

## Case Report

# Combination of 1064-nm QS:Nd-YAG laser with modified Jessner's peel and dermal fibroblast conditioned medium serum for the treatment of post inflammatory hyperpigmentation on lower limb

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**Abstract** Post-inflammatory hyperpigmentation (PIH) has clinical manifestations in the form of macules or patches with the same distribution and location where the inflammatory process begins. This condition can occur in any part of the body, including the lower extremities. Combination therapy is considered more than single therapy. We reported a case of PIH on lower limbs of 26 year old male Fitzpatrick IV. After 1 month of using the topical therapy, the patient was programmed for the 1064-nm QS:Nd-YAG Laser combination followed by Modified Jessner chemical peel in the same session 6 times with 1 month intervals. After the procedure, the treated area is applied with a serum containing DFCM. After 6 therapy sessions, HPI faded. This combination gave satisfactory results in cases of HPI lower limbs on Fitzpatrick skin type IV.

### Key words

Post-inflammatory hyperpigmentation; Lower extremity; 1064-nm QS:Nd-YAG laser; Modified Jessner's peel.

## Introduction

Post-inflammatory hyperpigmentation (PIH) is an acquired hypermelanosis that occurs after inflammation due to dermatosis, trauma to the skin, and even dermatological procedures.<sup>1</sup> Although it can affect all skin types, PIH often occurs in Fitzpatrick III-VI skin types that can lower self-esteem and impression so that it impacts the quality of life of the patients.<sup>2-4</sup> The clinical course of PIH is chronic and often difficult to predict. However, the resolution of

epidermal PIH is likely to be faster than PIH that occurs in the dermal layer.<sup>3</sup>

Post-inflammatory hyperpigmentation can occur anywhere on the body, although it is often a complaint in the face area. Handling PIH in areas other than the face, such as the lower limbs, is challenging because research related to PIH therapy in areas other than the facial area is still limited.<sup>5</sup> Various therapeutic modalities are available in the treatment of PIH. Combination therapy is considered more effective than single therapy.<sup>3,4,6</sup>

The Q-switched neodymium-doped yttrium-aluminum-garnet 1064-nm (QS:Nd-YAG) laser and the modified Jessner chemical peel, either alone or in combination, have been reported to

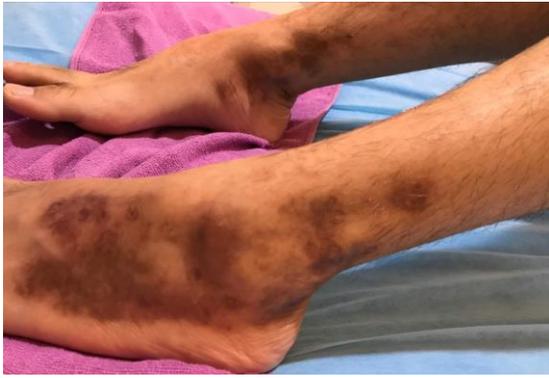
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**Figure 1** Post inflammatory hyperpigmentation on lateral side of left lower limb.



**Figure 2** PIH on lateral side of left lower limb—before procedure

be successful in treating cases of hyperpigmentation such as mixed type melasma and Nevus Ota. Jessner's modified chemical peeling agent consists of 17% lactic acid, 17% salicylic acid, and 8% citric acid in 95% ethanol.<sup>7,8</sup> In addition, the administration of topical anti-inflammatory or creams containing growth factors and oral tranexamic acid are therapeutic options to minimize the risk of post-procedure HPI such as laser and chemical peels.<sup>9</sup> Topical products containing growth factors are reported to accelerate wound healing.<sup>10,11</sup> Dermal fibroblast conditioned media (DFCM) is a medium containing dermal fibroblasts that secrete various types of proteins such as growth factors, which can accelerate wound healing and have an effect on skin rejuvenation.<sup>12</sup> Therefore, the authors present a case report of PIH in the lower limbs, which was successfully treated using a combination of QS:Nd-YAG laser with modified Jessner chemical peel and serum containing DFCM in addition to standard topical therapy.

### Case report

A 26-year-old man with the main complaint of dark patches on both lower limbs for 3 months. Four months earlier, the patient had experienced inflammation in both lower limbs. After 1 month receiving treatment and recovering, its

left dark patches on the patient's lower legs. Currently, the patient is worried because he often uses shorts for daily activities and wants to fade the black marks on his lower legs, especially on the outer side of the left leg, which is quite wide. The patient had a history of atopy but no history of keloids.

On dermatological examination, there were dark brownish-black hyperpigmented patches with unclear borders, multiple on both lateral and medial lower limbs, varying in size, the most extensive on the lateral side of the left lower leg measuring 12 x 6 cm. (**Figure 1**).

