

Hydrogel plus growth factors treatment after 2940nm erbium:YAG lattice laser improves periorbital wrinkles and wound healing: a case report

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Abstract

Skin aging is an inevitable physiological process and periorbital wrinkling is an active sign of the process. Laser therapy is an effective method for improving periorbital wrinkles and wound care after laser therapy can accelerate the wound healing process. This case report describes a typical case of a 47-year-old male that presented with a 10-year history of gradually-worsening bilateral periorbital wrinkles. These were treated using a 2940 nm erbium (Er):YAG lattice laser combined with recombinant bovine basic fibroblast growth factor (bFGF) gel and hydrogel (HG) treatment on the left side of his face compared with laser therapy and bFGF gel on the right side of his face. HG combined with bFGF gel treatment after 2940 nm Er:YAG lattice laser therapy improved postoperative swelling and pigmentation compared with bFGF gel alone; and it promoted periorbital wrinkle improvement and wound healing. In conclusion, HG combined with GFs after laser therapy could be an alternative therapy for periorbital wrinkles.

Keywords

Hydrogel dressing, growth factors, laser, periorbital wrinkles, skin rejuvenation

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Introduction

Skin aging is an inevitable physiological process characterized by atrophy of the extracellular matrix, reduced production of collagen, which manifests as increased facial wrinkles and hyperpigmentation.¹ Laser therapy has become a common cosmetic treatment, making facial skin rejuvenated, correcting wrinkles and repairing pigmentation.² Post-laser wound care is equally important, thus growth factors (GFs) and hydrogel (HG) have been used for wound repair after laser treatment.¹⁻⁴ GFs have been confirmed to have positive effects on wound healing and anti-skin aging.² HG is a medical material mainly composed of polyvinyl alcohol and polyvinylpyrrolidone, which is beneficial for maintaining a moisturized environment to promote the wound healing process.³ This case report describes a typical case in which periorbital wrinkles and wound healing were rapidly improved by using a 2940 nm erbium (Er):YAG lattice laser combined with recombinant bovine basic fibroblast growth factor (bFGF) gel and HG treatment.

Case report

In April 2019, a 47-year-old male visited the outpatient clinic in the Department of Laser Therapy, The Fifth People's Hospital of Hainan Province, Haikou, Hainan Province, China with a 10-year history of gradually-worsening bilateral periorbital wrinkles. The patient had never received periorbital invasive or non-invasive anti-aging treatment. Before treatment, static wrinkles with a pronounced appearance were observed on his bilateral periocular area (Figure 1: A1, B1, C1, D1). He received a viable therapy to manage his periorbital wrinkles as follows: the left orbital area was subjected to 2940 nm Er:YAG lattice laser and then HG (Changchun JA

Biotech, Changchun, China) 10 h/day combined with recombinant bovine bFGF gel (Beifuxin gel; Essex Bio-Pharmaceutical, Zhuhai, China) twice daily for 4 days (hereafter, LHG); while 2940 nm Er:YAG lattice laser and bFGF gel twice daily for 4 days (hereafter, LG) were applied to the right orbital area as the control. This therapy was explained to the patient and he provided written informed consent prior to the procedure. The VISIA[®] facial image analysis system (Canfield Scientific, Parsippany, NJ, USA) was used to monitor the periorbital areas on days 1, 4, 7, and 30 after treatment. The LHG therapy improved postoperative swelling and pigmentation compared with the LG therapy (Figure 1: A2–A5, B2–B5). Noticeably, the wrinkles on the LHG side on day 30 were obviously improved, while the control side had more wrinkles because of the unsmooth wound surface caused by crusts (Figure 1: C2, D2). LHG therapy accelerated the wound healing process as it effectively reduced the blood vessels due to the laser treatment (Figure 1: C3–C5, D3–D5).

The patient agreed to the publication of his case report and written consent was obtained. The publication was approved by the Ethics Committee of the Fifth People's Hospital of Hainan Province. The case report conforms to the CARE guidelines.⁵

Discussion

Periorbital wrinkling is a sign of skin aging.⁶ Laser therapy is an effective method for improving periorbital wrinkles.⁷ The 2940 nm Er:YAG laser is an effective tool to implement skin rejuvenation due to its specific wavelengths, high security and short healing time.⁸ Furthermore, wound care with GFs or HG can accelerate epithelial regeneration and the wound healing process.²⁻⁴ Previous research has indicated that wound dressing plus GFs, compared

