Facial rejuvenation and skin-tightening using monopolar radiofrequency

Abstract

This article will discuss how the use of monopolar radiofrequency for skin tightening is increasing due to the popular demand of non-surgical treatments with minimum downtime. It will show how to carry out the correct consultation and assessment and what considerations to take into account, as well as explaining how intrinsic and extrinsic factors contribute to ageing and the different types of radiofrequency available on the market. The use of radiofrequency in conjunction with other anti-ageing collagen-stimulating treatments to support and optimise final treatment results will also be detailed. The focus will be on the technology and treatment used with the BTL Exilis Ultra 360™ device and how it compares to other skin-tightening treatments.

Key words

▸ Skin tightening ▸ Radiofrequency ▸ Combination treatment
▸ Collagen stimulation ▸ Non-surgical

The continued growth of non-surgical treatments is leading to the constant advancement of interest in non-invasive treatments (American Society for Aesthetic Plastic Surgery, 2018). The concern with jowls, thinning skin and nasolabial folds is no secret and has always been an area of focus for patients seen in clinics across the UK. Laxity, especially in the skin, is one that has a great impact on function and quality of life (Mendonça and Rodrigues, 2011). Minimal downtime and natural results are becoming a top priority for patients, and this is why the use of radiofrequency for non-surgical skin tightening is becoming one of the most highly used techniques (Alster and Lupton, 2007).

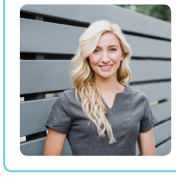
Causes of ageing

The manifestations of ageing occur as a result of gravity impact, muscle action, loss of volume, reduction of superficial and deep fat and loss of skeletal support, which collectively lead to the face sagging, as well as a change in shape and contour. There are two categories of factors affecting skin ageing: intrinsic and extrinsic. Intrinsic factors are, unfortunately, out of a person's control and cannot be prevented; these are predominately determined by genetics, such as telomere shortening, mitochondrial damage and hormonal changes (Mahto, 2018). On the other hand, extrinsic factors are usually referred to as photo ageing. These are exacerbated by environmental factors, such as smoking, sleep deprivation, stress, alcohol consumption, poor nutrition and air pollution. Usually, these factors are within a person's control, and causes such as UV exposure (which creates free radicals) can account for up to 80% of visible signs of ageing in the skin, including dry appearance, scalping, wrinkling (Grant, 2008) and elastosis (skin laxity).

The skin's dermis consists mostly of type I collagen, elastin and glycosaminoglycans (GAGs). At younger ages, collagen is created in abundance; however, at approximately the age of 25 years, the body stops producing collagen. After the age of 25 years, collagen levels deplete by 1% each year. In the first 5 years post-menopause, collagen levels in women reduce by a dramatic 30%, which is usually why aesthetic practitioners have a high proportion of patients aged 40–60 years who visit clinics to seek anti-ageing treatments, as this is when the most notable differences show in the skin. As the body ages, there is an increase of collagen network density and reduced stability of the crosslinks. GAGs are among the primary dermal skin matrix constituents assisting in binding water. In photo-aged skin, the total hyaluronic acid (HA) level in the dermis of the skin that ages intrinsically remain stable; however, epidermal HA diminishes markedly (Elsner and Maibach, 2005). The function of elastin, a protein found in the connective tissue, starts reducing (stretch and recoiling), and atrophy of subcutaneous fat is also noted (Brinckmann et al, 1994).

