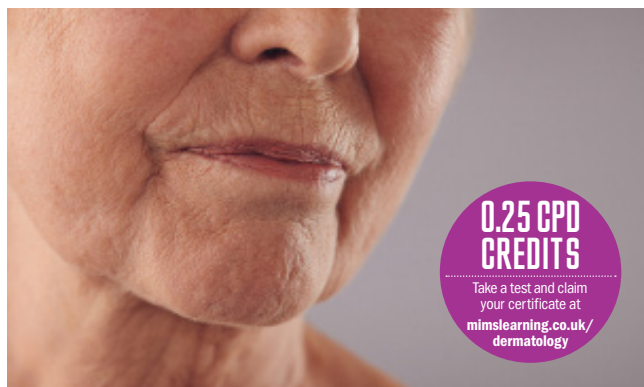


Non-surgical skin tightening

Dr Paul Charlson explains how skin tightening devices work and outlines the possible side effects of this increasingly popular aesthetic treatment



No long-term studies of skin tightening devices are available

Non-surgical skin tightening is a popular treatment for reducing wrinkles. All skin tightening devices (see box, below) essentially work by heating the skin and underlying structures, creating immediate tightening of the skin by contraction of collagen fibres and delayed remodelling via neocollagenesis.

Collagen fibres are triple helix protein chains linked with interchain bonds into a crystalline structure. Heating to a specific temperature (above 85 °C for milliseconds or above 60 °C for seconds) causes breakage of the hydrogen bonds and contraction to a folded thicker crystalline structure.

Most skin tightening devices work but offer modest results. It is also worth considering that heat delivery is often painful and so there is a balance between pain and efficacy, although there are few other significant side effects. No long-term studies demonstrating effects of more than a year are available. The key to patient satisfaction is in selecting the right patients. Suitable patients usually have mild to moderate skin laxity and reasonable expectations of treatment outcomes.

RADIOFREQUENCY

Radiofrequency devices are either monopolar or bipolar. Monopolar devices work with a single electrode and the power is close to the electrode with potential for deep tissue penetration. Cooling is required to protect the outer layers of skin. Bipolar devices have two electrodes a specific distance apart. The current distribution is more controlled but depth of penetration is limited to about half the distance between the electrodes. The depth of energy penetration also depends on the tissue, because conduction varies, and the mode of delivery (for example, surface-based or needle-/probe-based). Higher temperature and wet skin conducts better, so cooling the skin increases penetration, which is why cooling gels improve results.

One drawback of radiofrequency is pain but this can be

reduced by using lower energies and multiple passes. Monopolar devices are commonly used in facial skin tightening. Bipolar devices often use two technologies to heat the skin. The theory is that tissue is preheated so that the radiofrequency delivery is more effective on the deep tissues. Needle-based radiofrequency devices deliver the radiofrequency energy into the deep dermis, sparing the epidermis.

A study of the effects of a bipolar radiofrequency device showed that after three treatments 21% of patients reported “significant improvement”, 50% reported “moderate improvement” and 29% reported “mild improvement”. In a large study of a monopolar radiofrequency machine using lower energy multi-pass protocols, 92% of patients observed skin tightening at six months with 5% finding the procedure too painful.

ULTRASOUND

Ultrasound is commonly used in skin tightening devices. Most modern devices rely on microfocused ultrasound (MFU). This uses lower energy than high-intensity focused ultrasound (HIFU) devices, such as those used in surgical ablation and body contouring. MFU heats the tissue to over 60 °C producing small thermal coagulation points at around 5 mm, which is in the mid-deep reticular dermis and subdermis.

In one study of 70 patients, 72% achieved a visible lift of greater than 20 mm of the submental area (at the midline below the chin) and this was largely sustained at three months. Another study showed 67% of patients had visible improvement at six months. Whilst these are relatively small effects, they are still significant.

These treatments are quite painful, scoring around 6/10 on pain scales. Methods used to reduce pain are topical lidocaine, NSAIDs and oral diazepam.

INFRARED

Infrared light has been used effectively with epidermal cooling in darker skin (types IV and V) with minimal downtime, but there are few studies available.

TITANIUM PYRAMIDS

A promising new device, which results in 75% wrinkle attenuation with lower pain scores of about 3/10 and low downtime, uses thermal ablation with 81 titanium pyramids at 400 °C.

LASERS

Lasers have been used for several decades for skin tightening. Ablative lasers do reduce wrinkling in the skin, although side effects such as pain, downtime, scarring and pigmentation make them less useful than some of the other available methods. Nonetheless, using fractional ablative systems where microscopic thermal wounds are separated by spared tissues appear to produce reasonable results with fewer side effects. Non-ablative fractional lasers may have some effect with even fewer side effects.

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Skin tightening devices

- ▶ Radiofrequency
- ▶ Monopolar
- ▶ Bipolar with light energy
- ▶ Bipolar with microneedles
- ▶ Ultrasound
- ▶ Ultrasound with radiofrequency
- ▶ Infrared light
- ▶ Titanium pyramids