

Efficacy of Laser Puncture on Postoperative Pain and Edema after Facial Cosmetic Surgery

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ABSTRACT

Purposes: this study was designed to investigate the effect of laserpuncture on post-operative pain and edema after facial cosmetic surgery. **Subjects:** Thirty patients were involved in the current study. Their age ranged from 45 to 55 years old. They were assigned randomly and equally into two groups. Group I (Study Group, n=15patients) received laserpuncture, 24 minutes daily for 10 days . Group II (Control Group, n =15 patients), treated with sham laserpuncture 24 minutes for 10 days. **Assessment:** including evaluation of facial edema using tape measurement, evaluation of pain through visual analogue scale and detecting the level of serum reactive protein. Assessment was performed on the 1st day post-operative and after the end of treatment at 10th days post-operative. **Results:** following the suggested period of treatment, the results revealed significant differences between the two groups in pain intensity (66.2% versus 52.2%), edema (50% versus 34.2%), and reduction of C-RP (72.26%versus 59.7%) in Laserpuncture versus control group ($P<0.05\%$). **Conclusion:** according to the result of this study supported by the relevant literature it can be concluded that laserpuncture can be used as an additional modality to the current physical therapy protocol for treatment of pain and edema of patients following facial cosmetic surgery.

Key words: (Laserpuncture and Facial surgery).

INTRODUCTION

Facial cosmetic surgery is associated with postoperative edema and pain, which start shortly after operation and last for several days. These facial edema and pain may be sever enough that anti-edema measures and potent analgesia are given. This postoperative edema is due to accumulation of the fluid secondary to changes in capillary hemodynamics and loss of vascular integrity. Furthermore this swelling can be prolonged by lymphatic obstruction secondary to damage of lymphatic vessels that lead to lymph fluid accumulation in tissues results in visible swelling of the face^{1,2}.

Needle acupuncture has been used in the treatment of various complaints for thousands of years in China and in the last decades has become very popular in western countries. Since the early 1980s, laserpunctur have been used anecdotally to stimulate acupuncture points (instead of needles) to help in pain. control It is painless, non invasive and produces no painful reaction, when applied to the skin^{3,4}.

In stimulation of acupuncture points with laser it is believed that light energy (laser) transfer to electromagnetic waves radiating along acupuncture channels causing the same effects of needle acupuncture^{4,5}.

The laserpuncture is reported to have an anti-inflammatory effect and the clinical and

laboratory evidence for this was repeatedly reported and its ability to assist the healing of open wound and relief pain is also well accepted⁵.

However the use of laserpuncture to reduce pain, produced variable results by different researchers. Unfortunately there are no definitive guidelines determined the ideal wavelength of laser beam, power of the laser output, number of joules and frequency of treatments⁶.

On the other hand and over the past two decades laserpuncture has been used to treat pain associated with conditions such as traumatic injuries, postoperative pain arthritic conditions, postherpetic neuralgia and dental pain. Some of the suggested mechanism underlying therapeutic effects with laserpuncture have been reviewed and includes; (1) increase ATP production by the mitochondria, and enhance oxygen consumption at the cellular level, (2) increase serotonin, and endorphin, (3) anti-inflammatory effects (4) improve blood circulation to skin, with consideration to photobiological rather than photothermal effects⁽⁷⁾ Despite its wide spread use the results of experimental and clinical studies are conflicting. The results of some placebo controlled studies suggested that laserpuncture might be useful for reducing pain. On the other hand a number of placebos controlled randomized trails failed to demonstrate any significant or convincing relevant effect of laserpuncture over control groups^{6,8}.

Moreover, recent reports indicated the efficacy of laserpuncture in the treatment of edema with remarkable rapid improvement within few hours of irradiation. This type of treatment has been examined for treatment of fibrous scar tissue and has been shown to affect cultured fibroblasts. It has been suggested that laserpuncture encourage

lymphangiogenesis and stimulate lymphatic motorcity^{9, 10}.

