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# Treatment of Acne Valgaris by 805 nm Diode Laser

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**Abstract**
Acne vulgaris is very common dermatological problem which is disfiguring, it occurs in young age group.
The purpose of this study is to evaluate the therapeutic effect of 805nm diode laser on inflammatory popular type of acne vulgaris.
The sample of study was 30 patients of both sexes, ages varies between 15-32 years, collected at Al-kindy teaching hospital.
The study protocol was the application of laser therapy to acne lesions which was classified according to severity into severe, moderate and mild, considering other side as a control.
The cw diode laser used had the fallowing parameters, 805nm wavelength, and 500Hz frequency, 300 second time, 3W power, and with 1cm distance between the lesion and laser source.
The results were collected for more than 5 weeks and shown that there is a good response rate in the treatment of lesions with diode laser especially in severe and moderate type which shows decrease in severity and numbers of popular acne.
The response of lesions to the laser therapy was with very little side effect in comparison with other treatment modalities, and is disappearing within less than an hour. There is no sex difference related to side effects.
Finally this type of therapy is very effective concerning the response and side effects and hope in the future to prolong the follow up period and larger the number of patients, including different types of acne and using other parameters of lasers .
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**Keywords:** acne valgaris, diode laser

## 1. Introduction

The use of laser in dermatology is very well established, the main biological effects caused by laser light were, Increase vascularity (circulation) by increasing the formation of new capillaries, Stimulate the production of collagen, Stimulate the release of adenosine tri phosphate (ATP). Increase lymphatic system activity, Increase RNA and DNA synthesis, reduce the excitability of nerve tissue, these assist in regulating the nerves, thereby relieving pain. Stimulate fibroblastic activity, Increase phagocytosis, Stimulate tissue granulation and connective tissue projections, Stimulate acetylcholine release. [1, 2, 3]

Laser and acne, can remove acne with laser? Laser treatment, however, worked from the inside out without bleeding and with much lower risk of infection. Laser treatments are the fastest way to deal with scars and hyperpigmentation left behind when acne heals, but can also be beneficial for inflammatory acne. However, it's not known to be particularly helpful for non-inflammatory comedonal acne. The primary benefit of laser therapy, as well as the primary drawback of laser therapy, is that is has very precise effects. [4, 5, 6]

**Laser Safety measures development**

With increasing use of lasers a need arose to establish appropriate safety precautions, including appropriate eye protection for the patient, the surgeon, and the operating room personnel from exposure to the laser light. All laser manufactures provide accessory laser glasses and goggles to provide necessary safety while using their equipment. The potential risk of exposure to laser plumes clearer following different publications showing the presence of intact bacterial spores and human papilloma virus DNA fragments following $CO_2$ laser vaporization of verrucae in the laser plume . [7, 8, 9]

## 2. Patients and method

Setting, This study was done at AL-kindy teaching hospital, dermatology department, beginning from the 1st of September to the 20th of October 2016.

Sample, 30 patients from both sexes 13 male 17 female age range form 5y-32y, with clinically defined acne vulgaris inflammatory papular type only.

Assessment , After clinical assessment of papular acne in the face and grading it as severe, moderate, and mild according to the texts of dermatology. Severe mean severe inflammation with erythema, edema, and pain. Moderate mean moderate inflammation, erythema without edema and pain. Mild mean mild inflammation without erythema, pain and edema. Using good light source for inspection and palpation which is required for diagnoses, choosing inflammatory popular acne.

Diode laser (K LASER), the system used was K LASER system, equipped with diode laser source (Ga Al As diode), emitting a red visible beam as an aiming beam.

| Specifications | details |
|---|---|
| Laser system | Class IV |
| Aiming beam power | 2.5 mw max |
| Aiming beam wavelength | 635-650 nm |
| IR laser (main laser) | Ga Al As Diode |
| Wavelength | 790 -/+ 15% |
| source cw power | 6W max cw at the source |
| Optic fiber cw power | 4w max cw |
| Kind of laser emission | modulated cw |
| Modulation frequency | 1-20000 HZ |
| Duty cycle | 50% |
| Optical fiber laser | 3 mm diameter |
| coupling spot size diameter | 8 mm |
| Beam laser divergence | 60 milliradiants -/+20% |
| Treatment time calculation | automatic |
| Output mode | TEM 00 |

**KPERATION** details :

The setting of laser

The dose parameters for diode laser bio stimulation used in this study were:

| | |
|---|---|
| power | 3 w |
| Time | 300 sec |
| Frequency | 500 Hz |
| Total energy | 470 Jules |
| spot size | 8 mm |
| power density | 6 w/cm$^2$ |

**Safety measures**

The K laser 4 used in this study is classified as class IV laser product. The general laser safety recommendation included eye protection using goggles (univet mod.501.02.01.07.) even if it is only the aiming diode to be in used by the patient and operator .Eyes were covered with mops of wet cotton, when irradiating the face.

