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Clin. Prof. Dr. Niwat Polnikorn's Publications on

755nm Picosecond and 1064nm/532nm Q-switched *Laser Technology*

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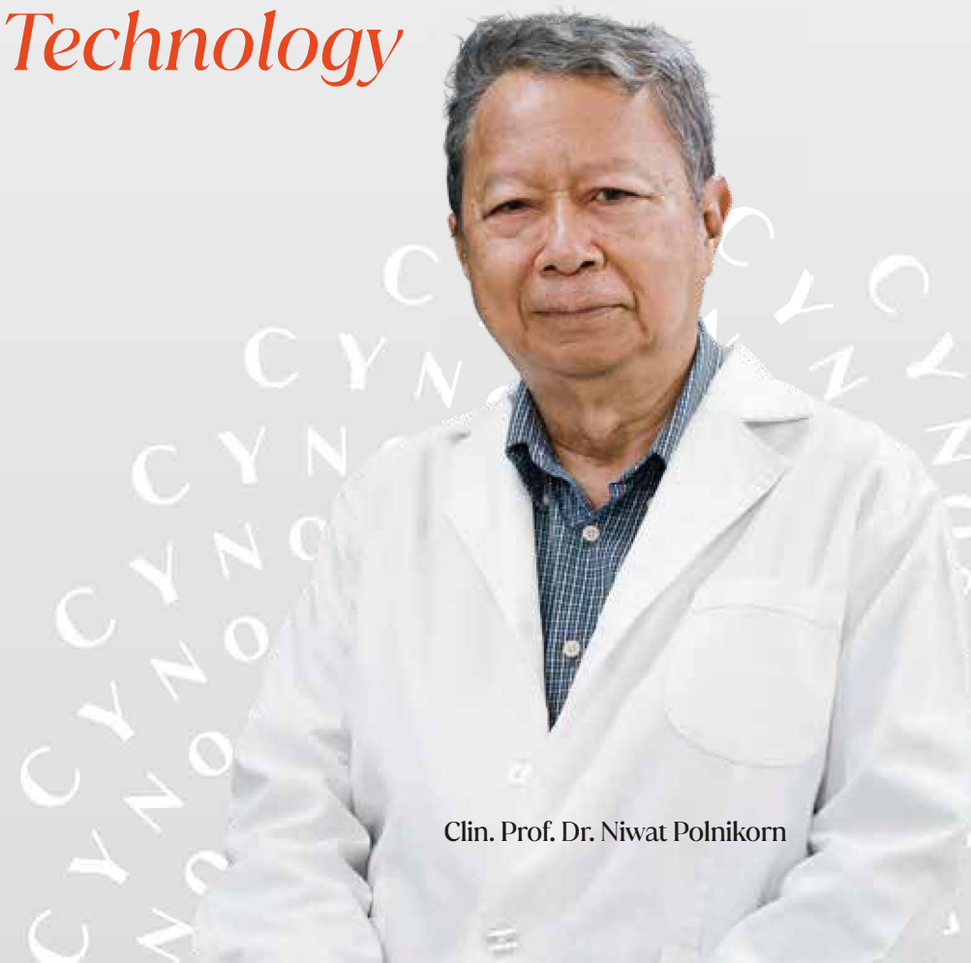

Clin. Prof. Dr. Niwat Polnikorn

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Treatment of Melasma in Skin Type IV and V with a New Adjustable Fluence Diffractive Lens Array Picosecond 755nm Laser.

Niwat Polnikorn MD., Pawit Padungsaksawat MD., PhD. Harit Leksuksri MD., M.Sc.

American Society for Laser Medicine and Surgery Abstracts (2024)

BACKGROUND AND OBJECTIVES

Melasma, a complex skin condition, challenges traditional therapies like topical agents and peels. Advancements in 755nm alexandrite picosecond laser technology, especially with adjustable fluence, promise tailored treatments. This study evaluates its efficacy and safety in Asian patients.

METHODS

This retrospective study, conducted from November 2022 to November 2023, analyzed patients treated for facial melasma with a 755nm alexandrite picosecond laser at a private dermatology center. It included two patient groups, differentiated by their previous melasma treatment history, and utilized the Melasma Severity Index and Quartile grading scale for evaluation.

RESULTS

Over 12 months, this study involved 50 patients (14% men, 86% women, ages 31-60) treated for facial melasma. On average, 3.26 treatment sessions were conducted, with Melasma Severity Index (MSI) scores improving from 14.10 to 8.34, showing statistically significant enhancement. Improvement varied: 10% excellent, 30% good, 22% moderate, 14% mild, and 24% no improvement. No substantial difference was noted in treatment efficacy between Mixed and Telangiectatic melasma or between previously untreated and refractory cases. Overall, 76% showed melasma improvement post-treatment, underscoring the method's effectiveness.

CONCLUSIONS

Our results demonstrate that the adjustable fluence 755 picosecond laser with DLA, alongside standard medications, effectively and safely treats mixed and telangiectatic melasma in skin types IV and V, improving pigmentation and rejuvenating skin.

Treatment of Refractory Melasma in Asians With the Picosecond Alexandrite Laser

Polnikorn N, Tanghetti E. Dermatol Surg. 2020 Dec;46(12):1651-1656.
doi: 10.1097/DSS.0000000000002612.

BACKGROUND AND OBJECTIVES

The picosecond Alexandrite laser was studied in our practice with the diffractive lens array and the flat optic to treat melasma.

METHODS AND MATERIALS

Sixty patients with melasma were treated in a prospective investigation with the picosecond Alexandrite laser. Nineteen patients were treated with the flat optic and 41 patients were treated with the diffractive lens array. Treatments were performed with 1 pass at 2-week intervals for 6 treatments. The Melasma Severity Index (MSI) was used to evaluate the patients before treatment and 3 and 6 months after the final treatment session.

RESULTS

At 6 months after the last treatment, there was an 18.5% difference between the groups with a 75.7% improvement in the MSI in patients with the diffractive lens array and a 57.2% improvement in the MSI score in patients with the flat optic. At 6 months, there was recurrence of melasma in 5% of the cases with no hyperpigmentation with the diffractive optic in contrast to recurrence in 16% of the cases in the flat optic group and a transient macular hyperpigmentation in 21% of the cases.

CONCLUSION

This investigation highlights the utility of a picosecond Alexandrite laser with a flat and diffractive lens to successfully treat a large percentage of Asian patients in a sunny climate.

Five Years Follow Up of Refractory Melasma After Treatment with Medlite C6

Niwat Polnikorn MD., Journal of Cosmetic and Laser Therapy. 2015

Laser toning was a new technique for treatment of refractory melasma with subphotothermolysis threshold Q-switched NdYAG laser. Since the first publication of the author in 2008 there were many subsequent publications confirmed the efficacy of this technique. Most of the studies had followed up the cases for 3-6 months. One retrospective article had reported occurrence of Confetti like hypopigmentation in 5 cases of melasma who had been received many treatments with this technique.

The purpose of this study was to evaluate 5 years efficacy and complications of this new technique in 15 refractory melasma cases. The cases were treated with Medlite C6 laser (Cynosure Conbio, USA) with 1064 nm, 3-3.6 J/cm² every 2 weeks for 10 treatments then at 1-2 months interval for 5 years. The average number of treatments was 47 times. Severity of melasma was determined using MASI scores.

Average pre treatment MASI score was 0.89, decreased to 0.54 at two years and 0.45 at five years. After 5 years MASI score decreased more than 50% in 8 cases, less than 50% in 4 cases and increased in 3 cases with mean MASI score reduction of 49%. At 5 years macular(Confetti-like) hypopigmentation occurred in 3 cases (20%) which was lower than 7 case (46.7%) after two years. At five years, 4 cases (26.7%) had recurrence of melasma.

In conclusion, laser toning for refractory melasma with long term maintainance, 1-2 monthly treatment was effective. Macular hypopigmentation was detected in 20% and recurrence occurred in 26.7%.

Journal of Pigmentary Disorders

New Approach for Laser Treatment of Melasma and Hyperpigmented Lesions

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Abstract

Melasma is one of the most common aesthetic problems in Asians and is one of the most difficult conditions to be treated. In the past result after laser treatment was usually believe to be unpredictable. This believes was based on anecdotal reports with variable laser parameters. In order to get better and long lasting result, we need to understand biology of melanin synthesis, pathogenesis of melasma, laser / light tissue reaction, sun screen and effect of whitening agents.

Keywords: Melasma; Melanin; Laser; Lesions

Melanin Synthesis

Most of melasma patients are photo skin type III to V. These skin type's response to sunlight by increasing of melanin synthesis. Melasma relates to strong sun light exposure and high estrogens. Melanins are synthesized in epidermal melanocytes and transfer to epidermal keratinocytes. One melanocyte supplies thirty six keratinocytes and is called "epidermal melanin unit" . Majority of melanin granules are distributed in the keratinocytes. Melanin granules in melanocytes are mainly early stage (stages I-II) which contains less melanin. UV exposure stimulates keratinocytes to release cytokines (especially endothelins) which bind to endothelin receptors on melanocyte cell membrane. The binding of keratinocytes and melanocytes is through binding of Stem Cell Factor (SCF) on keratinocytes and C-kit protein on melanocytes. Endothelins together with Melanocyte Stimulating Hormone (MSH) stimulate tyrosinase enzymes synthesis. These enzymes are essential for melanin synthesis. Any conditions producing basement membrane injuries will lead to melanin dropping down into upper dermis .They will be engulfed by macrophages transforming to what we call "melanophages". These melanophages will persist in dermis for many years. Recently, there were many published articles on finding of increase of vascular dilatation and vascular growth factor in melasma.

In normal skin most of the mature melanins (stage V) will be in keratinocytes Epidermal or follicular melanocytes contain unmelanized melanin (stage I-II). This unmelanized melanin will not absorb enough laser energy to produce "Selective Photothermolysis" or photomechanical destruction of melanin and also of melanocytes. The surviving memalnocytes are the major source of recurrence of lesions after selective pigmented laser treatment (e.g. 532 nm frequency-doubled Q-switched Nd: YAG laser). For hyperpigmented lesions, mature melanin present in all these locations; keratinocytes, epidermal melanocytes and melanophages. In order to reduce hyperpigmentation, the treatment should be able to reduce melanin all three locations. In hyperpigmented lesions melanin granules also aggregate into clumps. This produces dark color, while small fragmented and dispersed melanin produce lighter colour [1-6].

In summation, the following mechanisms had been used with mild to moderate result for treatment of melasma:

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1. Superficial peelings e.g. chemical peels, microdermabrasion, laser resurfacing.

2. Stimulation of keratinocytes turnover. Example: vitamin A acid, glycolic acid, salicylic acid.

3. Suppression of melanin synthesis. Example: hydroquinone, arbutin, kojic acid, licorice PT40, tranxemic acid etc.

4. Reduction of pigment transfer from melanocytes to keratinocytes. Example: Niacinamide, Clove extracts

5. Destruction of melanin's containing cells (melanocytes and Keratinocytes) e.g. Q-switched laser, Fractional laser

Pathogenesis

Melasma is a complex disease. The pathogenesis involves: 1) Hyperfunction of clones of epidermal and follicular melanocytes in certain sun-exposed area. 2) Increase in number of epidermal and follicular melanocytes in lesions (average 30%). 3) Presence of dermal melanophages. 4) vascular dilatation and endothelial proliferation and 4) mild chronic perivascular inflammation. The dermal melanophages will be able to survive in the dermis for many years and resisted to all topical treatments. Recently histologic study in melasma in Asians has demonstrated that, majority (more than two third) of melasma is a combination of epidermal melanocytes hyperactivity, increase in melanocytes with dermal melanophages. There is no such condition that has been called dermal melasma. If mature melanocytes are detected in the dermis, they should be classified as a condition in the group of dermal melanocytotic disorder. The most common condition in this group is acquired bilateral nevus of Ota like macules (Hori's nevus) which was found in 2% of adult Asian women and Nevus of Ota [6-15].

