

Scars: impact and management, with a focus on topical silicone-based treatments

Each year in the developed world, 100 million patients acquire scars, some of which cause considerable problems, as a result of 55 million elective operations and 25 million operations after trauma. Scarring is a physical consequence of an operation or trauma and its effect on body image and quality of life is underestimated (Brown et al, 2008). There are an estimated 11 million keloid scars and four million burn scars, 70% of which occur in people in the developed world (Bayat et al, 2003).

Nurses have a role in helping patients with scar management, including scar prevention after trauma then ongoing scar management, with the aim of achieving a good cosmetic result and preventing psychological distress. This article discusses why scars occur, different types of scars, invasive and non-invasive treatments, as well as guidance on self-management for patients with topical treatments and massage.

Wound healing: how and when scars form

There are four stages in the wound healing process. Scar formation occurs in phase 4—maturation and remodelling. A scar is an accumulation of collagen that forms as part of the healing process following trauma to the skin. Depending on the size and depth of the wound, scar formation can take up to 2 years.

It is important to revisit the four phases of healing that occur in all wounds to understand how scars are formed.

Phase 1. Haemostasis

This is the first stage, which lasts for a few hours, when skin injury (because of trauma or surgery) results in haemostatic events; bleeding and platelets come into contact with collagen. The coagulation cascade, activated through intrinsic and extrinsic pathways, leads to platelet aggregation and clot formation to limit blood loss (Velnar et al, 2009).

Phase 2. Inflammation

The complement cascade is a series of molecular events leading to the infiltration of the wound site by neutrophils over a period of 3–7 days.

Neutrophils start phagocytosis to destroy and remove foreign bodies, bacteria and damaged tissue—wounds with a bacterial imbalance will not heal. After a few days,

Abstract

Many people are living with scars caused by surgery or traumatic injury. Scar prevention in the early stages of wound healing is an essential aspect of care. Ongoing scar management is generally by self-care, using non-invasive methods such as silicone sheeting and/or massage. Silicone is considered to be the first-line non-invasive, prophylactic and therapeutic measure for scar management. Nurses have a role in supporting patients with self-care of their scars as well as providing psychological support, as the impact of a scar and effect of quality of life can be significant.

Key words

► Scars ► Psychological impact ► Silicone ► Treatments

once contaminating bacteria have been removed, neutrophil activity changes and a process of cell death called apoptosis produces slough and eliminates redundant neutrophil cells.

During the late inflammatory phase (48–72 hours after injury), phagocytosis occurs because of macrophage activity. A myriad of cellular activities produces tissue growth factors, activating keratinocytes, fibroblasts and endothelial cells, which start wound repair.

The last cells to enter the wound are lymphocytes, activated by interleukin 72 hours after injury, which start collagen regeneration. This phase causes wound symptoms including oedema and swelling, an increase in wound temperature, induration and change in skin colour; it also involves sensation loss, itching, burning or pain, with possible loss of function, depending on the site (Velnar et al, 2009).

Phase 3. Proliferation

This stage lasts for approximately 2 weeks. Once haemostasis has been achieved and immune responses are in place, tissue repair can start.

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Fibroblasts proliferate for 3 days and an extracellular matrix, composed of fibrin and fibronectin, is formed by the end of the first week (an essential part of the repair process) to establish the wound edges. Fibroblasts are then eliminated by apoptosis, which leads to the intracellular matrix foundation within the wound made of collagen. This results in granulation tissue being formed. In a wound, granulation tissue is made up of 40% type-3 collagen, compared with 80% type-1 collagen and 25% type-3 collagen in normal dermis (Velnar et al, 2009).

New blood vessels are established, attracting neutrophils, macrophages and other cells to modulate cell growth and heal the wound by processes called adhesion, traction and epithelialisation (Velnar et al, 2009).

Phase 4. Maturation and remodelling—scar formation

The final phase of wound healing is the development of new epithelium and scar tissue formation. This occurs by synthesis and breakdown of collagen and more extracellular matrix remodelling; this process of collagen synthesis and breakdown is continual, and results in the formation of granulation tissue (Velnar et al, 2009).

Collagen fibres regain approximately 80% of their original strength after skin injury but original strength can never be regained. A scar, when mature, will never attain the normal strength of the surrounding skin. Hair follicles and sweat glands at the scar site will not grow back (Wood, 2017).

Types and characteristics of scars

There are several different categories of scars. Furthermore, scars can look different on different skin types. For example, skin types IV and V (Asian and Afro-Caribbean) are susceptible to keloid scarring, where there is an overgrowth of dense fibrous tissue outside the boundary of the wound. Skin type I (white and freckled) tends to produce more noticeable scars than other skin types.

Keloid and hypertrophic scarring are more common in younger patients (typically aged 10–30 years).

All scars mature differently; in the first 6 months to 1 year, scars will usually be red and raised, gradually flattening and fading over time. In most cases, they will continue to improve, particularly with good aftercare.

