

Scarless Wound Healing

Edited by Hari G. Garg and Michael T. Longaker

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A Review by Ranella J. Hirsch, MD,
New York, New York

In reviewing this text for the general readership of *Cutis*[®], a preface is needed. This text represents far more than the average clinician will likely ever need on the subject of wound healing, but for those with a research interest in the area, it represents a remarkably detailed and thorough resource on the subject.

Although it is not yet a reality, scarless wound healing represents the hope of many. The 36 contributors to this book give a thorough review of the science of wound healing.

The book reviews the chemistry of scarring, focusing on the role of dermatan sulfate proteoglycans and the structural changes they undergo in scar development. Assorted scar types are the product of differences in the size of the glycosaminoglycan side chains, alterations in the degree and location of sulfation, changes in size of the protein core, epimerization alterations, and different proportions of particular proteoglycan types.

Proteoglycan sulfonation is discussed as a possible remedy for scarring. It is the sulfates (heparin and dermatan/chondroitin) that function as the "business ends" of the proteoglycan and act as receptors or facilitators of intercellular interactions.

The role of several molecules in the wound repair process are discussed in detail, including syndecans (cell surface proteoglycans synthesized with covalently attached heparin sulfate glycosaminoglycan chains), integrins (structural molecules essential in cell adhesion and signal transmission), and collagen. There is an excellent review relating collagen to wound repair and scar creation. The authors discuss the features of collagen, its tensile strength, and role in wound contraction.

There is also a fascinating section on fetal wounds that provides a paradigm of scarless wound repair. Fetal wounds "demonstrate faster reepithelialization, occur in a sterile environment, and have a reduced inflammatory response and decreased angiogenesis. Such scarless healing is also notably associated with a prolonged increased hyaluronic acid content as compared with scar-forming wounds." A later chapter discusses characteristics of fetal wound healing. With increasing technology facilitating earlier prenatal diagnosis, an understanding of how the fetus is able to heal early-gestation cutaneous injury without scar will permit

repair of a variety of disorders that currently necessitate postoperative scarring. Ultimately there is the intriguing possibility of its application towards improvement of adult wound healing.

Several chapters explore the role of hyaluronan in wound repair. Recent research has shown beneficial effects with the application of hyaluronan on dermal wounds. Evidence suggests that hyaluronan will be a pivotal entity in the evolution of optimal wound healing and decreased scarring.

Other chapters discuss keloid biology, the biology of dermal proliferative disorders, the role of transforming growth factors- β (TGF- β) in cutaneous scarring, and organ regeneration in the skin and peripheral nerves.

Another chapter reviews recent advances in the study of embryonic wound healing. Studies in the mouse embryo suggest that the stage at which wounds result in scars rather than heal in a scarless manner in fetal life is at approximately the same time as platelets are first seen. This suggests the presence of an acute inflammatory response that likely leads to a sustained release of many growth factors and cytokines, most notably TGF- β 1, which is released in excess at the wound site. The reduction of TGF- β 1 yields more perfect healing with less scar formation and provides an arena for further study.

A section of relevance to practicing dermatologists gives an overview of skin substitutes. In the management of burn patients and children with genetic skin disorders, skin substitutes provide wound coverage and improve cosmesis. However, even the best results with skin substitutes do not compare to the outcome of a carefully applied full thickness skin graft. This is clearly one area that will be extensively studied for years to come.

In summary, *Scarless Wound Healing* provides a welcome addition to the available literature on the subject. Although most of this book goes into greater detail than what is likely to be of interest to the average clinician, several chapters could be applicable to many practitioners. Most applicable are the chapters on fetal scar biology and skin substitutes. Overall, this book represents a wonderful resource for anyone interested in understanding the physiology of scarring and what the future holds for scarless healing.

To order this book, please telephone Marcel Dekker at 800-228-1160.