Research Article

Treatment of Port Wine Stains with Pulsed Dye Laser: A Retrospective Study in Pakistani Population

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Abstract

Background:- In the field of Plastic Surgery, variable-pulse 585 nm pulsed dye lasers (PDLs) are now in common usage for management of vascular skin lesions. However, there is little information available for the treatment of port-wine stains in our population.

Objectives:- To determine the efficacy of pulse dye 585 nm laser (PDL) in the treatment of port-wine stains (PWSs)in the local population.

Methodology: This was a descriptive case series conducted at Jinnah Burn & Reconstructive Surgery Centre, Lahore, from December 2018 to November 2019.A total of 36 patients of Fitzpatrick skin types III and IV with PWS underwent multiple treatments with 585 nm Pulsed Dye Laser therapy. Serial photographs were taken before and after every session and were assessed by two consultant plastic surgeons. Efficacy was measured by "The Physician Global Assessment score"in terms of clinical recovery response after 3 months of treatment. Significant improvement" (skin recovery: 51%–75%), and "cure" (skin recovery: 76%–100%) was taken as efficacy yes, otherwise taken as no.

Results: Two (5.5%) patients showed a total cure. Significant improved in 15 (41.6%) patients and moderate improvement were observed in 12 (33.3%) patients. Poor improvement was shown in 7(19.4%) patients. 8 (22.2%) patients showed post-laser bruising which settled down with steroid cream (Hydrocortisone 1%) over 1 week. None showed recurrence of PWS till now.

Conclusion: PDL 585nm wavelength with a fluence of 8-10j/cm2 with a pulse duration of 1.5 to 40 ms is an effective and safe treatment for port-wine stain in Pakistani skin.

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Introduction

Vascular lesions of the skin include a vast range of various entities. Truly, these lesions have inadequately been comprehended, and their classification of vascular lesion reflects this. Throughout the times, with advance and development in clinical conduct, treatment, comprehension in histopathology, and visualization,the classification system has been refined.[1] In the mid-1980s, initial substantial strides towards characterizing vascularlesions and tailoring the treatment were made.[2] In 1982, the first binary system of diagnosis was established by Mulliken and Glowacki and it was based on histological characteristics, thus separating the lesions into two groups i.e. hemangiomas and vascular malformations.[3]

During the 1970s, the Argon laser's utilization was extensive and comprehensive. In any case, complications such as hyperpigmentation and fibrosis can occur more frequently. In the 1980s, in the light of these shortcomings, the specialists were impelled to supplant this

laser with flash lamp light PDL. Subsequently, a 585 nm PDL with 0.45 ms duration of pulse was picked as the optimal treatment option for vascular lesions which include nevus flammeus (PWS), haemangioma, and telangiectasia. Even now, Pulsed dye laser (PDL) is considered the highest quality level treatment.[4,5] By the process of selective photothermolysis to destroy capillary malformations is the recognized mechanism of PDL in treating vascular lesions.[6,7] In a study, good to the excellent response of pulsed dye laser was seen in 48.0% of PWSs patients, 78.0% of telangiectasia patients, and 54.0% of haemangioma patients.[8] As there is not any local study in the literature that has assessed the results of pulse dye 585 nm laser in vascular skin lesions.

So, our objective is to determine the efficacy of pulse dye 585 nm laser for the treatment of port-wine stains in our local population. No other study was published here in Pakistan regarding the management of PWS with lasers. The results of this study will not only modify the treatment of this problem but also set baseline data both at the national and international levels.

Methodology

A descriptive case series was carried out at Jinnah Burns and Reconstructive Center from December 2018 to November 2019. All patients presenting with port wine stain of either gender and age ranging from 15 years to 50 years were included in the study. Patients who had undertaken some surgical treatment or mentally retarded were excluded from the study. Ethical approval was obtained from the Hospital Review Board. The treatment protocol of variable-pulse PDL having a wavelength of 585 nm and pulse duration between 1.5 and 40 ms, fluence of 8- 10 j/cm^2, the spot size of 7mm, and pulse rate 1.5 Hz were set for each patient. Topical analgesia of 10% lignocaine gel applied half an hour before each session for surface anesthesia. Laser treatment was carried out along with the cooling of a lesion through a dynamic cooling device attached to the machine, after applied eye shield to patients and protective goggles for operators and attendants in the laser room. Topical antibiotic with a steroid (Hydrocortisone 1%) is advised to apply for 5 days along with uveal forte sp-60 sunblock and were asked to avoid ultraviolet exposure. The interval between treatment sessions were two to three weeks. Mild to moderate purpura is considered tissue reaction while charcoal grey is for pigmentation risk and over-treatment.