Nussbam and Walsh, reported that laserpuncture could stimulate macrophage cells, and immune system. All these effects indicated that laserpuncture could be an effective treatment for patients with facial edema and associated pain^{11,12}.

The results of current study might help the physicians, and physical therapist to introduce laserpuncture to overcome post-operative pain and edema instead of drug therapy as a safe, economic and non invasion way of treatment.

Therefore, this study was primary designed to examine the pain relieving properties of laserpuncture and to determine whether it can reduce facial edema following facial cosmetic surgery.

SUBJECTS, MATERIALS AND METHODS

Subjects

Thirty female patients had been involved in current study. Their age ranged from 45 to 55 years old. They were assigned randomly and equally into two groups of equal groups. Group I (Study Group, n=15patients) patients received laserpuncture, 24 minutes daily for 10 days. Group II (Control Group, n =15 patients), treated with sham laserpuncture 24 minutes for 10 days. Preoperative clinical and laboratory examination was done to ensure that all patients had no cardiac, circulatory or pulmonary disorders and fit for administration of anesthesia. Also patients with sever facial or trigeminal nerve disorders were excluded from the study. All patients were non diabetic and non smokers. The study was conducted in kaser El Ainy University hospital. The study design was pre -test post -test design. All patients underwent facial cosmetic surgery

(open face left, open face left with Blephero-plasty, open face left with fat injections).

Pre operative preparation

The procedure of the study was explained to each patient: including evaluation and therapeutic procedure. Each patient was asked to assign the consent of the current study before enrolling in the study.

Instrumentations

Assessment Instrumentation

1- Flexible Tape

A simple retracting flexible plastic tape (Manufactured in Germany) was used in this study. This tool was chosen for its simplicity, ease of use, in-expensiveness.

2- The visual analog scale (VAS)

The visual analog scale (VAS) was chosen and used to quantify pain intensity. It consists of a standard 10-cm line with verbal anchoring indicating “no pain” at one end (0) and “severe pain” at the other end (10). The VAS is reliable and valid measures¹¹.

3- Cunumeter

A device (manufactured by Alternative Medicine South Hospital Sirilanka) composed of two arms connected in fulcrum, used to measure the Cun of patient (the distance between middle and lateral aspect of height point of distal phalanx of patient's thumb).

4- Elexcess Twenty Ten Device

Elexcess twenty ten device (manufactured by Roch Company –Germany) was used to analysis venous sample for estimation of Serum CRP. The C-RP concentration increase in response to

inflammatory stimuli (either traumatic or surgically), and are frequently used clinically as a systemic measure of inflammation with subsequent pain reduction.

Treatment instrumentation

1- Laser Device

The laser device (Manufactured by ASA Bravoteerza Serie, Italy) was used for providing infrared laser irradiation. The device has the following parameter (frequency: up to 10,000 HZ, wavelength of; 902nm, Power output; up to 25W and pulse duration; up to 200ns).

PROCEDURE

A- Evaluating procedure

1- Facial edema: evaluation of facial edema was performed between well defined anatomic marks at the face and neck through using tape measurements. The therapist evaluate the extant of the edema by calculating the sum of the three measured distance at each side of face as following (1) tragus – mental protuberance, (2) tragus- mouth angle, and (3) mandibular angle–nasal wing. This procedure was repeated three times by the same therapist and the mean value was taken to ensure accuracy of measurements³.

2- Pain assessment: The VAS was explained to the patients and each patient was asked to put mark on one of the scale numbers. Distance from the zero point to the donut mark was measured and expressed as pain intensity. The test was performed three consecutive times by the author and other therapist and the mean value of three measures was considered as the value of pain intensity^{8,14}.

3- The C - Reactive Protein. 22ml of venous blood was taken into a plain tube and allowed to clot and serum was removed and stored at 20 degree until assayed⁽¹⁴⁾. The assessment procedure for facial edema, pain assessment and CRP was performed on the first day postoperative (Pre) and at 10 days postoperative (Post).

