

# Comparison of Combined Pulsed Dye Laser and Intralesional Triamcinolone Versus Intralesional Triamcinolone Alone in Treatment of Keloid

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## ABSTRACT:

### BACKGROUND:

Keloids are described as benign dermal fibroproliferative growths, they are usually firm, raised, pruritic, painful; and can cause cosmetic disfigurement and physical disability, many modalities were used for treatment but none of them have been determined as gold standard of care.

### OBJECTIVE:

Compare the effectiveness of a combined pulsed dye laser and intralesional triamcinolone versus triamcinolone alone in treatment of keloid.

### PATIENTS AND METHOD:

Twenty five patient included in the study, ten patients had two keloid scars, one lesion received pulsed dye laser with intralesional triamcinolone acetamide (group A) and the other receive intralesional triamcinolone acetamide only (group B), and the remaining fifteen patients had single lesion in which we divide it into two halves one half receive pulsed dye laser with intralesional triamcinolone acetamide (group A) while the other half receive intralesional triamcinolone acetamide alone (group B).

The laser parameters used (fluence 8 j/cm<sup>2</sup>, spot size 7 mm, pulse duration 1.5 ms) or (fluence 5 j/cm<sup>2</sup>, spot size 10mm, pulse duration 0.45 ms). The concentration of intralesional triamcinolone acetamide was 10-40 mg/ml. Each group given their treatment at 0, 1, 2, 3 months (Four sessions). Then follow up done monthly for two months, we assess the response each visit using Vancouver Scar Scale (VSS) and Patient Observer Scar Assessment Scale (POSAS).

### RESULT:

There was significant improvement in total VSS and POSAS within each group between the first visit and the second follow up visit which mean that both modalities are effective in the treatment of keloids (P value =0.0001).

There was significant difference in the mean of the total **Vancouver scar scale** (VSS) at the second follow up between group A and group B, P=0.005 .

There was significant difference in the mean of the total **observer score** at the second follow up in group A and group B which was P=0.031

There was no significant difference in the mean of the total **patient score** at the second follow up in group A and group B where P=0.708.

### CONCLUSION:

The use of intralesional steroid monotherapy was beneficial and effective in keloid treatment, but the effect will be slightly better when we use pulsed dye laser in combination with it.

**KEYWORDS:** Keloid, Hypertrophic scars, Pulsed Dye Laser, Triamcinolone acetamide.

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## INTRODUCTION:

Keloid scars are known to be benign fibroproliferative growths of dermis, they are unique to humans, and occur in predisposed individuals usually associated with abnormal wound healing after an injury; sometimes hypertrophic scars are difficult to distinguish from keloids. Both of them can be pruritic, raised, firm, and painful; but, hypertrophic scars

tend to regress with time and remain within wound borders. Importantly, both hypertrophic scars and keloids may cause physical impairment and cosmetic disfigurement, eventually leading to psychological problems and decreased quality of life.<sup>(1)</sup>

Both genetic and environmental factors play a role in keloid development although many cases

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occur sporadically, a positive family history is not uncommon.<sup>(2)</sup>

Recent researches show that keloids formation is linked with genetic, epigenetic, local and systemic risk factors, mainly the tension of skin around scars. All these findings propose that cellular, molecular, and /or tissue-level approaches that focus on one or more of the aforementioned risk factors can be promising in scar therapies. Further researches of scar-related genetics, epigenetics, and mechanobiology are needed, as they likely help to identify more effective prophylactic and clinical treatment strategies for wounds and scars.<sup>(3,4)</sup>

Although numerous treatment modalities are used, but none of them have been considered to be the gold standard one. Keloid therapy continues to be highlighted area of research in attempt to find the best possible treatment. Many treatment modalities are used in the clinical setting, ranging from simple noninvasive to surgical intervention.<sup>(5)</sup>

Different lasers have been utilized and studied in the treatment of keloids and hypertrophic scars including Er:YAG, CO<sub>2</sub>, PDL, and others.<sup>(6)</sup>

The target chromophore in vascular lesions is the oxyhemoglobin which present in the red blood cells (RBCs) inside the blood vessels. The final result is thrombosis of these blood vessels. (7) Other suggested theories include heating of collagen fibers with disulfide bonds dissociation and subsequent realignment, laser-induced hypoxia, collagenolysis through cytokine proliferation, and selective photothermolysis of vasculature. Studies of keloids show PDL decreases fibroblast proliferation and type III collagen deposition.<sup>(7)</sup>