Avoiding pointing the laser beam to the eyes or thyroid gland. Procedure, Selection of the area to be treated with diode laser was done by selecting an inflammatory popular acne lesion. A 1. 5 x1.5 cm areas were chosen considering the surrounding area as a control. The area to be treated must be without any systemic therapy selecting last month.

No other conventional therapy was used with this treatment, received the treatment once weekly for three consecutive weeks. The follow up done for another two weeks, no specific preoperative preparations was required. Safety measures were carried out, the eye of both patient and the operator must be protected with the protective goggles.

The patients is sitting or in supine poison the hand piece of the laser system pointed perpendicularly towered the area with spacing of 1 cm ,after finishing the area we overlaps the irradiation of the first area by another area ,we repeat this procedure for all area of treatment. The program we choose will automatically set the energy.

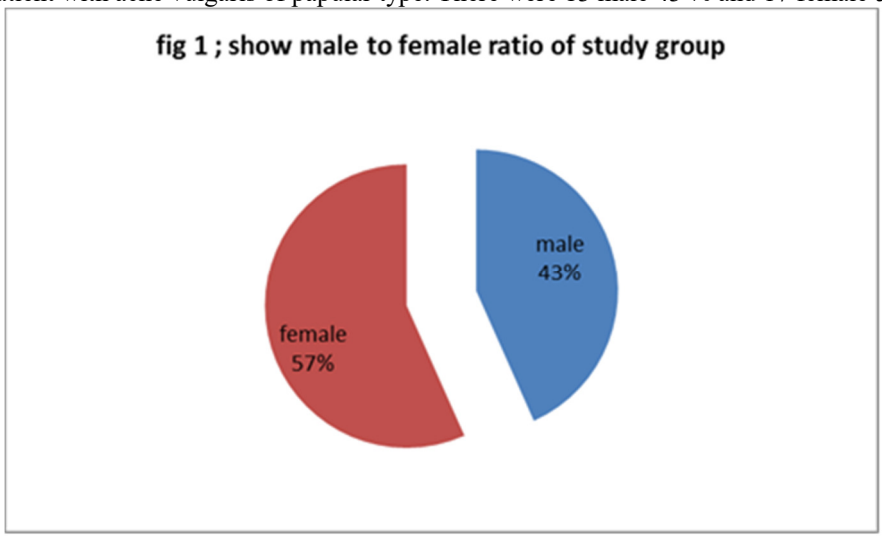
No specific postoperative treatment care was needed apart from inform the patient not to use treatment (topical) on the area of irradiation.

Ethical consideration, from scientific committee of department of dermatology in the hospital, written document from patients involved in the study.

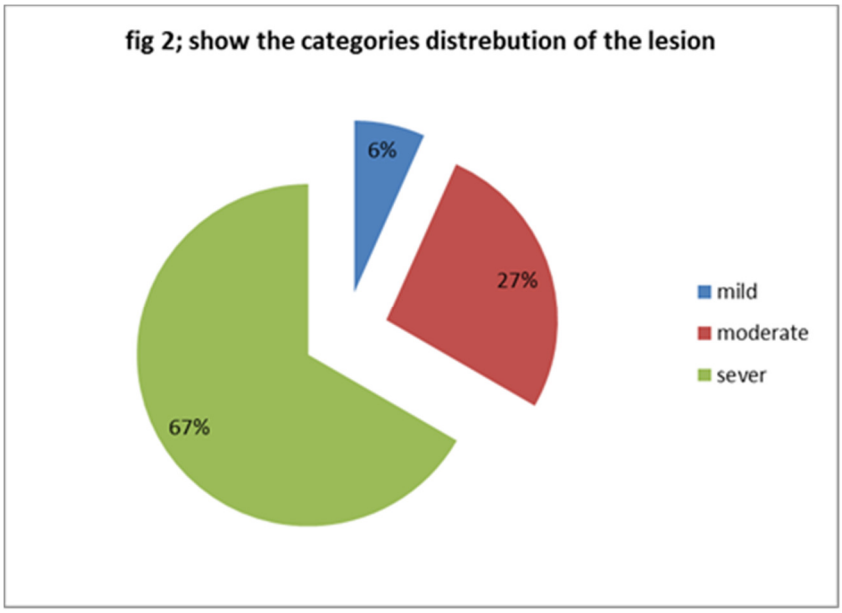
Laser safety, to establish appropriate safety precautions, including appropriate eye protection for the patient, the surgeon, and the operating room personnel from exposure to the laser light.

