

Reducing the impact of hypertrophic scarring

KEY WORDS

- ▶ Camouflage
- ▶ Hypertrophic scar
- ▶ Pressure garment
- ▶ Scar assessment

While a “normal” scar is soft, flat, pale in colour, and hardly visible, the deeper a wound is and the longer it takes to heal, the more abnormal and problematic the subsequent scar may be. Hypertrophic scarring is a common scar abnormality and often occurs following burns. This article explores how early and ongoing scar assessment is important and sets out specific regimens suitable for those with hypertrophic scars.

Hypertrophic scarring is thought to occur for a variety of reasons. These include affected haemostasis at the time of wounding, an exaggerated inflammatory phase during wound healing, prolonged re-epithelialisation, excessive extracellular matrix production and abnormal remodelling of this, increased formation of new blood vessels, and reduced apoptosis of myofibroblasts – meaning that more collagen is created than degraded, all of which lead to the abnormal creation of thickened, nonpliable, red scarring (van der Veer et al, 2009). Some patients may have a predisposition to hypertrophic scarring and should be more closely monitored.

PRESENTATION

Hypertrophic scars are typically described in terms of the “3 Rs” – red, raised, and rigid. Other symptoms include altered pigmentation, scar contractures, altered sensation, pain, and itch. Hypertrophic scars stay within the margins of the original wound and, with time, reduce in size (*Figure 1*), unlike keloid scars, which are also red, raised and firm, but spread beyond the borders of the original wound.

During the remodelling phase of wound healing, the vascularity of the wound increases (Hawkins and Pereira, 2008), and scars appear more red in colour. Scar colour may vary depending on the position of the scar on the body, for example, scars to the feet (areas with a dependent blood supply) may stay darker in colour for longer than a scar higher on the body, such as to the chest. Scar colour usually fades with time as the scar matures and vascularity reduces to more normal levels.

Hypertrophic scars are commonly less pliable due to a lack of elastin. Normal skin is made up of a regular, “basket weave” layout of collagen fibres, extra cellular spaces are consistent throughout the dermis, and it is scattered with skin appendages (i.e. sebaceous glands, hair follicles, and sweat glands). Scar tissue has increased type I collagen, decreased type III collagen, reduced extra cellular spaces, and has a dense, thick layer of collagen laid down in random patterns (Rawlins et al, 2006). This is often described as “whorls” or “nodules” – bundles of collagen that are raised and firm, compared with normal skin.

Melanocytes, which are responsible for skin pigmentation, are often destroyed during wounding due to their superficial position within the epidermis of the skin. As melanocytes return, so does pigmentation, but to variable degrees. A scar may be hypopigmented (lacking in pigmentation and paler than the normal colour of the patient’s skin), hyperpigmented (darker than the normal colour of the patient’s skin), or a combination of both, termed mixed-pigmentation (*Figure 2*). Scars may initially be hypopigmented,



Figure 1. An example of a hypertrophic scar.

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Figure 2. An example of altered pigmentation.



but pigmentation may return, starting with small “spots” of pigmentation (i.e. groups of melanocytes), which gradually multiply and spread to join up and give a more uniform colour.

As injured skin heals, the wound contracts to enable closure. This contraction can continue beyond wound closure, creating shortening of the scar tissue and underlying soft tissues. If this happens near to movable body parts, movement of these areas may become limited because the newly healed skin is inelastic compared to normal skin; this is called a contracture (Spence and Ware, 2006; Figure 3). If movement is limited, this may in turn limit a patient’s function. For example, a contracture at the back of the knee may limit a patient’s ability to straighten their knee and, thus, their ability to walk.

Pain in the early stages following an injury is due to the normal stimulation of pain receptors in the skin. Pain receptors become more sensitised due to the inflammatory response, and as nervous tissue regenerates, abnormal excitation of these areas can occur due to regular stimulation during painful procedures, such as dressing changes. Once healed, persistent itch or altered sensation (e.g. a lack of sensation or hypersensitivity to touch or temperature) may occur in scars. Any of



Figure 3. An example of a contracture of the knee following healing of a burn.

the above can be extremely distressing to patients possibly disrupting sleep and everyday activities and reducing their quality of life.

