

Scars: how pharmacists can help

More than half the UK population have scars. In this article, **Christine Clark** discusses scars and the treatments available



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Widened scars can appear as a result of skin tension

A scar is a visible result of wound healing. When a wound heals, scar tissue (fibrous collagen) is formed. This can occur externally and internally. Minor injuries that only involve the epithelium (eg, superficial scratches) are unlikely to cause scarring but any injury that involves the dermis and deeper tissues may leave a scar. Causes include surgical operations, trauma, burns and diseases affecting the skin (eg, acne or chickenpox).

Scars are aesthetically and functionally inferior to the tissue that they replace. Some experts suggest that wound healing has been optimised for speed of healing under dirty conditions and that scarring is the price we pay for this survival advantage.

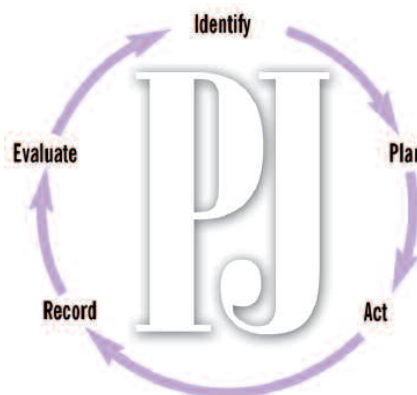
For most people, scars are not a problem but some scars can be disfiguring, painful or functionally disabling. A number of treatments have been used and products marketed for scar reduction. Pharmacists may be asked for advice about these as well as on scar prevention after an injury.

Wound healing

Wound healing can be divided into three stages: inflammatory, proliferative and maturative. Immediately after an injury, the coagulation cascade is activated. A fibrin clot is formed and platelets are trapped. Platelets release platelet-derived growth factor (PDGF) that attracts neutrophils. Neutrophils digest bacteria and activate fibroblasts (cells that generate collagen) and keratinocytes (skin cells that will proliferate to form new epithelium). Lymphocytes and monocytes are also attracted to the wound and the scene is set for the proliferative phase.

During the proliferative phase there is active repair of tissues. Cytokines (including PDGF, transforming growth factor- β (TGF- β) and vascular endothelial growth factor [VEGF]) control the laying down of collagen and the formation of new blood vessels. This is also often described as the granulation phase because the base of a healing wound has a granular appearance. In addition to granulation, the wound begins to contract. As

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Identify knowledge gaps

1. What is a keloid?
2. What products are available to prevent scarring?
3. What is the evidence for the use of vitamin E to improve the appearance of a scar?

Before reading on, think about how this article may help you to do your job better. The Royal Pharmaceutical Society's areas of competence for pharmacists are listed in "Plan and record", (available at: www.rpsgb.org/education). This article relates to "appropriate management of common symptoms" (see appendix 4 of "Plan and record").

this phase progresses and the wound fills up from the base with regenerating tissue, a recognisable skin surface begins to form (epithelialisation). Finally, in response to an unknown signal, fibroblast activity and vascular proliferation cease and this brings the proliferative phase to an end.

For a normal scar, the maturation phase involves gradual fading and flattening of the scar tissue. This phase usually takes between 12 and 18 months.

Types of scar

Abnormal scars present a problem. These can be classified as hypertrophic, keloid, atrophic, widened (stretched) and contractural.

Hypertrophic scars and keloid scars

Hypertrophic scars are raised lesions. There appears to be over-production of collagen in the healing wound. Hypertrophic scars are also red, raised and nodular and can sometimes be itchy or painful. They remain confined to the original wound and do not progress after 12 months. The appearance of hypertrophic scars can improve spontaneously.

Keloid scars are also raised, again due to over-production of collagen, but they behave differently from hypertrophic scars. Keloid scars spread beyond the boundary of the orig-

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Panel 1: Factors that affect wound healing

- Age
- Corticosteroid therapy
- Nutritional deficiencies
- Smoking
- Temperature — warm wounds heal better than cold
- Humidity — moist conditions promote healing
- Trauma
- pH — the optimum pH for wound healing is 7.4
- Oxygen levels — well oxygenated wounds heal better than hypoxic wounds

inal wound, invading the surrounding skin. They continue to grow and do not regress spontaneously. Keloid scars are often puckered and nodular and can be itchy or painful when they are growing.