Pulsed dye laser treatment also has been associated with downregulation of transforming growth factor-beta 1 (TGF-β1) expression. Transforming growth factor-beta\_1 is thought to induce and regulate collagen formation. Downregulation of TGF-β1 also has been linked to an increase collagenase-3 function.<sup>(8,9)</sup>

### **AIM OF THE STUDY:**

To compare the effectiveness of combined pulsed dye laser with intralesional triamcinolone in comparison to intralesional triamcinolone alone in treatment of keloids.

### **PATIENTS AND METHODS:**

This was an **interventional, prospective, therapeutic study** carried out at the Center of Dermatology and Venereology/ Medical city /Baghdad/ Iraq, from August 2021 to September 2022 for comparison of combined pulsed dye laser and intralesional triamcinolone versus intralesional triamcinolone alone in treatment of

keloid. **Twenty-five** patients were included in the study.

### **Inclusion Criteria:**

All patients attended the Center of Dermatology /Medical City complaining from keloid scar.

### **Exclusion criteria:**

- Uncooperative patient.
- Previous treatment within one month
- Pregnant women.
- Patients with unrealistic expectations.
- Children less than 10 years of age.

### **Ethical considerations:**

- Informed consent was obtained from them and for those patients who were under 18 years, parents have signed the informed consent.

- All information were kept anonymous, confidentiality was insured to the patients, and the collected data were used for scientific purposes only.

### **Procedure:**

Full history was taken from the patient. Preoperative examination of the scar was done including the site, size, texture, color, elevation, and Fitzpatrick skin type.

Twenty-five patients were included in the study, ten patients had two keloid scars, one lesion received pulsed dye laser with intralesional steroid (group A) and the other lesion receive intralesional steroid only (group B), and the remaining fifteen patients had single keloid lesion in which we divided into two halves, one half receives pulsed dye laser and intralesional steroid (group A) while the other half receives intralesional steroid only (group B) each group was given their treatment at monthly interval for four months then follow up done for two months. Pulsed dye laser delivered to group A scar area using fluences 7-8 j/cm<sup>2</sup>, 1.5 ms pulse duration with the-use of a 7- mm spot size, or 4-5 j/cm<sup>2</sup>, 0.45 ms pulse duration with the use of a 10-mm spot size., the end result was erythema and /or purpura on the treated area.

After that both groups were injected area of scar by triamcinolone 10-40 mg/ml (we start with 40 mg to both groups then titrate the dose according to response in each patient at the subsequent visits) until blanching of skin.

All the treated patients were evaluated by Vancouver Scar Scale (VSS) with its four items; vascularity, pliability, pigmentation, and height. Each variable has four to six possible scores with total score ranges from 0 to 13<sup>(10)</sup>. And Patient observer scar assessment scale (POSAS) consists of two numerical scales: the first one is Patient Scar Assessment Scale (Patient scale) scores scar pain, itching, thickness, color, stiffness, and irregularity, and the other Observer Scar

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Assessment Scale (Observer scale) scores scar vascularization, pigmentation, thickness, relief and pliability. Each item has a 10-step score, score 1 represent normal skin whereby the score 10 reflects the worst imaginable scar or sensation (11).

### RESULTS:

Twenty five patients included in the study, given their treatment at 0, 1, 2, 3 months (Four sessions). Then follow up done monthly for two months.

The comparison between study patients in means of total VSS score between both groups was not significant in the first three visits, but at the fourth visit and follow up visits group A show significant improvement in the total VSS.

The comparison between study patients in mean of total observer score between both groups become significant at the follow up visits in which group A show better response than group B.

The comparison between study patients in mean of total patient score between both groups was not significant during the treatment and follow up visits.

Demographic characters of study shown in Table 1.