SCAR ASSESSMENT

Early and ongoing scar assessment is important to identify problem scarring and direct scar management to optimise and evaluate scar outcomes (van der Wal et al, 2012). Equipment is available for objective scar assessment, but is expensive and, therefore, it is not possible for all services that manage scars to purchase.

Clinical photography is used by many services and provides a useful pictorial record to plot a patient’s progress. Patients also find this method beneficial as they are often unable to notice improvements in their scars due to seeing them every day.

Scar assessment scales are more commonly used by clinicians. While they are subjective, scar assessment scales are easy to use, rating scars using some of the scar features discussed above. The most commonly used scar assessment scale is the Vancouver Scar Scale (VSS; Sullivan et al, 1990), which rates the scar on its pigmentation, pliability, height, and vascularity. However, clinician-related scales may have little significance for the patient. An alternative is the Patient and Observer Scar Assessment Scale (POSAS; Draaijers et al, 2004). It requires the patient to also rate their scar for factors such as pain and itch, in addition to the aspects described above, and may in fact be more significant as an outcome measure. No matter how good the clinician feels the scar is, ultimately it is the patient who has to live with the scar and, hence, the patient’s opinion is key to achieving positive outcomes.

SCAR MANAGEMENT

While hypertrophic scars regress with time, the visible presence of a scar and its symptoms can be distressing to patients and disrupt their everyday life. Therefore, scar management techniques should endeavour to prevent hypertrophic scarring or reduce the symptoms and promote the regression of scarring that has already developed (Mustoe et al, 2002).

Some scars may respond well to simple interventions that are accessible in any healthcare

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setting; some scars may be more stubborn and require more aggressive therapies. The latter may only be available in more specialist services requiring GP referral to a local burns or plastics unit. Examples of both simple and more specialist interventions are discussed below.

Wound healing

Prompt wound healing (less than 3 weeks) is the first step in reducing the possibility of developing hypertrophic scarring (Deitch et al, 1983). Wounds must therefore be appropriately dressed to promote and achieve wound healing within this timescale. Slow wound healing due to a patient's other medical comorbidities or wound infection are the main complications that may limit this being achieved, and expert advice regarding dressings may need to be sought from Tissue Viability or Burns and Plastics Specialist Nurses if wound healing becomes static.

For burn wounds, skin grafting surgery would be considered if it was thought that the wound would not heal within 3 weeks.

Massage and moisturisation

Once healed, moisturisation with a non-perfumed emollient (e.g. Doublebase [Dermal Laboratories], Diprobase [Schering-Plough], or E45 [Forum Health Products]), 2–3 times daily is advised to hydrate the skin due to the loss of sebaceous glands in the dermis. Firm, circular-motion massage (sufficient to cause the scar to blanch; *Figure 4*) is used to apply the moisturiser and is thought to assist with improving skin pliability and alignment of collagen fibres in a more regular pattern rather than in random whorls.

Evidence is limited, but in practice many clinicians and patients advocate massage and moisturisation. Patients may need to trial different emollients to find one that suits them best, but it is more the action of massage – rather than the moisturiser used – that improves the scar.

Silicone

Silicone can be applied to scars to soften and improve pliability, reduce redness, and flatten scars. Why silicone works is not fully known, but it is thought to be due to hydration, decreasing capillary activity, and decreasing collagen

production in the scar (Bloemen et al, 2009). It can be used for scar prevention if commenced following wound healing, or as a treatment once a scar has developed, but the evidence for the former is greater.

Silicone is available in different formulations. Gel sheets should be worn for up to 23 hours per day, but removed twice daily to clean the scar and skin beneath to avoid maceration. Thin gel sheets, such as Mepiform® (Mölnlycke Health Care; *Figure 5*), are adhesive and useful for areas of scarring to the limbs or torso. Thicker gel sheets, such as SilGel® (Nagor) or Advasil Conform® (Advancis Medical), are more useful for areas of scarring where additional pressure is required and may need to be held in place by a garment or splint. Topical gels, such as Scarsil® (Jobskin) or Kelocote® (Enaltus; which is also available in a spray for larger areas) can be used for scars in a variety of locations, but may be of more use for areas where it is difficult to keep sheeting in place due to movement, such as the fingers, and can also be applied beneath pressure garments. Gels and sprays should be applied in a thin layer over the scar, twice daily.

