Academic Journal of Medical Sciences
ISSN: 2708-2725
ORIGINAL ARTICLE

The Efficacy and Safety of Pulsed Dye Laser for Treatment of Cutaneous Leishmaniasis

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Funding information
Self-funded

Conflict of interest
None declared by the author

DOI: ***10.5281/zenodo.16736710***

ABSTRACT

Background*: Cutaneous leishmanisis is the most common type of leishmanisis. Although it is a self-limiting condition, the protracted course of the lesions and scars left after healing can cause significant mental and emotional problems. There is currently no prophylactic treatment or vaccination available to prevent the condition, and no satisfactory treatment exists to treat the disease and prevent unsightly scarring.*

Objective*: To evaluate the efficacy and safety of a 595nm pulsed dye laser (PDL) in treating cutaneous leishmanisis.*

Patients and methods: Ten lesions from 6 patients were treated with a single pass of PDL across the whole lesions and 0.5cm of their margins to the endpoint of purpuric development. The laser parameters were applied, such as fluence (8 Joules/cm2), spot size (10mm), and pulse duration (1.5ms). Every fifteen days treatment sessions were offered, with follow-up every two weeks until three months following the final session.

Results*: Six out of 10 lesions responded exceptionally well in the third session. Which were located on the face, while the remaining four lesions, which were located on the neck and lower leg, required five sessions to achieve a satisfactory result.*

Conclusion*: PDL can be considered a safe and effective therapeutic option for treating cutaneous leishmaniasis, with less chance of scar formation.*

Keywords: ***Pulsed dye laser, Cutaneous leishmaniasis***

1. INTRODUCTION

Leishmaniasis is caused by Leishmania species and transmitted to humans through the bite of a sandfly. It is endemic in many developing countries with high economic and health impacts [1]. Cutaneous leishmaniasis (CL) is a global health problem that has become more prevalent and neglected worldwide[2]. Although leishmaniasis is rarely associated with mortality, it is difficult for patients to cope with the disease, particularly its consequences, given the inferior cosmetic outcome of the cutaneous infection and the resultant scarring that tend to persist long-term. Some communities regard the scar left behind by CL as a stigma, which can lead to various mental problems[3].

There is currently no effective drug or vaccine available to prevent CL; thus, public education and awareness is by far the most effective protective measure against the disease, as there is a significant lack of proper information regarding the disease, its transmission, and prevention among the general public in endemic areas[4].

Various treatments have been proposed for the treatment of CL, such as systemic and intralesional antimony, amphotericin B, dapsone, photodynamic therapy, miltefosine, cryotherapy, heat therapy, topical and systemic paromomycin, and imidazoles. Antimony compounds are recommended as a first-line treatment. Despite the currently available treatments, none is considered definitive, and as such, the treatment remains a challenge with high inter-individual variation in response. Traditional therapeutic drugs have numerous local and systemic side effects, with many experiencing unsatisfactory results, particularly scar formation following treatment. Developing novel treatment modalities with a lower risk of scarring is highly desirable [5].

Laser has been implicated in the treatment of CL in several cases. Some studies have published various laser treatment modalities such as fractional ablative and non-ablative lasers and the long-pulsed Nd:YAG. [6–8]. Although the mechanism of action of the pulse dye laser (PDL) on CL is not entirely understood, cutaneous lesions are thought to have a significant vascular component, as evidenced by the discovery of dermoscopic vascular patterns and erythema in almost all leishmania lesions in a study by Omi et al.[9], making PDL a prudent modality of treatment. Heat denaturation of the Leishman bodies, as in thermotherapy, cutaneous immune

stimulation, and local inflammatory cells and cytokine alterations triggered by the PDL are two other putative modes of treatment [10].

Researchers have suggested utilizing PDL to treat acne and warts because it stimulates hypoxia, which causes laser-induced heat and vascular injury while also modifying local collagen development[11,12]. On the contrary, just a few trials evaluating PDL's efficacy for treating CL have been conducted recently [13–15].