B-Treatment Procedures

The treatment procedure was started at first day 6-9 Hours post operative. Each patient was placed in a comfortable supine lying position. The laser unite was recalibrated before the study to ensure its accuracy and objectivity of its parameters. The laser unite was set at the following treatment parameter (frequency of 1000Hz, duration of treatment 24 minutes, pulse duration of 55ns, power intensity of 25mW, and dosage of 1.5 J/cm², with wavelength of 905nm)^(8,9) Laserpuncture was performed eight sites commonly used in the treatment of pain and edema. These points were selected by using (nummeter and in acupuncture points included.

I) Specific acupuncture points for edema¹².

- 1- Guanuo (Ren-4); located in front midline, 3 cun below the umbilicus.
- 2- Shimen (Ren-5); located in front midline, 2 cun below the umbilicus.
- 3- Shuifen (Ren-9); located in front midline, 1 cun above the umbilicus.
- 4- Xiengue (St-43); located in the depression between the base of the 2nd and 3rd metatarsals.

II) Analgesic points¹⁵

- 1-Neiting (St-44); located 0.5 cun proximal to the web margin between the 2nd and 3rd toes.

2- Hegu (Li-4); it is situated in the web between the forefinger and thumb on the dorsal aspect of the hand¹⁵.

3- Houxi (Si -3) it is located at the medial end of the main transverse crease of palm on clenching fist.

4-Yanglao (SI-6) it is located on the back of the wrist in the depression proximal to the inferior radioulnar joint.

The laser treatment probe was held in contact with and at right angles to the skin in acupuncture point. Each point had been irradiated for one minute with total duration of 8 minutes. This procedure had been repeated for three consecutive trials in same setting therefore the total duration of treatment was 24 minutes. The applied dose of energy per acupuncture point was (4.5 J/cm²)⁹.

The same procedure was used in sham laserpuncture, while the power was switched off. The patients in both groups received standard medical treatment (Antibiotic, anti-inflammatory and analgesic (voltaren 75 ml amp), antiedematus (repair tablets and gel). Each patient was instructed to wear, the garment (open face mask, Jobskin Garment, Jobst, Thurles, Ireland). The garment was recommended to be worn at home and overnight for 10 days^{2,16}.

C- Data analysis

Base line demographic data of both groups were expressed as (mean and SD), for parametric data and as number and percentage for nonparametric data. The student t test for paired measurements was used to detect significant differences within groups, while unpaired t test was used to detect significant difference between the two groups. The level of improvement expressed as percentage. The level of significant was assumed at (P<0.05%) at two tailed test.

RESULTS

The study consisted of 30 female patients. They were classified into two groups of equal number.

Study Group; had 15 patients underwent facial cosmetic surgery followed by laserpunctur therapy Control group; had 15 patients, underwent facial cosmetic surgery followed by sham laser puncture. The data regarding to patient's age was similar in both groups, and revealed no significant differences ($P>0.05$). The mean value of age was 53 ± 5.8 versus 52 ± 5.7 years, for study versus control groups respectively. Subgroups of patients undergoing facial cosmetic surgery were created. They were identical in size, age distribution, numbers and types of surgical procedures. Seventeen patients underwent open face-lift (9 in study & 8 in control), six patients underwent open face-lift with bephoroplasty (3 in study & 3 in controls). Seven patients underwent open face-lift with fat injection (3 in study & 4 in control).

I-Results of Facial edema

As shown in table 1&2 and fig 1,&4 The mean value of facial edema volume at 1st day postoperatively was approximately 38 ± 12.2 versus 40 ± 13.9 for control versus study group with no statistical significant differences ($P>0.05$). There was a significant reduction of edema volume ($P<0.05$), at 10th day with mean value of $25.\pm 9.6$ versus 20 ± 5.6 for control versus study. While the great percentage of

reduction observed in study at the end of treatment (10th day) was 34.2 % versus 50 % for control and study groups respectively.

