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Clinical response to infra-red device treatment in combination with PEGylated dermal filler in a woman with skin laxity on the arms. Case report

Zastosowanie podczerwieni w połączeniu z PEGylowanym wypełniaczem skórnym u kobiety z wiotkością skóry ramion. Opis przypadku

ABSTRACT

A 46-year-old woman approached the clinic with the defect of loose and sagging skin on her arms. She was offered therapy with an infrared-generating device combined with hyaluronic acid and micronized calcium hydroxyapatite.

The aim of the case report was to evaluate the clinical response to the therapy.

The visual effect, particularly appreciated by the woman, was the modelling of the arms, a significant reduction in skin flaccidity, and a significant reduction in stretch marks. In the presented case, the combination of hyaluronic acid cross-linked with polyethylene glycol (PEG) and infrared gave satisfactory results due to its high tolerability and effectiveness. In addition, the therapy induced a visible change in elasticity, hydration, and firming of sagging skin.

Keywords: skin aging, sagging skin, arms, infrared, dermal fillers, hyaluronic acid

STRESZCZENIE

Do gabinetu zgłosiła się 46-letnia kobieta z defektem luźnej i obwisłej skóry na ramionach. Zaproponowano jej terapię urządzeniem wytwarzającym podczerwień 74478884, w połączeniu z kwasem hialuronowym oraz mikronizowanym hydroksyapatytem wapnia.

Celem opisu przypadku była ocena odpowiedzi klinicznej na terapię.

Efektem wizualnym, szczególnie docenionym przez kobietę, było wymodelowanie ramion, znaczne zmniejszenie wiotkości skóry, a także wyraźna redukcja rozstępów. W prezentowanym przypadku połączenie kwasu hialuronowego sieciowanego glikolem polietylenowym (PEG) oraz podczerwieni dało satysfakcjonujące rezultaty ze względu na wysoką tolerancję i skuteczność. Dodatkowo terapia wywołała widoczną zmianę w elastyczności, nawilżeniu, a także ujędrnieniu zwiotczałej skóry.

Słowa kluczowe: starzenie się skóry, wiotka skóra, ramiona, podczerwień, wypełniacze skórne, kwas hialuronowy

INTRODUCTION

The skin is recognised to be the most voluminous organ of the body, with an excessive exposure to the outside environment: both inherent and extrinsic ageing factors. Skin ageing is characterized by features such as wrinkling, loss of elasticity, laxity, and rough-textured appearance [1].

This ageing process is accompanied by phenotypic changes in cutaneous cells as well as structural and functional changes in extracellular matrix components such as collagens and elastin. In this review, the changes in skin ageing, research advances of the molecular mechanisms leading to these

alterations, and the treatment strategies aimed at preventing or reversing skin ageing are summarized [1].

Upper arm skin laxity is common, but many people are unaware that it has a solution. Depending on the case, the severity of the deformity of the area, or skin laxity, and the possible outcomes, the results can be quite satisfactory while avoiding the severe approach of plastic surgery. It is mostly a concern for woman above 40 years old, when they start paying attention to the skin changes of different zones of the body, also in menopause and start having an important cosmetic concern. It is the responsibility of medical practise to provide not only the visible effect, but also assess for ageing process, to educate and explain the real expectation about these results with non-invasive treatment. The spectrophotometric and histochemical alterations of the skin, including the tightening of the skin in certain areas of the body and the improvement of skin laxity with infrared, have been previously documented. The immediate post-treatment histological evaluations showed architectural disarray of dermal collagen and elastin [1].

The development of the technology and refinement of treatment protocols, including the upgrading of the technology of the fillers, allows us to obtain better outcomes and modulate positively the changes of the dermis and epidermis structure, and to improve the consistency and preventive effects of the results.

Hyaluronic acid-based fillers (HA) and energy based devices are important tools that are used daily in aesthetic medicine to correct the skin aging process of womens' faces. Aesthetic physicians often offer combined therapies using both techniques - HA fillers with energy-based devices [2-4].

The articles related with skin tightening described the treatment of skin laxity via radiofrequency (RF), ultrasound, or light-based devices. Skin laxity directly depends on genetic factors (chronological ageing) and extrinsic factors (ultraviolet radiation). There are many RF, ultrasound, and light-based devices use for treating skin laxity. All of these devices target and heat the dermis to induce collagen contraction [5, 6]. Heating of the dermis causes collagen denaturation and immediate contraction in addition to long-term collagen remodelling. Via RF, light, or ultrasound, these skin-tightening devices deliver heat the dermis to create new collagen and induce skin tightening. This case shows the combination and overview of the effect of the infra-red medical device (Berger & Kraft Medical Sp. z o.o, Poland), with PEGylated HA dermal filler (Matex Lab S.A, Geneva, Switzerland) and linear HA (Matex Lab S.A, Geneva, Switzerland) and provide excellent results. The above mentioned method is a potentially useful tool to adapt in medical practice as a protocol.

PEGYLATED DERMAL FILLERS AND INFRA-RED DEVICE USED IN THIS CASE REPORT

For the last almost 30 years, modifications of HA concentration and degrees of cross-linkage with biphasic and monophasic gels were investigated [7, 8]. Crosslinking agents were also introduced and changed in order to decrease the toxicity and to increase both biocompatibility and long-lasting effectiveness. In this way, after divinyl sulfone and 1,4-butanediol diglycidyl ether, polyethylene glycol (PEG) polymer was introduced. PEG polymer, used as a crosslinking agent creating the so-called PEGylation [9-11], seemed to offer considerable advantages in terms of safety and performance of the gel.