**3.Results**

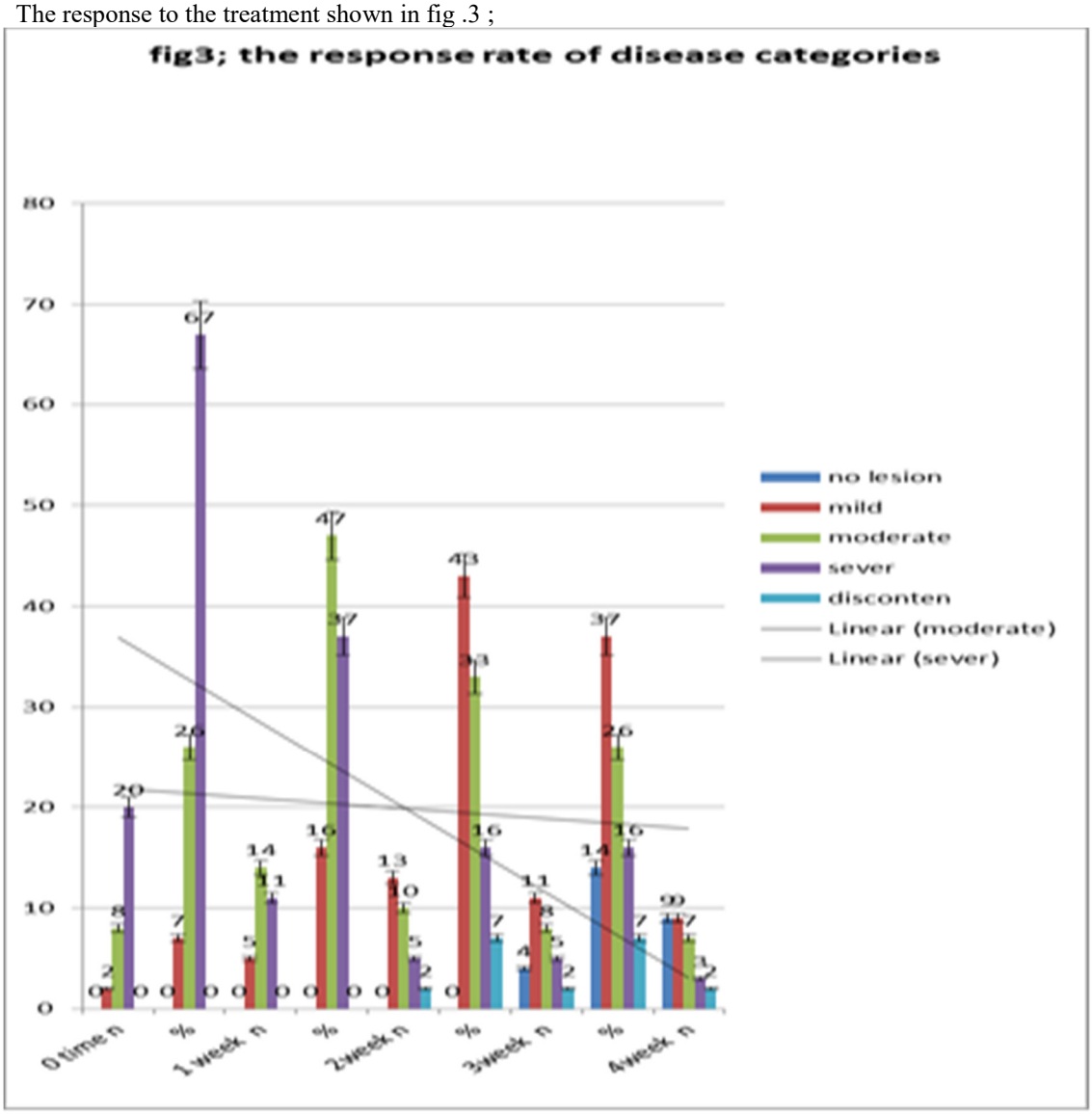
Thirty patient with acne vulgaris of papular type. There were 13 male 43 % and 17 female 57 % as shown in fig.1