II-Results of Pain

As shown in Table 1&2 &fig 2&5, the pain intensity showed similar mean values as measured at 1st day postoperative with 80 ± 23 versus 83 ± 21.7 mm, for control versus study with no statistical differences between them ($P>0.05$), the mean value of pain intensity was decreased during period of the study with greatest reduction in study group, as it was 38 ± 16.2 versus 28 ± 8.11 at 10th day postoperatively. The reported incidence of improvement was 52.5 % versus 66.2%, at 10th day postoperatively for control versus study respectively.

III-Results of C - reactive protein

As regarded in tables 1&2 fig 3&6, the increase in of C-RP was similar in both groups and it was (29.8 ± 4.9 versus 32.32 ± 8.7 mg/l, for control versus study groups respectively, and no statistical differences between them ($P>0.05$). This level was decreased in both groups, during period of the study with greatest reduction in study group, as its mean value was 8 ± 3.2 versus 12 ± 3.8 mg/l at 10th day postoperatively, table (2) fig (6). The reported incidence of improvement was greatest in (study versus control), as it was 75.26 versus 59.7 at 10th day postoperatively for study versus control respectively.

Table (1): The mean value of facial swelling, pain assessment and C-RP at 1st day postoperative before treatment (Pre).

Statistics	Edema assessment		Pain assessment		C-RP	
	Control	Study	Control	Study	Control	Study
X±SD	38±12.2	40±13.9	80±23	83±21.7	29.8±9.4	32.32±8.7
P-value	0.15		0.12		0.8	
Level of significant	NS		NS		NS	

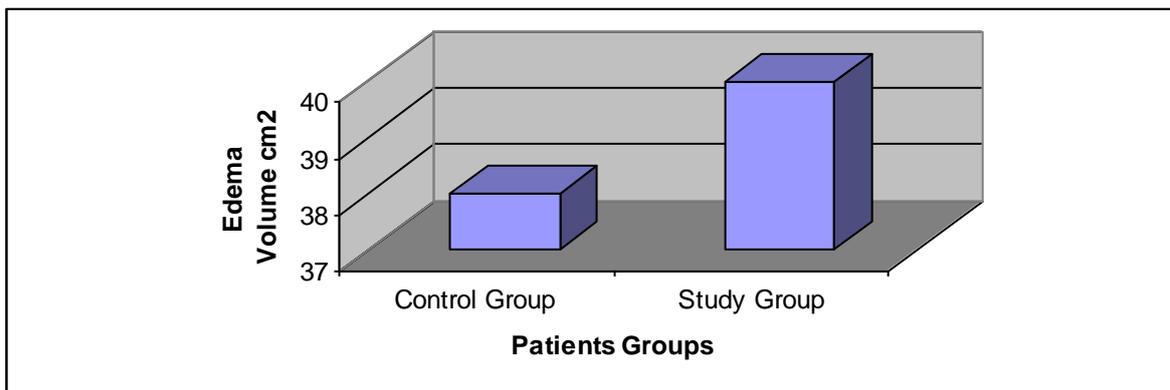


Fig. (1): The mean value of edema volume of face at pre-treatment (1st day postoperative) for both group.

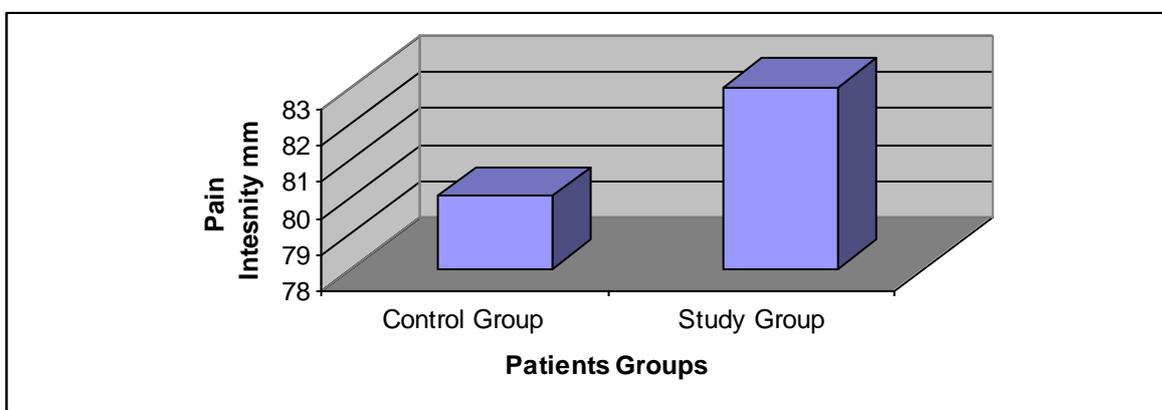


Fig. (2): The mean value of pain intensity at pre-treatment (1st day postoperative) for both group.