Based on history and dermatological examination, the patient was diagnosed with post-inflammatory hyperpigmentation. The management of this patient is the administration of topical therapy broad spectrum SPF 30 sunscreen lotion in the morning also moisturizer containing ceramides in the morning and evening immediately after the shower. At night, 4% hydroquinone cream and 0.05% retinoic acid cream were applied to the lesion area. This topical therapy was given for one month after the diagnosis of PIH. After one month, we planned the patient for 6 sessions of combined QS:Nd-YAG 1064-nm laser (CuRas; Ilooda: Korea) followed by Modified Jessner chemical peel and application of DFCM serum for after

treatment in one-month intervals. Before the procedure, the patient was given an explanation of the procedure. The patient agreed and then signed the informed consent. **Figure 2** shows the PIH lesions before the procedure. The PIH lesions only faded slightly clinically. Preparation at the time of the procedure is using topical anesthetic cream (a mixture of lidocaine 2.5%; prilocaine 2.5%) for 1 hour on the PIH site. Then after cleaning, the patient was treated with a 1064-nm QS:Nd-YAG laser with parameters, namely fluence 2.0-2.5 J/cm<sup>2</sup>, frequency 10 Hz, spot size 8 mm collimated, 2 passes, and the endpoint was erythema. The Modified Jessner peel application is single until a double layer is applied after the QS:Nd-YAG laser in the same session. The endpoint of chemical peel that occurs is slightly frosting.

After the procedure, the treated area was applied with serum containing DFCM that commercially available (QTCell; S.THEPHARM Co., Ltd, Seoul, Korea) followed by 0.9% normal saline compress with sterile gauze for 15 minutes. For 3 days after the procedure, the patient was instructed to apply a moisturizer containing ceramide 2 times a day and a broad spectrum SPF 30 sunscreen lotion in the morning. For the maintenance phase, the previous topical therapy was continued and discontinued 1 week before the next treatment session.



**Figure 3** Two weeks follow up after 3rd session.

Follow-up is done every 2 weeks after the procedure. The following is a photo of the patient's lower limbs at the time of control 2 weeks. After 3 and 6 sessions (**Figure 3,4**), the hyperpigmented patch lesions started to fade.

## Discussion

Post-inflammatory hyperpigmentation in the lower limb area is quite challenging to treat compared to the facial area. This is due to several factors, including the fewer pilosebaceous units, the thickness of the epidermis, and the reduced blood supply in the lower extremity area, which results in a longer healing period, in addition to the thicker epidermis compared to the facial area.<sup>5</sup>

In the general management of PIH, topical therapy such as sunscreen is mandatory, and whitening agents such as hydroquinone and retinoic acid are the first line. In addition, to accelerate improvement and increase patient satisfaction with the results of therapy, a combination with other treatment modalities such as chemical peels and lasers can be considered.<sup>3</sup> This is the reason why we used this combination in this case.

To our knowledge, the combination of low fluence QS:Nd-YAG with a modified Jessner



**Figure 4** Two weeks follow up after 6th session.

peel and DFCM serum as post-procedure treatment in the same session to manage PIH in the lower limbs has not been previously reported. Lee *et al.*'s research has reported the success of the combination of low fluence QS:Nd-YAG with Jessner peel in the same session for melasma cases.<sup>13</sup> In our case report, choosing a combination of these two modalities in the same session with an interval of 1 month for 6 sessions is because these two combinations show a good synergistic effect. It can accelerate the desquamation of epidermal melanin to maximize the skin lightening effect and prevent the long-term side effects caused by these two modalities when used alone. The side effects that are commonly found are mottled hypopigmentation and rebound hyperpigmentation due to multiple laser frequencies.<sup>7,8,14</sup> In addition, we also consider where patients live far away and in different districts, as well as considering the ongoing COVID-19 pandemic during this treatment period. The successful combination of the two modalities has been previously reported, although not in the same session and in cases of hyperpigmentation in the facial area, namely nevus Ota and melasma.<sup>7,8</sup> As we know that research related to the treatment of PIH is still limited, and most of it still refers to scientific evidence of research on the treatment of melasma.<sup>3</sup> Low fluence QS:Nd-YAG or also called "laser toning," works by selectively causing fragmentation of melanin granules with minimal thermal damage.<sup>13,15</sup> The use of chemical peels here includes body peel or a non-facial chemical peel, in principle the same as a facial chemical peel both for preparation before, during and after the procedure. The chemical peel agent chosen was modified Jessner because it is a type of superficial chemical peel. It is a good choice for PIH cases, especially for areas other than the face.<sup>12</sup> In addition, the advantage of modified Jessner peel compared to Jessner peel is that it does not contain resorcinol, so the

risk of allergies and PIH due to resorcinol is reduced.<sup>8</sup>

The post-treatment of these two combinations is divided into 2, immediately after the procedure and a few days afterward. Application of serum containing DFCM because DFCM accelerates wound healing in the early phase. In addition, DFCM is also reported to have skin rejuvenating effects such as improving skin texture, improving skin pigmentation and collagen maturation.<sup>11,16</sup> Compress with normal saline to reduce discomfort. Broad-spectrum sunscreen is not used immediately after the procedure because it can cause a burning sensation and irritation. Excessive sun exposure should be avoided, and also reducing household activities using abrasive chemicals.<sup>5</sup>

## Conclusion

The combination of 1064nm QS:Nd-YAG laser with modified Jessner peel and DFCM serum successfully treated PIH in the lower limbs previously treated with standard topical therapy. In the future, we hope there will be further randomized controlled trials on the efficacy of this combination therapy protocol in PIH with a larger number of samples.

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