Comparison between study patients by total VSS score shown in Table 2

Comparison between study patients by total observer score shown in Table 3

Comparison between study patients by total patient score shown in Table 4

**Table 1: Characteristics of the study sample.**

		No	%
Age (years)	10---19	6	24.0
	20---29	6	24.0
	30---39	7	28.0
	40---49years	6	24.0
	Mean±SD (Range)	28.9±11.9 (10-49)	
Gender	Male	8	32.0
	Female	17	68.0
Site	Face & Scalp	6	24.0
	Chest & Trunk	12	48.0
	Extremities	7	28.0
Duration (years)	<5years	13	52.0
	5---9	9	36.0
	=>10years	3	12.0
	Mean±SD (Range)	5.7±5.4 (1.5-30)	
Skin type	(Type 2)	2	8.0
	(Type 3)	11	44.0
	(Type 4)	12	48.0
Number of lesions	One	15	60.0
	Two	10	40.0

**Table 2: Comparison between study patients by total VSS score.**

	Laser & Steroids	Steroids only	P value
Vancouver Scar Scale (VSS) Score			
First visit	8.6±0.7 (7-10)	8.6±0.8 (6-10)	0.854
Second visit	7.9±1.2 (5-9)	7.9±1.3 (5-9)	0.909
Third visit	5.0±2.0 (1-9)	5.9±1.5 (3-9)	0.095
Fourth visit	4.0±2.0 (0-8)	5.0±1.6 (2-8)	0.048#
First follow-up	3.2±2.1 (0-7)	4.6±1.4 (2-7)	0.006#
Second follow-up	3.1±2.1 (0-7)	4.6±1.4 (2-7)	0.005#

-Data were presented as Mean±SD (Range)

#Significant difference between dependent means using Paired-t-test at 0.05 level.

#Comparing First visit x Fourth visit : P=0.0001 (Highly significant)

#Comparing First visit x Second follow-up : P=0.0001 (Highly significant)

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**Table 3: Comparison between study patients by total observer score.**

	Laser & Steroids	Steroids only	P value
Observer Scale Score			
First visit	20.7±5.6 (9-28)	20.7±5.6 (9-28)	-
Second visit	17.6±5.2 (6-26)	17.6±5.2 (6-26)	-
Third visit	13.6±4.8 (5-22)	14.3±4.4 (5-22)	0.584
Fourth visit	10.8±4.2 (4-21)	12.2±3.7 (6-22)	0.227
First follow-up	9.0±3.9 (4-17)	11.2±3.5 (6-19)	0.047#
Second follow-up	8.6±3.7 (4-17)	10.8±3.3 (6-19)	0.031#

-Data were presented as Mean±SD (Range)

#Significant difference between two dependent means using Paired-t-test at 0.05 level.

#Comparing First visit x Fourth visit : P=0.0001 (Highly significant)

#Comparing First visit x Second follow-up : P=0.0001 (Highly significant)

**Table 4: Comparison between study patients by total Patient Scale.**

	Laser & Steroids	Steroids only	P value
Patient Score			
First visit	37.2±9.9 (18-55)	37.2±9.9 (18-55)	-
Second visit	30.0±10.2 (10-49)	30.0±10.4 (10-49)	-
Third visit	24.2±10.2 (7-45)	24.8±10.0 (7-45)	0.835
Fourth visit	19.6±9.3 (6-42)	20.2±9.0 (6-42)	0.830
First follow-up	16.6±8.4 (6-40)	17.2±8.1 (6-40)	0.798
Second follow-up	15.0±7.7 (6-34)	15.8±7.3 (6-34)	0.708

-Data were presented as Mean±SD (Range)

#Significant difference between two dependent means using Paired-t-test at 0.05 level.

#Comparing First visit x Fourth visit : P=0.0001 (Highly significant)

#Comparing First visit x Second follow-up : P=0.0001 (Highly significant)



Figure 1: 10 years old boy with keloid at posterior part of right thigh before and after 4 sessions of treatment A: PDL + steroid B: only steroid.