Treatments

Since melasma had been believed to be a hyperfunctional disorder, the accepted treatment was topical bleaching agents. The most widely used drug was hydroquinone. Other drugs e.g. Arbutin, Kojic acid, Licorice PT 40 are less popular because of lower efficacy and higher cost. The recommened concentration of hydroquinone was 2-4%. Eventhough hyderoquinone is still the bench mark for medical treatment of melasma it has created many problems. One of the most common problem after prolong using of hydroquinone is rebound hyperpigmenatation and cutaneous toxicity (e.g. ochronosis) both are common in Asians. Combination of hydroquinone with retinoic acid and steroid (Kligman's formula: 5%Hydroquinone + 0.05% retinoic acid + 0.1% dexamethasone) increases effectiveness but also increases cutaneous side effects (atrophy, telangiectasia, acne, dryness and rebound hyperpigmentation). Topical treatment takes long time ,after treatment with Kligman's formula for 6 months about 30% had completed clearing, 30% improved more than 50% and 30% did not response or developed rebound melasma. Newer drugs had recently been introduced e.g 4-butyl resorcinol, inhibit both tyrosinase and DHICA-oxidase (which is an alternative pathway enzyme for melanin synthesis) has been found to be as effective as hydroquinone without its side effects. Fullerine and Ascorbyl phosphate palmitate sodium is another recently introduce combination drugs with both antioxidation and whitening results without the side effect. To enhance delivering of drugs into the skin many treatment modalities had been introduce for delivering of ascorbic acid and tranxemic acid for whitening affects e.g. Iontophoresis and electroporation, and intradermal injection of tranxemic acid.

Many new combination drugs with medications that interfere with melanin biosynthesis pathway e.g. tyrosinase inhibitors (e.g. alpha-Arbutin) + exfoliating agents (e.g. glycolic acid) + transfer of melanins blocking (e.g. niacinamide) has recently been available. This product often resulted in mild to moderate whitening effect but is safe for long term use.

Laser Treatment

Ablative laser resurfacing and dermabrasion had been studied in treatment of melasma. Not only the procedures were painful and complicated, the healing and recovering took long times. Dyschromia (hyper and hypopigmentation) was common after the treatments. In Asians, scar a keloids were other important side effects. To be effective, the ablation depth

should be enough to remove the follicular germ cells which locate as deep as mid dermis. This may explain why, dermabrasion had been claimed to be more effective than ablative laser resurfacing (CO_2 or Erbium YAG laser). The prolonged post treatment downtime and risk of hypopigmenation had discouraged performing this treatment for melisma [16-18].

For pigment selective lasers according to the principle of Selective Photothermolysis e.g. 532 nm frequency-doubled Q-switched Nd:YAG (2-3J/cm²), 694 nm Q-Switched ruby (6-8J/cm²) or 755 nm Q-switched alexandrite laser (6-9J/cm²), the results was disappointingly. Diffusely located melanins in epidermis resulted in almost total epidermal necrosis after these lasers exposure. Epidermis sloughed off resulting in peeling similar to ablative laser resurfacing. Usually the deeply located follicular melanocytes persisted and repopulated the treated area resulting in rapid rebound hyperpigmentation. Injuries to basement membranes also produce melanin dropping, follow by melanophages. One month after treatment all treated area will be darker from both epidermal melanocytes hyperactivity and present of melanophages in the dermis. This condition was difficult to treat and hyperpigmentation post selective laser treatment of melasma will persist for years. Too aggressive selective pigment laser treatment with higher energy would end up destroying all melanocytes down to the depth of follicles end up with permanent hypopigmentation.

Intense pulsed light (IPL) with broad band light 535-1000nm, initially had been claimed to be effective for hyperpigmented lesions. In Asians, it was later found out to be only minimally effective for melasma. In Asians with SPT IV-VI, high energy fluence often resulted in epidermal burn followed by healing; hypopigmentation or post inflammatory hyperpigmentation. Lower energy fluence was not enough to reduce follicular melanocytes. Only patients with SPT II or III with focal epidermal hyperpigmentation e.g. solar lentigines had mild to moderate reduction in hyperpigmentation of lesions after multiple IPL treatment [19-21].

Minimal Photothermolysis Laser for Melasma

For the past five years, the author has studied the new technique using principle of minimal selective photothermolysis with 1064nm Q-switched NdYAG laser, hat-top beam, 6-8mm diameter spot size, 2-3.5Joules/cm², 10Hertz , accumulative energy for each spot was 10-70 Joules/cm² for treatment of melisma. Most of the patients were treated with Medlite C6 laser (cynosure-Conbio, CA, USA).

The author has found that more than 60% of the patients had good (>50% clearing, 30% had completed clearing) result after 10-20 weekly treatments. The complications were mild and transients including, pain, erythema, rash, urticaria and exacerbation of acne. Less than 10% had rebound melasma, recurrence of melasma was found in 30%. Hypopigmentation was found in 5%.

The important contributing factors for the good result of treatment are:

1. High cumulative energy of hat-top 1064nm Q-switched Nd:YAG laser beam (10-20passes)

2. Large diameter spot size (6-8mm)

3. Rapidly repeated pulses (10hz)

4. Epidermal cooling with cool air (5°C)

5. Repeated treatment at 1-2 weeks interval

6. Long term photoprotection and topical whitening treatment

Eventhough the actual mechanism of treatment is still under study, minimal photothermolysis reaction by repetitive low threshold pulses resulted in melanins fragmentation, dispersion and eventually destruction of melanocytes. Clinically gradual depigmentation of melasma was observed. Topical moderate potency whitening agents e.g. alph-Arbutin, Fullerine + Ascorbyl phosphate palmitate sodium together with UVA + UVB blocker sunscreen prevented recurrence.

Treatment Technique

The treatment is done by delivering high repetitive (10 Hz) 5 nanoSecond, 1064nm laser , homogenous spot size pulses with sub-immediate whitening threshold fluence (usually 2 to 3.5 Joules/cm²) on to the lesions until immediate erythema is seen. Pulses of laser should be applied perpendicular to the surface with 10-20% overlapping between pulses and move laser pulses slowly across the lesions. Usually approximate 20 passes are performed on each spot. If the melanins are mainly in the epidermis, there will be immediate lightening of color of lesions. Patients will feel stinging sensation and warm. Cool air (5-10°C) is applied just before and after the treatment to reduce discomfort. Erythema will last a few hours.

The treatment should be done at short interval of 7-14 days before new epidermal cells with melanin granules replace the treated layer. Usually after about 10 treatments epidermal melasma will fade between 50-80%. Dermal melanophages will also response to this treatments but take longer time and and higher repetition.

To continue repeated treatments more than 10 times have to be judged case by case. The incidence of side effects especially hypopigmentation related to number of treatments. Detection of mottling hypopigmentation indicates that the treatment may reach the stage of permanently destruction of melanocytes which is undesirable. The treatment if needed to be done should be performed only to the remaining hyperpigment areas. The author has found that for melasma with melanophages the improvement was not as dramatic as epidermal lesion alone. The migration of melanophages needs longer time.

Topical whitening drugs and UVA and UVB blockers (SPF >30 and PA +++) are prescribed after the first treatment and continued for at least six months. The choice of whitening agents has to be judged case by case. The case that has been using hydroquinone containing cream for some time should continue with the treatment and slowly replace by other safer medications. Immediate termination of hydroquinone often results in rapid rebound hyperpigmentation. Cases without history of hydroquinone should use other newer agents with less long term side effects e.g. Alpha Arbutin, Fullerine etc.

Dermal melanocytic lesions e.g. acquired bilateral nevus of Ota like macules (Hori's nevus) and brownish lesion of Nevus of Ota also fade after repeated (more than 10) treatments. Blue or black nevus of Ota lesions usually does not response, repeated high energy (>8Joules/cm²) is still the recommend treatment. Periorbital darkening also improved after 10 treatments.

Post Inflammatory Hyperpigmention (PIH) is another condition which response rapidly to this new treatment. PIH or hyperpigmentation after skin injuries from any treatments is the result of both epidermal melanin synthesis and melanohages. It will response after few treatments. Melanins fragmentation/dispersion and enhancing of melanophages migration may explain this rapid response. In this condition, usually the numbers of melanocytes were reduced but they contained large clumps of melanin. These cells will be very sensitive to exposure with 1064nm laser light. Lower fluence is recommended for dark lesion. Immediate grayish white discolouration is a warning that too high energe has been delivered. Energy fluence should be lowered.

For epidermal lesions with hyperplasia of melanocytes e.g. solar lentigoes, ephilides, lentigines and café au lait macules usually response faster with 532 nm, Q-switched Nd:YAG laser treatments. For the collimated beam, lower energy fluence should be applied. This may reduce the risk of basement membrane injuries and PIH. The author has now used immediate grayish discolouration as the treatment end points. There will be thin brownish scabs for 3-5 days. After the scab fell off, faint hypopigmentation persisted for few weeks but PIH was much lower than using the old parameter.

The author has treated more than 500 cases of melasma with Minimal Photothermolysis Technique. In epidermal melasma more than 80% reduction of pigmenatation at lesions was obtained in more than 70% of cases, the remaining 30% has 50-80% response after 10 weekly treatments. 50% of combined melasma has 50-70% response. PIH or axillar hyperpigmentation responded better and faster. All cases received broad spectrum sunscreen (Anthelios XL, La Roche Posay, France, SPF 50, PA+++) with topical bleaching creams 7% Arbutin solution, triple drugs or Kligmen's formula (Trilumar , Galder-

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ma) applied twice daily. Few cases with very dark dermal lesions receive weekly intradermal transamin (5mg/ml) for 3-4 times.

A case with history of previous topical hydroquinone treatment was maintained with topical triple drugs (Trilumar). Long term follow up of more than 5 years after treatment was done in 30 cases. More than 30 % still had good result (50-75% reduction of MASI scores). Recurrence occurred in 30% of cases and confetti like hypopigmentation developed in 5% of cases [22-24] (Figures 1-3).