Atrophic and hypertrophic scars

Atrophic scars are typically small, flat or depressed relative to the surrounding skin. They are often caused by acne or chickenpox, where collagen is destroyed within the dermis where the cysts occurred. These scars can be drier and less elastic than normal skin; over time, the pigment matches the surrounding skin (Gold et al, 2014a).

Hypertrophic scars are red and raised above the surface of the skin but do not go beyond the boundaries of

the original wound site. They can continue to thicken for up to 6 months and can be very itchy or painful. These scars are further defined as being immature, when a scar is inflamed and raised; immature scars can increase in size then regress. When a scar becomes light coloured and flat, it is described as a mature scar (Gold et al, 2014a).

Keloid scars

Keloid scars grow beyond the boundary of the original wound site because of an overproduction of collagen (Xue and Jackson, 2015). They can develop up to 1 year after injury. Keloids can be defined as minor (extending over normal tissue) or major (raised and >0.5 mm diameter). They may be itchy and painful. Both minor and major types will not regress without intervention (Gold et al, 2014a).

Striae

Striae occur as a result of the skin suddenly stretching because of rapid growth or weight gain. The dermis breaks in places, allowing the deeper layers to show through.

Maternal age and weight gain during pregnancy are factors for striae. Moderate to severe striae in pregnancy (known as striae gravidarum) are associated with a family history of striae and a younger gestational age (average age 26 years) at delivery (Osman et al, 2007).

Scar assessment

All scars should be assessed on an ongoing basis and there are several tools to do this. The Patient and Observer Scar Assessment (POSAS) tool is recommended by the international scar advisory panel (Gold et al, 2014a). The POSAS consists of an observer and a patient scale and includes a comprehensive list of items, based on clinically relevant scar characteristics. The observer scores six items: vascularisation; pigmentation; thickness; surface roughness; pliability; and surface area. The patient scores six items: pain; pruritus; colour; thickness; relief; and pliability. All items are summed to give a total scar score, so a higher score represents a poorer scar quality (van der Wal et al, 2012). The POSAS scale can be used by the patient and the health professional to jointly assess scar quality during the 2-year remodelling and maturation wound-healing phase.

Patient perspective of living with a scar

The psychological perspective of patients living with major scarring following burns injury is well documented; one study stated that 13%–23% experienced depression and 13%–45% post-traumatic stress disorder (van Loey and van Son, 2003). The psychological effect of other types of scarring is less well documented, especially its impact on quality of life (Brown et al, 2008).

One study looked at quality of life after scarring in adult patients with a variety of scars. It explored: physi-

cal comfort and functioning; acceptability to self and others; social functioning; confidence in the nature and management of the condition; and emotional wellbeing. The majority of respondents were unhappy with their scars' appearance because of stigma and psychological associations, and adopted different types of coping behaviour to hide or compensate for them. Often this made them unsociable and interfered with their communication skills, personal relationships, work and leisure activities (Brown et al, 2008).

Nurses should be aware of the impact a scar may have on the life of patients. Nurses should assess these effects on the individual and support patients by educating them on long-term management of their scars to avoid unrealistic expectations (Brown et al, 2008). If there are doubts, prompt referral to a specialist interested in management of skin scars, such as a plastic surgeon or dermatologist, is advised (Brown et al, 2008).

Treatment options for scars

Treatment options for patients with scarring include self-care strategies (non-invasive) and medical intervention (invasive).

Scar prevention immediately after wound closure is managed by three components: tension relief; hy-

dration/taping/occlusion; and pressure garments (Monstrey et al, 2014). Patients with extensive scarring because of trauma or burns often require invasive methods; other types of scars, depending on size and psychological distress, may also be treated with invasive procedures. These include surgical correction and, in the past 10 years, laser therapy has come to the forefront of treatment (Gold et al 2014b).

Hypertrophic and keloid scars can be treated with intra-lesional corticosteroid injections; there is evidence for combining this with 5-fluourouracil (Gold et al 2014b). Invasive treatment for atrophic scarring (for example acne scarring), includes chemical peels, collagen fillers, dermabrasion, micro-needling, photodynamic treatment and laser resurfacing (Monstrey et al, 2014). Unfortunately, these treatments are not usually available on the NHS, so are generally carried out in private aesthetic clinics.

Atrophic, hypertrophic and keloid scars should be treated with non-invasive measures to help with good cosmetic results. Non-invasive treatments are generally self-care methods, so the patient needs education and advice on ongoing scar management, which continues for up to 2 years.

Initially, pressure dressings may be advised to flatten

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and soften scars; these are used most often for large hypertrophic scars. Silicone gels or sheets can be used to reduce redness and minimise hypertrophic or keloid scars. Scar massage with creams and oils can help to improve the appearance of scarring, hydrating the skin and making it more supple. There are several options from simple moisturising creams to oil with properties to help reduce scarring, for example Bio-Oil, which contains vitamin A and E, calendula and purcellin oil. A silicone-containing cream, Medline Remedy, contain 24% silicone with additional botanical oils with antioxidant and anti-inflammatory properties, and no fragrance or parabens (Romay et al, 1998).