2. METHODOLOGY

This study included six patients (two males and four females) with clinical and laboratory diagnoses of CL. They had ten lesions in total (1.6 lesions per patient). The age range was from 5 to 50 years. Before the study, the lesions were present between one to four months. They were found on exposed body parts such as the face, lower legs, and neck in order of frequency. Exclusion criteria for the current study were pregnancy, peripheral neuropathy, photosensitivity, chronic and immunocompromised illnesses like connective tissue diseases, diabetes mellitus, chronic kidney disease.

The clinical diagnosis was confirmed by the presence of Leishman bodies in the smear produced and stained with Giemsa stain. All patients were treated with one pass of PDL (Candela Vbeam perfecta, Syneron R Medical Ltd), treatment performed every two weeks with the following parameters fluence of 8J/cm2, pulse duration 1.5ms, 10mm spot size, and DCD cryogen topical anesthesia in the form of EMLA cream was applied to the lesions 30 minutes prior to treatment.

A baseline assessment of each lesion is performed by measuring its surface area, degree of erythema, and the indurations. Monitoring was performed bi-weekly, with progress recorded and any arising side effects. The photographic assessment was made for documentation purposes. Clinical cure was defined as the regression of the edema and erythema reduction for three months following the last treatment session.

Following lesion response or regression, monthly checks were performed for three months. We determined the degree of healing by the absence of the parasite in the smear as well as the clinical improvement of the lesions.

Informed consent was taken from the patient or there relatives before commencing the treatment sessions .

3. RESULTS

All patients responded well following the first session, with decreased erythema, induration, and surface area. Six of ten lesions responded exceptionally well in the third session (**Tables 1 & 2**) and (**Figures 1-5**), on the face and the remaining four lesions on the neck and lower leg, for which five sessions were required to achieve a satisfactory result (Figures 6&7). The more superficial and thinner the lesions, the faster and better the response to laser treatments. Post-laser purpura lasted about 10 days after the treatment sessions. There were no significant side-effects during the treatment, and at three months follow-up, there were no signs of recurrence or complications. Most importantly, most lesions healed with no scarring or residual pigmentation. Only a more significant ulcerated lesion in the lower leg had marked post-inflammatory hyperpigmentation.

Table 1. Row data of the 6 participant patients and laser sessions

	Patient					
Variable	**1**	**2**	**3**	**4**	**5**	**6**
Age (year)	50	5	7	34	40	9
Gender	Female	Male	Female	Male	Female	Female
Site of the lesions	Lower legs	Face	Face	Face	Neck	Face
The number of lesions	1	2	1	1	3	2
Duration	8	12	14	7	6	3
PDL laser parameters						
Spot size	10 mm	10 mm	10 mm	10 mm	10 mm	10 mm
PD	1.5 ms	1.5 ms	1.5 ms	1.5 ms	1.5 ms	1.5 ms
Fluence	8J/cm²	8J/cm²	8J/cm²	8J/cm²	8J/cm²	8J/cm²
PDL treatment sessions	5	3	3	3	5	3

Table 2. Summary of data of the participant patients (N=6)

Variable		No.	%
Age / mean± SD (year)	24.2 ± 19.2	-	-
Gender	Male	2	33.3
	Female	4	66.7
Site of the lesions	Face	4	66.7
	Neck	1	16.7
	Lower legs	1	16.7
Number of lesions	One	3	50.0
	Two	2	33.3
	Three	1	16.7
Duration / Mean ± SD (weeks)	8.3 ± 4.0	-	-
PDL treatment sessions	Three	4	66.7
	Five	2	33.3
PDL laser parameters			
Spot size	10 mm	6	100.0
PD	1.5 ms	6	100.0
Fluence	8J/cm2	6	100.0

Documentary photos of the 6 patients before and after PDL laser sessions

Figure 1: (A) Lesion before & (B) after 3 PDL laser sessions.

