

Scars: General Information

Any wound that breaches the dermis results in a scar. Only superficial epidermal injuries heal without scarring. The scar formation is a very complex process that we understand in part, but cannot presume to have fully fathomed.



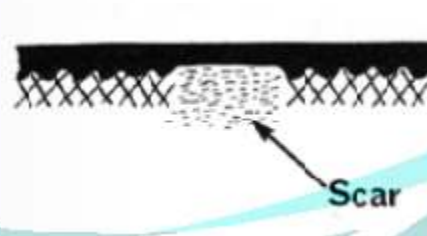
When a wound is formed, the injured blood vessels vasoconstrict for a period of approximately 45 minutes. Once blood clot formation [has happened] at the site of the vascular injury, active vasodilation begins after about one hour, and then cellular events start to occur. Initially, [polymorphonucleocytes] are released into the wound and their function is to phagocytose debris and start to autolyze the wound.



Vasodilation continues on over the next week, while the number of white cells being released into the wound increases. At the same time, epithelialization in the surface of the wound begins within a day of wound formation. After a couple of days, the white cells start to differentiate into fibroblasts and collagen synthesis begins.



In a small wound, epithelialization will have completed after about a week or two, but the cellular events continue to unfold. The PMN cell count drops off and fibroblasts are the predominant active cell in the wound. Collagen synthesis starts in earnest, and wound contraction starts to occur.



After about a month, active vasodilation is still going on, mononucleocytes are the predominant wound cell, epithelialization is complete, collagen synthesis is starting to [peter off], wound contraction is still occurring and collagen remodelling is in [full swing]. Vasodilation persists for quite some time and collagen remodelling becomes the main feature of the wound underneath the healed epithelium.

There are numerous growth factors that influence the process as well as other factors that are less well understood. For example, epithelium releases [EDFTGF alpha AFGF, beta FGF EGF] smooth muscle releases [PDGF and MDGF], whereas fibroblasts release [PDGF alpha FGFa FGfb FGF EGF TGF alpha MDGF IGF IL1 and IL2]. An analogy of the process is rather like a building construction site. Over the first three months, the raw materials for the building are dumped on the building site, and then over the next two years, the raw materials are rearranged in a neat, orderly

fashion. Positive factors in wound healing include the right level of moisture at a cellular level, and good oxygenation of the tissues, the correct balance of steroids, vitamins, in particular A, E and C, the correct balance of minerals, in particular zinc, magnesium and others, and the right balance of growth factors. The things that mitigate against wound healing are physical shearing stress, haematoma formation (blood is particularly toxic to tissues once it has broken down), infection, particularly those caused by staph, strep and pseudomonas, and other factors such as dehydration, nutritional diseases, such as diabetes, nutrition imbalances, other disease processes and external factors such as chemotherapy and radiotherapy. Surgical technique has a bearing on scar quality, and in particular suture placement should be done in such a way as to prevent inversion of wound edges, to allow approximation of epidermis and dermal elements in the wound edges, so there is not a step between the two, and appropriate dressings should be placed on [raw] wound beds to minimize scarring. For a neat suture line, simply a support dressing, such as Steri-Strips or Mefix is adequate and this is able to be wet post-operatively. In some instances, if the suturing is strong enough, no dressing at all is required, and the wound can be washed and simply covered with a bland Vaseline-type ointment. If the area is at risk of becoming infected, then Bactroban ointment is appropriate to use for a few days.

For superficial wounds, the current dressings available are categorized into several groups: Hydrocolloids are those dressings which contain material which absorbs the growth factors and the various nutrients released in the serous exudate that comes out of the wound, and the dressing is designed to hold the growth factors etc, on the wound surface. These dressings tend to be good to promote auto-debridement of the wound, but sometimes precipitate hypergranulation and are not so good for encouraging epithelialization of the wound.

Calcium alginate dressings are designed to create a layer of calcium alginate over the wound. These dressings tend to be good to encourage epithelialization, but are not good at cleaning up sloughy wounds. Various brand substitutes are available. In the hydrocolloids, Duoderm Extra Thin, Duoderm CGF, Comfeel Transparent, Comfeel Ulcer Dressing, Comfeel Plus, are all adhesive occlusive dressings. They have the disadvantage of sticking quite firmly to the wound, and producing an offensive, seeping malodorous paste over the wound, and as mentioned above, tend to result in hypergranulation of the tissues.

[Aquacel] is a hydrocolloid, but comes in a cloth form. This tends to not work if it is kept dry, sticks to the wound and is relatively ineffective. If it is wet, it has a much more beneficial effect on the wound, however, technically it is difficult to use as it slides around on the wound, and has to be secured with a Tegederm or some other occlusive dressing, and holding it in the correct position is quite difficult.

Calcium alginate dressings such as Caltostat or [Algostat] are appropriate for some wounds, but they have a propensity to dry out and become adherent to the healing epithelium and if they are forcibly removed, they may produce irreparable damage to the fresh tissue and donor sites may [end up not healing] for a period of months as a result of this trauma.

Polymem dressings are the best of both worlds. They are an absorbent sponge that has hydrocolloid imbedded in it, along with a [..... actant] but not only do they encourage autolysis and autodebridement of slight sloughy wounds, they also encourage epithelialization and they do not produce the malodorous [soup paste] over the wound. In addition they are easy to secure, and in keeping with very fragile skin, they can be held in place with a Tubigrip or a crepe bandage, and do not even need to be secured with tape, which may cause further skin damage. Sometimes sloughy wounds will need [some sort of] antimicrobial therapy.

There are various dressings that contain [silver], such as [A.....] or Polymem Silver Dressings or [Aquacel AG]. These tend to be useful for wounds that are heavily colonized, but have limited value for seriously sloughy infected wounds.

SSD cream (silver sulfadiazine) is traditionally used on burns. This however is very messy and technically difficult to apply and hold in place, and I think with time will be replaced by Polymem Silver Dressings, which are by far superior and much easier to use.

Steroid and antibiotic mixture creams such as Kenacomb are excellent to use on hypergranulating wounds, and I find are superior to treatment with [silver cautery], however, they should not be used for longer than two or three weeks, as they cause the wound to regress.

Bactroban ointment is also very useful for infected wounds, but again should not be used for longer than 10 days.

Once the wound is healed, then scar management plays a role in speeding up the maturation of the scar process. Silicone gel pads, iontophoresis using dexamethasone and steroid injections are all ways of treating scars, and all have their place. For a routine wound, scar management for a period of two to three months is adequate, but for people at risk of hypertrophic scars, their wounds should be treated for approximately six months. True keloid scars develop up to a year after injury, and should therefore be kept under strict surveillance for a long period of time, and management of these scars should be aggressive and early to avoid irreparable and irreversible scar damage. For serious problem scars that look to be early hypertrophic, an injection of Kenacort A-10 is adequate. If they appear to be not responding to this or are suspected to be keloid, then Kenacort A-40 intralesionally is a better choice of agent.

Keloid scars and hypertrophic scars are not an extension of one another. They are histologically different and they are clinically different, and often the term keloid is used inappropriately and erroneously. A true keloid scar spreads beyond the zone of injury, usually takes about a year after the injury before it starts to develop, continues to grow for a period of time and does not resolve. Hypertrophic scars are an exaggerated normal scarring response. They peak at about three to six months, and then resolve [slightly] with time. Usually hypertrophic scars are precipitated by something, such as a poor wound-healing environment, e.g. infection or contamination of the wound. Keloid scars on the other hand, tend to be more genetically driven, and the wound healing factors may not have been anything out of the ordinary to produce bad scarring.



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