

# Efficacy and safety of intense pulsed light in vascular lesions

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## Abstract

**Background** Intense pulsed light (IPL) devices are non-laser high intensity light sources that make use of a high output flashlamp to produce a broad wavelength of noncoherent light. The working basis of IPL rests on the principles of selective photothermolysis which exploits the hemoglobin absorption peak among its range of wavelength and can be used for many vascular skin lesions. However, the response of vascular lesions to therapy are influenced by the type of light source used, clinical characteristics of the target lesion and patient specific factors (e.g. skin color).

**Objective** The aim of this study was to assess the efficacy and safety of intense pulsed light in vascular lesions in Asian skin types.

**Study Design** Quasi-experimental study.

**Methods** A total of thirty patients having different types of vascular lesions predominantly on face were treated repeatedly with IPL for 2 years. They were evaluated by clinical observations before and after the treatment sessions. The outcome was assessed by dividing the results into four categories: Poor improvement (<25% response), slight improvement (25-50% response), moderate improvement (50-75% response) and marked improvement (>75%).

**Results** Six patients showed excellent response (>75% improvement). Among them five patients had rosacea (erythematotelangiectatic type). Three patients achieved a moderate improvement. Ten patients had slight improvement. Eleven patients showed poor response, majority of them had haemangiomas. Only one patient had burning and crusting after two treatment sessions.

**Conclusion** IPL can be effective for vascular lesions depending upon the type of lesions in Asian skin type.

## Key words

Intense pulsed light, vascular lesions, Asian skin type.

## Introduction

Intense pulsed light (IPL) technology has evolved remarkably in the last two decades. These are non-laser high intensity light sources

that produce broad wavelength of non-coherent light in the range of 500-1200nm. Individual systems use different cooling systems to protect the epidermis. IPL can be safely and effectively used for the cosmetic treatment of vascular lesions, unwanted hair and pigmented lesions.<sup>1</sup>

The working principle of IPL is selective photothermolysis that destroy specific targets in

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the skin with minimal damage to the surrounding structures.<sup>2</sup> Light energy must be delivered in a manner that results in potential absorption by light absorbing molecules called chromophores located within the target. This leads to heating and coagulation of the target.<sup>3</sup>

Lasers and IPL are used for the treatment of multiple cutaneous vascular lesions. IPL can target oxyhemoglobin, deoxygenated hemoglobin and methemoglobin.

The successful treatment of vascular lesions with IPL depends on the type and size of vessels. Broader wavelength range emitted by IPL devices and delivered through variable pulse durations and multiple-pulses enables deep seated vessels to be targeted.<sup>4</sup>

## Methods

A total of thirty patients having different types of vascular lesions predominantly on face were treated repeatedly. They were evaluated by clinical observations before and after the treatment sessions.

The results were assessed by two independent dermatologists who divided the performance into four categories: poor response <25% improvement, fair or slightly improvement between 25-50%, moderate or good improvement 50-75%, marked or excellent improvement >75% response. Sessions were carried out at intervals of 4-6 weeks. We used double and triple pulses of 4-20 msec with thermal relaxation time range 30-80 msec with 12-30 J/cm<sup>2</sup> fluence depending upon the tolerance of patient.

## Results

Thirty patients predominantly females (27 females and 3 males) completed the treatment

sessions (range 2-24) over a period of 2 years. (Table 1 & 2). The distribution of different diagnoses is given in Table 3. 86% patients achieved more than 25% improvement. Among them 23% had excellent response (>75% improvement), 16% percent had a response between 50-75%, and 46% had fair response (Table 4).

All the patients of port wine stains were improved, majority had >25% improvement. The number of sessions were variable but patients having increased number of sessions showed increased response. All the patients of rosacea (mostly steroid induced rosacea like dermatitis) showed >75% improvement. Patients did not require much sessions to show this improvement, even after 2-3 sessions patients achieved excellent response.