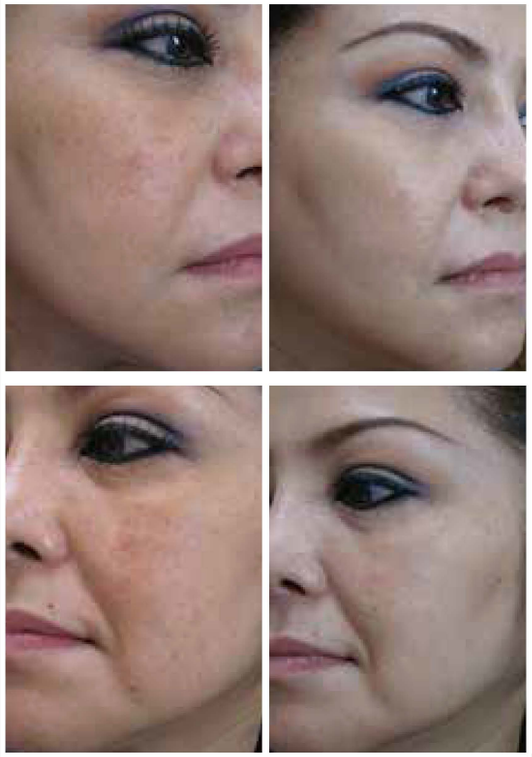

Figure 1: Pre and post 10th Medlite C6 treatment of epidermal melasma , 1064nm, 3.4J/cm², 6mm spot size, 10 Hz, 20 passes with cool air cooling at weekly interval. There is more than 80% clearing of lesions with much improvement in skin textures.
(Clin Prof Niwat Polnikorn, Bangkok,Thailand)

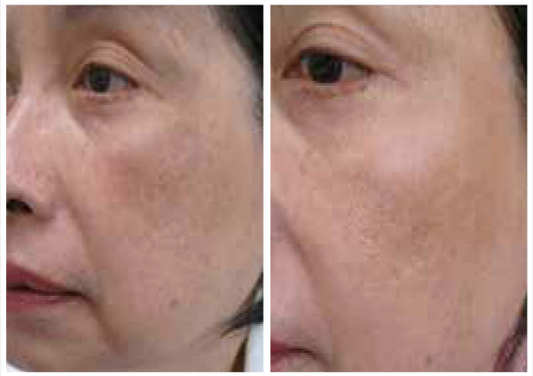

Figure 2: Pre and post 10th of dermal melasma and PIH with Med lite C6, 1064nm, 3.4J/cm², 6mm spot size, 10Hz, 20 passes, weekly interval. There was more than 50% reduction of dermal melasma and PIH.
(Clin Prof Niwat Polnikorn, Bangkok, Thailand)

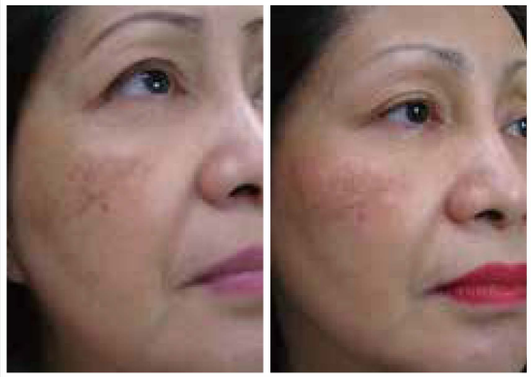

Figure 3: Pre and post 8th treatment of combined epidermal melasma and Acquired Bilateral Nevus of Ota like Macules (Hori's nevus) with Medlite C6, 1064nm, 3.4J/cm², 6mm spot size, 10Hz, 20passes. There was more than 80% clearing of epidermal melasma and 50% lightening of Hori's nevus.
(Clin Prof Niwat Polnikorn, Bangkok)

Citation: Polnikorn N (2014) New Approach for Laser Treatment of Melasma and Hyperpigmented Lesions. Pigmentary Disorders 1:128. doi:10.4172/JPD.1000128

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A Study of the RevLite® Electro-Optic Q-Switched Nd: YAG Laser in the Treatment of Acne Scars in Asian Skin: Results for Two Subjects

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Introduction

Acne is a common dermatological problem that has the potential to leave lasting scars. Injury from acne lesions initiates a cascade of wound healing events that are among the most complex of biological processes. Eighty to ninety percent of people with acne scars have those associated with a loss of collagen (atrophic scars), compared to a minority who show hypertrophic scars and keloids.[1] In patients with Asian skin types, even mild cases of acne can cause scarring and hyperpigmentation. Lasers in particular have assumed a central role in the management of acne scarring, as atrophic scars from inflammatory lesions tend to be unaffected by other medical therapies.[2]

In 2006, Lipper and Perez[3] reported a small study of acne scar patients treated with a short-pulsed 1064nm Nd:YAG laser in which scar improvement was noted in all treated subjects with minimal discomfort and no downtime or adverse effects. Friedman and colleagues[4] noted that treatment with a non-ablative 1064nm Q-Switched Nd:YAG laser resulted in significant quantitative improvements in skin topography in patients with mild to moderate atrophic acne scarring and continual, incremental improvements through six months post-treatment, indicating ongoing dermal collagen remodeling. In addition, practitioners utilizing this Q-Switched device for skin rejuvenation and acne scars in clinical practice indicated some contemporary reduction in active acne lesions, suggesting that further quantification of this effect was warranted. The objective of this study was therefore to evaluate the use of the RevLite Electro-Optic Q-Switched Nd:YAG laser in the treatment of acne scars and acne lesions in hard-to-treat darker Asian skin types. Two case reports from preliminary results of this study are presented.

Methods

Subjects provided informed consent to participate in this trial, which is ongoing under the general supervision of the Ethics Committee at Kasemrad Prachacheun Hospital. The study was open to subjects with Fitzpatrick Skin Types III-VI, with evidence of atrophic scarring and mild to severe facial acne. In order to replicate standard clinical conditions, and with the exception of isotretinoin use within 6 months prior to study enrollment, subjects were allowed to continue any topical or oral acne medications during the course of the trial. Study patients received a total of 10 bi-weekly treatments with the RevLite system at the following settings: 1064nm in the Photoacoustic Technology Pulse® (PTP) Mode, 6mm spot size, 10Hz, 5.7J/cm² and either 10 or 20passes per session. Pulses were overlapped until the immediate treatment endpoint of mild to moderate erythema was achieved.

Subjects were scheduled to return for follow-up at three months after the final treatment visit. Improvement in acne scarring was assessed using the Global Acne Scarring Classification[5] as follows:

GRADE 1	**Macular scarring** [postinflammatory macular (flat) dyspigmentation]
GRADE 2	**Mild atrophy or hypertrophic scarring** that may not be evident at 50cm or greater and may be adequately masked by makeup or hair patterns
GRADE 3	**Moderate atrophic or hypertrophic scarring** obvious at social distances and not easily masked
GRADE 4	Severe atrophic or hypertrophic scarring

Improvement in acne vulgaris was judged using the investigators' Global Assessment6 [iGA] scale:

GRADE 0	**Clear skin** with no inflammatory or noninflammatory lesions
GRADE 1	**Almost clear;** rare noninflammatory lesions with no more than one small inflammatory lesion
GRADE 2	**Mild severity;** greater than Grade 1; some noninflammatory lesions with no more than a few inflammatory lesions (papules/ pustules only, no nodular lesions)
GRADE 3	**Moderate severity;** greater than Grade 2; up to many noninflammatory lesions and may have some inflammatory lesions, but no more than one small nodular lesion
GRADE 4	**Severe;** greater than Grade 3; up to many noninflammatory and inflammatory lesions, but no more than a few nodular lesions

At the three month follow-up visit, subjects rated their satisfaction with the outcome of treatment according to the following likert scale:
1 = Very Dissatisfied; **2** = Dissatisfied;
3 = Neither Satisfied or Dissatisfied;
4 = Satisfied; **5** = Very Satisfied.

CASE REPORT 1

Subject 1

30-year-old Asian female with fitzpatrick skin type IV.

At baseline her acne scarring was rated at Grade 3 (moderate) and her acne severity was Grade 3 (moderate). She underwent 10 treatments with the RevLite laser. Assessments taken at three months post-treatment revealed an acne scar score at the lowest, Grade 1 (macular [flat] scarring), and an acne severity at Grade 1 (almost clear). The subject rated her satisfaction at 4 (Satisfied).

Subject 2

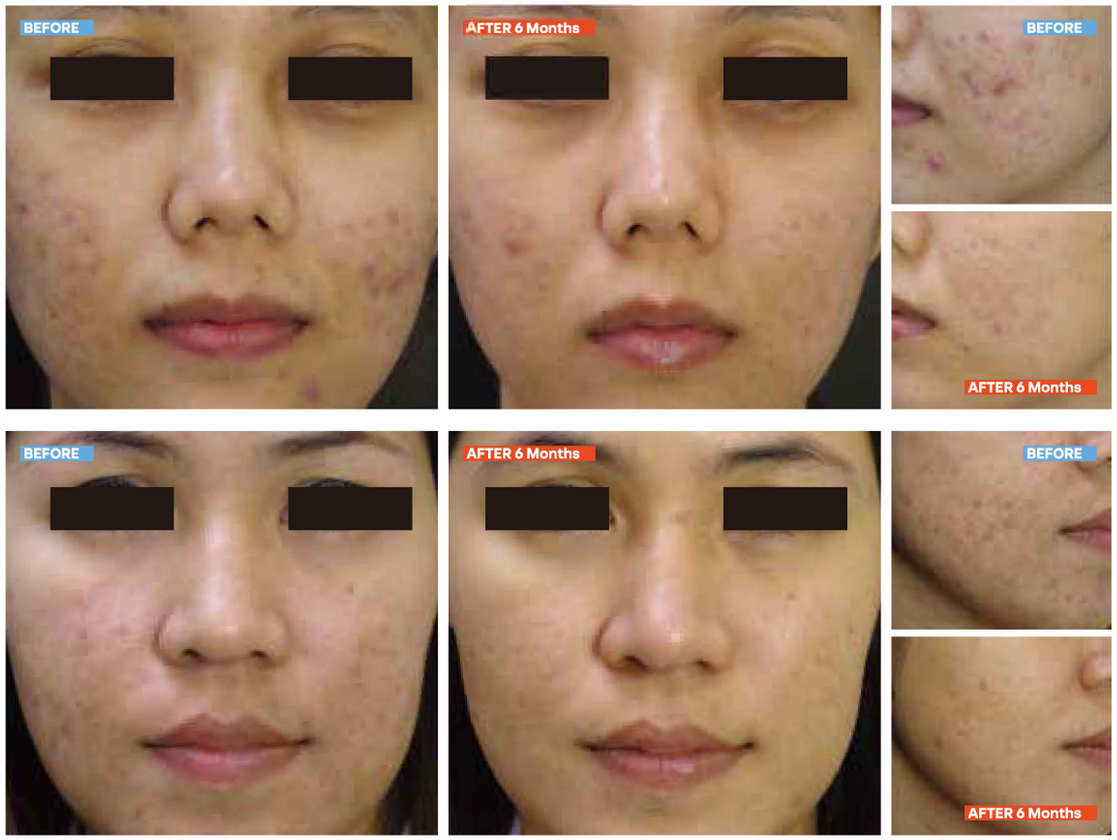
30-year-old Asian female with fitzpatrick skin type IV.

At baseline she was rated as a Grade 2 (mild scarring) for atrophic acne scars, and a Grade 2 (mild) for acne severity. This subject also underwent 10 treatments with the RevLite laser system. At study end, her acne scarring score was at the lowest, Grade 1 (macular [flat] scarring), and her acne rating had also dropped to Grade 1 (almost clear). This subject reported that she was very satisfied (score of 5) with the results of her treatment regimen.

Discussion

Acne scars can be improved by injecting hyaluronic acid or collagen fillers, but these solutions are only temporary, usually lasting three to six months.[7] Attempts at facial resurfacing through (micro) dermabrasion can cause permanent skin discoloration or blotchiness in patients with darker skin types. Chemical peeling, glycolic acid and salicylic acid are other alternatives for acne scarring that can be used with caution in skin of color; however, patients should be made aware that topical treatments containing salicylic acid can cause transient mild erythema and dryness.[1] Patients who are sensitive to these topical agents are often well served by nonablative laser treatment, which provides the well-known benefits of collagen stimulation, a smoothing of skin texture and an evening of irregular skin tone and pigment. Nonablative skin remodeling systems have become increasingly popular for the treatment of acne scars because they decrease the risk of side effects and the need for postoperative care.[1] In this study we used the PhotoAcoustic Technology Pulse® (PTP) mode of the RevLite: the PTP option is a unique dispersion of maximum energy that delivers very narrow pulse widths at more power than other Q-Switched devices. The RevLite in PTP mode is able to apply more energy over a larger spot size at the same fluence level as the standard mode, enabling the physician to treat a larger area more rapidly.

