



PLASMALITE™

Preliminary report of study of Plasmalite™ in Thai patients.

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10/22-23 Phahonyothin 5, Bangkok 10400, Thailand

Photoageing in Asians with dark skin type differs from those of white skin. Wrinkles and elastotic changes tend to occur at older age while dyspigmentation is more common problems. Photorejuvenation in dark skin type therefore has to address problem of hyperpigmentation. The common hyperpigmentation problems in Asians' Fitzpatrick skin type 3 to 5 includes senile or actinic lentigos, freckles, melasma (epidermal and dermal type), dermal melanocytic lesions and postinflammatory hyperpigmentation. Acne scars, hypertrophic scars and keloids are also common problems in Asians.¹ In the past management of hyperpigment problems in dark skin type centered around medical treatment with tyrosinase inhibitor e.g. hydroquinone, chemical peel and microdermabrasions. Hydroquinone which is still the most potent topical medication for lightening of pigmented lesions also processes long term toxicity and

has now been removed from the FAD approved drug in many countries.² Chemical peel with trichloacetic acid or glycolic acid together with microdermabrasion if were performed too aggressively in dark skin will eventually end up with more hyperpigmentation. Eventhough the recently introduced ablative laser resurfacing or short pulse pigmented laser have been shown to be effective in Asian's skin,^{3,4} the problems of post operative wound cares, postinflammatory hyperpigmentation or erythema and higher incidence of scars and keloids have discouraged both doctors and patients from performing this operation.⁵ The recently introduced intense pulse light technology which has been claimed to be effective for photorejuvenation in Fitzpatrick skin type 1 and 2 without wound or post operative downtime is also promising to be an advantage treatment for dark skin type.⁶ Prior

to the treatment the light energy was calibrated with photometer. *Plasmalite™* is an intensified pulsed light source emitting a continuous light spectrum with most of its energy between 535 and 1000 nm. The system utilize dye-impregnated polymer filter to cut off wavelength below the desired levels (535, 551, 560, 580 and 615 nm) together with copolymer matrix filter to filter out infrared light (>1000nm) from the gas-filled flashlamp.(Figure 1) The high energy pulse light is directly transmitted through sapphire light guide with foot-print area of 0.8x23 mm².(Figure 2) The sapphire light guide is continuously cooled with circulating cold water to 5 oC. The pulsed width which correlate with the energy fluence can be manually adjusted to 100 mS. Before treatment new selected polymer filter will be changed and the machine calibrated to the desire energy fluence (usually between 25-40 Joules/cm²) using photom-

eter. The gas-filled flash lamp is interchangeable between the high power (20 mm) for hair removal and medium power (15 mm) for skin rejuvenation.⁷

The purpose of this study is to report the preliminary study of Plasmalite TM in skin type 3 to 5 Thai patients.

PATIENTS AND METHODS:

Patients with the following conditions : melasma, frekles, senile/ actinic lentigos, post-inflammatory hyperpigmentation, dermal pigmented lesions, acne-scars, hypertrophic scar , keloids and facial telangiectasia were invited to join the study. Exclusion criterias are active inflammatory diseases, infections or photosensitive dermatoses. On the first and subsequent follow up visits clinical findings were recorded, standardize photography with Polaroid Macro5 camera with fixed distance and flashing were performed. The clinical results will be grading by an independent observer at 1 or 2 months. The complications were also recorded and photographed. During postoperative treatment , the only treatment that were given was broad-spectrum sunscreen and moisturizer.

The clinical improvement will be graded as follow:

- 5 = excellence
(improvement >75%)
- 4 = good
(improvement 50-75%)
- 3 = fair
(improvement 25-50%)
- 2 = stable
(no improvement)
- 1 = worse
(increased hyperpigmentation)

Energy

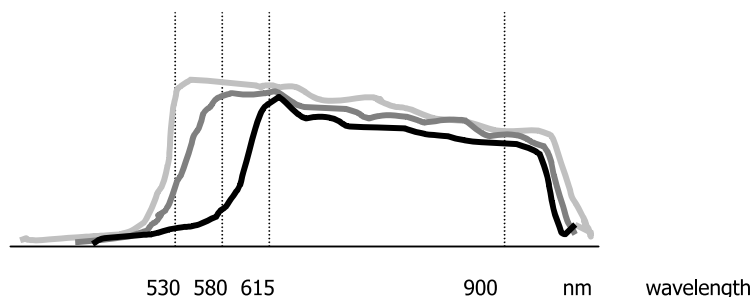


Figure 1 : polymer filters cut off wavelength lower than 535, 580 and 615 nm while copolymer matrix filter cut off infrared light (>1000 nm).