Types of radiofrequency

There are a number of radiofrequency devices advertised on the market. The main difference between the methods is the formation of the electrodes to be applied to the skin, which affects the way energy is transmitted to the tissues, as detailed below:



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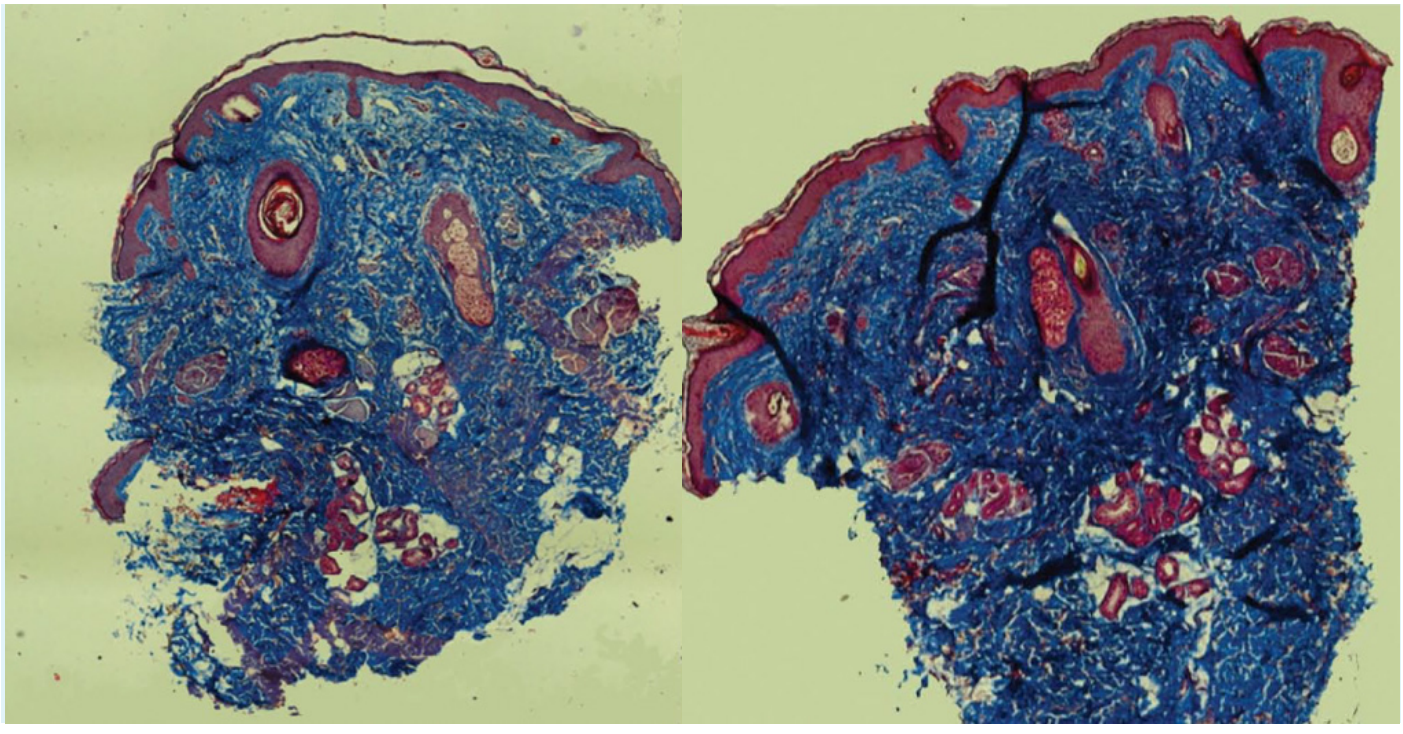

Supplied by the author

Figure 1. Pre-treatment (left) and post-treatment (right). Masson staining in one subject demonstrates increased collagen (blue) at 3 months post treatment

- Monopolar: the radiofrequency energy travels from the handpiece (active electrode) to a distant pole (passive electrode), which is usually in the form of a grounding pad that is attached to the body. Using this technique, the radiofrequency can affect both the skin and subcutaneous fat
- Bipolar: the radiofrequency energy alternates between two electrodes situated at a short distance from one another; the energy travels from one pole on the handpiece to another penetrating only the skin. In the tripolar and multipolar devices, bipolar energy switches between different poles at every moment. The energy is concentrated at the site of treatment, and the depth achieved is half of the distance between the two electrodes (Montesi et al, 2007).