Early results from the current study indicate that the RevLite can provide safe and effective treatment for acne scarring in Asian skin. Both



Top: Subject 1, Front and left side view
Bottom: Subject 2, Front and right side view

of the cases presented here had a significant improvement in their atrophic acne scarring; in 3 months, the pitted scars had improved to the point where they could be described as macular scarring or simple flat dyspigmentation. These scar remnants can now be further treated with the Q-Switched laser, perhaps in combination with topical lightening agents.

Acne vulgaris is a widespread and multi-factorial dermatologic complaint, and blue light therapy has been the traditional treatment avenue for patients seeking light-based therapy for this condition. Blue light targets the fast-growing P.acnes bacteria; wavelengths in the blue light spectrum are thought to trigger endogenic porphyrins (components that are produced as part of normal bacteria metabolism), which naturally destroy the bacterial culprit in acne. The addition of the light-absorbing chemical Levulan (topical ALA), which concentrates in the sebaceous glands, increases the effectiveness of blue light treatment. Laser treatments utilize an entirely different mechanism of action: several wavelengths have proven effective for sebaceous hyperplasia; they are thought to treat the condition by shrinking the oil-producing glands that are overactive in patients with acne.[8] Results from laser treatment are theoretically longerlasting than those from blue light, and laser treatment provides other well-known benefits: collagen stimulation, a smoothing of skin texture and an evening of skin tone and color: all of which are not within the scope of a blue-light regimen.

The subjects also showed significant improvement in the severity of their acne condition; from baseline to study end as rated by both the physician and patient. One subject had mild acne and one had moderate acne when they entered the trial, and both showed marked improvement. Neither of these subjects had an adverse event during their participation in this trial, and both expressed satisfaction with the results from their treatments.

Conclusion

Preliminary results of two case reports from this on-going study demonstrate successful treatment using the RevLite® with Photoacoustic Technology Pulse® (PTP) to resurface the skin and to noticeably raise and even out common atrophic acne scarring. These promising results also appear to warrant further investigation for acne vulgaris*. Patients with darker skin types can expect a smoothing effect on their existing acne scars over time, without the concerns for post-inflammatory pigmentation issues that can occur with other laser or topical treatments, and with the possibility of concurrent improvement in their active acne lesions.

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* RevLite is FDA-cleared for the treatment of acne scarring but not for the treatment of active acne.

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Treatment of Melasma, Hyperpigmentation, Rejuvenation and Acne with Revlite

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Melasma is the most common hyperpigment disorders in Asians. Consultation for treatment of this disfiguring condition accounts for more than 50% of aesthetics consulltation in Asian countries. Pathogesis of this condition is complex and relates to genetic, sunexposure, hormonal factor, subclinical vascular reactions, etc. Clinically the lesions occur in middle age women on sunexposure area of face especially on cheek, forhead and upper lips.The common presentation is bimalar and centrofacial types. The lesions starts as a brownish asymptomatic irregular border macules.The lesions slowly spread out forming brownish patches. Later on the color changes to grayish brown with indistinct borders. This disease mainly effect women (female to male ratio=9:1). Eventhough spontaneous remission after menopause happens but in most of the patients the lesions persists for decades. Melasma has been one of the most difficult hyperpigmented lesions to be treated espeicially in colored skin of Fitzpatric's skin type III-V. Eventhough total clearing upto 60% of cases is possible with long term triple-combination agent formula (hydroquinone+retinoic acid+ topical steroid). This treatment result in only temporary clearing with possibiltity of complications and common recurrence. Eventhough laser had been introduced for treatment of hyperpigmented lesions for more than thirty years. The early results after ablative laser, continuous yellow light laser or high fluence nanosecond pulsed laser had been disappointing. Only recently that new high energy nanosecond-pulsed infrared laser with homogenous beam profiles technology has been developed **Medlite C 6 laser** (Hoya-Conbio,USA).-Originally this new technology has been designed for rapid tattoos removal with minimal downtime. The author was the first to report new technique in treatment of refractory melasma with repeatitive subthrehold energy fllu-ence. Recently clinical efficacy of this new technique has been confirmed in larger study of melasma. Studies from other centers in Thailand, Korea and Japan have been reported confirming effectiveness of this new technique which has been called "Laser toning" or " Minimal photothermolysis" techniques. Most recently, **Revlite laser**, (Hoya-Conbio, USA with Photothermolysis Pulses Technology mode has been introduced. The author has performed clinical study for application of this newest laser in colored skin for 12 months. Recently the author has started the research project of effectiveness of Revlite in active acne and acne scar. The research is still going on, preliminary result will be presented.

Pathogenesis

In melasma genetically predetermined clones of melanocytes on specific facial areas which are stimulated by ultraviolet light, oxidative stress and aging became hyperactive and proliferate. The normal pathway of melanin synthesis is being stimulated leading to hyperpigmentation. Melanin granules are synthesis in epidermal and follicular melanocytes by stimulation with ultraviolet light especially in the range of UVA (320-400nm). UV stimulation of keratinocytes leads to activation of binding of keratinocytes and melanocytes through specific binding proteins and receptors (SCF, Stem cell factor and C-kit proteins) stimulation. This lead to releasing of epidermal cytokines (endothelins). Epidermal cytokines released from keratinocytes stimulate vascular proliferation, and hypermelanization. Endothelins will bind to endothelin receptors on melanocyte cell membrane. These cytokines are potent stimulator of tyrosinase enzymes synthesis. Endothelins stimulation leads to increase in melanin synthesis in melanosomes. The mature melnin granules (Stage IV to V) in melanosones are then transferred to keratinocytes (epidermal melanocyte unit). Melanins granules in keratinocytes are shedded daily. In order that melasma lesions are clinically stable, hyperactive state of melanin synthesis are continuous maintained for long period of time. Vascular dilatation and endothelia cells proliferation results in telangiestasia which is common finding in long standing melasma. Leakage of vascular components lead to activation of arachidonic acid and prostaglandins synthesis. This result in stimulation of melanization and vicious cycles of more vascular proliferation. This visious cycle is the driving force for persistence of melasma. Any treatments that damage basement membrane resulted in dropping of melanins and mlanophage formation. Melanophages persist in the dermis for many years before slowly migrate out from the lesions.

In Asian's skin (Fitzpatrick's skin type III to VI), there is a wide range of melanin synthesis, aggregation and distribution leading to different shades of brown colour. The darker the colour the higher density of mature and large clumps of melanins. These melanins distribute in both keratinocytes and melanocytes. Only at some specific locations, melanocytes develop greater response to ultraviolet light resulting in epidermal hypermelnization. These hyperactive melanocytes will also proliferatel and populated the areas. Large melanized melanin (stage IV-V) were detected in epidermal melanocytes and keratinocytes. Usually in normal skin these mature melanin granules will be found mainly in keratinocytes. More than two third of the cases of melasma, macrophages containing melanin granules (melanophages) were detected in upper dermis. These result from dropping of melanin granules through damage basement membranes into dermis. Basement membrane damages were result of treatments with many topical agents or past treatments especially ones that damaged basement membrane e.g. chemical peel, ablative laser, high energy pigment selective laser etc. In some cases telangiectasia of dermal vessels may play important role in chronicity of lesion. Vicious cycle of prostaglandins synthesis through leakage of telangiectatic vessels may be the cause of persistent melanin synthesis.

Melasma had been classified into three groups 1) Epidermal type with hyperactive melanocytes only in the epidermis, 2) dermal type with presence of melanophages in dermis and 3) mixed type with presence of both hyperactive epidermal melanocytes and dermal melanophages. Many histologic study from Asians' melasma lesions had demonstrated that more than two third of cases were mixed type, the remaining were epidermal type. Dermal type melasma had not been found. The presentation of only dermal melanophages could be found in post inflammatory hyperpigmentation. The author believes that melasma should be reclassified into three major groups 1) epidermal melasma 2) mixed melasma and 3) telangiectatic melasma.

In order to treat melasma effectively for long lasting result we should be able to control epidermal melanin synthesis, reduce melanins aggregation in both melanocytes and keratinocytes, decrease melanins transportation into keratinocytes, mobilization of melanophages and reduction of telangiectasia. This is not possible with single treatment method. From theoretical point of view combination treatments targeting different steps in pathogenesis of melasma will ensure better, faster and long lasting.

For treatment of acne, the inflammatory cytokines released after exposure to laser beam has been believed to promote healing of inflammatory acnes. Long term exposure will result in neocollagenesis and improvement of atrophic scar.

Treatments

The treatments of melasma can be grouped as follow:

1.Reduction of melanin synthesis:

Tyrosinase enzyme is the most important enzyme in melanization. It changes dopa to dopaquinone and eumelanin. Topical applica-

tion of tyrosinase inhibitors is the most widely use method. Eventhough there are many new chemical agents claiming to be effective bleaching agent, hydroquinone (2-4%) is still the most widely prescribed topical bleaching agent. Hydroquinone usually result in short term improvement, 30% has total clearing within three months follow by recurrence. Long term maintainance with even 2% hydroquinone relates to many side effects e.g. skin irritation, hypopigmentation, rebound hyperpigmentation and ochronosis. Other newer agents include, kojic acid, arbutin, licorice, ascorbic acid, fullerine etc are less effective than hydroquinone. In order to enhance effectiveness of hydroquinone, it has been combined with retinoic acid (0.05%) and steroid (0.1% dexamethasone) . This formular which is known as Kligman' s formula enhance effectiveness to >60% of cases have total clearing but also increase side effects especially skin irritation, dryness, acneiform eruption, rosacea-like dermatitis, skin atrophy and telangiectasia. Many patients develop steroid dependent rosacea-like facial dermatitis after prolong application. For mild to moderate epidermal melasma alternative topical treatments are alpha arbutin, licorice extract, paper mulberry extract and phyllanthus emblica extract. Since free radicals or reactive oxygen species are important stimulation of melanin synthesis, application of stable and fat soluble ascorbic acid e.g. ascorbyl phosphate palmitate sodium plus strong free radical scavenger, e.g. fullerene is also effective for both treatment and prevention of repigmentation. Recently topical decapeptides have been introduced, it has been to be as effective as hydroquinone, but safer for prolong usage.

2.Increase melanins transfer and shedding

This is possible by superficial peeling which can be done by repetitive peeling of keratinocytes. This interferes with melanin transporation, enhance desquamation and reduction of hyperpigmentation. Retinoic acid (0.1%), glycolic acid (30-50%), and salicylic acid (20%) work on this principles. The clinical effectiveness of superficial peel for melasma is only mild to moderate. Periodic peelings are necessary to sustain the result. This often increase side effects especially skin irritation. Better result is obtained if peeling has been combined with topical bleaching.