The papular lesion is divided in to three categories, severe (20) patients, moderate (8) patient, and mild (2) patients as shown in fig 2.




The response to the treatment shown in fig .3 ;




At which is notice at zero time the severe popular acne was 20 patient, moderate was 8, and mild was only 2.At the first week the severe lesion decrease to all patient the moderate become 14, and the mild become 5 patients.

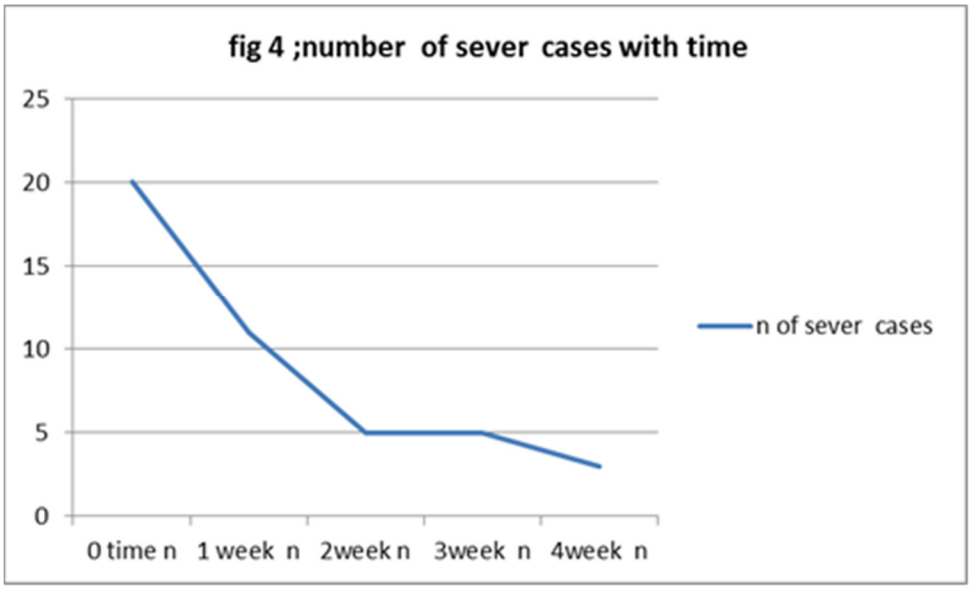
 

At the end of second week sever become 5 patients, moderate become 10 patients and mild increase to 13 patients, two patients discontinue the treatment. .At the end of the third week the severe was 5, moderate 8, mild 11 patients and no lesions in 4 patients. At the fourth week when we stops treatment the Severe only in 3 patients, moderate in 7 patients mild in 9 patients and 9 patients become free of lesions.

Table. 1 shows also the response rate during this study in percentage.

| | 0 time n | % | 1 week n | % | 2week n | % | 3week n | % | 4week n | % |
|---|---|---|---|---|---|---|---|---|---|---|
| **no lesion** | **0** | **0** | **0** | **0** | **0** | **0** | **4** | **14** | **9** | **30** |
| **mild** | **2** | **7** | **5** | **16** | **13** | **43** | **11** | **37** | **9** | **30** |
| **moderate** | **8** | **26** | **14** | **47** | **10** | **33** | **8** | **26** | **7** | **23** |
| **sever** | **20** | **67** | **11** | **37** | **5** | **16** | **5** | **16** | **3** | **10** |
| **disconten** | **0** | **0** | **0** | **0** | **2** | **7** | **2** | **7** | **2** | **7** |

Fig.4 shows the response rate of severe type only, at first week 20 at second 11, at third 5 at fourth week only three patients.




Because of descriptive type of the study there were overlaps in the assessment of moderate and mild lesions so we cannot predict the actual change in each of these two categories.

