

NEWS, VIEWS, AND REVIEWS

Scar Wars: A Review of Topical Scar Therapies

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BACKGROUND

Scarring is a natural part of the wound healing process, but it may result in disfigurement, functional limitations, psychosocial distress, discomfort, pruritus, and pain, highlighting the need for preventative and therapeutic strategies.[1-3] Given the range of available topical scar treatments, many of which are accessible over-the-counter (OTC), clinicians often encounter patients seeking guidance on their use. This review evaluates the efficacy of common topical therapies, including silicone products, retinoids, pressure therapy, corticosteroids, and cannabinoids, to inform clinical decision-making and support patient counseling.

Pathophysiology of Scar Formation

Scar formation is believed to result from the replacement of normal dermal architecture with fibroblast-driven collagen bundles, producing dense, disorganized tissue.[4] It's hypothesized that scar dehydration, resulting from impaired stratum corneum barrier function and transepidermal water loss (TEWL), may stimulate fibroblast activity and promote hypertrophy.[5]

Silicone

Silicone-based products are currently available in various formulations, including gels, sheets, and liquids, and are considered the gold standard treatment for scar management.[6,7] Silicone enhances stratum corneum hydration, thereby promoting keratinocyte migration and re-epithelialization.[6] It has also been hypothesized to reduce capillary exudation, fibroblast proliferation, and collagen deposition.[6] In a meta-analysis, Wang et al reported that silicone gel demonstrated greater efficacy in post-operative scar prevention compared with placebo or no treatment at six months.[7] Data indicates that silicone gel sheets should be applied for up to 12 hours a day over a duration of 12 to 24 months.[5] In contrast, De Decker et al found that silicone gel was less effective than occlusive moisturizers in reducing TEWL, suggesting that previously observed benefits may derive primarily from their hydrating and occlusive properties rather than from silicone itself.[5] Silicone products are generally safe, but may cause mild irritation and skin maceration.[6] While substantial evidence supports the role of silicone in scar management, emerging data suggest that its benefits may be replicated or even enhanced in other topicals that promote hydration and occlusion.

Retinoids

Retinoids, derived from vitamin A, are frequently utilized in scar remodeling for their ability to enhance follicular epithelial turnover and modulate fibroplasia, collagen synthesis, and angiogenesis.[8,9] In a Phase II study, Loss et al evaluated the efficacy of adapalene gel 0.3% in 20 patients with moderate to severe atrophic acne scars.[10] Patients applied adapalene once daily for four weeks, then twice daily for 20 weeks. After 24 weeks, 55.6% of patients demonstrated a 1-or 2-grade improvement on the global scarring scale.[10] Additionally, 83% of patients reported improved skin texture, and 89% reported improved atrophic scarring, though the results are limited by the absence of a control group and small sample size.[10] Retinoid initiation requires careful management due to potential cutaneous irritation.[9] Common adverse effects include peeling, dryness, and erythema, typically arising during the initial weeks and mitigated through gradual initiation, patient education, and protective skincare.[9]

Pressure Therapy

While the exact mechanism of pressure therapy remains unclear, it is proposed that mechanical compression reduces oxygen delivery to the wounded site.[11] This hypoxic environment may inhibit collagen synthesis and downregulate transforming growth factor-β1 (TGF-β1) activity, thereby limiting fibroblast proliferation and minimizing wound contracture.[11,12] In a prospective cohort study of 18 patients with 26 hypertrophic scars, 10 received pressure therapy and 16 served as controls.[12] Patients in the treatment group wore garments delivering 15 mm Hg of pressure for 23 hours daily over 3 months. Significant improvements in Vancouver Scar Scale, scar thickness, and erythema were observed compared with controls.[12] Despite suggested efficacy, patient adherence remains a challenge due to discomfort and the need for near-continuous wear.[3]

Topical Corticosteroids

The role of topical corticosteroids (TCS) in managing scar-related symptoms, including pain and pruritus, and in promoting scar regression has been proposed based on their well-documented pharmacological effects.[13] Specifically, TCS suppress inflammation, reduce fibroblast proliferation, inhibit angiogenesis, and promote remodeling of the extracellular matrix.[13] In a prospective study of 32 patients with hypertrophic scars and 9 with keloids treated with 0.1% triamcinolone acetonide lotion twice daily for 3-7 months,

improvement rates were 84.4% and 44.4%, respectively.[13] However, evidence supporting their efficacy in scar prevention and treatment remains limited due to the few adequately powered randomized controlled trials. Prolonged or unsupervised use may increase the risks of skin atrophy, depigmentation, pruritus, and telangiectasia, emphasizing the importance of patient education and clinical monitoring.[13]

Cannabinoids

Cannabinoids have been implicated in wound healing and modulation of inflammation, primarily through the activation of cannabinoid receptors.[14] Activation of these receptors, particularly cannabinoid type 2 receptor agonists, has been shown to reduce the expression of pro-inflammatory cytokines, enhance anti-inflammatory mediators, and potentially promote epigenetic changes, such as DNA methylation, which are hypothesized to accelerate the wound healing process.[15,16] Additional studies report accelerated wound closure, enhanced re-epithelialization, decreased collagen deposition, and reduced oxidative stress following cannabinoid treatment.[15] In a case series of three patients with epidermolysis bullosa (EB), topical cannabidiol (CBD) led to significant improvements in pain and wound healing rates, despite the lack of a standardized dosing regimen.[15] Similarly, an international survey of 71 EB patients and their caretakers indicated that both oral and topical CBD use improved pain, pruritus, and wound healing outcomes.[15] In a retrospective study, Kong et al evaluated the effects of a topical CBD-enriched ointment applied twice daily for three months in 20 patients with psoriasis (n=5), atopic dermatitis (n=5), and resulting outcome scars (n=10).[14] The treatment resulted in significant reductions in scarring and cutaneous blemishes, with no reported adverse effects.[14]

CONCLUSIONS

Despite the substantial volume of research on scar management, many studies analyze the same primary data or produce inconclusive or contradictory results, complicating the development of standardized guidelines. This review evaluates the efficacy of topical silicone products, retinoids, pressure therapy, corticosteroids, and cannabinoids. Silicone-based products, which optimize hydration and occlusion, are considered first-line treatment, though similar effects may be achieved with certain OTC occlusive moisturizers, warranting further investigation. Retinoids enhance epithelial turnover, playing an important role in scar treatment. Pressure therapy, while effective, may yield low patient compliance due to discomfort and prolonged wear requirements. Topical corticosteroids and cannabinoids show potential but require evaluation in large, randomized trials. Given the complex pathophysiology of scar formation and variability in individual responses, combination therapies may offer superior outcomes and should be explored in future studies.

DISCLOSURE

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