



The Mechanism for Repair in Wound Healing

By Gay Wardle

The treatments that we perform in our salons are becoming more and more invasive to the skin. Results show that by doing these treatments we are able to slow down ageing, improve the texture of the skin and reduce scar tissue. Skin needling, IPL treatments and deeper-level peels are all excellent treatments that give us these results.

As some of these treatments may cause a trauma it is important that we also understand how the skin will respond to a wound and the mechanisms that affect its healing process. In this article I am covering the body's physiological responses and mechanisms that it will perform to enable it to heal the wound. It is also important to understand that the body will also require the right nutritional support in order to perform this repair.

THE PROCESS OF WOUND HEALING

Wound healing is a biological process that begins with trauma and ends with scar formation. There are two types of tissue injury. These are full and partial thickness. Wound healing, or wound repair, is an intricate process in which the skin repairs itself after injury. In normal skin, the epidermis and dermis exists in a steady-state equilibrium,

forming a protective barrier against the external environment. Once the protective barrier is broken, the normal physiological process of wound healing is immediately set in motion.

Partial thickness injury is limited to the epidermis and superficial dermis, with no damage to the dermal blood vessels. The healing process here occurs by regeneration of other tissues. Full-thickness injury involves loss of the dermis and extends to deeper tissue layers, and disrupts dermal blood vessels. Wound healing involves the synthesis of several types of tissue and scar formation.

THE 3 PHASES OF REPAIR

The classic model of wound healing is divided into three or four sequential, yet overlapping, phases:

- **Phase 1** – Lag (which is part of the homoeostasis and inflammatory stage)
- **Phase 2** – Proliferative
- **Phase 3** – Remodelling

Upon injury to the skin, a set of complex biochemical events takes place in a closely orchestrated cascade to repair the damage. Within minutes post-injury, platelets (thrombocytes) aggregate at the injury site to form a fibrin clot. This clot acts to control active bleeding (homoeostasis). The fibrin clot acts like a highway for the migration of cells into the wound site. Within the first four hours of injury, neutrophils begin to appear. In the inflammatory phase, bacteria and debris are engulfed by monocyte or macrophage. Debris is phagocytosed and removed, and factors are released that cause the migration and division of cells involved in the proliferative phase.

Next the monocyte, or macrophage, appear, which are part of our lymphatic system. The function of these cells includes the killing of microbes, the breakdown of wound debris, and the secretion of cytokines that initiate the proliferative phase of repair.

Synthetic cells, or fibroblasts, proliferate and synthesise new connective tissue, replacing the transitional fibrin matrix. At this time, an efficient nutrient supply develops through the arborisation (terminal branching) of adjacent blood vessels. This ingrowth of new blood vessels is called angiogenesis.

This new and very vascular connective tissue is referred to as granulation tissue. Let's look at the three phases of repair a little more closely.

LAG PHASE

The first phase of repair is called the **lag or inflammatory phase**. The inflammatory response is dependent on the depth and volume of tissue loss from the injury. Characteristics of the lag phase include acute inflammation and the initial appearance and infiltration of neutrophils. Neutrophils protect the host from microorganisms and infection. If inflammation is delayed or stopped, the wound becomes susceptible to infection and closure is delayed.

PROLIFERATIVE PHASE

The **proliferative phase** is the second phase of repair and is anabolic in nature. The lag and remodelling phase are both catabolic processes. The proliferative phase generates granulation tissue. In this process, acute inflammation releases cytokines, promoting fibroblast infiltration of the wound-site, then creating a high density of cells.

Collagen is the major connective tissue protein produced and released by fibroblasts. The connective tissue physically supports the new blood vessels that form, while endothelial cells promote the growth of new vessels. These new blood vessels are necessary to meet the nutritional needs of the wound healing process. The mark of wound closure is when a new epidermal cover seals the defect.

REMODELLING PHASE

The process of wound healing continues beneath the new surface. This is the **remodelling or maturation phase** and is the third phase in healing.

In the maturation and remodelling phase, collagen is remodelled and realigned along tension lines and cells that are no longer needed are removed by apoptosis. However, this process is not only complex, but fragile, and susceptible to interruption or failure, leading to the formation of chronic non-healing wounds. Factors which may contribute to this include diabetes, venous or arterial disease, old age, and infection.

THE ROLE OF NUTRITION

Providing proper nutrition is important in order to support the healing process. Protein is essential for wound repair and regeneration. Without essential amino acids, angiogenesis, fibroblast proliferation, collagen synthesis and scar remodelling will not occur. Amino acids also support the immune response. Adequate amounts of carbohydrates and fats are needed to prevent the amino acids from being oxidised for caloric needs. Glucose is also needed to meet the energy requirements of the cells involved in wound repair. Albumin deficiency is the most important indicator of malnutrition because it is sacrificed to provide essential amino acids if there is inadequate protein intake during wound repair. Other nutrients include vitamin A, zinc, vitamin C, vitamin E and iron.

Starving the body of good nutrition will have an enormous effect on wound healing, so knowledge and information on nutrition should be part of your protocols. **APJ**

Ref: *Encyclopedia of Surgery.*

Gay Wardle is greatly respected as a trainer and educator in the aesthetic industry. She is a multi-award winner having received 14 business and industry awards for the achievements of her two salons in Queensland. Gay travels extensively throughout Australia training salons in IPL and equipment technology and also conducts training in the Advanced Skin Analysis Pastiche Method. Gay is currently pursuing a degree qualification in Dermal Sciences with Victoria University. She trains others on her highly successful strategies that come from a strong understanding of what drives a salon to succeed and how to be known for exceptional results. Gay can be contacted on 0418 798 455.



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