Keloid scars appear to be more common in people with dark skin and usually occur in people aged between 10 and 30 years. Patients usually have a personal or family history of keloid formation.

Keloid scarring can follow surgery or trauma and can also occur at vaccination sites and after ear-piercing. In women with keloid scars, these can remain red, pruritic, and painful until the menopause.

Atrophic scars Atrophic scars appear as indentations in the surrounding skin. Common examples of atrophic scars are pock marks due to chickenpox (or for older people the mark left at the smallpox vaccination site) and some acne scars.

Widened scars Widened scars appear when surgical wounds are stretched as a result of skin tension (eg, caused by movement) during the healing process. Initially the scar appears normal but gradually widens over two to three weeks after surgery. Widened scars are typically pale, flat, soft and symptomless, but they can be aesthetically displeasing. The stretch marks of pregnancy are a type of widened scar resulting from injury to the dermis and subcutaneous tissue. Initially these are red but they fade with time.

Scars with contractures A contracture is a permanent shortening of a scar that can be disfiguring and can restrict movement. Contractures tend to occur when the wound crosses joints or when large areas of skin have been lost, for example, in extensive burns.

Scar prevention

One way to manage scars is to reduce their likelihood and severity. For example, the incidence of acne scars can be minimised by effective treatment of the acne. Once a wound occurs, prompt and proper treatment is important. For minor abrasions rapid epithelialisation is the target, using moist healing with ointment or semi-occlusive dressings to keep

the wound moist but well-oxygenated. Delayed epithelialisation (more than 10 days) results in a considerable increase in the incidence of hypertrophic scarring.

Semi-occlusive (or semi-permeable) dressings are waterproof but permeable to water vapour and oxygen. First aid for minor cuts and abrasions involves cleansing of the wound under running water, or using an alcohol-free, wound-cleansing wipe, followed by application of a sterile dressing. Contrary to popular belief, wounds that are allowed to form a crust and scab, heal more slowly than those that heal in a moist environment. The use of antiseptics is generally not recommended as povidone iodine, for example, is toxic to fibroblasts and may retard the healing process.

Medical advice should be sought if:

- The wound does not stop bleeding
- The wound is large or deep
- The wound was caused by an animal or insect bite
- There is something embedded in the wound
- The wound is on a joint crease or near to an artery
- The wound is red, sore and painful or has pus coming out (ie, it may be infected)

Factors that can adversely affect wound healing include smoking² and a poor vitamin C and zinc intake, so scar prevention may present a health promotion opportunity for pharmacists. Although vitamin deficiency is associated with poor wound healing, large doses of vitamins do not improve healing — only normal levels are required. Other factors are listed in Panel 1.

The formation of scar tissue can be minimised if the edges of a wound are brought close together and tension is limited. Surgical wounds are made, if possible, along lines of least skin tension. If this is not possible then one of number of splinting techniques (eg, permanent intradermal sutures) can be used to reduce the tension on the wound and thereby reduce the risk of widening. The risk of contractures in healing burn wounds can sometimes be reduced by splinting.

Treatment of scars

Available treatments for scars can be divided into non-invasive, invasive and leave-alone options. A problem in this area is that for most treatments there is little or no evidence of efficacy — many are supported by anecdotal or poor quality evidence. The international clinical guidelines for scar management published in 2002¹ concluded that there was evidence to support only two interventions: silicone gel sheets and intralesional steroid injections.

Non-invasive options In more recent years, products such as silicone gel sheets (eg, Cica-Care, Mepiform, Silgel) have become available. Over-the-counter products are marketed for red, dark or raised scars, including keloid scars.