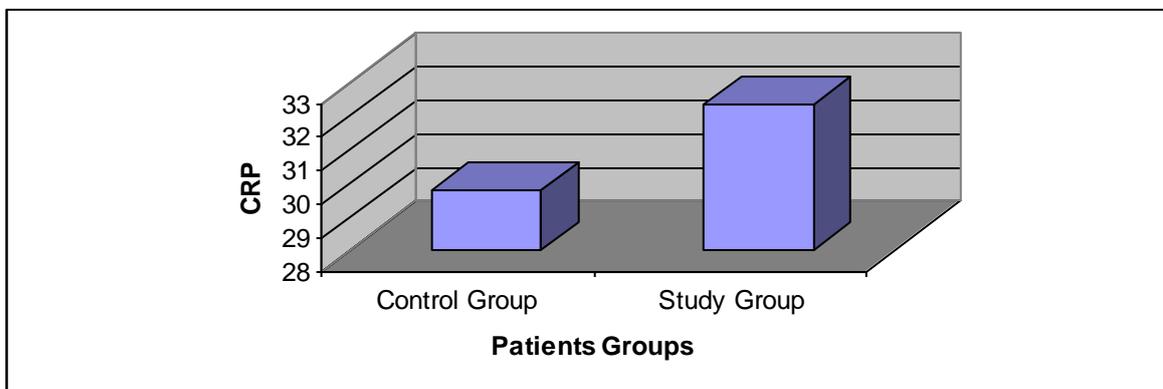


Fig (3): The mean value C-RP at pre-treatment (1st day postoperative) for both group.

Table (2): The mean value of facial swelling, pain assessment and C-RP at 10st day postoperative post treatment (Post).

Statistics	Edema assessment		Pain assessment		C-RP	
	Control	Study	Control	Study	Control	Study
X±SD	25±9.6	20±5.6	38±16.2	28±8.11	12±3.8	8 ±2.3
P-value	0.01		0.002		0.002	
Level of significant	S		S		S	

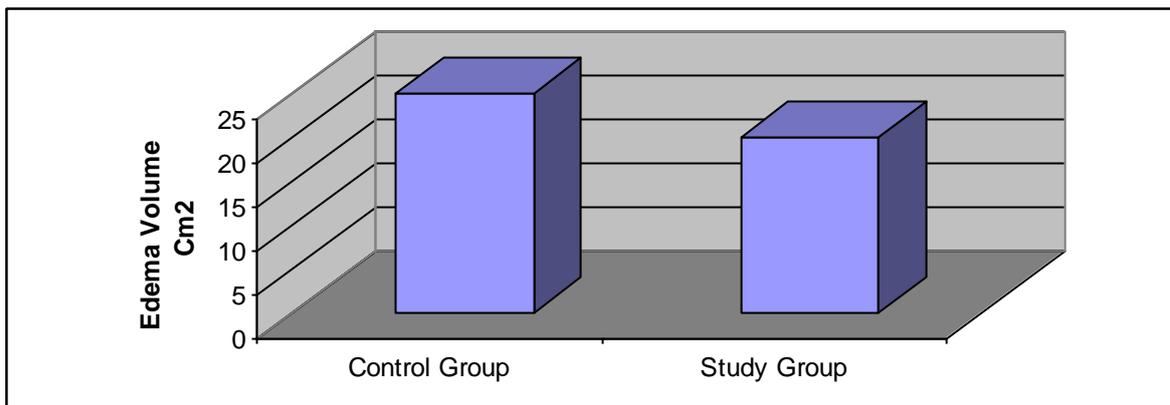


Fig (4): The mean value of edema volume of face after end of treatment (10th day postoperative) for both group.