Consultation, considerations and assessment

During the initial consultation with the patient for potential treatment, a full medical history should be taken to make sure the patient is a suitable candidate. When using monopolar radiofrequency, a collagen-stimulating treatment that uses a grounding pad for the radiofrequency connection, the practitioner should take careful note with regard to any autoimmune conditions, chronic inflammation and metal implants or other devices the patient may have. Correct patient selection is key to improved patient outcomes and satisfaction. Patients' age, degree of laxity, history of smoking, ethnicity and pain threshold could all influence their response to treatment (Northington, 2014). Patient expectations should also be noted and discussed as, although surgical facial lifting will be the most effective option for facial lifting, it is not without risk, and side effects, such as scarring, bruising and infection should be explained to the patient so they can be made aware of the advantages and disadvantages of each treatment.

Treatment

As previously stated, at age 25 years, the body stops creating its own collagen. Therefore, to stimulate the production of collagen, a form of 'injury/micro-trauma/inflammation' must be inflicted on the skin. The author uses the Food and Drug Administration-approved BTL Exilis Ultra 360™ to carry out all radiofrequency skin tightening for facial and body areas. This machine is the first and only device to simultaneously combine radiofrequency and ultrasound to tighten the skin and address body concerns. It has two handpieces: a smaller applicator for facial treatment and larger applicator for body treatments. The small applicator uses monopolar radiofrequency, which helps improve laxity, reduce fine lines and wrinkles and aids facial lifting. The large applicator is used for body treatments, which also incorporates monopolar radiofrequency for skin tightening, combined with ultrasound for fat reduction.

The machine has an embedded energy flow control system, which ensures that the exact amount of energy

Table 1. Comparative summary of non-invasive skin-tightening devices (Lee et al, 2012; Fabi et al, 2013; Oni et al, 2014; Chilukuri and Lupton, 2017)

	Ultherapy	UltraCool	Exilis Ultra 360™
Technology	Microfocused Ultrasound	Monopolar radiofrequency	Monopolar radiofrequency
Mechanism of action	Collagen denaturation and subsequent synthesis	Collagen remodelling	Collagen remodelling, increase of elastin and collagen fibres (small applicator), fat apoptosis (large applicator)
Treatment time (full face in minutes)	60–85	60–120	45
Number of treatments	1–2	1–2	2–4
Therapeutic temperatures (°C)	65	65–75	40–45
Anaesthetics	Yes	Yes	No
Clinical efficacy	58.1–96%	47–95%	89–93%
Patient satisfaction	65.6–95%	53–78%	77–97%
Pain (0–10 score)	3.9–6.53	6	No data
Non-responsive patients	14–20%	5–14%	3–8%
Worsening of patient's condition	24.7%	2.5%	No data
Serious adverse events	Rare	Rare	None

needed is delivered during the treatment. It continually measures and adjusts the radiofrequency power to skin contact and maintains stable heat, eliminating the possibility of hot spots and skin burns.

The large applicator has a built-in thermometer, so there is no risk of overheating, and it also has an option for 'layered cooling', which allows the practitioner to precisely control the heat and the level at which the energy is delivered. This controls whether the energy is delivered to the superficial skin layer or is targeted to the deeper tissue, which is advantageous when using the device for fat reduction.

The real-time control of cooling and heating also means that the treatment is comfortable at the surface of the skin for the patient, and, although during the treatment the skin may feel slightly warm (comparable to a hot stone massage), there will be no pain or bruising.

For facial treatments using the small applicator, the author tends to break down the facial areas into sections (i.e. neck, jawline, lower face, eyes and forehead). Most of the author's patients have two treatment areas as a package, as this tends to provide much better results (e.g. neck and jawline treatments create more definition and help with the overall lift for submental laxity).

Radiofrequency devices are ideal as a standalone treatment but are also beneficial when used in combination with other collagen-stimulating treatments. Ideally, every patient is first put on a course of skin tightening prior to threads or dermal filler application. The author has found that, by doing this, there is great improvement in anchorage for the threads and an increase in dermal thickness. This has allowed patients who initially would not have been suitable due to the thinness of their skin or would have minimal or even no positive results due to the low presence of existing collagen to be treated.