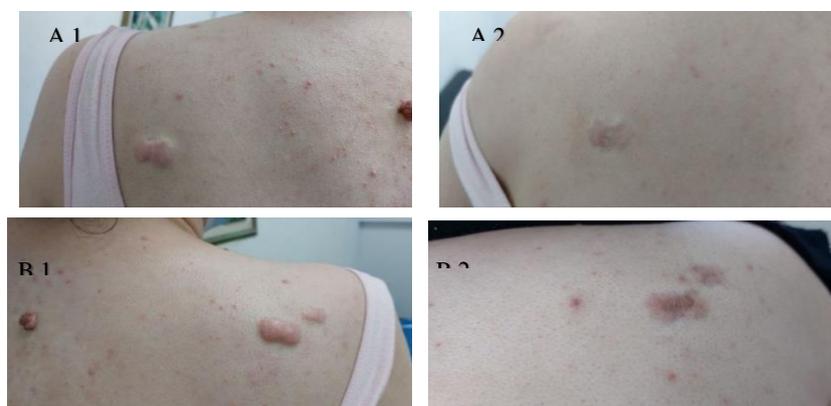


Figure 2: 33 years old female with keloid at both shoulders.  
A1: before treatment A2: after four sessions of PDL and intralesional triamcinolone acetionide  
B1: before treatment. B2: after four sessions of intralesional triamcinolone acetionid.

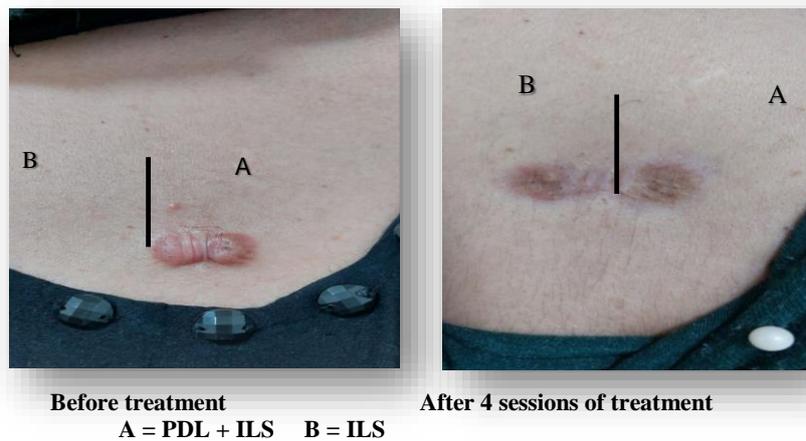


Figure 3: 38 years old female with keloid at the chest.

### DISCUSSION:

Aberrant wound healing can result in hypertrophic scars and keloids, which is regarded as great global health challenge. These abnormal scars may cause significant psychological distress, physiological pain and become a financial concern. Due to the pathogenesis of such scars, biological complexity regarding scar formation, and how to prevent their formation remains elusive.<sup>(12)</sup> Flash lamp pulsed dye lasers (FPDL) are nonablative technology which has an excellent results in vascular lesion treatment. And regarded as one of the most specific laser available in the current time for the management of superficial vascular lesions. Recent indications for this technology have been extended to include the nonvascular lesions which have vascular structural involvement, which make the possibility of treating them with such laser. FPDL not always the first choice of treatment for the scars; these can be treated using different methods successfully<sup>(13)</sup>, in this study we were seeking for the effect of PDL in treatment process. So we attempt to figure out whether PDL useful or not in keloid treatment.

#### Age

In the present study the mean age of patients was 28.9 years, this reflect the fact that keloids most common in young age group as they more prone to injuries, and agree with **Shaheen et al.** which explain this probably due to:

- (a) Young age people may have a high frequency of trauma; and also their skin is more elastic than the skin of elderly people.
- (b) The young people also have high level of sexual hormones than elderly (Keloid growth also can be stimulated by numerous hormones, as stated by some studies in which their results had suggested a high incidence of keloids at puberty and during pregnancy, and a decrease in the size after menopause.<sup>(14)</sup>

#### Gender

In this study the females number was more than males, **Kouotou EA et al.** also found in his study that keloids are more frequent in females and attributed the cause that females concerned about their appearance more than males, and more often preoccupied with the possible negative esthetic impact that keloids may cause; hence they are more prone to seek a medical help for treatment.<sup>(15)</sup>

#### Site of lesion

In this study there were (48 %) of patients had keloid at Chest & Trunk, this go with the fact that keloid favor sites of increased wound tension like upper trunk, and agree with **Shaheen et al.** who found Anterior chest, upper arms, shoulders and cheeks have a higher predilection for keloid formation.<sup>(14)</sup>