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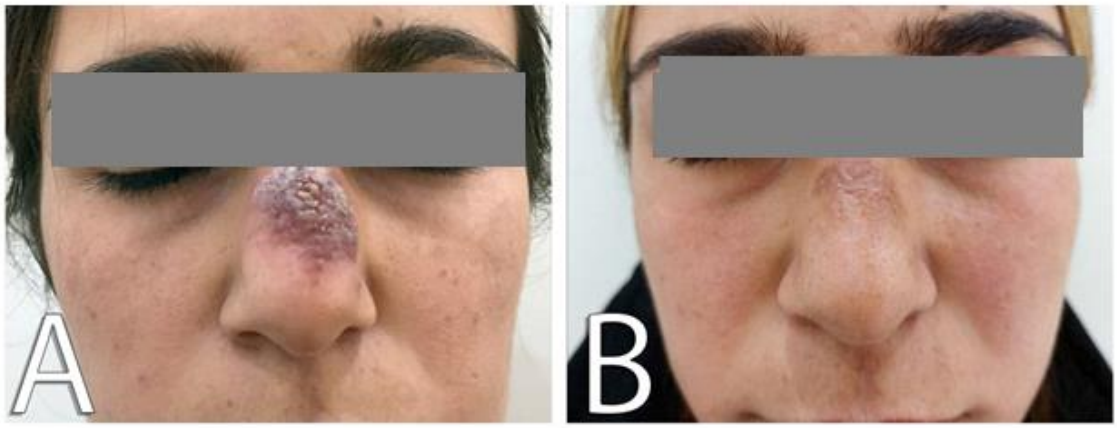

Figure 2: (A) Lesion before & (B) after 3 PDL laser sessions.

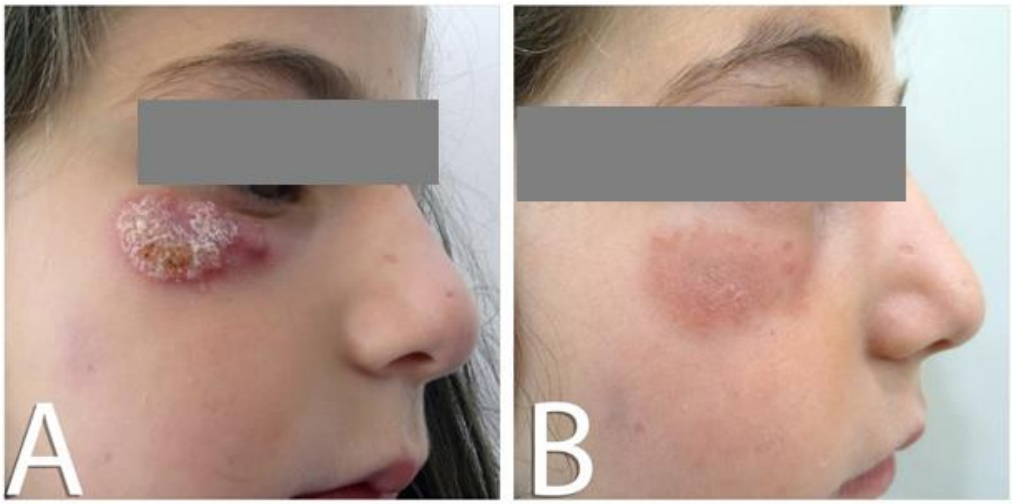

Figure 3: (A) Lesion before & (B) after 3 PDL laser sessions.

Figure 4: (A) Lesion before & (B) after 3 PDL laser sessions.