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Keloid scarring can follow ear-piercing

Keloid scars appear to be more common in people with dark skin

Signposting

- Embarrassing problems
www.embarrassingproblems.co.uk
- Changing Faces gives help and support to people with any type of unusual facial appearance. The Squire Centre, 33–37 University Street London WC1E 6JN. Tel: 0845 4500 275. www.changingfaces.org.uk
- British Red Cross Skin Camouflage Services are provided free (but a donation is welcome) at a number of hospitals. They use volunteers trained by the Red Cross. A referral letter from a GP is required. 9 Grosvenor Crescent, London SW1X 7EJ. Tel: 0870 170 7000. www.redcross.org.uk
- British Association of Skin Camouflage, PO Box 202, Macclesfield SK11 6FP. Tel: 01625 871 129. www.skin-camouflage.net
- The British Association of Plastic Surgeons
www.baps.org.uk



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Scars that have failed to respond to silicone sheeting may respond to local steroid injections

Silicone gel sheets Several prospective, randomised trials support the use of silicone gel sheets in flattening scars and reducing stiffness. Ideally, the silicone sheet should be applied at an early stage when a scar is showing signs (eg, redness, growth) of developing into a hypertrophic scar. Silicone gel sheets should not be applied to open wounds. People at high risk of developing hypertrophic scars (ie, those under age 40, with a previous history of hypertrophic scars or with dark skin) can be advised to use the sheets as soon as the skin has healed (and after sutures have been removed from surgical wounds).

The sheet needs to be kept in place for a minimum of 12 hours each day and might need to be used for up to six months. Its mechanism of action is unknown but is probably related to its semi-occlusive properties and the pressure maintained over the scar.

The daily wearing time has to be increased gradually over the first few days and treatment has to be continued for at least two to four months. The sheet can be removed for normal washing of the skin and the product itself can be washed and reused. Some manufacturers recommend that the sheet is cleaned twice daily. Most gel sheets last for between 14 and 28 days.

Vitamin E Anecdotal reports claim that vitamin E speeds wound healing and improves the cosmetic outcome of burns and other wounds and some physicians recommend its use. However, one double blind study³ found that vitamin E ointment made no improvement to the cosmetic appearance of scars and one third of patients developed contact dermatitis to vitamin E.

Other non-invasive options Products containing onion extract have also been recommended recently. It has been suggested that, as well as having antiseptic properties, onion extract inhibits fibroblast function, but evidence of efficacy is lacking. In one randomised

The main problem that for most treatments there is little or no evidence of effectiveness

comparison of a gel containing onion extract with a petrolatum-based ointment, the ointment reduced scar erythema but the gel had no effect on erythema or pruritis. Other non-invasive options include garments (eg, masks) and devices to maintain pressure over the scar.

Camouflage make-up is not a treatment but it is something that can be considered. A consultation with an experienced cosmetician trained in the use of camouflage make-up is the best way to get started. These consultants are able to advise on suitable products and teach people how to use them to cover blemishes effectively (see Signposting Panel for contact details).

Invasive options Patients with scars that cause problems can be referred to a plastic surgeon. At the initial assessment the “four S” approach is commonly used in which site, symptoms, severity (of functional impairment) and stigma are considered. Scar assessment tools such as the Vancouver scar scale or the Manchester scar proforma are used to provide quantitative assessments. Colour photographs of the lesion are also routinely used to monitor treatment progress.

Triamcinolone injections Prospective trials show that scars that have failed to respond to silicone sheeting can respond to local steroid injections, using triamcinolone injected into the scar area. The dose depends on the size of the scar and can vary between 10mg and 120mg. The steroid acts by inhibiting fibroblast growth and promoting collagen degradation, and injections are given every four to six weeks. There is a risk of fat atrophy, dermal thinning and pigment changes, and the treatment itself is painful. A local anaesthetic may be applied. There is no good evidence to support the use of topical steroids.

Other treatments Surgical excision of hypertrophic scars is possible but should only be undertaken if more favourable conditions for

Key points

- Some people are more prone to scarring than others
- The available evidence supports only two interventions: silicone gel sheets and intralesional steroid injections
- Abnormal scars (hypertrophic, keloid, atrophic, widened and scars with contractures) present problems in that they can be disfiguring, painful or functionally disabling
- Scars may be minimised by prompt and proper treatment of wounds

wound healing can be provided than on the first occasion so as to minimise the possibility of making the scar worse. Keloid scars should be approached with more caution because simple surgical excision carries a 50–80 per cent risk of recurrence. The usual management involves a combination of surgery with either intralesional corticosteroid injection or radiotherapy.

