

Flashlamp-Pumped Pulsed Dye Laser (585nm) for the Treatment of Portwine Stains – A Study of Treatment Outcome in 94 Asian Patients in Singapore

C L Goh

ABSTRACT

Background: This is a report of a prospective study on the treatment outcome of 94 Asian skin Types III and IV patients with port-wine stains with the 585 nm flashlamp-pumped pulsed dye laser in Singapore.

Results: All patients had completed at least 1 year of follow-up post treatment and had received treatment at 8 – 12 weekly intervals under topical lidocaine-prilocaine anaesthesia. Our patients received an average of 4 treatments sessions. At the end of each treatment (8 – 12 weeks after the last laser treatment / before the next laser treatment) and on completion of the last treatment (8 – 12 weeks after the final laser treatment), patients were assessed for response based on a subjective scoring system where excellent = > 75% improvement, good = 50% to 75% improvement, fair = 25% to 49% improvement and poor = < 25% improvement and the same = no observable improvement. The dermatologist also recorded scores after each treatment in a similar way. On completion of the final treatment, patients were asked to score (8 – 12 weeks after the final laser treatment) the overall response to the treatment themselves using the same scoring system.

The mean age was 26.4 years (range 1 year to 58 years). The mean initial treatment energy density dose was 6.24 J/cm². Eighty percent of our patients experienced excellent or good response to treatment after the initial treatment and further improvements were observed with each subsequent treatment.

Results: The author scored 86% of our patients having “excellent” or “good” response while 83% of our patients scored “excellent” or “good” response upon completion of their treatment. The dermatologist generally recorded better improvement scores than the patients. The dermatologist scored 36% and 50% of our patients having “excellent” and “good” response respectively. The corresponding treatment response scores by our patients were 22% (“excellent”) and 61% (“good”).

Conclusion: Macular lesions appear to respond better than papular/nodular lesions, but the difference was not statistically significant probably due to the small study cohort. Light coloured port-wine stains tended to respond better to treatment than darker lesions (not statistically significant), but overall, all colour lesions responded well to treatment. Patients’ expectation of improvements was generally higher than the dermatologist’s.

Keywords: capillary malformation, capillary haemangioma, cosmetic laser treatment

INTRODUCTION

The incidence of port-wine stain is estimated to be about 0.3%⁽¹⁾. It is a capillary malformation of the superficial cutaneous vessels which does not fade with time unlike the capillary haemangioma. Port-wine stains can cause severe disfigurement. Not uncommonly, the capillary malformation progresses with age, leading to dilate vascular blebs on the skin. The introduction of the vascular lasers with selective photothermolysis activity, has allowed port-wine stains and other vascular malformations to be treated with little scarring and side effect⁽²⁾. The 585 nm flashlamp-pumped pulsed dye laser which was introduced about a decade ago has been proven to be effective in the treatment of port-wine stains⁽³⁻⁷⁾. Most of the reports of treatment response come from treatment on fair-skin Caucasians. We report our treatment response of 94 Asian patients mainly with Fitzpatrick skin Types III and IV with port-wine stains using the 585 nm flashlamp-pulsed dye laser (SPTL-1, Candela Corp, Wayland, Mass, USA). The objectives of the study were to assess the treatment response of port-wine stain to the flashlamp-pumped pulsed dye laser on Asian skin, and to assess the treatment dose (energy density) and complications associated with the flashlamp-pumped pulsed laser on our patients.

National Skin Centre
1 Mandalay Road
Singapore 308205

C.L.Goh, MRCP (UK),
FRCP (Edin), FAMS
Medical Director &
Senior Consultant

MATERIALS AND METHODS

This is a prospective study of patients with port-wine stains on the face, who were referred to the National Skin Centre between April 1993 and March 1996 and who received treatment with the 585 nm flashlamp-pumped pulsed dye laser (SPTL-1, Candela Corp, Wayland, Mass, USA). Informed consent was obtained from the patients before laser treatment commenced.

A protocol to record the demographic data of the patient, skin type (Fitzpatrick classification), colour and texture of the port-wine stain was used. The patients received treatment by the author at 8 – 12 weekly intervals under topical lidocaine-prilocaine anaesthesia (EMLA, Astra, Sweden). The energy density for each treatment, immediate post-treatment skin reaction, and response to treatment after 8 – 12 weeks were recorded. Photographs were taken during each visit to document the treatment response.