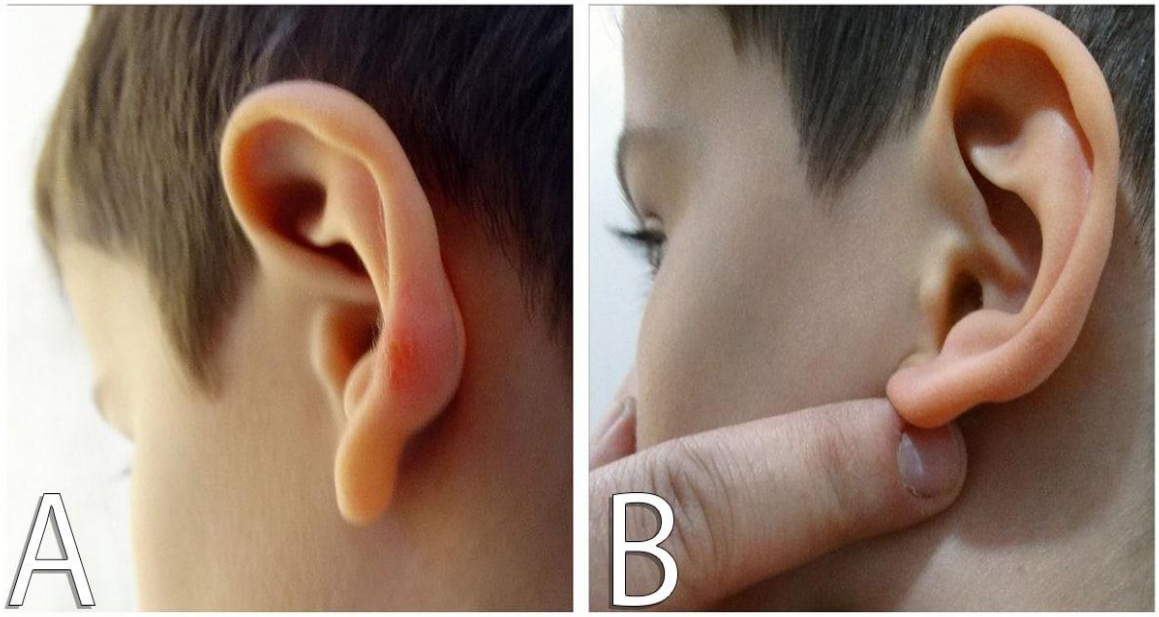

Figure 5: Same case of figure 4, (A) Lesion before & (B) after 5 PDL laser sessions.

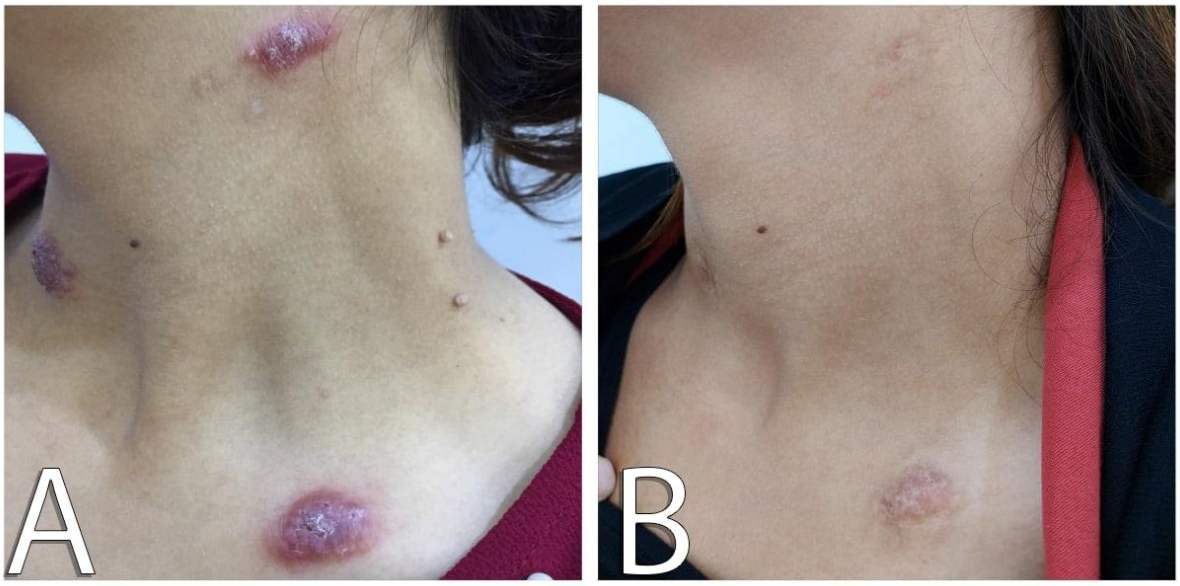

Figure 6: (A) Lesion before & (B) after 5 PDL laser sessions.