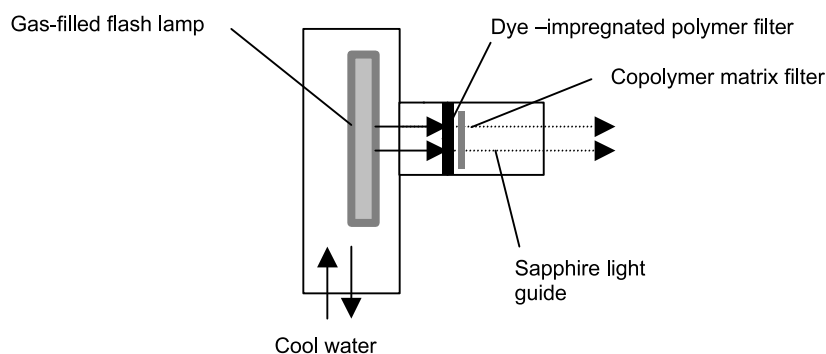


Figure 2: Components of Plasmalite^R hand piece

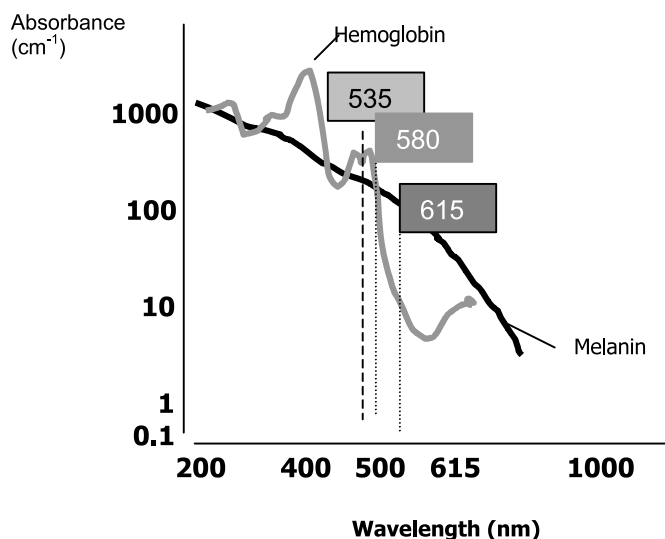


Figure 3: Absorption spectrum of major skin chromophores (melanin and Hemoglobin) and cut off wavelength of three filters (535, 580 and 615 nm)

RESULTS:

Study population: there were 136 patients treated between 1 June to 25 August 2001. 73 patients were follow up more than one month and will be analysed. 69 patients were female, 4 were male age range 21 to 62 years. All patients had Fitzpatrick skin type 3 to 5. The result will be classified according to the problems treated into 7 groups. (Table 1)

Group 1: Wrinkles and photoaging

There were 6 patients with mild to moderate degree of photoaging and wrinkles, 5 cases were of Fitzpatrick skin type 3 and one case with skin type 4. Two cases were treated with 535 nm, 19 J/cm², two treatments, two cases treated with 550 nm, 17.5-20 J/cm², two treatments and one case treated with 580 nm, 20 J/cm² one treatment. There was fair improvement in 66.7% (4/6 cases) (Figure 1a, b), no change in 16.7% (1/6 case). One case (16.7%) developed hyperpigmentation.

Group 2: Hypertrophic scars and keloids

There were 6 patients (6 cases with Fitzpatrick skin type 3 and 2 cases with type 4). All were treated with 580 nm, 25-27.5 J/cm² double passes. 62.5% (5/8 cases) had fair to good response. (Figure 2 a, b) There was no complication.

Group 3: Acne scars

There were three patients of acne scars, all had Fitzpatrick skin type 3. The treatment was performed with 580 nm, 15-20 J/cm² for 3 treatments. All three had fair

improvement without any complication.

Group 4: Epidermal hyperpigmentation (Freckle/Senile and actinic lentigos)

There were 19 patients (13 with Fitzpatrick skin type 3, 6 with type 4). For the skin type 3 patients 11 cases were treated with 535 nm, 15-17.5 J/cm², 1-2 times, 3 cases were treated with 550 nm, 15-20 J/cm², 1-2 times. For the skin type 4, 3 cases were treated with 535 nm, 15-20 J/cm², 1-2 times, 2 cases were treated with 550 nm, 15-20 J/cm², 1-2 times and one case was treated with 580 nm, 15 J/cm² for one time.