3.Skin resurfacing:

Eventhough the reported result of treatment of melasma with dermabrasion was good. This treatment did not gain wide acceptance. The prolong post operative downtime and risk of complications had discourage both patients and doctors in performing this operation. Carbondioxide laser resurfacing had been studied in melasma with poor result and unexceptable side effects. Intraepidermal laser resurfacing ended up with severe post treatment hyperpigmentation while deep resurfacing down to mid dermis ended up with persisted hypopigmentation. Erbium Yag laser resurfacing had been studied with similar result. Intense pulsed light works by production of epidermal necrosis form absorbed light that had been converted into heat. The effects are similar to intraepidermal laser resurfacing. Post inflammatory hyperpigmentation and persistent hypopigmentation were common especially in dark skin types.

4.Reduction of telangiecasia:

Since vascular dilatations, plasminogen activation and prostaglandins synthesis may be one important factor in prolonging pathogenesis of melasma, reduction of telangiectasia should be one effective treatment of melasma. Oral tranxemic acid which has been used widely in Japan for many years, might work on this principle. Recently a study from Korea has shown effectiveness for intralesion tranxemic acid in melasma. Yellow light laser e.g. copper bromide 577nm, or Intense pulse light had been shown to be effective in some preliminary studies. Reduction of telangiectasia may be one factor for effectiveness.

5.Pigment selective lasers:

High energy pigmented selective laser which destroyed pigmented cells by "Principle of Selective Photothermolysis" e.g. 694nm, Q-switched ruby laser, 755nm Q-switched alexandrite laser, 532nm Frequency-doubled Q-switched Nd:YAG laser and 1064nm Q-switched Nd:YAG laser had been studied for treatment of melasma with poor results. Balance normal skin colour was rarely achieved.

During treatment with high energy fluence almost all epidermal melanins containg cells, e.g. epidermal melanocytes and keratinocytes will be destroyed. Melanocytes with early stage of melanin formation (Stage I-II) and follicular melanocytes will survived. Clinically hypopigmentation followed by hyperpigmentation is normal finding after this treatment. The author had reported had better result after combination of pulsed CO_2 laser and Q-switched alexandrite laser when compared to ultrapulse CO_2 laser alone. This support the important of follicular melanocytes as source of repigmentation of melasma. Due to complexity of the procedures together with prolonged recovering time and complications this combination laser treatment is still not widely accepted.

6.Fractional laser resurfacing

Pigment lightening was a coincidental finding after application of a new type of laser delivering system for collagen stimulation. This laser delivers linear or random scanning of laser beams producing microtermal necrotic zone (MTZ). Originally laser was diode laser but other lasers have been introduced to produce similar result e.g. pulsed carbondioxide (10,600nm), pulsed Erbium glass fiber laser (1,550nm). The microspot size of fractional CO_2 laser is 100-300 microns, while fractional erbium glass laser produced smaller spot size of 25 microns. Fractional CO_2 laser produce minutes epidermal burns, scabbing, erythma and post inflammatory hyperpigmentation while fractional erbium glass fiber laser produces less erythema and hyperpigmentation. Thus fractional Erbium glass fiber is more appropriate for dark skin color. Generally energy of fractional erbium fiber laser pulse for treatment of melasma is between 5-10Joules/cm^2 delivering depth of MTZ down to 300-500 microns with 1000-2000 dots/cm^2. Preliminary data from uncontrolled study has shown fair to moderate result in treatment of epidermal melasma in Fitzpatrick skin type II-III. The mechanism of pigment lightenting may be explained by partial destruction of epidermal melanocytes and transepidermal elimination of dermal melanophages.

7.Minimal Photothermolysis Laser (Medlite C6, Revlite : Hoya–Conbio,USA)

Medlite C6 (Hoya, Conbio, USA) is the new generation of Q-switched Nd:YAG laser systems that has been introduced since 2006. The important properties of this laser that differs from the older or other systems and enable this laser to be applied for treatment of melasma are:

1. High pulse energy of 1.2 Joules

2. Large spot sizes 6 and 8mm in diameter with maxim energy fluence of 4 and 3Joules/cm^2 respectively.

3. Collimated and hat-top beam profiles

4. Pulse width of 5 nanoSeconds

5. High repetition (10Hz)

6. Coaxial aiming beam

Figure 1:
Medlite C6 Laser (Hoya-Conbio, USA)

Medlite C6 and melasma:

Principle of Minimal Photothermolysis Treatment:

Recent histologic study of laser toning technique has shown that after exposure to repetitive sub-ablative threshold hat-topped 1064nm Q-switched Nd:YAG laser beam, melanin granules will be fragmented and dispersed into cellular cytoplasm. Dendrites of epidermal melanocytes also decrease. The smaller size and dispersion of melanins results in pigment lightening. Multiple passes should disperse melanins layer by layer, after 10-20passes, the whole thickness of epidermis should receive enough energy for melanin dispersion. The total cumulative dosage of energy should be less than toxic accumulative energy that would lead to irreversible damage of the pigmented cells. Beyond toxic accumulative dosage, melanocytes with dense melanin will die. Subsequent treatment at weekly interval would gradually reduce hyperpigmentation of melasma without damaging to the epidermis. During treatments, few layers of most superficial keratinocytes will be vaporized. This improves the textures and comlextion of skin similar to superficial chemical peelings. Some dermal melanophages with dense melanin granules should absorbed enough energy to critical level of cellular damage and cell death. By average about 8 to 10 weekly treatments are required to reduce the hyperpigmentation of melasma down close to normal skin colour. Due to the effects of improving complexion and textures some doctors called this technique "Laser toning". Then recurrence is prevented by long-term application of topical safe whitening and antioxidant agents e.g. 5% alpha arbutin, Fullerine+Ascorbly phosphate sodium together with UVB+UVA blocker sunscreen (SPF>30,PA>+++), oral Tranexamic acid or topical decapeptides. Laser toning can be repeated if there is recurrence of hyperpigmentation. Prolong continuous treatment is not adviced because of potential side effect. Since the total commulative dosage of laser energy related to destruction of melanocytes and dyschromia, it should be kept to minimum.

Figure 2:
Revlite (Hoya-Conbio, USA)

Revlite (Hoya-Conbio, USA) is a newest and most powerful Q-switched Nd:YAG laser system available. The high energy 5 nanoseconds, twin pulses (800mJ) with 140 microsecond interval, 1064nm wavelength, total 1.6Joules (+/-20%) has been patened as The Photoacoustic Therapy Pulse (PTP). A This PTP mode, therefore result in both photoacoustic and photothermal effects with breakage of target melanins or tattoos at larger spot size than ordinary Q-switched Nd:YAG laser together with more thermal reaction and less epidermal injuries. Homogenous or hat-topped beam profile deliver deep homogenous energy preventing problems of central hot spot. Large spot size also enables precise overlapping (5-10%). The overall result is more evenly melanin breakages, without wounding and textural changes. Because of high pulse energy, the frequency –doubled mode, produce 532nm, nanosecond pulse beam upto 5Joules/cm^2 at 2mm spot size. This is enough for red tattoos removal. The system also provide Optical MultiLite Dye laser handpiece which converted 1064nm to 585nm and 650nm nanosecond pulse laser. With 585nm, 2mm spot size, the energy of pulse laser is 10Joules/cm^2 and 6.5Joules/cm^2 for 585nm wavelength. These are powerful enough for green and blue tattoos removal. The author has studied application of this new laser in many conditions for more than twenty four months. The advantages of this new laser are 1) faster clearing of dermal melanins and multicolor tattoos with reduction of number of treatments required 2) absence of epidermal wounds and recovering time 3)with lower peak energy but wider pulses, there is more thermal effects for dermal collagen stimulation 4) with dye adaptors, this laser has enough energy for removal of both blue and red color tattoos. When PTP mode is turned off, this laser is equivalent to Medlite C6.

Technique:

1.Treatment area should be cleaned and dried

2.Take standard photographies (front, side views 45, 90°, close-up)

3.Measuring of Melanin Index at lesions and normal facial skin

4.Patient should wear cap and protective eye goggles, wanted hair (eye brows, eyelashes) should be protected with tape and eye goggle.

5.Precooling of treatment area with cool air (-20°C) for few minutes

6.Setting parameters:

Epidermal melasma: *Medlite C6, Revlite(PTP off)*
Fitzpatrick skin type III-IV, 1064nm, 3-3.6Joules/cm², 6-8mm spot size, 10Hz, 10-20passes
Fitzpatrick skin type V-VI, 1064nm, 2.5-3.2Joules/cm², 6-8mm spot size, 10Hz, 10-20passes

Dermal/mixed melasma: *Medlite C6, Revlite(PTP off)*
All skin types , 1064nm, 3.4-4.2Joules/cm², 6mm spot size, 10Hz, 10-20passes

Rebound melasma :*Medlite C6, Revlite(PTP off)*
All skin types, 1064nm, 2.5-3.2Joules/cm², 6mm spot size, 10Hz, 10-20passes

Postinflammatory hyperpigmentation: *Medlite C6, Revlite (PTP off)*
All skin types, 1064nm, 2.8-4.2Joules/cm², 6mm spot size, 10Hz, 10-20passes

Rejuvenation /wrinkles /dilated pores:
Fitzpatrick skin type II-III,1064 nm, *Medlite C6* 3.4-4.2 Joules/cm², 6-8mm spot size, 10Hz, 10passes, *Revlite*(PTP on) 6Joules/cm², 6mm spot size 5-10passes
Fitzpatrick skin type IV-VI, *Medlite C6*, 1064nm, 2.8-3.4 Joules/cm², 8mm spot size, 10Hz, 10passes *Revlite(PTP off)* 3.2Joules/cm², 8mm spot size 5-10passes

Ephilides
Fitzpatrick skin type II-III, 532nm, *Medlite C6*, *Revlite(PTP off)* 1.8-2.5Joules/cm², 3-4 nmspot size, 1-2Hz, 1pass
Fitzpatrick skin type IV-VI, *Medlite C6*, *Revlite(PTP off)*1064nm 2.5-3.4Joules/cm², 6mm spot size, 10Hz, 10passes

Solar lentigoes
Fitzpatrick skin type II-III, *Medlite C6*, *Revlite(PTP off)*532nm, 2-3Joules/cm², 3-4 mm spot size, 1-2 Hz, 1 pass
Fitzpatrick skin type IV-VI, *Medlite C6*, *Revlite(PTP off)*532 nm, 2-2.5Joules/cm², 3-4mm spot size, 1-2Hz, 1pass

Atrophic scars
All Fitzpatrick skin type, *Medlite C6*, 1064nm, 4-6Jouls/cm², 4-6mm spot size, 10HZ, >20pulses or *Revlite(PTP on)*, 1064nm, 6Joules/cm², 6mm, 10Hz, 10-20passes (fine petechiaes are observed)

Dermal melanocytic lesions (Nevus of Ota, or Hori's nevus)
All Fitzpatrick skin types, *Medlite C6*, 1064nm, 6-8Joules/cm², 4mm spot size, 4-10passes or *Revlite(PTP on)*, 6Joules/cm², 6mm, 10Hz, 5passes, repeated
every month until the lesions fade

Tattoos removal (Black,blue black)
All Fitzpatrick skin types, *Medlite C6*,1064nm, 3-4mm spot size, 6-8Joules/cm², 10Hz, 1-2passes, or *Revlite(PTP on)*, 6-12 Joules/cm², 6 or 4mm spot size, 1-2passes
Every month until tattoos fade >80%

Tattoos removal (Red)
All Fitzpatrick skin types, *Medlite C6*, 532nm, 2mm spot size, 5Joules/cm², 1pass, every month until tattoos fade