Pain, itch, and altered sensation

Other than medication, there are simple practical ways to relieve pain, itching, and altered sensations associated with scarring. Keeping cool with a fan or cooling clothing may be helpful. Towels or moisturiser kept in the fridge and applied to the skin can help reduce pain and itch. Relaxation or distraction techniques may benefit some patients.



Figure 4. An example of a scar being massaged.



Figure 5. The hypertrophic scar shown in *Figure 1* dressed with a Mepiform® (Mölnlycke Health Care) gel sheet.

Desensitisation exercises, such as tapping affected areas, light touch, or massage, can assist with normalising altered sensation.

Exercises and splints

It is important to maintain movement and function from the acute phase of healing through to the scar maturation phase to prevent or minimise contractures. Referral for review by a physiotherapist may be required to assist the patient with exercises and stretches.

If full movement cannot be maintained, or contractures have developed, then a thermoplastic splint (Figure 6) should be fabricated by a physiotherapist or occupational therapist to apply a prolonged stretch to the area and oppose the scar tissue. This is often worn overnight and the affected area exercised and used functionally during the day. This can prevent further deterioration, gradually reduce the contracture, and improve movement.

Pressure garments

Pressure garments can be used prophylactically to prevent scarring or to reduce redness and soften and flatten raised scarring. The evidence for the use of pressure garments to reduce scarring is variable and the mechanism is also not exactly known, but they are thought to work by applying pressure to influence the realignment of the collagen bundles and limit collagen production by reducing blood flow to the scar (Johnson, 1984).

Pressure garments should only be commenced once wounds have healed and should be worn for up to 23 hours per day. The garments should be maintained until scars have matured, which may be up to 12–24 months, depending on the size of the scar and its response to treatment.



Figure 6. An example of a hand splint and pressure garment.

Specialist scar services may have in-house technicians, who fabricate individual made-to-measure garments for patients, or measurements are taken and garments are fabricated by specialist manufacturers. Patients identified as being at risk of hypertrophic scarring may benefit more from prophylactic management than trying to treat a problem scar after it develops.

Before and after photos of the use of a pressure garments to manage scars on a hand are shown in Figure 7.

Camouflage

For scars with altered pigmentation or colour, short-term treatment is limited, but most improve with time. Cosmetic camouflage is a useful adjunct for a patient to use during the time while pigmentation is returning to normal or vascularity is reducing and can increase confidence and self-esteem.

A consultation is undertaken to match the correct shade of products to the patient's natural skin tone to camouflage the scar, although this can be limited if the patient's scar has an altered texture or contours, and it is important to manage the patient's expectations with this modality – the scar cannot be made invisible. The patient is then taught how to apply the products.

Outside of specialist scar services, camouflage is available via charities and some high street make-up counters and, therefore, has become more accessible to a wider population of patients in recent years. These include: Changing Faces (www.changingfaces.org.uk), The British Association of Skin Camouflage (www.skin-camouflage.net), The British Red Cross (www.redcross.org.uk), and Clinique (www.clinique.co.uk).

Psychology

The physical and visible effect of scars can often have a significant psychological impact on the patient. Support from the clinicians managing the patient's wound and scarring is vital in helping the patient to accept their scars from an early stage, and to avoid unrealistic expectations in terms of the scar management techniques being able to make their scars "disappear".

Sometimes even the smallest of scars may invoke a large psychological reaction from a patient,