The overall result in both skin type 3 and 4 was 47.36% (9/19 cases) good (Figure 3 a, b) and 26.32% (5/19 cases) fair result. There was no complications.

Group 5: Postinflammatory hyperpigmentation

There were 8 cases with Fitzpatrick skin type 3, 5 cases were treated with 535 nm, 15-19 J/cm², 1-2 treatments, 1 case was treated with 550 nm, 15 J/cm² and 2 cases were treated with 580 nm, 15 J/cm², 2 treatments. 25% (2/8 cases) had good result (Figure 4a, b), 50% (4/8 cases) had fair result. Two cases developed worsening of hyperpigmentation. One case was treated with 535 nm, 17.5 J/cm², for 2 times another case was treated with 550 nm, 15 J/cm² for one time. (Figure 5a, b)

Group 6: Dermal melanocytic lesion (Hori's nevus)

There were 5 cases with dermal

melanocytic malar lesion (Hori's nevus) all were of Fitzpatrick skin type 3. After two treatments with 580 nm, 15-20 J/cm², there was no response.

Group 7: Melasma

There were 24 cases (13 cases with Fitzpatrick skin type 3 and 10 cases with type 4). 11 cases in skin type 3 group were treated with 535 nm, 15-20 J/cm², 1-3 treatments, one case was treated with 550 nm, 15 J/cm² one treatment and another case was treated with 580 nm, 15-17.5 J/cm² for two treatments. There was 15.38% (2/13 cases) good result, (Figure 6a, b) 23.08% (3/13 case) with fair result while 23.08% had no change and 38.5% (5/13 case) was getting worse.

For the Fitzpatrick skin type 4 group, 4 cases were treated with 535 nm, 15-19 J/cm², 1-2 treatments, 6 cases were treated with 580 nm, 15-17.5 J/cm², 1-3 treatments. 40% (4/10 cases) had good result, 10% (1/10 cases) had fair result.

The overall result for treatment of melasma in Thai patients with skin type 3 and 4 was 25% good result, 16.7% fair result.

Worsening of hyperpigmentation was found in 20.8% (5/24 cases). (Figure 7 a, b) while 3 cases (12.5%) developed mild degree of epidermal burn with microcrusting in the first two days after treatment. (Figure 8 a, b)

Table 1: Summary of result of treatment with Plasmalite™ in Thai patients

Diagnosis	No	Skin type			Wavelength (nm)			Energy J/cm ²	Result				Complications	
		III	IV	V	535	550	580		Good	Fair	Stable	Worse	Hyperpig	Hypopig
1. Wrinkles	6	5	1	-	2	2	2	17.5-20	-	4	1	-	1	
2. Scars/keloids	8	6	2	-	-	-	8	25-27.5	2	3	2	1	-	-
3. Acne scars	3	3	-	-	-	-	3	15-20	-	3	-	-	-	-
4. Freckles/lentiginos	19	13	6	-	14	4	1	15-20	9	5	2	3	-	-
5. PIH	8	8	-	-	5	1	2	15-19	2	4	1	1	2	
6. Hori's nevus	5	5	-	-	5	-	-	17.5-20	3	2	-	-		
7. Melasma	24	13	10	1	15	1	8	15-20	6	4	7	7	5	2

PIH =postinflammatory hyperpigmentation

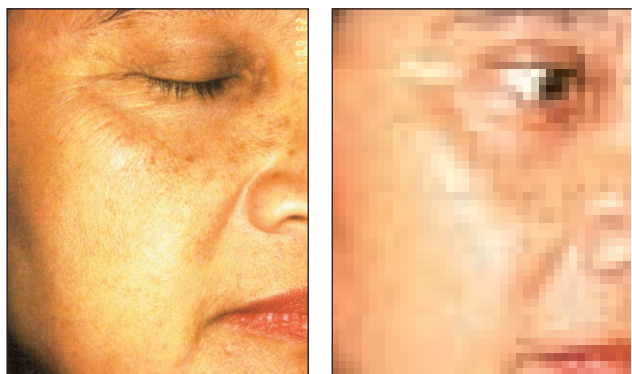


Figure 1 a,b : Pre and two month post treatment of wrinkle with *Plasmalite*™, 535 nm, 17.5 J/cm².