Cosmetic camouflage is not a treatment but can be a helpful adjuvant, covering up scars, particularly in visible areas such as the face and hands. If cosmetic camouflage is recommended, the patient should be referred to a camouflage practitioner for assessment, colour matching, application technique and support. Cosmetic camouflage services are offered by the British Association for Skin Camouflage (www.skin-camouflage.net) or Changing Faces (<https://changingfaces.org.uk/skin-camouflage>); patients can be referred or refer themselves.

Silicone-based treatments

Silicone contains long-chain silicone polymer (polysiloxanes), silicone dioxide and volatile components. Long-chain silicone polymers cross link with silicone dioxide (Puri and Talwar, 2009). In gel form, silicone is spread as an ultra thin sheet. Silicone creams also provide additional emollient quantities. Silicone is also impregnated into tape and can be left in place for 24 hours.

Key points

- ▶ Scars are very common and affect millions of people in the UK
- ▶ Scar formation occurs in the wound healing phase 4 (maturation and remodelling); the process takes up to 2 years
- ▶ Scars can be managed with invasive and non-invasive treatments
- ▶ All patients with scars should incorporate non-invasive treatment into a daily routine to improve the cosmetic appearance of scars
- ▶ Nurses are ideally placed to offer support and education in scar management

CPD Questions

- ▶ Consider the impact scars can have on quality of life for patients
- ▶ Analyse the evidence on different treatments and measures to reduce scarring. How would you support your patients with scar management?
- ▶ Consider the role of silicone-based treatments for scar management in your practice

Silicone has four main properties; first, it increases hydration of the stratum corneum and thereby facilitates the regulation of fibroblast production and reduces collagen production. Silicone modulates the expression of growth factors, fibroblast growth factors and tumour growth factors. Fibroblast growth factors normalise the collagen synthesis in an abnormal scar and increase the level of collagenases that break down excess collagen. Tumour growth factors stimulate fibroblasts to synthesise collagen and fibronectin, which results in the restoration of the balance of fibrogenesis and fibrolysis (Puri and Talwar, 2009).

Silicone treatments make a difference to the patient as well as the scar as they can reduce the itching and discomfort associated with scars. The scar tissue is protected from bacterial invasion and prevents bacteria-induced excessive collagen production in the scar tissue. Silicone also allows the skin to 'breathe' and ultimately results in a softer, flatter scar (Mustoe, 2008).

The role of silicone in the prevention and treatment of hypertrophic and keloid scars has been researched widely, with a large majority of studies showing positive effects (Mustoe, 2008; Monstrey et al, 2014).

The research evidence for silicone gel sheeting was evaluated in a Cochrane review, which looked at 20 clinical trials with 873 people ranging in age between 18 months and 81 years. These were randomised con-



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trolled trials comparing adhesive silicone gel sheeting with: no treatment; non-silicone dressing; other silicone products; laser therapy; triamcinolone acetonide injection; topical onion extract; and pressure therapy. In the prevention studies, when compared with a no treatment option, silicone gel sheeting reduced the incidence of hypertrophic scarring in people prone to scarring. In treatment studies, silicone gel sheeting produced a statistically significant reduction in scar thickness and colour amelioration. However, the Cochrane study noted that the studies were susceptible to bias (O'Brien and Jones, 2013).

How can nurses support patients with scar management?

Many patients lack confidence in managing their scars, and health professionals can provide support in self-management. Following surgery or trauma, the first priority should be prevention of abnormal scar formation, as discussed above.

When a wound has healed, silicone therapy is advocated as the first-line prophylactic and non-invasive treatment option for all scars (Monstrey et al, 2014; Gold et al, 2014a). Silicone sheeting requires fixing and is not always suitable for large areas or around joints, as well as on exposed areas such as the face and hands (Monstrey et al, 2014).

Nurses should be aware that patients may need help to apply silicone gel sheeting. An older person may not have the dexterity to manage to fix sheeting on a difficult-to-reach area of the body, so may need help from a partner/relative or if they live alone, or they may need to book an appointment with their practice nurse. An adequate supply of silicone sheeting can be prescribed at the discretion of the prescriber but the patient may have to buy it over the counter at an average price of £8–£10 per sheet.

Striae are best managed with massage, as they generally occur over a larger area. There is limited evidence for reversion of striae in pregnancy with massage (Osman et al, 2007).

Silicone creams, emollient creams and oils are options for scar massage and can be used in conjunction with silicone sheets. The patient should be instructed to massage a cream, gel or oil into the scar twice daily to keep the scar hydrated and soften the scar tissue. Then, if required, when the skin has dried, silicone gels or sheets can be applied to the scar.

It is also important that, if a scar is on a sun-exposed area, a sunscreen with an SPF of at least 25 is applied to prevent pigmentation.

Conclusion

Scar management, support and education for patients should be incorporated into nursing practice. Self-care scar management can improve the cosmetic ap-

pearance of scars and help reduce psychological distress. Non-invasive techniques with silicone-based treatments can be effective, as can fixed sheeting or as gel or cream applications used in conjunction with scar massage. ◀JAN

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