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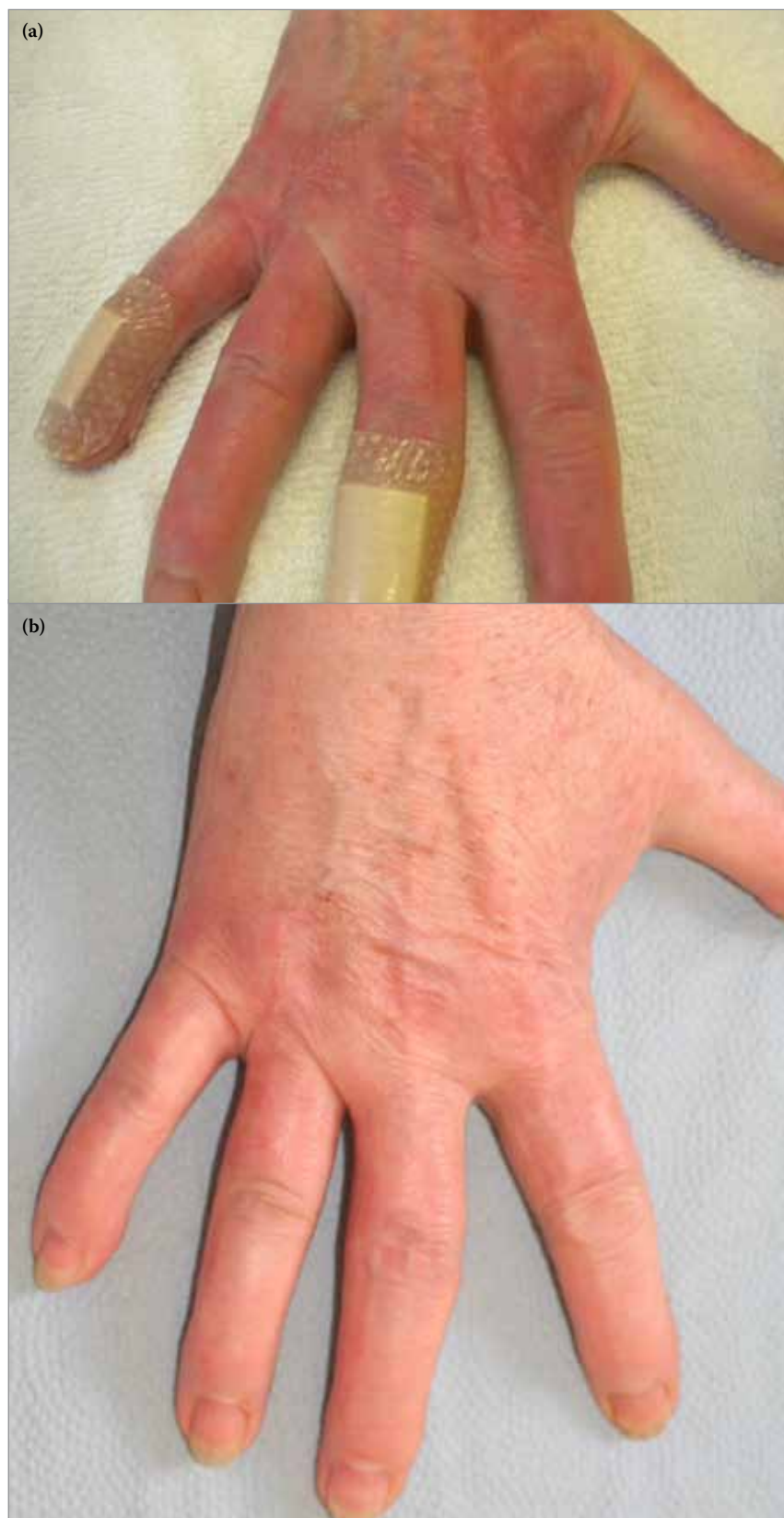


Figure 7. (a) Before and (b) after the use of pressure garments to manage post-burn scarring.

whereas patients with large injuries and more severe scarring who may be expected to have more psychological difficulties may cope more readily (Wisely and Gaskell, 2012). Patients with ongoing psychological or appearance-related concerns may require referral to a specialist clinical psychologist to assist them with coping strategies.

CONCLUSION

The input of a variety of multidisciplinary team members may be required for scar management. A variety of measures may need to be attempted to find an effective one; as every patient and every scar is different and respond to different modalities. Therefore, treatment should be individualised and adapted, depending on the patient's needs.

An important factor is the patient's concordance with treatment, although even with this the improvements that are made may not be sufficient for the patient to be fully happy with the outcome. Patient education on skin care and scar management modalities may help to promote concordance to optimise scar outcome. WUK

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