Figure 1 shows a histological analysis of a biopsy sample taken from a study carried out by McDaniel et al (2014), who conducted a two-treatment protocol for skin laxity using 90-Watt Dynamic monopolar radiofrequency device—BTL Exilis Ultra 360™.

Patients will typically visit the clinic a minimum of four times, allowing the practitioner to build a strong rapport and both educate the patient and up-sell further treatments. Ideally, the patient will need 4–6 treatments at 7–10 days apart (see *Figure 2*). With any collagen stimulation, the patient will see optimum results from a 12-week post-course of treatment.

A recent study by Chilukuri and Lupton (2017) compared the treatment efficacy and patients' subjective satisfaction of three non-invasive skin-tightening devices: Exilis Ultra 360™, Ultherapy and ThermaCool.

Ultherapy and ThermaCool devices leverage higher therapeutic temperatures to achieve results with a smaller number of treatments. This seems to be offset by increased patient discomfort and the need to use anaesthetics, which also prolongs the overall time needed for each session. The Exilis Ultra 360™ protocol consists of four treatments but shows higher patient

comfort. The highest rate of versatility is offered by the Exilis Ultra 360™ device, which can be used for treating additional areas on the body and intimate body parts in women.

The number of non-responding patients is comparable between Exilis Ultra 360™ and ThermaCool devices, ranging from 3% to 8%. Ultherapy studies show a slightly higher percentage of non-responders, as reported by Oni et al (2014) (17.2%), Lee et al (2012) (20%) and Fabi et al (2013) (14%).

The results are summarised in *Table 1*.

How the treatment works

The monopolar radiofrequency causes heating in the dermal layers, which activate the matrix metallopeptidase (MMP) enzymes to activate. MMPs are responsible for the degradation of the collagen protein structure—the triple helix. The thermal energy created causes the hydrogen bonds in the structures to break. As a direct consequence, collagen remodelling and neo-collagenesis is initiated.

The microinflammation created stimulates the fibroblasts (due to the heating), resulting in their proliferation. Heating the collagen to the therapeutic temperature of 41–42°C stimulates specific amino acids, such as glycine, proline, alanine and hydroxyproline, which are responsible for the proper formation and function of type 1 and 3 collagens. Dermal contraction results in tightening, and fibrous septae contraction results in contouring. The thermal heating effects of radiofrequency have been shown to change the shape, length and diameter of the collagen fibres for the correct formation of collagen (Paasch et al, 2009).

Aftercare and maintenance

During the course of treatment, patients must stay very hydrated and drink at least 2 litres of water a day. As stated previously, there is no downtime so they can resume daily activities. Collagen-stimulating treatments last up 2 years, although it is recommended that patients have maintenance sessions yearly.

Key points

- Growth of non-surgical treatments is leading to the constant advancement of interest in non-invasive treatments
- Monopolar radiofrequency is ideal as a standalone treatment but is also beneficial when used in combination with other collagen-stimulating treatments
- Practitioners can achieve results with minimal downtime and very low discomfort

CPD reflective questions

- How can monopolar radiofrequency support after aesthetic treatments for facial rejuvenation?
- What is the effect of radiofrequency on existing dermal fillers?
- What alternative treatment options are there for skin laxity, which are non-invasive with little to no downtime?

Supplied by the author

Figure 2. Pre-treatment (above) and post-treatment (below), carried out by the author. This patient had a course of four treatments spaced 7–10 days apart

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Monopolar radiofrequency is the ideal treatment for patients looking for non-invasive procedures with minimal downtime

Summary

In summary, monopolar radiofrequency is an excellent choice for patients who are seeking a non-invasive approach to skin tightening. It is a great standalone treatment or can be used in combination with other anti-ageing procedures and no topical anaesthetic or oral analgesia is required. Practitioners can achieve results with minimal downtime and very low discomfort; however, correct patient selection is fundamental to optimise satisfaction and clinical results. JAN

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