The laser used was the flashlamp-pumped pulsed dye laser SPTL-1 (Candela Corp, Wayland, Mass, USA) emitting 450-usec pulses at 585 nm with a 5 mm laser beam spot size.

Initially a site of 2 cm was treated with an energy density of 4.5 to 6 J/cm² depending on the age of the patient and the response was assessed 8 weeks later. Test site treatment was discontinued after the initial 12 months when the author became familiar with the treatment response to the various doses of energy densities during the initial treatment. Treatment of the entire port-wine stain was started if there was response and no blistering following the test spot laser treatment. The energy density was increased by 0.5 to 1 J/cm² during each visit. No attempts were made to assess the treatment response according to the anatomical location of the port-wine stain on the face.

Patients who received treatment and were followed-up for more than 1 year from the date of the first treatment, excluding test spot treatment, were included in our study. Generally, these patients received a total of 4 treatments. At the end of each treatment (8 – 12 weeks after the last laser treatment / before the next laser treatment), the author assessed response based on the following subjective scoring system viz: excellent = > 75% improvement; good = 50% to 75% improvement; fair = 25% to 49% improvement; poor = < 25% improvement and same = no observable improvement.

The author scored the overall response based on the above scoring system. Patients were also asked to score their response to the treatment based on a similar scoring system at the end of their treatment course (8 – 12 weeks after the final laser treatment). Any complications during the treatment were recorded. Treatment was stopped when no further lightening of the lesion was noted or upon the patients' request.

The Chi-squared test was used for statistical analysis for the differences in proportion. A p value of < 0.05 was considered significant.

RESULTS

Ninety-four patients with port-wine stains on the face and neck were included in the study. There were 73 (78%) females and 21 (22%) males. There were 89 (95%) Chinese and 4 (5%) Malays. Their mean age was 26.4 years (range 1 year to 58 years). Two (2%) had skin type II, 57 (61 %) had skin Type III, 34 (36%) had skin Type IV and 1 (1%) had skin colour Type V (Fitzpatrick classification)⁽⁸⁾.

Out of 94 patients, 67 (71%) lesions were classified as flat/macular, 20 (21%) papular, 4 (4%) papulo/nodular and 3 (3%) nodular. Twenty (21%) lesions were classified as pink, 54 (57%) as red, 12 (13%) as purple and 8 (9%) as dark purple.

Table I shows the mean treatment energy density and treatment response at different stages of treatment. The mean starting dose was 6.2 J/cm². Most patients experienced "excellent" or "good" improvement after the initial treatment and further improvements were observed with each subsequent treatment. All patients observed at least some improvement after the first 2 treatments.

Of the 67 patients who assessed their treatment outcomes, 22% scored "excellent" outcomes, 61% scored "good" outcomes, 10% scored "fair" and 6% scored "same". Of the 94 patients who were assessed by the dermatologist, 36% scored "excellent" outcomes, 50% "good", 13% "fair" and 1% "same" outcomes. The mean number of laser treatments was 4. Eighty-six percent of our patients experienced either "excellent" (36%) or "good" (50%) responses (Figs 1a, 1b and 2a, 2b). The dermatologist generally recorded better improvement scores than the patients. There were no significant differences statistically in the treatment response among the macular, papular and nodular lesions as assessed by the patients. But

Table I – The mean treatment energy density and response to the number of treatment received

Treatment	Mean dose (range) J/cm ²	Excellent	Good	Fair	Same
Initial (n = 94)	6.2 (4.5 – 8.0)	21 (22%)	55 (59%)	17 (18%)	1 (1%)
Second (n = 91)	6.9 (5.5 – 9.0)	37 (41%)	48 (53%)	5 (6%)	1 (1%)
Third (n = 68)	7.5 (6.0 – 9.0)	31 (46%)	36 (53%)	1 (2%)	0
Fourth (n = 40)	7.9 (5.5 – 9.0)	24 (60%)	16 (40%)	0	0
Fifth (n = 29)	8.3 (6.0 – 9.5)	17 (41%)	12 (41%)	0	0

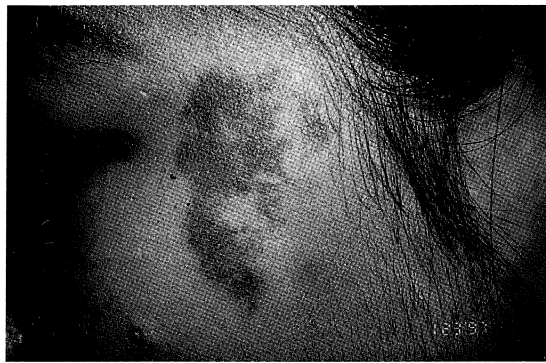


Fig 1a – Portwine stain on the face before flashlamp-pumped pulsed dye laser treatment.