The surrounding area was considered as a control, the results shows that there is little or no change in severity of the lesions in the first week, and slight decrease in severe cases to 18 in the second week and 15 in the third and fourth weeks. There were no lesions in 4 patients at the end of fourth week. As shown in fig (3)

Fig .5 shows the side effect of treating acne with diode laser from the thirty patients chosen , only 5 patients ( 17 % ) shows mild erythema immediately after irradiation ,and disappear within less than 30 min - Burning sensation occur in 2 patients ( 7 % ) and continue for about 60 min or less. Superficial burn occurs in one patient and disappears in less than one week

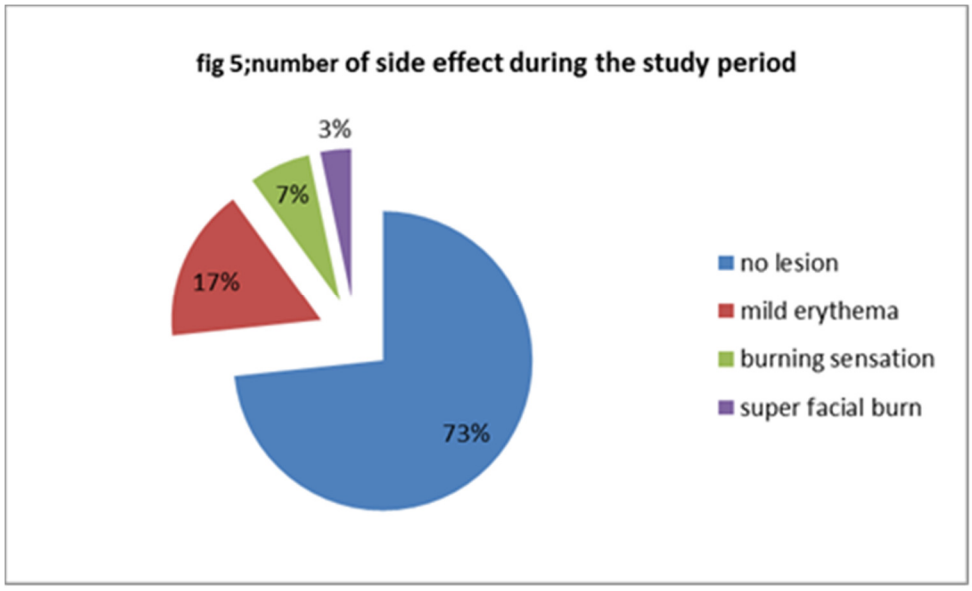
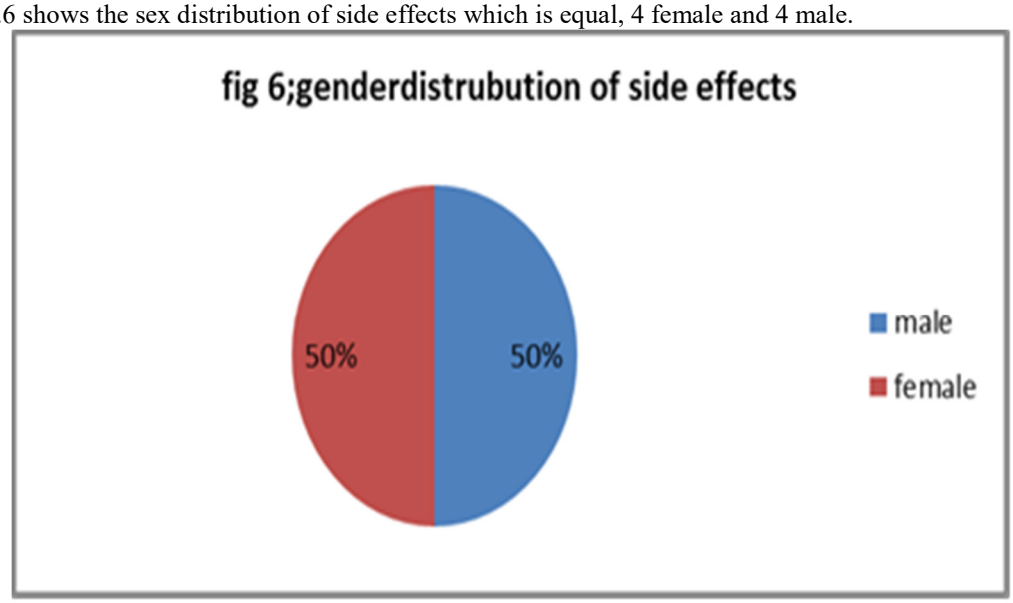



Fig.6 shows the sex distribution of side effects which is equal, 4 female and 4 male.