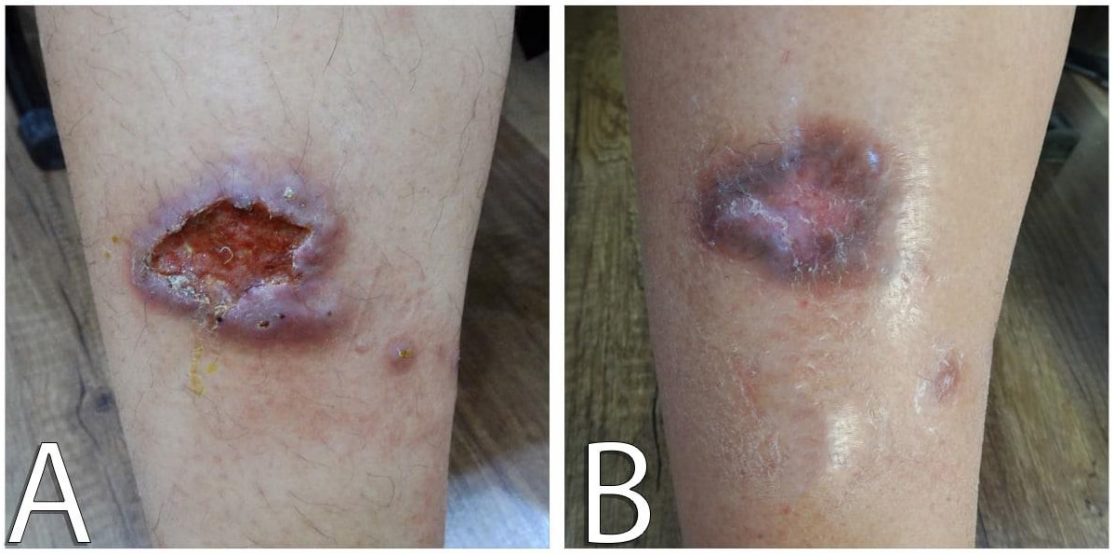

Figure 7: (A) Lesion before & (B) after 5 PDL laser sessions.

4. DISCUSSION

Pulse Dye Laser can be considered a safe and effective treatment option for treating CL, especially in the early stages of the disease. Scarring is unlikely when the lesions are superficial and have slight induration. Localized CL has been treated with different kinds of local and intralesional therapies, and different kinds of laser have been applied alone and in combination with show effective with little side effects, but still some develop post-inflammatory hyperpigmentation and hypertrophic scarring [16]. Rakaheev et al. reported a complete cure by using Argon laserT [18]. Mashaki et al. [19]used an Erbium glass laser, but there was pain, erythema, and edema during treatment. Unfortunately, with all kinds of treatment for CL, unsightly atrophic scar may develop. In our study, we used PDL with 2-week intervals to decrease the duration of treatment because of the displeasing appearance of the lesion, so the maximum duration was 10 weeks and most of the lesions healed without scar formation, especially in those whose lesions were early treated. The rationale for using PDL in CL is to implement the type of wavelength that affects the vascular component and allows heat ablation of leishmania bodies [19]. Also PDL may affect the process of remodeling and may also prevent scar formation precisely in early lesions, and this is due to the remodeling of collagen fibers by thermal wound healing, the releasing of basic fibroblast growth factors and finally by the inhibition of transforming growth factor B1 [20,21].

5. CONCLUSIONS

Conclusion: Pulsed Dye Laser can be considered a safe and effective therapeutic option for treating cutaneous leishmaniasis, with less chance of scar formation.

As such, we recommend the application of Pulsed Dye Laser to treat localized leishmaniasis, particularly in early lesions and those with lesions on their faces, as it may cause permanent and unpleasant-looking scars. Multicenter studies with a larger sample size are also recommended to confirm the safety and efficacy of Pulsed Dye Laser for treating Cutaneous Leishmaniasis.

Ethical Approval:

All ethical issues were approved by the author. Data collection and patient's enrollment were in accordance with the Declaration of Helsinki of World Medical Association, 2013 for the ethical principles of researches involving human. Signed informed consent was obtained from each participant and data were kept confidentially.

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Citation:

*Mohammad Y. JAF The Efficacy and Safety of Pulsed Dye Laser for Treatment of Cutaneous Leishmaniasis. AJMS 2025; 11 (3): 58-67. DOI: **10.5281/zenodo.16736710***