For clinical assessment, photographs were taken pre and post laser sessions and were evaluated by the two consultant plastic surgeons (at least 3 years of post-fellowship experience). They reviewed the color changes, size of the lesion, and proliferative changes appear in the lesion of the patient's "red mole" (PWS) by comparing the photographs pre and post treatment, by using the Physician Global Assessment.[9] The Physician Global Assessment includes "poor improvement" (skin recovery: 0%–25%), "moderate improvement" (skin recovery: 26%–50%), "significant improvement" (skin recovery: 51% –75%), and "cure" (skin recovery: 76%–100%). Cure, significant improvement, and moderate improvement were defined as yes to efficacy. Sun sensitivity of the patients was also assessed by the Fitzpatrick skin type classification system.[10] All patients were followed regularly, a total of 6-10 sessions were given and efficacy was calculated by physician global assessment after 3 months of treatment. The information collected was analyzed by using SPSS 20. For numerical variables like age, size of lesion mean and the standard deviation was calculated. Frequency and percentage were calculated for categorical variables like gender, site of lesion (face/neck/chest/upper arm/upper back). Data was stratified for age, size of the lesion, site of lesion (face/neck/chest/upper arm/upper back), to address effect modifiers. Post-stratification chi-square was applied to see their effects on efficacy and p-value $\leqslant 0.05$ was considered as significant.

Results

Within one year, the total number of 36 cases who fulfilled the inclusion criteria were enrolled from the outpatient department of JBRS&C. Mean age of patients was 24.3 +_4.6years,and males encountered were 15 (41.7%). Fitzpatrick's skin type was III to IV. None of them taken any treatment before. The PWSs treated were mainly located on the face in 27 (75%) patients, followed by neck 4(11.1%) trunk 4(11.1%),and extremities 1(2.8%). Sizes of the lesions were 0 to 10cm^2 in 11(30.6 %) and 10 to 20 cm^2 were in 25 (69.5%) patients. The mean size of the lesion was 11.6$\pm$ 5.9cm^2.

The mean number of treatment sessions was 7.33+ 1.4, the shortest follow-up period was 3 months and the longest was 1 and a half years.

The Physician Assessment scoring system showed a cure (76%– 100% of PWSs) in 2(5.5%) of the 36 patients (Fig 1: -a, b, c), a significant level of improvement or recovery (51%–75%) was scored in 15(41.6%) (Fig

1:- d, e, f)moderate level of improvement (26%–50%) was found in 12 (33.3%), and poor level of improvement or recovery (0%–25%) was in 7 (19.4%) of 36 patients (Table 1).

Table 1: *Demographic and Clinical Profile of Patients*

Variable n=36	Frequency	Percent
Age Mean= 24.30 SD=4.6 Min=16 Max=41		
< 30 years	32	88.9
> 30 years	4	11.1
Gender		
Male	15	41.7
Female	21	58.3
Total	36	100.0
Leision Size Mean=11.64 SD=5.09 Min=2.30 Max=23.00		
< 10 cm^2	11	30.6
> 10 cm^2	25	69.4
Fitzpatrick type		
Type III	28	77.8
Type IV	8	22.2
No of treatments Mean=7.33 SD=1.43 Min=5 Max=10		
< 5	3	8.3
> 5	33	91.7
Global Score		
Poor improvement (0-25%)	7	19.4
Moderate improvement (26-50%)	12	33.3
Significant improvement (51-75%)	15	41.7
Total cure (76-100%)	2	5.6

Patients were divided into two age groups (< and > 30 years) to check the effect of efficacy on age and the post-stratification chi-square test was applied and foundp= 0.209. (Table2) .when compared with gender it showed P-value is equal to 0.43, size of the lesion (< and >10cm) A p-value of 0.56 was found.(Table 2)

Figure 1: *(a) Initial lesion (b) After 3rd session (c) After 6th session. (d) Another patient initial lesion (e) After 3rd session (f) After 7th session.*