**4. Discussion:**

Acne vulgaris is very common dermatological problem which is disfiguring the patient especially it occurs in young age group. (10)

Usually the acne is treated with traditional therapy and it takes months or probably years of treatment and may cost a lot of money and time and a lot of side effects, the other physical modality like comedon extraction may be painful to the patient and also with many side effects. (11)

Diode laser were used for treatment of inflammatory popular acne with the parameter mention above as photo bio stimulation mechanism. In clinical trials, the diode laser reduce pain, inflammation and edema of acne lesions i.e. reduced the activity of inflammatory acne (88),also diode laser reduce the number of propioni bacterium acnes or shrink the sebaceous gland by photo thermal damage. (12).

In this study diode laser was used with power 3w; 5minute time; frequency 500 Hz and a total energy of 470 Jules, for treatment of popular type of acne vulgaris, with severe moderate and mild categories of both sexes, the lesions chosen on one side of the face considering the other side as a control. (13, 14).

The thirty patients with popular lesion shows three categories ,severe in 20 patients ,moderate in8 patients ,and mild in 2 patients at zero time (first irradiation).One week later shows a decline in the number of severe cases to 11 patients and an increase in number of moderate to 14 patients and the mild become 5,this is because there was a good response to diode laser treatment for severe acne .The moderate is larger in number because of the overlapping of moderate and severe which become moderate ,the mild is 5 only. At the end of second week the severe become 5, the moderate 10, and mild 13 patients, two patients discontinued the treatment. At the end of

third week the severe was 5, moderate 8, mild 11and 4patients with no lesions.

At the end of fourth week 9 patients with no lesions and 9patients with mild ,7 with moderate and only 3 with severe lesions. This might be because the diode laser (by photo thermal effect ) on the propioni bacterium acne as shown in in vitro study by Miss Rawaa which state that maximum increase in inhibition zones were obtained with 7.96w/cm2 at 3 mints exposure time in P.acne isolate , also because bio stimulation effect of diode laser decreasing the edema, pain, and erythema [15,16]

One study done by Jeffrey S.said that the improvement in acne vulgaris with 1450nm, diode laser occurs because of acne shrinkage of sebaceous gland by thermal damage. So the effect of diode laser on acne might be due to bio stimulation or photo thermal, and in general there is no strict line between these two effects.[17]

As in table 4 shows that the severe cases decrease in number from 20 in the first week to 11 in the second week, then 5 at the third weeks and 3 at the end of forth week .Because of descriptive type of the study there were over lapping in the mild and moderate cases so we cannot predict the actual change in each of these two categories.

As in fig 3 there was no significant decrease in severity of acne vulgaris in the control side of the face.

The side effect occur in only 8 patients of the thirty .Five of them shows mild erythema immediately after treatment which was expected and it disappeared within 30 minute so it is not important. Burning sensation occur in two patients both of them were female, may be because of hyper sensitivity or psychological effect, the burning sensation disappear in less than 60 minute. One patient presented with super facial burn immediately after irradiation which disappear after one week. There was no pain or post inflammatory hyper pigmentation or hypo pigmentation as shown with the use of diode laser 1450nm for treatment of acne by E.V.Rose; M.D; M.A.Blair at Naval Medical Center in San Diego. This study also shows erythema but no burning sensation. [17]

No recurrence of the lesion occurs during the period of the study which lasted five weeks.

This study had several limitations, like small number of patients, and enrolment of patients with popular type of acne only. What is more, inflammatory acne is known to be a self-limiting disease. Nevertheless these results support the findings from the other studies that diode lasers effectively improve inflammatory acne, at least temporarily

**Conclusion**

Diode laser (805nm) treatment of acne vulgaris could be considered as a valuable alternative to other more traditional therapy. This treatment can offers good results in treatment of inflammatory popular acne vulgaris with simplicity, short time, without pain or other significant side effect.

**Future work**

Prolonged follow up, for larger group of patients and with different types of acne lesions, are required to clarify the value of this treatments.

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