Cutaneous scarring: Pathophysiology, molecular mechanisms, and scar reduction therapeutics

Part II. Strategies to reduce scar formation after dermatologic procedures

Christos Tziotzios, MA, MB, BChir (Cantab), MRCP (UK),[a] Christos Profyris, MA, BM, BCh (Oxon), MRCS (Eng),[b] and Jane Sterling, MA, MB, BChir, PhD (Cantab), FRCP[c]
Cambridge and London, United Kingdom

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After completing this learning activity, participants should be able to describe the variety of approaches commonly used by the practicing dermatologist for scar reduction; delineate the scientific evidence for currently available antiscarring agents; discuss novel and promising antiscarring agents; correlate the mechanism of action of these innovative agents and some of the conventional modalities with the molecular pathophysiology of cutaneous scarring; and discuss the value of translational research and describe the rationale for further work in this area.

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The evidence base underpinning most traditional scar reduction approaches is limited, but some of the novel strategies are promising and accumulating. We review a number of commonly adopted strategies for scar reduction. The outlined novel agents are paradigmatic of the value of translational medical research and are likely to change the scenery in the much neglected but recently revived field of scar reduction therapeutics. (J Am Acad Dermatol 2012;66:13-24.)

Key words: antiscarring agents; cutaneous scar reduction strategies.

ANTISCARRING STRATEGIES

A cutaneous scar results from overgrowth of fibrous tissue after damage to the skin after injury or surgery and represents an exuberant healing response.[1] The type of scar depends on how exuberant the healing response is, with hypertrophic scars not extending beyond the wound borders and keloids extending. The former are clinically more favorable than the latter because they are more amenable to treatment and often even regress spontaneously.[2] Both types of cutaneous scarring are underpinned by similar pathobiologic processes, and it is not surprising that they respond to the same physical or pharmacologic interventions. They are managed similarly and we therefore refer to the two terms interchangeably in this article.

Hypertrophic and keloid scars can be associated with physical and psychological symptoms, yet no major advances have been achieved so far in scar reduction therapeutics. This is probably because of the limited commercial interest and subsequently insufficient research investment in the field. Little research investment entails little product return and little evidence basis for any conventional treatment modality.

In Part II of this review, we aim to recap and evaluate management steps that can be taken to reduce the risk of hypertrophic or keloid scarring and to treat such scars if they develop (please see Table I for an overview), and also to look to the future for therapies that may give a better result profile for skin surgery. The value of translational research will become apparent, and we recommend consulting part I of this review for a better appreciation of the molecular basis of scar therapeutics.

CAPSULE SUMMARY

- "Will there be a scar?" From minor operative procedures to trauma-related surgery, this question is often at the center of patient-related concerns.
- In order to address the aforementioned common clinical question, this review aims at critically reviewing conventional and innovative strategies that may be adopted to minimize scarring following dermatologic procedures.
- Identifying high risk is paramount to hypertrophic scar prophylaxis, as is clean surgery and good wound care.
- Nonsurgical scar reduction strategies include numerous over-the-counter products, such as onion extracts and Vitamin E -based remedies, not supported by a sufficient evidence base.
- Intralesional corticosteroids, 5-fluorouracil, bleomycin, and lasers are commonly used in clinical practice, while radiation and surgical revision are only seldom-used modalities.
- Human recombinant interleukin-10 and, to a lesser extent, mammose-6-phosphate, are innovative and promising products of translational research that are currently under development for cutaneous scar reduction.
- More extensive and better trials are essential for numerous other agents that have shown promise but have been tested only sporadically.

PRACTICAL PROPHYLACTIC CONSIDERATIONS

Key points

- **Identifying high risk is paramount to preventing hypertrophic scarring after dermatologic procedures**
- **Certain high-pressure body sites are more likely to show exaggerated scarring, and patients of Afro-Caribbean descent and those with personal or family history of scarring are at increased risk of engaging in such a response**
- **Minimizing skin tension and the inflammatory response after surgery by using the appropriate materials and ascertaining clean surgery and good wound care are simple practical prophylactic measures**

An individual at increased risk of developing a thickened scar may benefit from certain prophylactic measures to reduce this risk when skin surgery is contemplated. If surgery is urgent or if the procedure is of medical importance, such as skin cancer therapy, then a detailed approach to scar minimization measures may seem irrelevant.

From Addenbrooke's Hospital,[a] Cambridge University Hospitals NHS Foundation Trust, Cambridge; Department of Plastic and Burns,[b] Chelsea and Westminster Hospital, London; and the Department of Dermatology,[c] University of Cambridge, Cambridge University Hospitals NHS Foundation Trust, Cambridge, United Kingdom.

Reprint requests: Christos Tziotzios, MA, MB, BChir (Cantab), MRCP (UK), Addenbrooke's Hospital, Cambridge University Hospitals NHS Foundation Trust, Hills Road, Cambridge CB2 0QQ, Cambridge, United Kingdom. E-mail: ct287@cantab.net.

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