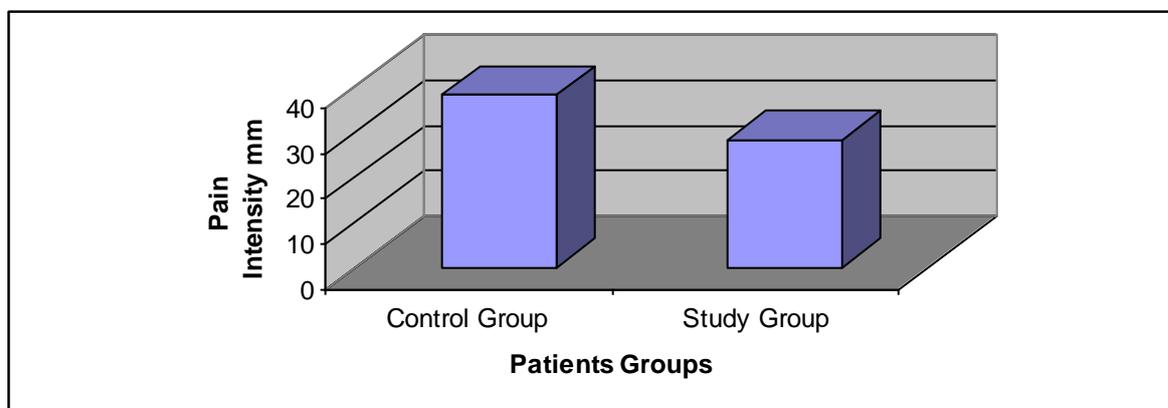


Fig (5): The mean value of pain intensity after end of treatment (10th day postoperative) for both group.

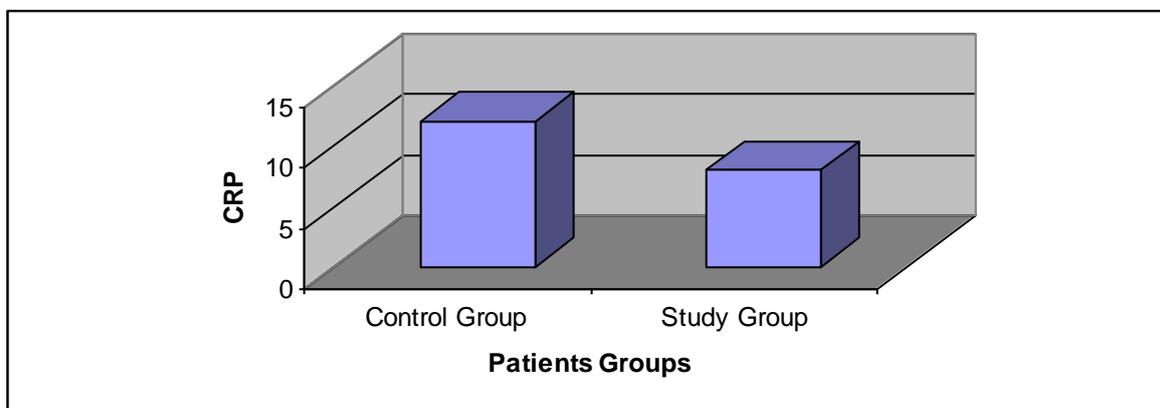


Fig (6): The mean value C-RP after end of treatment (10th day postoperative) for both group.

DISCUSSION

The results of this study showed that laserpuncture was an effective treatment in

reducing post-operative pain, edema and inflammation following facial plastic surgery.

The use of laserpuncture may reduce edema and associated pain Although it's

primary recommendation based on positive clinical experiences and not based on clinical placebo controlled study¹⁵.

Ress et al.,¹⁶ found that edema and haematome formation occurred within 48 hours of surgery in 57% of facelift procedures, the incidence of this problems was not affected by age, medical history, gender, type of anesthesia and medication, and it required surgical evacuations.