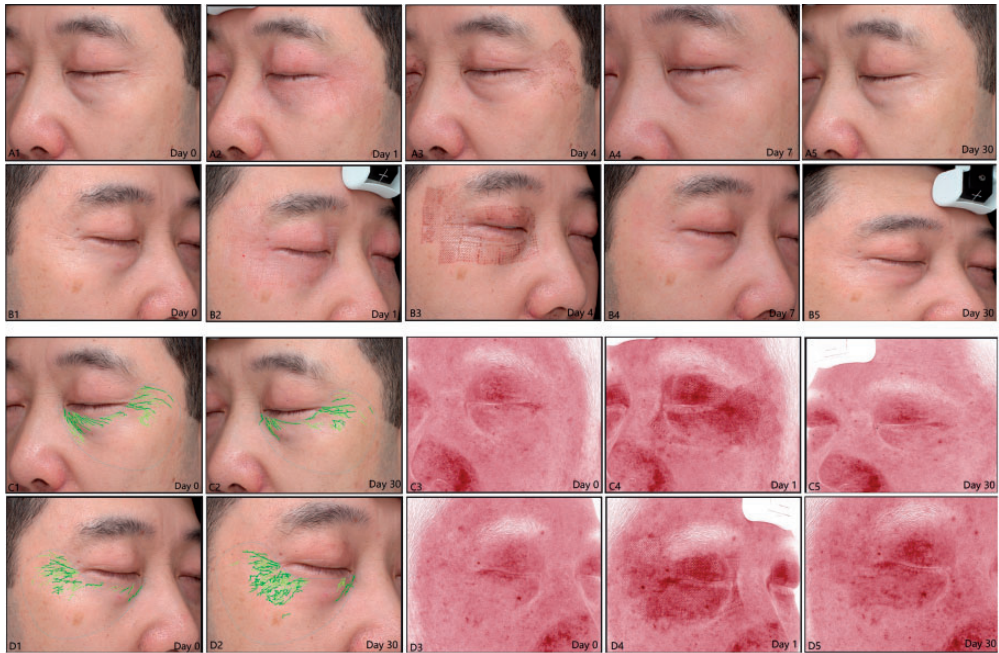


Figure 1. Representative photographs obtained using a VISIA[®] facial image analysis system of a 47-year-old male that presented with a 10-year history of gradually-worsening bilateral periorbital wrinkles. The photographs were taken in order to analyse the extent of wrinkling and red areas before and after treatment: (A1–A5) photographs of the left side of the face treated with lattice laser therapy, hydrogel combined with basic fibroblast growth factor gel (LHG) on days 0, 1, 4, 7 and 30; (B1–B5) photographs of the right (control) side of the face treated with lattice laser therapy and basic fibroblast growth factor gel on days 0, 1, 4, 7 and 30; (C1–C2) photographs of the wrinkles on the LHG side on days 0 and 30; (C3–C5) views of the red areas on the LHG side on days 0, 1 and 30; (D1–D2) photographs of the wrinkles of the control side on days 0 and 30; (D3–D5) views of the red areas on the control side on days 0, 1 and 30. The colour version of this figure is available at: <http://imr.sagepub.com>.

with wound dressing alone, showed more therapeutical benefits after laser treatment.² However, treatment with GFs exhibits limited curative effects because they are rapidly degraded, having only a short half-life.³ During wound healing, HG is able to absorb liquids, keep the wound moist, improve the inflammation, promote collagen deposition and blood clotting capacity.^{8–10} In addition to accelerating the rate of re-epithelialization, HG loaded with bio-active drugs showed a higher drug release rate and enhanced biological activity.^{9,11} A study demonstrated that using laser therapy combined with HG might contribute to the

synthesis of collagen and the process of wound healing.⁴ HG in combination with GFs could maintain the sustained release of GFs, while HG prevents the degradation of GFs by proteinases, and enhances the pharmacological effect of GFs to promote wound healing.^{3,12} The role of lasers and GFs in facial rejuvenation has also been demonstrated previously,^{13,14} so this current case was treated with LHG therapy and LG control therapy on the contralateral sides of his face to see if the LHG therapy would have a better effect on periorbital wrinkle treatment. In summary, LHG treatment significantly improved skin aging with

an accelerated wound repair and wrinkle improvement. To the best of our knowledge, this is the first case of a patient with periorbital wrinkles treated with 2940 nm Er:YAG lattice laser therapy plus GFs and HG. It should be noted that the underlying mechanisms have not been elucidated. HG combined with GFs after laser therapy could be an alternative therapy for periorbital wrinkles. However, the mechanism and curative effect of the LHG therapy need to be further studied.

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Authors' contributions

J.Z. and Z.L. reviewed the literature and wrote the manuscript; S.F., J.L. and Y.Z. collected the clinical data and helped to draft the manuscript; F.L. treated the patient and made revisions related to important intellectual content of the manuscript. All authors provided final approval for the version to be submitted.


Declaration of conflicting interest

The authors declare that there are no conflicts of interest.

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