Figure 1 c,d: Pre and post treatment of photodamage skin with lentigines, Telangiectasia and wrinkles with *Plasmalite*™, 535 nm, 17.5J/cm²

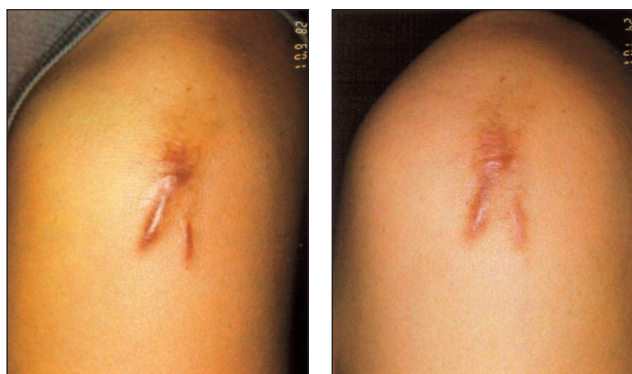
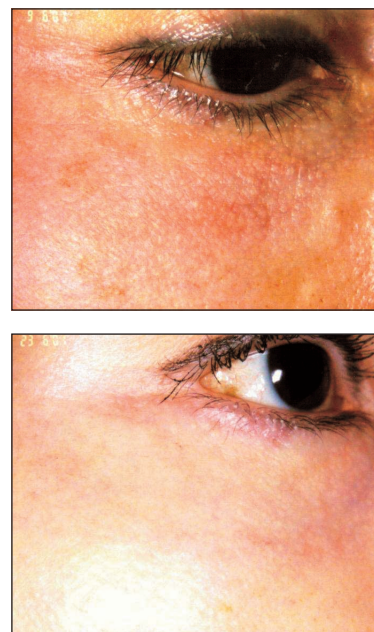


Figure 2 a,b: Pre and two month post treatment of keloid with *Plasmalite*™, 580 nm, 25 J/cm²

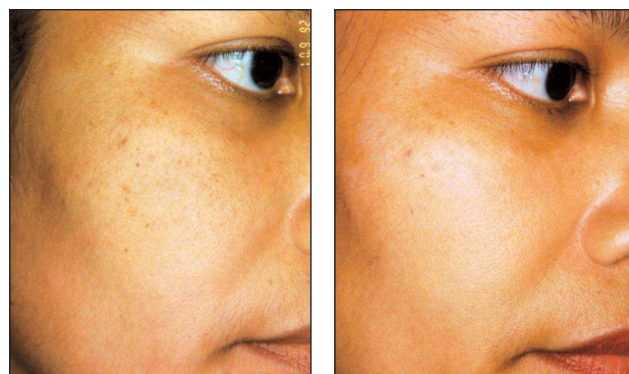


Figure 3 a,b: Pre and two month post treatment of freckles with *Plasmalite*™ 535 nm, 17.5 J/cm². There is good response to the treatment with more than 70% reduction of pigmentation.



Figure 4 a,b: Pre and two month post treatment of post inflammatory hyperpigmentation with *Plasmalite*™, 580 nm, 19 J/cm².



Figure 5 a,b. Worsening of postinflammatory hyperpigmentation, one month after treatment with *Plasmalite*™, 550 nm, 17.5 J/cm²



Figure 6 a,b: Pre and two months post treatment of melasma in skin type IV

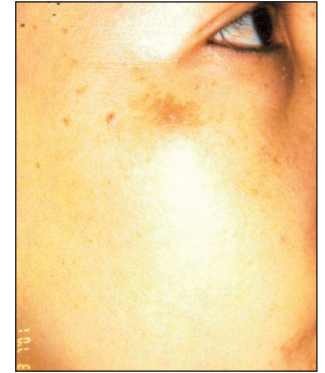


Figure 7 a,b: Worsening of melasma after treatment with *Plasmalite*™ in skin type III patient.

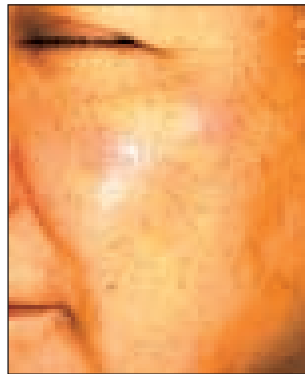
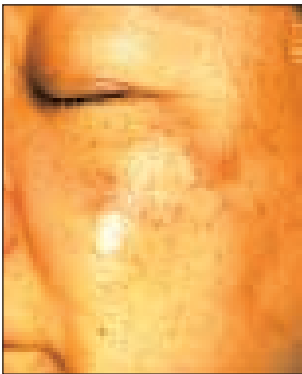


Figure 8 a,b: Crusting and hypopigmentation after treatment of melasma with *Plasmalite*™, 580 nm, 19J/cm² double passes.