Fig 1b – Portwine stain treatment response after 6 treatments. Notice > 75% improvements in colour.

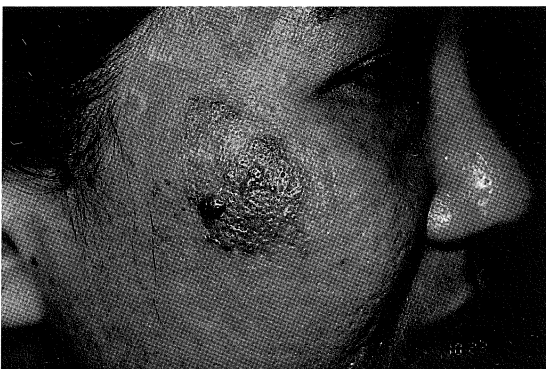


Fig 2a – Portwine stain with papular component before flashlamp-pumped pulsed dye laser treatment.

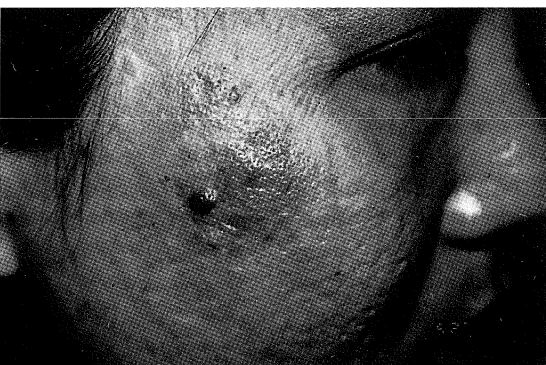


Fig 2b – About 50% improvement after 4 pulsed dye laser treatment. Note that the papular lesion has not changed significantly.

Table II – Treatment response scores according to the types of lesion as assessed by the patients and the dermatologist

Type	Total (n = 94) 100%
Patients' score	n = 67
Excellent	15 (22%)
Good	41 (61%)
Fair	7 (10%)
Same	4 (6%)
Doctor's score	n = 67
Excellent	34 (36%)
Good	47 (50%)
Fair	12 (13%)
Same	1 (1%)
Mean No Rx	4.0 (sd = 2.2)

the assessment by the dermatologist showed that macular lesions (91% scored excellent/good results) responded significantly better than papular lesions (71% scored excellent/good results) ($p = 0.004$).

Table III compares treatment response scores by patients and the dermatologist according to the colour of the port-wine stain. Lighter lesions tend to respond better to treatment than darker lesions (not statistically significant) but overall, all lesions responded well to treatment.

There was no statistical significant difference in the response to treatment for different skin types. Types III and IV skin which were the most common skin type showed almost equal proportions with "excellent" or "good" responses.

None of the patients experienced any scarring following the full course of treatment. All the patients experienced mild post-inflammatory pigmentation presenting as a faint brownish hue on the treated sites 3 to 4 weeks after treatment. The brownish pigmentation cleared after 3 months without any treatment. All patients had faint erythema from residual underlying vascular malformation after completion of the four treatments. Some patients continued to receive up to 10 treatments with further improvement.

DISCUSSION

Our findings indicate that the flashlamp-pumped pulsed dye laser (585 nm) is effective in the treatment of port-wine stains on the face and neck. More than 80% of our patients were satisfied with the improvement observed. This finding is similar to previous reports done elsewhere⁽⁴⁻⁷⁾.