Tattoos removal (Blue, Green)
All Fitzpatrick's skin types, *Revlite+ Optical Mujltilite Dye laser handpiece*
For blue tattoos: 585nm, 10Joules/cm², 2mm spot size
For green tattoos: 650nm, 6.5Joules/cm², 2mm spot size
1-2passes, every month until clearing

Tattoos (cosmetic, skin color)
All Fitzpatrick skin type , *Medlite C6*, 1064nm, 3-4mm spot size, 6-8Joules/cm², 1 pass *Revlite(PTP on)*, 6-12Joules/cm², 6 or 4mm spot size, 1-2passes(tattoos darkening is possible, test spot is recommended)

Periorbital darkening
Fitzpatrick skin type III-IV, *Medlite C6*, 1064nm, 4mm spot size, 4-6Joules/cm², 10passes
*Revlite(PTP on)*1064nm, 6mm spot size 6Joules/cm², 10 passes every month

Axillary hyperpigmentation
Fitzpatrick skin type III-V, *Medlite C6*, *Revlite(PTP off)*1064nm, 6mm spot size, 3-4Joules/cm², 10-20passes every month until the lesions fade(6-10 times)

Hyperpigmented hypertrophic scar
Fitzpatrick skin type III–V, *Medlite C6*, 1064nm, 4mm spot size, 6-8Joules/cm², 10-20
passes every month, *Revlite(PTP on)*, 6Joules/cm², 6mm, 10Hz, 5passes

Lips darkening
All skin type, *Medlite C6*, *Revlite(PTP off)*532nm, 2-3Joules/cm², 3mm spot size, 1pass

Lentigines
All skin type, *Medlite C6*, *Revlite(PTP off)*532nm, 2-3Joules/cm², 2-3mm spot size, 1pass

Café au lait, segmental lentigines, Nevus spilus etc
All skin types, *Medlite C6*, *Revlite(PTP off)* Medlite C6, 1064nm, 4mm spot size, 6-8Joules/cm², 10-20passes every month, or Revlite(PTP on), 6Joules/cm², 6mm, 10Hz, 5passes follow by 532nm, 2-3Joules/cm², 2-3mm spot size, 1pass, every month until hyperpigmented areas improve.

Acne, post acne redness and acne scar
All skin types, *Medlite C6*, 1064nm, 4mm spot size, 6-8Joules/cm², 10-20passes every month, or *Revlite(PTP on)*, 6Joules/cm², 6mm, 10Hz, 10passes every two weeks

7.The face should be divided into multiple treatment areas and treat one area at a time.

8.The laser beam should be delivered perpendicular to the surface and move the beam slowly in such away that there is <10% overlapping between pulses.There are two techniques of treatment
A. Painting technique. Laser beam is moved along the linear lines. For treatment of melasma the beam is moved forward and backward along that lines for 10 times before moving to adjacent area. After completion of first pass treatment of that area. The second pass will be performed in similar manner perpendicular to the direction of first pass.
B. Tracing technique, Laser beam is moved following the pattern of lesions.
Generally for extensive melasma lesion and rejuvenation, painting technique is recommended. For telangiectatic or dyschromic lesions tracing technique is better in following the pattern of lesions.

9.Clinical end points:
Epidermal melasma: immediate pigment lightening, immediate whitening of fine hair and Perilesional erythema
Dermal/mixed melasma: immediate darkening of lesions, immediate perilesional erythema
Rebound melasma: immediate pigment lightening, immediate perilesional erythema
Dermal melanocytic lesions (Nevus of Ota, Hori etc): immediate darkening of lesions, immediate perilesional erythema
Post inflammatory hyperpigmentation: immediate lightening of lesions, perilesional erythema
Periorbital / axillar darkening: immediate lightening of lesions, perilesional erythema
Ephilides /solar lentigoes: immediate grayish discolouration (1064nm) or whitening (532nm) ,
Rejuvenation: immediate erythema with improvement of fine textures, pore sizes, wrinkles
Atrophic scar: immediate erythema +/- minute petechiaes
Tattoos: immediate whitening, minutes petechiaes
Acne: diffuse erythema, whitening of fine hair

10.Follow-up treatments:
For melasma, the treatment should be performed at 1-2 weeks interval for 5 to 10 times. The number of treatments depends on clinical response. The goal of treatment is to reduce the hyperpigmentation down close to normal skin colour but not to completely treated melasma. Then treatment is then continue with topical whitening agents e.g. 5% Alpha Arbutin+ 2% Kojic acid, Fullerine+ Ascorbyl phosphate palmitate sodium (F+ APPS) or 4% hydroquinone+ 0.05%retinoic acid and broad spectrum sunscreen (PA> +++ and SPF>30) to maintain long term remission. For rejuvenation treatment will be performed every 2 weeks for 4-6 sessions, then every 1-3 months for maintainance. For post inflammatory hyperpigmentation fewer treatments are required. For ephilides and solar lentigoes, few treatments with 532nm at monthly intervals are required. Most of the cases will develop mild to moderate PIH. Few treatments with 1064nm similar to treatment for melasma will clear this complication within one month. For acne and acne scar, bi weekly treatments upto three months will be required to treat acne and improved post acne scar.

11.Results:
Epidermal melasma response better and faster than dermal/mixed melasma. Complete clearing of lesions should be expected in more than 60% of cases of epidermal melasma after 10 Revlite treatment. Complete clearing of dermal /mixed melasma will be between 30-50%, while the remaining cases will show moderate improvement.

Post inflammatory hyperpigmentation and rebound melasma are sensitive to the treatment. Lower energy and fewer repetition is adequate to produce marked improvement. Ephilides need 1-2 treatments for >80% clearing. Solar lentigoes should be treated with 532nm wavelength for few times. In Fitzpatrick's skin type IV-V, PIH is common complication. PIH should be treated with l 1064nm, laser toning and topical whitening agents. Revlite with higher pulse energy cleared dermal melanocytic lesions faster than Medlite C6. To clear Nevus of Ota, monthly treatment for 4-10 times are required. Usually there will be less dyschromia when compare to older Q-switched NdYAG laser or other Q-switched laser systems.. Hori's nevus needs 2-6 biweekly treatments for more than 80% clearing Revlite offered advantage for collagen stimulation and gave good result for skin rejuvenation, reduction of wrinkles, dilated pores, telangiectasia and hyper/atrophic scars.

For acne, post acne hyperpigmentation and atrophic scar, the preliminary result by the author has shown moderate reduction in active acne lesions, good response for post acne hyperpigmentation and fair response for atrophic scar.

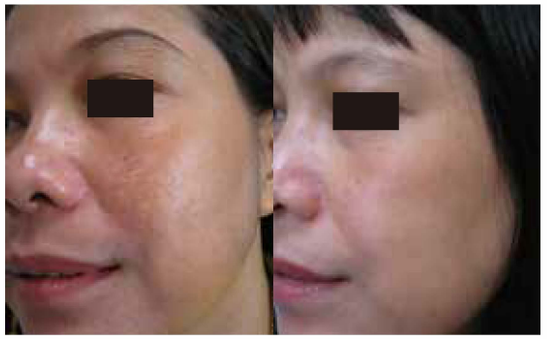

Figure 3: Pre and post eight treatment of epidermal melasma with Medlite C6 laser. Observe Improvement in both melasma and skin textures. *(Clin Prof Niwat Polnikorn)*

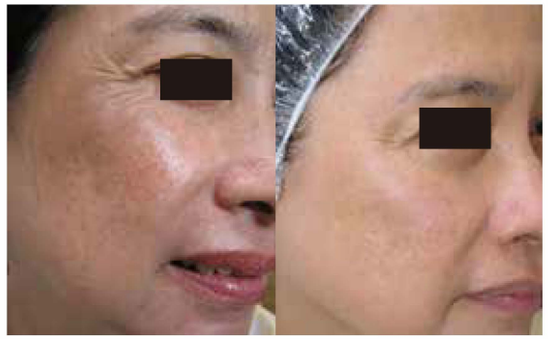

Figure 3: Pre and post 10 treatment of mixed type melasma, PIH and ochronosis with Medlite C6. Note improvement in melasma, clearing of ochronosis and improvement of textures. *(Clin Prof Niwat Polnikorn)*

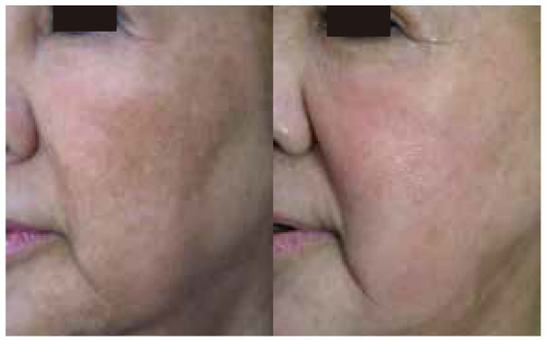

Figure 4: Pre and post eighth treatment of mixed melasma with Revlite (PTP off) 1064nm, 3.4J/cm², 6mm, 20passes at two weeks interval. *(Clin Prof Dr Niwat Polnikorn)*

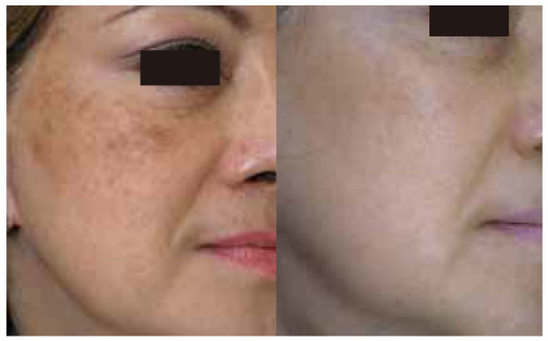

Figure 5: Pre and post fifth treatment of mixed melasma with Revlite (PTP off), 1064nm, 4J/cm², 6mm, 20passes. *(Clin Prof Dr Niwat Polnikorn)*

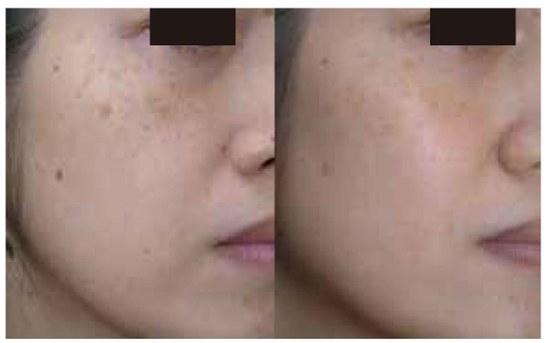

Figure 6: Pre and post second treatment of ephilides with Revlite (PTP off), 532nm, 1.5J/cm², 4mm, single pass. *(Clin Prof Dr Niwat Polnikorn)*

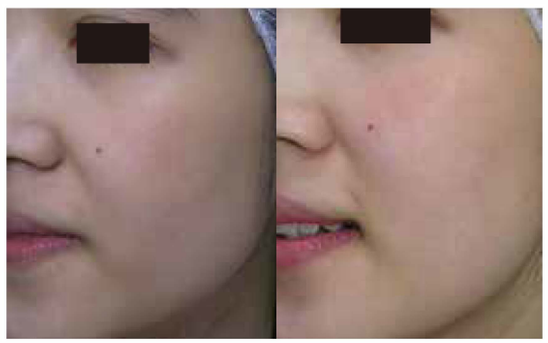

Figure 7: Pre and post fifth skin rejuvenation with Revlite (PTP on), 1064nm, 6mm, 6J/cm², 10passes. *(Clin Prof Dr Niwat Polnikorn)*