The advantageous properties of PEG, such as its hydrophilicity, non-toxicity and non-immunogenicity, are transferred to the combined filler here used through PEGylation, acting with a supplementary protective action towards the risk of immunological adverse reactions [12].

The injected filler appears harmoniously integrated with the structures inside the connective tissue, as collagen fibers, blood and lymphatic vessels, glands and nerves. Thanks to PEGylation, the filler used presented excellent rheological properties, such as cohesivity, viscoelasticity and plasticity, with an optimized adaptation to the receiving anatomic area and, at the same time, it maintained the desired shape for a long-lasting esthetical correction. In the present study, this was well demonstrated by the limited diffusion of the filler outside the injection site, and the limited dislocation. The desired volume appears maintained without any non-physiological compression to surrounding tissues [13, 14]. The filler not only gives volume and support to the connective tissue as injected substance, but, it has also a positive effect to regulate the water diffusion process, preventing an excessive swelling of the gel itself [15].

The technology of thermolifting with the use of infrared radiation (IR) in the case of skin manifested by the loss of firmness as a result of the aging process, hormonal and weight changes is one of the non-invasive lifting methods. IR device has a special handpiece finished with sapphire glass, which enhances the emission of IR light leading to the thermal effect of the skin. The device emits radiation in the wavelength range 750-1800 nm, allowing to obtain energy density in the range of 5-75 J/cm^2. During the treatment, the obtained temperature of heating of deep layers of the skin is 65°C.

CASE REPORT

The object of the study: The case of a healthy 46-year-old woman with flabby, sagging arms as a result of the aging process is presented. Woman underwent the first aesthetic procedure in 2019, and several plastic surgeries since 2006: mammoplasty, lipolaser, minifacial lifting, buttock prothesis.

Woman came to the Clinic for facial melasma treatment, in the meantime she also underwent botulin toxin treatment and dermal filler augmentation. During the conversation with the woman and planning a long-term approach to aesthetic medicine treatments, a shoulder contouring treatment was proposed - a local treatment for adipose tissue, to improve elasticity, skin flaccidity, even stretch marks to counteract the

Fig. 1 Before and after treatment pictures **Source:** Own study

Fig. 2 Results after the follow-up visit **Source:** Own study

normal aging process. The treatment plan consisted of one treatment session, with a follow up visit after 2 months.

Products used: PEGylated HA dermal filler - 26 mg/ml stabilized sodium hyaluronate with hydroxyapatite (1%), non-cross-linked sodium hyaluronate 18 mg/ml with hydroxyapatite (0.01%), and IR device.

Technique: Dermal filler augmentation in both arms, superficial approach: subdermal leaf shape technique local- anterior, 0.5ml per side, followed by the treatment with IR device - 2-3 passes (per side) with energy settings at 30-35 J/cm^2 (fig. 1).

Results: After two month a follow-up visit was performed with the usage of IR treatment and non-cross-linked mesotherapy to restore and hydrate the dermis and epidermis layers enhance the visible and preventive effect. In this session, non-cross-linked HA was administered by cannula and nappage technique directly to the right arm stretch marks using a total of 1.8 ml. The rest of the 0.7 ml product was given the same technique to the left arm to maintain a good result. The difference in the amount of non-crosslinked HA given was due to the significant asymmetry and different flaccidity of the skin on both arms. During the follow-up visit first observation was that the combined therapy of linear HA with low concentration of calcium hydroxyapatite combined with IR significantly improved the skin quality, tension, and laxity. It was visible the tissue is more elastic and more hydrated than before the treatment (fig. 2).

CONCLUSIONS

Combined therapy induced visible change in skin elasticity and hydration, and also affected skin laxity. Visual effect especially appreciated by the woman was the shoulder contouring with significant improvement of skin flaccidity and visible reduction of stretch marks. The increase in skin

elasticity can be the result of both IR treatment and skin stimulation associated with the implementation of stabilized HA, as well as the interaction of both of these factors. This is intriguing when examining potential risks linked to prolonged residence of an external entity, such as a HA-based filler implant, which may result in the formation of granulomas and other immunological responses. Zerbinati et al. [16] demonstrated that HA cross-linked with PEG has the ability to modulate polymorphonuclear leukocyte (PMN) functions, resulting in anti-inflammatory effects, and carries a very low risk of immune-mediated adverse effects. The unique safety, inflammatory, and immunological response outcomes of PEGylated filler monotherapy are especially notable, and when paired with IR technology, they are compatible with prior data on PEG's immunomodulatory capabilities. [17].

The combination of PEGylated HA filler, which gives great integration, safety profile and tolerability, with IR device can optimize and boost results not only because it is very well tolerated, but also effective [16, 17]. To sum up, the properties of PEGylated HA fillers affect the unique behaviour in tissues, and biointegration, which, combined with understanding, learning about anatomy and choosing the right application plane, as well as right product from the portfolio, may bring very unusual results.

Looking at the progress of aesthetic medicine, its future is surely the intelligent mixing of multiple technologies to get the best possible outcomes, as in the preceding example. Before beginning any surgery, every professional must describe the whole process, its reasons, and confront it with the patient's expectations. Collaborative efforts among specialists, after thorough consultations, together with increased utilisation of technological devices and individual commitment to personal discipline via the use of cosmeceuticals, might yield very favourable outcomes by avoiding the need for more invasive procedures, such as surgical interventions. Due to the fact that the examined group was small and there are few scientific reports in this area, further research is recommended, but even these preliminary results are optimistic.

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