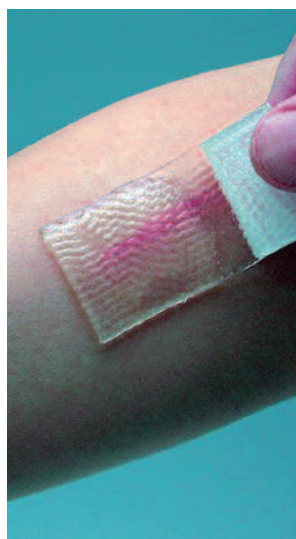
Other treatments that have been advocated include injections of fluorouracil, interferon gamma or bleomycin, radiotherapy, laser therapy and cryosurgery (controlled destruction of tissue by low temperature). Scar contractures usually require surgical intervention with or without skin grafts.

A number of measures have been used to treat the atrophic scarring of acne, including chemical peels, cutaneous laser resurfacing, dermabrasion, punch excisions (where the scar tissue is punched out and the hole repaired) and soft tissue fillers (eg, collagen). A Cochrane review of laser resurfacing concluded that there was insufficient evidence to allow conclusions to be drawn about the effectiveness of the treatment. Dermabrasion is a process that mechanically removes the top layer of skin (under anaesthetic). Chemical peels also remove the top layer of skin. Mild peeling is achieved with hydroxy acids (eg, glycolic acid), intermediate peels with trichloroacetic acid and deep peels with phenol. In both cases scrupulous post-operative care is needed because re-epithelialisation takes five to seven days and residual erythema can persist for up to four weeks. Sun protection is also essential.

Leave alone Some scars will shrink and fade to some degree. Many plastic surgeons recommend leaving scars alone for a year to mature. Clearly, in this situation it is important to manage the patient's expectations appropriately. Some patients might prefer to take a proactive approach.

Pharmacists should refer patients with scars that:

- Grow bigger
- Remain red or dark, raised and do not fade
- Cause discomfort, itching or pain
- Restrict movement of a joint



Smith & Nephew

Silicon gel sheets provide a non-invasive treatment option for scars

Future developments in the management of wound healing will include measures to influence the activity of TGF- β cytokines

Future prospects

Future developments in the management of wound healing will include measures to influence the activity of the cytokines involved, in particular the TGF- β family. The starting point for this line of thinking was the observation that scarless skin healing occurs in early mammalian embryos, including humans.

Studies showed that healing fetal tissue had high levels of TGF- β 3 and low levels of TGF- β 1 and TGF- β 2. In adult healing tissue, the pattern was reversed (ie, low TGF- β 3 and high TGF- β 1 and 2). This led to research efforts to find ways to augment TGF- β 3 levels and reduce of TGF- β 1 and TGF- β 2 levels. Injection of human recombinant TGF- β 3 into wounds improves the appearance of scars significantly. A number of clinical trials are now under way and a product (Juvista) could be marketed in the next three to five years. A competitive inhibitor of TGF- β 1 activation (Renovo) has also been shown to improve scars.

Another approach to prevent scar formation could be to interfere with local collagen synthesis.

References

1. Mustoe TA, Cooter RD, Gold MH, Hobbs FD, Ramelet AA, Shakespeare PG et al. International clinical guidelines for scar management. *Plastic Reconstructive Surgery* 2002;110:560–71.
2. Silverstein P. Smoking and wound healing. *American Journal of Medicine* 1992;93:22S–24S.
3. Baumann LS, Spencer J. The effects of topical vitamin E on the cosmetic appearance of scars. *Dermatologic Surgery* 1999;25:311–5.

Further reading

- Bayat A, McGrouther DA, Ferguson MWJ. Skin scarring. *BMJ* 2003;326:88–92.
- Mustoe TA. Scars and keloids. *BMJ* 2004;328:1329–30.

Action: practice points

Reading is only one way to undertake CPD and the Society will expect to see various approaches in a pharmacist's CPD portfolio.

1. Note down the advice you have given about scarring in the past and how this article compares.
2. Read the information on the packaging of silicon gel sheets.
3. Do you have a local wound management clinic? What advice does it give on wound care to avoid bad scarring?

Evaluate

For your work to be presented as CPD, you need to evaluate your reading and any other activities.

Answer the following questions:

What have you learnt?

How has it added value to your practice? (Have you applied this learning or had any feedback?)

What will you do now and how will this be achieved?