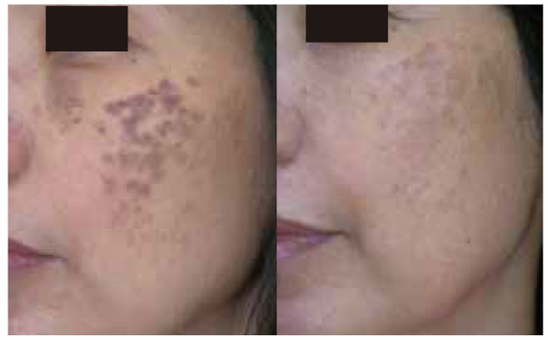

Figure 8: Pre and post third Revlite (PTP on), 1064nm, 6mm, 6J/cm², 5passes for treatment of Acquired Bialteral Nevus of Ota like macules(Hori's nevus). *(Clin Prof Dr Niwat Polnikorn)*

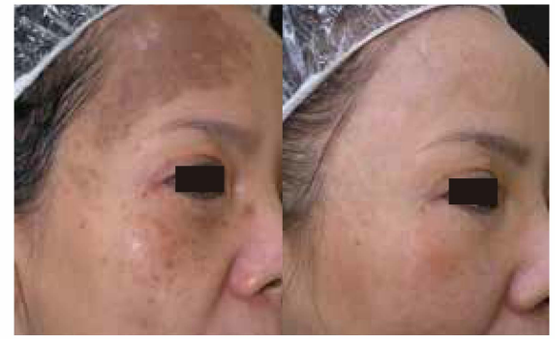

Figure 9: Pre and post 10th Revlite (PTP on), 1064nm, 6mm, 6J/cm², 5 passes for treatment of Nevus of Ota. *(Clin Prof Dr Niwat Polnikorn)*

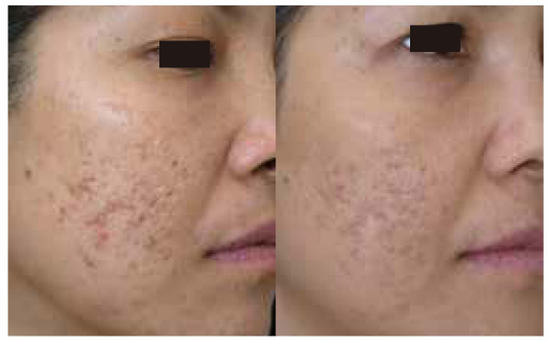

Figure 10: Pre and post fourth Revlite (PTP on), 1064nm, 6mm, 6J/cm² treatment of hyperpigmented acne scars. *(Clin Prof Dr Niwat Polnikorn)*

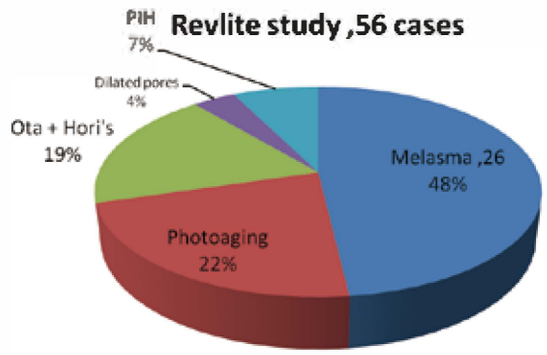

Figure 11: Diagnosis of 56 cases in Revlte study between 1 January-30 December 2009. *(Clin Prof Dr Niwat Polnikorn, Kasemrad Aesthetic Center)*

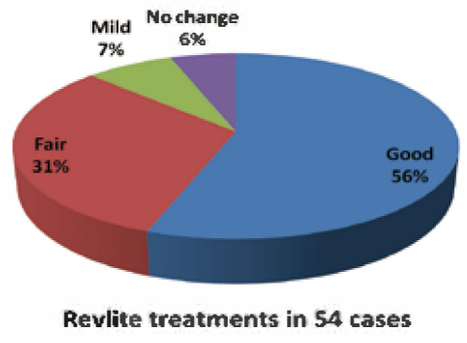

Figure 11: Result of Revlite treatment in 54 cases between 1 January 2009 to 30 December 2009.

12.Complications:
The following complications are transient reactions and do not require termination of treatment.

12.1 Immediate erythema
12.2 Physical urticaria
12.3 Acneiform eruption
12.4 Minutes petechiae
12.5 Whitening of fine hair

The following complications are serious and justified suspension of treatment

12.7 Rebound melasma
12.8 Dyschromia
12.9 Severe urticaria
12.10 Severe acneiform eruption
12.11 Herpes simplex activation

In this Revlite study cases, two cases (3.7%) developed rebound melasma after treatment with 1064nm, PTP on, 6J/cm², 6mm, 5-10passes. Two case (3.7%) developed dyschromia, they were cases with rebound melasma who developed grayish white discoloration immediately after treatment. One cases developed post inflammatory hyperpigmentation after treatment of Hori's nevus. Over all complications were 11.11%.

13.Maintainance:
After 2-10 treatments of melasma maximum result will be obtained. To continue more treatments need to be carefully judged on case by case basis. In mixed melasma or dermal melanocytic lesions continue treatment may be justified if there are already fair to moderate improvement without any sign of side effects. Usually epidermal melasma is maintained by topical bleaching agents e.g. 4% Arbutin +2% Kojic acid, Fullerine+ Ascorbyl phosphate palmitate sodium (F+APPS, SAL,Japan) or Kligman's formula (Trilumar, Galderma, USA). Long term monthly treatment of melasma with laser is not justified. Only when there is relapse of moderate melasma another course of treatment should be considered.

14.Combination treatment:
Result of Medlite C6 laser in treatment of melasma can be improved by the following combinations:

14.1 with topical bleaching agents e.g. 4% alpha arbutin+ 2% Kojic acid, Kligman's formula

14.2 with intralesional transxemic acid (5mg/ml)

14.3 with chemical peels (20-30% Glycolic acid)

14.4 with topical sunscreen

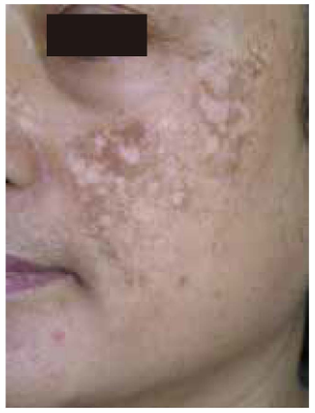

Figure 12: Patient with severe dyschromia developed after fourth Revlite treatment of rebound melasma.

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Treatment of Melasma with Medite C6 Q-switched Nd: YAG Laser

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niwatpol@yahoo.com

Melasma is the most common hyperpigment disorder in Asians. Consultation for treatment of this disliguring condilion accounts for more than 50% of aesthelics consultalioninAsian countries. Pathogesis of this condition is complex and relates to genelic, sun exposure, hommonal factor etc. Clinically the lesions occur in middle age women on sun exposune area of face especialy on cheek, forehead and upper lips. It siarts as a brownish asymplomatic irregular border macules.The lesions slowty spread out forming brownish patches. This disease mainly effect women (women:men=9:1), Even though sponlaneous remission after menopause happens but most of the patients will have the lesions for all their life. Considering treatment melasma, is one of the most difficult hyperpigmented lesions to be treated, Even though total clearing up to 50% of cases is possible with triple combination agent formula (kligman's formula). Recurrence is a rule. Topical ireatment result in only temporary clearing with possibility of long term complications and recurrence. Only recenlly that laser has been evaluated for treatment. Most of the sludies had reported poor result and complications. Medlite C6 laser (Hoya-ConBio, USA) has recently been studied by the author. The preliminary study using sub-photothermolysis threshold energy has shown good to excellence results with no down time and rarely produces adverse side afiecls. This has opened a new possibility of effective laser treatment for melasma.

Pathogenesis:

In melasma specific clones of melanocytes are hyperactive. The normal pathway of melanin synthesis is being stimulated leading to hyperpigmentation. Melanin granules are synthesis in epidermal and follicular melanocytes by stimulation with ultraviolet light especially in the range of UVA (320-400nm). UV stimulation of keratinocytes leads to activation of binding of keratinocytes and melanocytes through specific binding proteins and receptors (SCF, Stem cell factor and C-kit proteins) stimulation. This lead to releasing of epidermal cytokines (endothelins). Endothelins will bind to endothelin receptors on melanocyte cell membrane. These cytokines are potent stimulator of tyrosinase enzymes synthesis. Endothelins slimulation leads to increase in melanin synthesis in melanosomes. The mature melanin granules (Stage IV to V) in melanosomes are then transferred to keratinocytes (epidemal melanocyte unit). Melanin granules in keratinocytes are shed daily. In order that melasma lesions are clinically slable, hyperactive slale of melanin synthesis are continuous maintained for long period of time.

In Asian's skin (Fitzpatrick skin type lll to VI), there is a wide range of melanin synthesis, aggregation and dislribution leading to different shades of brown color. The darker the color the higher density of mature and large clumps of melanin in both keralinocytes and melanocytes. For still unexplained reason strong uitraviolet light activate clones of melanocytes from hair follicles in only some specific locations of the face. These hyperactive melanocytes will populaled the areas and synthesis more mature melanin granules. Large melanized melanins (stage IV-V) were detected in epidermal melanocytes and keratinocytes. Usually in normal skin these mature melanin granules will be found mainly in keratinocytes. More than two third of the cases of melasma, macrophages containing melanin granules (melanophages) were detected in upper dermis. These result from dropping of melanin granules through damage basement membranes into dermis. Basement membrane damages were result of treatment with many topical agents or past treatments especially ones that damaged basement membrane e.g. chemical peel, ablative laser, high energy pigment selective laser, etc.

Melasma has been classified into three groups 1)Epidermal type with hyperactive melanocytes only in the epidermis, 2) dermal type with presence of melanophages in dermis and 3) mixed type with presence of both hyperactive epidermal melanocytes and dermal melanophages.

In order to treat melasma effectively for long lasting result we should be able to control epidermal melanin synthesis, reduce melanin aggregation in both melanocytes and keralinocytes, increase melanin lransporalion inio keralinocytes and also mobilize melanophages from the dermis. This is not possible with single treatment method. From theoretical point of view combination treatmenis will ensure better, faster and longlastingresult than single treatment.

Treatments:

The treatments of melasma can be grouped as follow:

1. Reduction ofmelanin synthesis:
Tyrosinase enzyme is the most important enzyme in melanizaion, it changes dopa to dopaquinone and eumelanin. Topical application of tyrosinase inhibitors is the most widely use mehod. Even though there are many new chemical agents caiming to be effective bleaching agent, hydroquinone (2-4%) is stil the most widely prescribed topical bleaching agent. Hydroquinone usually result in short term improvement between 30-40% has total clearing within three months folow by recurrence. Long term maintenan with even 2% hydroquinone relates to many shide effects e.g. skin irritation, hypopigmentation, rebound hyperpigmentation and ochronosis. Other newer agents include, kojic acid, arbutin, licorice, ascorbic acid, fullarine, etc are less effective than hydroquinone. In order to enhance the effectiveness of hydroquinone, it has been combined with retinoic acid (0.05%) and sferoid (0.1% dexanethasone). This fommula which is known as kligman's formula enhance effectiveness to 50-60% of cases have total cleaning but also increase side effects especlally skin irritation, dryness, acnelform eruplion, rosacea-like dermalitis, skin atrophy and telanglectasia. Many paients develop steroid dependent rosacea-like facial dermatitis after prolong application.