Discussion

PDL with 585 nm wavelength emanate wavelength which penetrates deep into the skin and in this manner specifically targets deeper vessels.[11] They likewise enable the duration of pulse to be stretched out between 1.5 to 40 ms, to make it conceivable to target vascular anomalies. Besides, it has cryogen shower cooling equipped with it, which decreases adverse outcomes, for example, scarring and pigmentation, and decreasing the discomfort during the procedure.[12]

In comparison with our study, the results are similar to the study done on the Asian population with nevus flammeus and were treated with cryogen spray cooling and 585nm PDL.[13] In 2002, the response rate in the study

Table 2: *Physician Global Assessment, age gender, and size cross-tabulation*

Variables		Global score				Total	Chi-square P-value
		poor improvement (0-25%)	moderate improvement (26-50%)	significant improvement (51-75%)	total cure (76-100%)		
Age	< 30 years	6	9	15	2	32	X^2 =4.450
		85.7%	75.0%	100.0%	100.0%	88.9%	P=.209
	> 30 years	1	3	0	0	4	
		14.3%	25.0%	0.0%	0.0%	11.1%	
Gender	Male	1	6	7	1	15	X^2 =2.713
		14.3%	50.0%	46.7%	50.0%	41.7%	P=.438
	Female	6	6	8	1	21	
		85.7%	50.0%	53.3%	50.0%	58.3%	
Size of Leison (cm^2)	< 10 cm^2	1	3	6	1	11	X^2 =2.035
		14.3%	25.0%	40.0%	50.0%	30.6%	P=.565
	> 10 cm^2	6	9	9	1	25	
		85.7%	75.0%	60.0%	50.0%	69.4%	

conducted by Ho et al. were also very close to our study.[14] In their study, 25% clearance was showed by 60% of patients, and most of the patients (41.1%) had 25%– 50% clearance. Fewer than one-fourth of patients (23%) had greater than 50% clearing, and there was no patient with complete clearance.

The response of PWSs towards laser is variable and the results depend upon multiple factors. In our study, PWS of the head and neck region had a better response to laser compare to other regions, the same concurrence with other studies that also found successful results in facial regions than other areas.[15] The difference in treatment response among different areas cannot be easily elaborated. However, every region of the body has a variable thickness and has different structural characteristics of dermis suggested the variable response and effect of the laser.[16] Several studies linked the possible correlation between treatment results of nevus flammeus in different age groups.[17,18] In our results, the age of the patient and the clinical response did not correlate; however, more intense color and protrusion of lesions were noticed with growing age: no significant difference was found relative to an age when the results of treatments were expressed as percent improvement sowing to treatment. Nevertheless, the final response to the treatment in the younger population appeared to be better. In our study, there was no correlation found between duration of lesion and treatment response and no notable difference between gender and treatment response. However, the younger patients showed better treatment response in multiple studies[12]. This may be due to differences in characteristics of the skin in younger patients, they have relatively thin dermis with fewer collagen fibers, less melanin pigment in the epidermis, which could decrease the backscattering of laser out of the skin and lower the fractional blood volume.[19]

The number of treatment sessions affects the response rate of the laser. More number of treatment sessions showed a better response. This is the same response showed in a previous study.[20] In patients with darker skin, inflammatory changes as well as unwanted injury to the epidermis may create further problems, that lead to scarring and pigmentation of the skin. In our study, the incidence of pigmentations, atrophy, and hypertrophic scarring was much less than expected compared to previous studies.[21]

It was concluded by our results that the PDL had low clearance rate but had a high response rate in our population; however, there were certain limitations in the assessment of efficacy by two different examiners. As well, the earlier the interventions, the better was the efficacy. The response rate of PDL also depends upon multiple factors that include the size of malformation, anatomical site, existing hyperplastic lesions. A study with a larger sample size with the inclusion of the pediatric population is recommended. Earlier the intervention better will be the outcome.

Conclusion

In conclusion, the variable-pulse 585 nm PDL with a fluence of 8 to 12 j/cm^2 and a pulse duration of 0.4 to 20 ms has proved to be effective in treatment of vascular skin lesions. However, results may vary owing to age, disease, or the location of the lesions.

Conflict of Interest *None*

Funding Source *None*

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