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A Comprehensive Approach To Wound Scars: Modern Medicine And Ayurvedic Perspectives

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Abstract

Scarring is a natural consequence of the wound healing process, yet its implications often extend beyond aesthetics, impacting physical function and psychological well-being. This article presents a comprehensive overview of wound scars, integrating insights from both modern medical science and Ayurvedic traditions. It outlines the biological mechanisms of scar formation through the four phases of wound healing, classifies different scar types, and identifies key risk factors influencing scar development. Contemporary management strategies including topical agents, intralesional injections, laser therapy, and emerging modalities such as platelet-rich plasma and microneedling are critically evaluated. Additionally, the psychosocial burden of scarring is acknowledged, highlighting the need for a multidisciplinary treatment approach. The Ayurvedic perspective enriches this discussion by emphasizing traditional principles from Acharya Sushruta, including the concept of *Savarnikarana* and various herbal, surgical, and para-surgical interventions aimed at enhancing cosmetic outcomes. By bridging conventional and holistic approaches, this article advocates for integrative scar management that addresses both medical and aesthetic concerns, ultimately aiming to restore form, function, and confidence in affected individuals.

Key words: Scar formation, Scar types, Scar management, Multidisciplinary approach

Introduction

Scarring is an inevitable outcome of the body's natural healing response to injury. While scars are often perceived as mere cosmetic concerns, they can have significant physical, psychological, and functional consequences. Wound scars may result from various causes including trauma, surgery, burns, or chronic wounds. The nature of a scar is influenced by several factors, including the type and depth of the wound, the individual's age, genetics, and healing environment. Understanding the biology of scarring, its types, and the methods for its prevention and treatment is essential in both clinical and cosmetic settings. This article aims to explore the fundamentals of wound scarring, current management strategies, and evolving advancements in scar care.

Methods

1. Wound Healing and Scar Formation

Wound healing is a complex, dynamic process that occurs in four overlapping phases: hemostasis, inflammation, proliferation, and remodeling. Scarring typically results during the remodeling phase when the extracellular matrix is rebuilt, and type III collagen is replaced by type I collagen.

The body's primary goal is to restore skin integrity rapidly rather than perfectly. As a result, the regenerated tissue lacks the original dermal appendages such as sweat glands and hair follicles, resulting in a scar.

2. Types of Scars

Scars are broadly classified into several types

- ❖ Normotrophic Scars: These lie flat and are the result of normal wound healing.
- ❖ Hypertrophic Scars: Raised, red scars confined within the boundaries of the original wound. Often resolve over time.
- ❖ Keloids: Overgrown scar tissue that extends beyond the original wound margin. These are often persistent and may recur after treatment.
- ❖ Atrophic Scars: Depressed scars, commonly seen in acne or after chickenpox.
- ❖ Contracture Scars: Often result from burns, leading to tightening of the skin that can impair movement.

3. Risk Factors for Scar Formation

- ❖ Several intrinsic and extrinsic factors influence scar development:
- ❖ Genetic predisposition (especially for keloids)
- ❖ Wound depth and location
- ❖ Infection and delayed healing
- ❖ Age and skin type
- ❖ Tension across the wound site

4. Clinical Evaluation of Scars

Scars are evaluated based on:

- ❖ Color and texture
- ❖ Height and pliability
- ❖ Pain or itch
- ❖ Impact on function or aesthetics
- ❖ Scoring systems such as the Vancouver Scar Scale or Patient and Observer Scar Assessment Scale (POSAS) are used for objective assessment.

5. Preventive Measures

- ❖ Effective scar prevention begins with appropriate wound care:
- ❖ Early and meticulous wound closure using atraumatic techniques
- ❖ Avoidance of wound infection
- ❖ Application of occlusive dressings to maintain a moist healing environment
- ❖ Silicone gel sheets or topical silicone, widely used for reducing hypertrophic scars and keloids

Discussion

1. Treatment Modalities for Scar Management

- ❖ Treatment depends on the type and severity of the scar and may include:
- ❖ Topical Agents: Silicone gel, corticosteroids, onion extract, and vitamin E—though evidence is variable.
- ❖ Intralesional Injections: Corticosteroids (e.g., triamcinolone acetonide) are effective for hypertrophic and keloid scars, often combined with 5-FU or bleomycin for enhanced effect.
- ❖ Laser Therapy: Pulsed dye laser (PDL) and fractional CO₂ laser help reduce redness, improve texture, and stimulate collagen remodeling.
- ❖ Surgical Revision: Excision followed by appropriate closure techniques can improve scar appearance but may risk recurrence, especially in keloids.
- ❖ Pressure Therapy: Used mainly in burn patients, particularly helpful in early scar remodeling.
- ❖ Radiotherapy: Occasionally used post-keloid excision to reduce recurrence but must be used cautiously due to long-term risk of malignancy.
- ❖ Emerging Therapies: Platelet-rich plasma (PRP), stem cell therapy, and microneedling combined with topical applications are under exploration with promising results.

2. Psychological and Social Impacts of Scars

- ❖ Scars can cause psychosocial distress, particularly when located in visible areas like the face or hands. This may affect self-esteem, social interactions, and even lead to anxiety or depression. A multidisciplinary approach involving dermatologists, plastic surgeons, and psychologists may be needed in severe cases.

3. Ayurvedic perspective of scars

Samyak Roodha Vrana

रूढवर्तमानम् अग्रन्थिम् अशूनम् अरुजं व्रणम् ।
त्वक्सवर्णं समतलं सम्यग्रूढं विनिर्दिशेत् ॥२०॥

- Margins which are healed
- Which do not have any eruption
- Absence of swelling
- Absence of pain
- Attained normal colour and uniform surface

Ayurvedic principles of management of Roodha Vrana

Acharya Sushruta elaborates on various treatment principles for Vrana Chikitsa (wound management) in the *Dvivraniya Chikitsa Adhyaya*. He describes sixty treatment modalities under the concept of Shasti Upakrama.¹ These principles are not confined solely to wound management but have a broad spectrum of applications, including the early stages of *Vranashopha* (inflammation), surgical interventions for Vrana, and techniques for managing *Ruda Vrana* (scar tissue) to achieve improved cosmetic outcomes. Various surgical, para-surgical, and medical treatments aimed at restoring the skin's natural appearance are collectively described under *Savarnikarana*.

Methods of Savarnikarana

- उत्सादनम् - Raising the floor
 - अवसादनं - Removal/ leveling the excess growth
 - मृदुकर्म - Softening procedures
 - दारुणकर्म - Hardening procedures
 - कृष्णकर्म - Pigmenting /blackening
 - पाण्डुकर्म - Depigmentation
 - रोमसञ्जननं - Encouraging hair growth
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- Ayurveda offer herbal formulations and therapies for scar management, including:
 - Lepa (herbal pastes) using Haridra, Manjishtha, Kumkumadi taila
 - Abhyanga (massage) to improve circulation
 - Raktamokshana (bloodletting) in chronic scar pain
 - Internal medications to support tissue regeneration and reduce inflammation

Conclusion

Scar formation is an inherent outcome of wound healing, yet its impact extends beyond the skin surface. While some scars fade with time, others may become problematic, affecting function and appearance. Early and appropriate wound care, along with individualized scar management, can significantly improve outcomes. The combination of conventional treatments with newer biotechnological approaches and complementary therapies offers a comprehensive strategy for scar care. Ongoing research into molecular pathways and regenerative medicine continues to bring hope for scarless healing in the future.

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