#### Keloid scar assessment

##### Vancouver Scar Scale (VSS) Score

The present study showed that there was significant improvement in total VSS within each group between the first visit and the second follow up visit, which mean that both modalities were effective in keloids treatment (P value =0.0001), this goes with **Liu ZN et al.** study "Clinical effects of pulsed dye laser dynamically combined with triamcinolone acetonide in the treatment of keloids" who conclude that the VSS scores of patients' keloids in the TAC group and the dynamic treatment group (TAC injection, PDL, or PDL combined with TAC injection) one year after treatment were significantly less than those before treatment.<sup>(16)</sup> Regarding group A, the result of the current study go with **Yazdi et al.** who used PDL followed by intralesional steroid in treatment of keloid, they found Vancouver scar scale decreased significantly after treatment which was regarded an excellent achievement.<sup>(17)</sup> Similarly **Stephanides et al.**

concluded that pulsed dye laser with or without intralesional triamcinolone was effective in keloid scars treatment and had very good adverse-effect profile with high patient satisfaction.<sup>(18)</sup>

**Connell et al.** used pulsed dye laser and intralesional steroid in treatment of keloid scars concluded that pretreatment of keloids with PDL facilitated the injection of steroid by making the scar more oedematous and subsequently softer.<sup>(19)</sup>

There was improvement in the mean of total VSS in group A in our study about 56% between first visit and second follow up visit, this was in accordance with **Yang et al** who had an average decrease of total VSS about 20.8% after PDL treatment.<sup>(20)</sup>

**Al-Mohamady et al** used PDL laser versus long pulsed Nd:YAG laser in treatment of keloid found that statistically there were no significant differences between long pulsed Nd:YAG laser and PDL treated sites for total VSS.<sup>(21)</sup>

A systematic review done by **de las Alas et al.** about Pulsed dye laser for the treatment of keloid and hypertrophic scars, showed that treatment with PDL may be superior to conventional modalities in improving overall scar appearance.<sup>(9)</sup>

A study conducted by **Radmanesh et al.** concluded that both PDL and FCO2Ls were equally effective on hypertrophic scars.<sup>(22)</sup>

While **Alexander et al.** concluded that Combination therapy of FCO2L and ILS was more superior in efficacy in comparison to ILS alone, in the treatment of HTS and keloid.<sup>(23)</sup>

Regarding group B, the result consistent with **Beli et al.** study who using intralesional triamcinolone in comparison to intralesional verapamil, and found complete resolved in pain and pruritus in triamcinolone group.<sup>(24)</sup>

A study conducted by **Aggarwal et al.** using different modalities in treatment of keloid, concluded that Intralesional triamcinolone acetone was effective modality for the treatment of keloids.<sup>(25)</sup>

### Observer Scale Score

As we mentioned before this score gained by specialist of dermatology, we found significant difference between the first and last visit within each group  $P=0.0001$ , while regarding comparison between the two groups, there was significant difference between group A and group B,  $P$  value = 0.031 at the second follow up visit, this may be attributed that healing process take time till it become apparent and this goes with **Liu ZN et al.**<sup>(16)</sup> and also go with **Darougheh et al.** study using Intralesional

injection of triamcinolone alone or combine with 5-fluorouracil for the treatment of hypertrophic scars and keloids and concluded that The overall efficacy of TAC + 5-FU was comparable with TAC.<sup>(26)</sup> while **Asilian et al.** used PDL with intralesional steroid and 5FU concluded that the TAC+5FU+PDL combination seems to be the best approach for treatment of keloid and hypertrophic scars.<sup>(27)</sup>

### Patient scale Score

there was no significant difference between the two groups  $P$  value at the second follow up visit  $P = 0.708$ , this may be attributed to the fact that patients in the current study about two thirds of them had single lesion so they cannot determine the parameters of this score specifically in the same lesion that we divide it into two halves and as we know that this score determined by each patient subjectively.

### CONCLUSION:

The use of intralesional steroid monotherapy was beneficial and effective in the treatment of keloid.

The combination of PDL with intralesional steroid although statistically there were significant difference between the two groups clinically we notice slight difference, this may due to that the penetration of PDL laser not exceed 1.2 mm and most keloid scars consist of thick fibrous tissue which limit the deep penetration of laser.

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