Our findings also indicate that patients' expectation of improvement from treatment was significantly higher than that of the dermatologist. While the treating dermatology recorded 36% of the patients had "excellent" response, only 22% of the patients scored their improvement as "excellent" after the end of their treatment. One reason could be that

Table III – Comparing response scores according to the colour of the lesion by the patients and the dermatologist

Type of lesion	Pink/red (n = 20) (21%)	Red (n = 54) (57%)	Red/Purple (n = 12) (13%)	Purple (n = 8) (9%)
Patients' score	(n = 19)	(n = 33)	(n = 19)	(n = 7)
Excellent	6 (32%)	8 (25%)	1 (11%)	0
Good	11 (58%)	19 (57%)	4 (44%)	7 (100%)
Fair	1 (5%)	3 (9%)	4 (44%)	0
Same	1 (5%)	3 (9%)	0	0
Doctor's score	(n = 20)	(n = 54)	(n = 12)	(n = 8)
Excellent	10 (50%)	19 (35%)	2 (17%)	3 (38%)
Good	9 (45%)	28 (52%)	7 (58%)	3 (38%)
Fair	1 (5%)	7 (13%)	2 (17%)	2 (24%)
Same	0	0	1 (8%)	0
Mean No Rx	3.4 (sd:2.0)	4.3 (sd:2.4)	3.9 (sd:2.6)	3.9 (sd:1.5)

patients are observing their lesions daily and therefore may not observe significant changes. It appeared that patients receiving the laser treatment should be forewarned on the expected degree of improvement. Most patients' lesions improved significantly, necessitating little or no cosmetics to cover up the residual at the end of the treatment. All the patients had residual erythema due to underlying residual lesions. Patients should be told not to expect the colour of the port-wine lesion to return to that of normal skin completely. This finding was consistent with other study reported elsewhere⁽⁴⁻⁷⁾.

Our findings also indicate that more than two thirds of our patients observed good to excellent improvements after the first treatment and by the fifth treatment, all patients recorded either "good" or "excellent" improvements.

We also observed that macular lesions responded better than papular and nodular lesions. The difference was not statistically significant probably because of the small study cohort.

We also notice that lighter coloured (pink and light red) lesions tended to respond better than dark red/purple lesions. This observation is similar to that in other reports^(4,5,7). The capillary malformation of lighter coloured lesions probably represent very superficial capillary malformation and therefore are more readily destroyed by the flashlamp pulsed dye laser. The difference was not statistically significant probably due to the small study cohort.

Troilius et al⁽¹²⁾ and Fiskerstarand et al^(14,15), based on their studies of morphological structures of vessels diameter, recently reported the lack of response in port-wine stains with small sized or deeply located vessels and that red port-wine stains generally respond better than pink/purple lesions.

We did not notice any significant difference in the treatment response to skin type although it is generally believed that patients with lighter skin

type (eg. Types I and II) would respond better than dark skin type. In our study, we notice that light skin individuals (Type II) respond better than those with darker skin (Types III and IV) but the difference is not statistically significant (probably because of the small cohort in Type II skin). Nevertheless, the overall response was good in skin Types III and IV patients. The melanin in darker skin type may absorb part of the laser energy of the 585-nm wavelength thereby interfering with its effects on the blood vessels. The number of patients in our study precluded any significant comparison.

The mean starting energy densities for our patients (with darker skin) was similar to those used for Caucasian (lighter skin) patients⁽⁴⁻⁷⁾. The darker pigmentation of Asian skin probably tolerate higher energy densities as the pigmented skin might have absorbed some of the laser energy. We are currently reviewing the starting dose to see if we can achieve an even faster treatment response. This has important implications as the treatment cost with the pulsed dye laser is expensive. We could start the initial treatment with higher energy densities to obtain optimal results rather than starting at another energy density that will result in patients having to undergo treatments more often.

None of our patients suffered any side-effects. They were able to tolerate the laser treatment under topical anaesthesia. This observation is similar to those reported elsewhere^(12,13). None of our patients experienced any scarring. Mild hyperpigmentation was the common unwanted effect seen. However, all patients had their hyperpigmentation cleared after 3 – 6 months without any treatment. None received any bleaching cream (eg. hydroquinone) for their transient pigmentation. This is a similar observation in other reports^(4,6,14). However, a recent prospective study has indicated that minor side-effects including oedema in 73%, crusting in 46% – 93%, bleeding in 12%, hyperpigmentation in

27%, hypopigmentation, pyogenic granulomas and blistering in 1% of patients each, are not uncommon⁽¹⁵⁾.

We did not record the duration of post-treatment purpura but our earlier experience indicated that the purpura cleared within 2 weeks after pulsed dye laser treatment.

A recent report indicated that although good response to treatment is obtained with dye lasers, recurrence may occur⁽¹⁶⁾. We will need a larger following with our patients to see if recurrence does occur.

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