15,16} It includes a reorganization of new collagen fibers, forming a more organized lattice structure that progressively continues to increase wound tensile strength. The remodeling process continues for up to two years.^{5,6,7} This is a particularly vulnerable period for reulceration because the newly healed ulcer is not fully mature and is not yet able to withstand the vertical and shear stresses placed on it.¹³

The skin is very fragile during the remodeling stage

At the time of epithelial resurfacing, skin tensile strength is highly inadequate.

- At 2 weeks post epithelialization, the skin has less than 4% of the strength of healthy skin.¹⁵
- Even at 3-4 weeks post epithelialization, the skin strength starts to plateau at 40-70% of normal strength.^{16,34,35}
- Most healed wounds never exceed 70-80% of the strength of the original pre-wounded skin.^{5,6,7}

Typically, pressure ulcers reoccur within the first 6 months following initial ulcer healing, but predominately within the first 3 or 4 weeks after initial healing.¹³



Recurrence rates are high during the remodeling phase

Depending on the population studied, recurrence rates for chronic wounds in adults are between 13% and 83%.^{1,2,3,4} Examples of recurrence rates:

- 70%** The three year recurrence rate of diabetic foot ulcers, once healed.¹⁷
- 36-50%** The one year recurrence rate of pressure ulcers in people with SCI.^{18,19}
- 82%** Recurrence rate of pressure ulcers in paraplegics.²⁰
- 13-83%** Recurrence rate of pressure ulcers in entire adult population.^{1,2,3,4}
- 30-57%** Recurrence rate of patients with diabetes mellitus (DM) and peripheral neuropathy.^{9,10,11,12,13}
- 72%** Recurrence rate of patients with venous ulcers.²¹
- 33-43%** Two to twelve year recurrence rate of pressure ulcers that had been treated with cutaneous or musculocutaneous flaps.^{22,23}

Prevention of recurrence

Although all extrinsic factors should be addressed in the prevention of ulceration, the factors that affect the fragility of skin the most during the remodeling phase must be minimized to prevent recurrence.¹³ Pressure, shear and friction forces have a severely detrimental effect on new and healing skin, and their reduction has a significant potential to reduce recurrence rates.^{24,25,26,27,28,29,30,31,32} For example, a study evaluating pressure offloading using orthopedic shoes resulted in a drop of recurrence rate for diabetic ulcers from 83% to 17%.³³

Conclusion

Chronic ulcer recurrence is a serious and largely unaddressed problem. By continuing treatment during the remodeling phase, a large number of chronic wounds could be prevented.

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