2.Increase melanin transferandshedding:
This is possible by supericial peeling which can be done by repetitive peeling of keratinocytes. This interferes with melanin transporlation, enhance desquamation and reduclion of hyperpigmenlalion. Retinoic acid (0.1%), glycalic acid (30-50%), and salicylic acid (20%) work on this principles. The clinical effectiveness of superficial peel for melasma is only mild to moderate. Periodic peelings are necessary to sustain the resull. This often increase side effects especially skin irrtation. Betler resul is obtained if peeling has been combined with topical bleacning.

Medlite C6

The Medlite C6 (Hoya ConBio, USA) is the latest and most powerful Q-Switched Nd:YAG laser commercially available. The important properties that enable this laser to be applied for treaiment of melasma are:

1. Large spot size 6 and 8mm in diameter

2.Collimated and hat-top beam profiles

3.High energy pulse (up to 1Joules)

4.High repetition (10Hz)

5.Coaxial aiming beam

Medlite C6 and melasma:

Principle oftreatment:
By delivering repetitive large spot size, collimaled hat-lopped 1064nm Q-Switched Nd:YAG laser beam with sub-photothermolysis energy fluence (<5Joules/cm^2), melanin granules will be fragmented and dispersed into cytoplasm. The total accumulative dose should be lower than total toxic accumulative energy that will destroy the cells. This will lead to pigment lighlening. Subsequent treatments at weekly intervals will gradually reduce hyperpigmentation. This reaction can be classified as blostimulation effect of Q-Switched Nd:YAG laser at subcellular level without cellular damages or cell death. By average about 8 to 10 weekly treatmenis are required to reduce the hyperpigmentation down close to close to normal skin color. Then recurence is prevented by application of topical bleaching agents e.g. 7% arbutin, or Kligman's fomula bleaching agent together with UVB+ UVA blocker sunscreen (SPF>30, PA>+++).

Technique:

1. Wash face thoroughly and dry with clean towel

2.Take standard **photographs** (front, side views, close-up)

3.Measuring ofmelanin index atlesions and nomal facial skin (if available with either Dermatospectrometeror Mexameter)

4.Patient should wear cap and protective eye goggles, wanted hair (eye brows, eyelashes) should be protected with tape and eye goggle.

5.Pre-cooling of treatment area with cool air (5°C) for few minutes

6.Setting parameters:

7.The **face should be dividedinto multiple treatment areas** and treat one area at a lime.

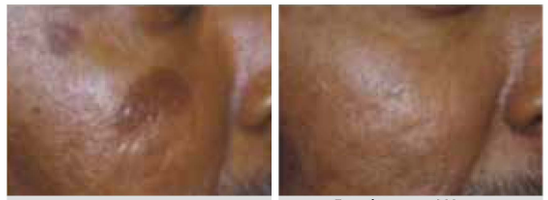
8.The laser pulsed will be delivered perpendicular to the surface and move the beam slowly in such away that there is 10% overlapping between pulses. Usually the laser beam is moved along that linear lines. The beam is moved forward and backward along that line for 10 times before moving to adjacent area. After completion of first pass treatment of that area. The second pass will be performed in similar manner perpendicular to the direction of first pass.

9.Clinical end points:

- Epidermal melasma: immediate pigment lightening, immediate whitening offine hairand Perlesional erythema
- Dermal/mixed melasma: immediate darkening of lesions, immediate perilesional erythema
- Rebound melasma: immediate pigment lightening, immediate perilesional erythema
- Post inflammatory hyperpigmentation: immediate lightening of lesions, perilesional erythema
- Ephilides/solar lentigoes: immediate whitening after 532nm
- Rejuvenation: immediate improvement of fine textures, pore sizes, wrinkles
- Atrophic scar immediate minute petechiae

10.Follow-uptreatments:
For melasma, the treatment is perfored at weekly interval for 5 to 10 times. The number of treatment depends on clinical response. The goal of treatment is to reduce the hyperpigmentation down close to normal skin color but not to completely treated melasma. Then treatment is then continue with topical bleaching agents e.g. 7% Arbutin, 20% Azaleic acid, Kligman's forula etc and broad spectrum sunscreen to maintain long term remission. For rejuvenation treatment will be perform evary weeks for 4-6 sessions, then every 1-3 months for maintenance. For post inflammatory hyperpigmentation fewer treatmenis are required. For ephilides and solar lentigoes, few treatments with 532nm at monthly intervals are required. Most of the cases will develop mild to moderate PIH. Few treatments with 1064nm similar to teatment for melasma will clear this complication within one month.

11.Results:
Epidermal melasma response better and faster than dermal/mixed melasma. Complete clearing of lesions should be expected in more than 50% of cases of epidermal melasma. Complete clearing of dermal/mixed melasma will be between 30-50%, while the remaining cases will show moderate improvement. Post inflammatory hyperpigmentation and rebound melasma are sensitive to the treatment. Lower energy and fewer repetitions are adequate to produce marked improvement.



Before Operation | Results even 6 Years After Operation

Hyperpigmentation

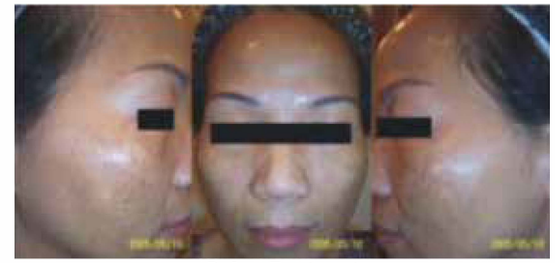
12.Complications:
The following complications are transient reactions and do not require termination of treatment.
12.1 Immediale eryihema
12.2 Physical uricaria
12.3 Acneiform eruption
12.4 Minules petechiae
12.5 Whitening offine hair
12.6 Rebound hyperpigmentation

The following complications are serious and justified suspension of treaiment
12.7 Mottling hypopigmentation
12.8 Leucoderma
12.9 Severe urticania
12.10 Severe acneifomm eruption
12.11 Herpes simplex activation

13.Maintenance:
After 8-10 treatments of melasma maximum result will be obtained. To continue more treatments need to be carefully judged on case by case basis. In dermal melasma or deral melanocyte lesions continue treatment may be justified if there are already fair to moderate improvement without any sign of side effect. Usually epidermal melasma is maintained by topical bleaching agents e.g. 7% Arbutin or Kligman's forula. Long term monthly treatment of melasma is not justified. Only when there is relapse of moderate melasma another course of Medlite C6 treatment should be considered.

14.Combination treatment:
Result of Medlite C6 laser in treatment of melasma can be improved by the following combinations:
14.1 with topical bleaching agents e.g. 7% arbutin, Kligman formula
14.2 with intralesional transxemic acid (5mg/ml)
14.3 with chemical peels (20-30% Glycolic acid)
14.4 with topical sunscreen

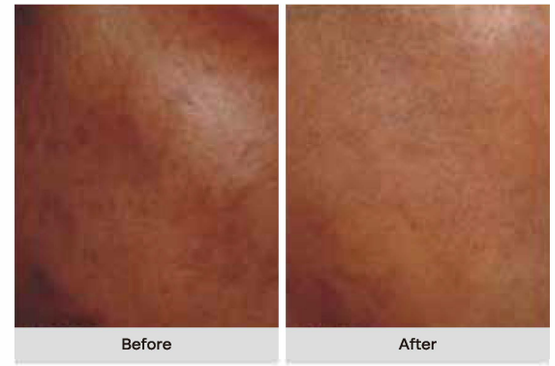
Dermal Melasma



Before Treatment

After Treatment with Medlite C6 Q Swilched *Nd: YAG Laser*

Hyperpigmentation



Before | After

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Journal of Cosmetic and Laser Therapy

Treatment of Refractory Melasma with the MedLite C6 Q-switched Nd: YAG Laser and Alpha Arbutin: A Prospective Study

Niwat Polnikorn, MD. **Journal of Cosmetic and Laser Therapy, 2010; 12: 126–13.**
doi: 10.3109/14764172.2010.487910

Abstract

To evaluate the effectiveness of a Q-switched Nd:YAG laser (MedLite C6; HOYA ConBio, Fremont, CA, USA) and 7% alpha arbutin solution (Skin Advance Laboratory, Japan) in the treatment of melasma. Methods: This was a prospective study of 35 refractory melasma cases treated with 10 weekly laser sessions, two monthly follow-up treatments and topical 7% alpha arbutin solution. Clinical photographs and severity grading on a 5-point scale were carried out by an independent observer at each visit. Results: At 6 months, 30% of study subjects received results in the excellent clearance category (>81% reduction of melasma) and 36.7% received good (51-80% reduction) clearance. Mild and transient side effects included discomfort during treatment, erythema, whitening of fi ne hair and urticaria. Three cases of mottling hypopigmentation (8.57%) and two cases of recurrence of melasma (5.71%) were recorded. Conclusion: Combination therapy with the MedLite C6 and 7% alpha arbutin solution is an effective and well-tolerated treatment for refractory melasma.

Dermatologic Surgery

Treatment of Hori's Nevus with the Q-Switched Nd: YAG Laser

Polnikorn, Niwat MD; Tanrattanakorn, Somsak MD; Goldberg, David J. MD
Dermatologic Surgery 26(5):p 477-480, May 2000. | DOI: 10.1046/j.1524-4725.2000.99305.x

Background

Hori's nevus is an acquired pigmented lesion involving bilateral blue-brown facial macules. There has been a dearth of reported treatment modalities for this condition.

Objective

The purpose of this study was to evaluate the efficacy of the Q-switched Nd:YAG laser for the treatment of Hori's nevus.

Methods

The Q-switched Nd:YAG laser was used to treat Hori's nevus in 66 Asian patients. Patients were treated up to seven times. The follow-up time after the final treatment ranged from 3 to 44 months.

Results

Twenty six percent of patients showed good to excellent clearing after one to two treatments. Fifty percent of patients who underwent more than two treatments received good to excellent results.

Conclusion

The Q-switched Nd:YAG laser can be used to treat Hori's nevus. Results are not as good as those seen with nevus of Ota.

Journal of Cosmetic and Laser Therapy

Treatment of Refractory Dermal Melasma with the MedLite C6 Q-switched Nd: YAG laser: two case reports

Niwat Polnikorn (2008) Journal of Cosmetic and Laser Therapy, 10:3, 167-173.
doi: 10.1080/14764170802179687

Objective

Dermal melasma in Fitzpatrick skin types III-V usually does not respond to topical treatments. Laser resurfacing often either fails to treat these lesions or results in severe postinflammatory hyperpigmentation (PIH) or permanent hypopigmentation. Two cases of refractory dermal melasma are reported, which responded to treatment with the MedLite C6 Q-switched Nd:YAG laser.

Methods

Case 1: A 50-year-old Asian female with refractory dermal melasma and severe PIH received 10 weekly laser treatments combined with 7% alpha arbutin and a broad-spectrum sunscreen. Case 2: A 45-year-old Asian female with refractory dermal melasma received 10 weekly laser treatments combined with 7% alpha arbutin and a broad-spectrum sunscreen.

Results

In both cases, there was a greater than 80% reduction in epidermal and dermal hyperpigmentation. The melanin index at the site of the lesions decreased from 50 to 35 and 45 to 33, respectively. There was no recurrence of melasma at 1 year (case 1) or 6 months (case 2).

Conclusion

Even in cases of long-standing refractory dermal melasma in a darker skin type, combination therapy has been shown to be an effective treatment for this difficult condition.

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