**Table 1** Descriptive Statistics for age

	<i>N</i>	<i>Min</i>	<i>Max</i>	<i>Mean</i>	<i>Std.Deviation</i>
Age	30	7.00	50.00	24.57	11.08800

**Table 2** Statistics for gender

	<i>Frequency</i>	<i>Percent</i>	<i>Cumulative Percent</i>
Female	27	90.0	90.0
Male	3	10.0	100.0
Total	30	100.0	

**Table 3** Descriptive statistics for diagnoses

	<i>Frequency</i>	<i>Percent</i>	<i>Cumulative Percent</i>
Angiokeratoma	1	3.3	3.3
Hemangioma	7	23.3	26.7
Port wine stain	15	50.0	76.7
Rosacea	6	20.0	96.7
Spiderangioma	1	3.3	100.0
Total	30	100.0	

**Table 4** Statistics for efficacy

	<i>Frequency</i>	<i>Percent</i>	<i>Cumulative Percent</i>
Excellent	7	23.3	23.3
Good	5	16.7	40
Fair	14	46.7	86.7
Poor	4	13.3	100.0
Total	30	100.0	

Patients of hemangiomas did not show much response in our study, even after increasing the number of sessions and modifying the pulse duration and thermal relaxation time.

Majority of patients were satisfied, only one had burning and crusting after second treatment session that settled in a week's time with topical steroids.

Post treatment phase was very important to prevent side effects. Patients had to apply cool compresses, emollient creams and sunscreens for at least 8 days.

## **Discussion**

An IPL source is different from laser technology but can be used like lasers. Lasers with single wavelength have limited penetration depth and the variable pulse width is relatively narrow. The pulse width and number of pulses in IPL are tunable so, a different pulse can be chosen for a different diameter vessels, and different wavelength and pulses for different depth of lesions. The large spot size of IPL increases the penetration and decreases the scattering of light. The thermal effects of IPL reach vessels of different sizes and depths and destroy them to clear or improve the lesion.<sup>4</sup>

Vascular lesions that benefit most from IPL treatment are port wine stains, angiomas, telangiectasias, leg veins, hemangioma, rosacea and poikiloderma of civatte.

The gender distribution of this study matches with the studies conducted by Gaung Li et al., P Campolmi et al. and Wai Sun Ho et al.<sup>4-6</sup> Females seek various types of cosmetic treatments more as compared to males. They feel loss of self-esteem and depression because of their skin blemishes in a male dominant society.

The mean age of patients in this study is 24 years. The average age of patients was 44 years in a study of Clementoni M et al<sup>7</sup>, who observed results of intense pulsed light mainly in rosacea. Since this is not a disease of young so this could be a reason for this difference of age. However, mean age of patients was 21 years in the study of Wai Sun Ho et al. similar to ours.<sup>6</sup> Wai-Sun Ho conducted study in patients of port wine stains and that was also the lesion of majority of our study patients.

None of our patients with port wine stains showed poor response, majority had fair and good response, few showed excellent results. Our results are almost similar to study of Guang Li<sup>4</sup> and Wai Sun Ho et al,<sup>6</sup> Guang Li evaluated efficacy of IPL on seventy two patients of port wine stain, 76% of their patients showed >25% improvement. Our results are different from Bjerring P et al. who took fifteen patients of PWS and treated them four times with IPL.<sup>8</sup> 46% of his study patients achieved >50% improvement. However, 53% patients obtained less than 25% clearance. This difference could be explained on the basis that Bjerring included patients who were found resistant to multiple pulse dye laser treatments and he found that in majority of the patients who did not respond their PWS was located in V2 area. PWS in V2 area are generally located deeper in skin and the energy may be insufficient to reach the deeper layers of the skin. Therefore, lesions didn't respond to both treatment modalities.

All patients of rosacea, mostly steroid induced rosacea-like dermatitis showed excellent response within two to three sessions in our study. The results are similar to study of Angemeier.<sup>9</sup> Three of his patients experienced 75 to 100% clearance after only a single treatment. Similarly 79.2% of patients of Bjerring obtained more than 50% reduction in number of vessels, 37.5 % had clearance

between 75 to 100%. Bjerring achieved clearance in diffuse erythema in more than 90% patients.<sup>10</sup>

Patients of hemangioma did show a stabilization of size and slight improvement in the study by Paquet<sup>11</sup> and colleagues but majority of hemangioma lesions failed to show obvious reduction in our study. It may be because of deep and mixed type of vascular tumours.

Other lesions like angiokeratomas and cherry angiomas showed reduction in size and may need multiple sessions to achieve better results.

Side effects were minimal in our study similar to Campolmi<sup>5</sup> and Bjerring<sup>8</sup> studies. IPL can be an effective and cheaper therapy for vascular lesions in Asian skin.

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