DISCUSSION:

Clinical application of intense pulse light is based on the principle of *selective photothermolysis*. The light energy will be selectively absorbed by the targets, which will be thermally destroyed. The adjacent tissue will escape injury by limiting the pulse width or by preserving surrounding tissue with cool temperature. Photorejuvenation by selectively transmitted light through epidermis to the dermis underneath and was absorbed by selected chromophores e.g. hemoglobin has been proved to be effective in white skin with minimal epidermal melanin. In dark skin with dense epidermal melanin, most of the light energy will be absorbed by the epidermis allow-

ing only small amount to pass through. This result in high incidence of epidermal injury and post treatment hyperpigmentation. To reduce this side effect, the low energy is recommended for dark skin type. This also resulted in low efficacy.

This study is the first preliminary short termed follow up study of *Plasmalite*™ in Fitzpatrick skin type 3 to 5 Thai patients. Even the number of cases is limit and the follow up time is too short (2 months) it is definite from this study that *Plasmalite*™ has a good and fair short term (< 2 months) result in many conditions. The epidermal hyperpigmentation (freckles, senile/actinic lentigo) had good

to fair result in 77.8% of cases.

There was also no post operative wounds or complications which were once very common with pigment laser treatments.

For melasma, I do not classified the patients into epidermal, dermal or mixed type because of inaccuracy of clinical classification. I personally believe that the different type of melasma only reflects the maturity of the lesions. The active melanocytes in the mid part of the adnexal structure are the source of recurrence of melasma after the medications are terminated or after reepithelization follow chemical peel or laser resurfacing. This study support this postulation only 15.38% had good result while

38.5% had worsening of melasma. Long term (at least 3-6 months) is needed to follow the patient who have favorable result, to determine that the response is temporary or permanent. The cases with worsening of lesions proved that the sub lethal energy will stimulate the surviving melanocytes either in the epidermis or adnexal structure to synthesis more pigment. From this finding before initiation of full face treatment of melasma a test spot with one month observation is recommended.

For dermal melanocytic lesions (Hori nevus), there was no clinical response after 2 months. It was likely that the energy was not enough to induced thermal reaction in the dermal melanocytes. From my experience with treatment of this condition with 1064 nm Q-switched Nd:Yag laser , first few months after treatment the lesions will become more hyperpigmented then slowly faded away. It took at least 6 months to see the full effect of the laser treatment. Our cases showed no reaction at all. Anyway, these patients should be followed up for at least 6 months to determine the real efficacy of intense pulse light in dermal melanocytic lesions. The treatment of post-inflammatory hyperpigmentation resulted in 75% good and fair results. These lesions usually composed of epidermal hyperpigmentation and superficial vascular dilatation , both of which respond quite well to intense pulsed light of 535 or 580

nm wavelength. 25% of treated cases who become worse may be the cases with adnexal regenerating melanocytes which were stimulated by sub lethal light energy. Test spot similar to those for treatment of melasma is recommended before initiation of treatment of the whole area.

For photorejuvenation, the improvement in wrinkles in 66.7% should be follow up at least six months. The early improvement may be the resulted of inflammations which will eventually subsided. The real advantage of this treatment was that the resulted obtained was comparable to those from Erbium:YAG laser resurfacing without the disadvantage of laser operation. The patient's acceptance was very high. There were some reports of histologic study after intense pulsed light treatment demonstrated neocollagenesis , and thickening of epidermis. One case who developed hyperpigmentation might be exposed to too high energy of 580 nm at 40 J/cm². The dark skin of Skin type 3 or 4 should not be treated with higher than 35 J/cm².

It is interesting that acne scar, hypertrophic scar and keloids seem to response to high energy, 25-27.5 J/cm², of 580 nm wavelength. The early result was 62.5% which was comparable to the treatment with 585 nm pulsed dye laser. These conditions need repeated treatment at interval of 1-2 months with long term follow-up of about one year before

the real efficacy will be determined.

I do not mention about permanent hair removal with *Plasmalite*TM, since the number of cases was too small and follow-up time was not adequate to determine any real significant result. This group will be part of the further analysis in the future.

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