The associated pain and edema after facial surgery (e.g. Rhionplasty) may persisted s for 7 days even with use of steroid therapy¹⁷, While Rapaport¹⁸, concluded that postoperative swelling and pain after facial surgery (face left, Rhinoplasty) may persisted for more than 9 days postoperative and found no significant difference when steroid was used.

In the present randomized study it was shown a significant differences between lasepuncture and placebo treatment irrespective to pain, edema and inflammation. First of all the reduction in VAS pain scores from 80mm to 28mm with 66.2% for laserpuncture compared with 52.2% for placebo might indicated greater success in the rate of pain reduction.

The results are in agreement with the work of Clokie et al.,¹⁹, who studied the effect of laserpuncture in 15 patients who had surgical removal of bilateral symmetrical mandibular third molars traction. They showed significant reduction in post-operative edema and of pain on the day of surgery and on the first following post-operative days.

This results conflict with two more comprehensive studies conducted to examine the effect of laserpuncture on post extraction pain and swelling in 64 patients, and the results revealed no significant differences in pain and swelling at either 3 to 7 days after surgery^{20,21}.

The exact mechanism of pain reduction by laserpuncture is not clearly understood. Different experimental studies suggested that a laserpuncture in specific acupuncture point has anti-inflammatory and analgesic effects. In another study the authors have suggested that neuronal activity inhibition might be responsible for the therapeutic effects and that the laser irradiation selectively inhibited nociceptive signals at peripheral nerves⁴.

As far as pain relief is concerned, the most popular neurological explanation is based on the "gate control theory" according to this theory, our perception of pain is modulated by a functional gate within central nervous system. Under normal circumstances this gate is wide open and pain impulses (via the small diameter fibers), get through quite easily, but when laserpuncture is carried out, a second stream of non painful impulses is set up from the site of stimulating (Via the large diameter fibers, A-fibers). The result is overcrowding at the gate causing it to close. In other words there is a competitive inhibition of the pain impulses and no pain or less pain is felt, even during surgical procedures^{15,22}.

Chemical or humoral mechanism are also involved in laserpuncture as walker²⁰ has suggested that laserpuncture affect serotonin metabolism, because it was noticed large increase of urinary excretion of 5-Hydroxyindolecatic acid (5-HIAA) which is product of serotonin metabolism, after irradiation by laser therapy in patients with orofacial disorders' surgical or traumatic^{15,23}.

Another chemical mechanism responsible for laserpuncture for pain reduction is an opiate theory in which the enkephalin inhibits pain through acting and blocking the release of directly excitatory neuron preventing the release of neurotransmitters such as acetylycholine and

glutamate, thereby reducing the receiving cell's excitatory input and causing pain relief²⁴.

On the other hand; analysis of results of C reactive protein showed significant decrease with greater percentage for laserpuncture which indicated systemic effect of laser therapy.

This findings are similar to that of Goats et al.,⁵ who showed significant reduction in both ESR and CRP after exposure to laserpuncture. Furhermore Palmgren et al.,²⁵ reported a decreased in CRP and ESR in similar study. On the other hand Hall et al.,²⁶ failed to demonstrated any significant effect of laserpuncture on the ESR and CRP in musculoskeletal disorders.

These results provide the therapist a chance to use laserpuncture as an adjuvant therapeutic methods that accelerate recovery of pain and edema of patients following facial cosmetic surgery.

Conclusion

Laserpuncture was used as adjuvant therapeutic methods that accelerate recovery of pain and edema of patients following facial cosmetic surgery.

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المخلص العربي

فاعلية الوخز بالليزر على الورم و الألم عقب جراحات تجميل الوجه

الغرض : الدراسة الحالية صممت للتعرف على تأثير الوخز بالليزر على الورم و الألم عقب جراحة تجميل الوجه. اشتملت الدراسة على ثلاثين مريضة تراوحت أعمارهن بين 45 و 55 عاما. تم تقسيمهم بالتساوي و عشوائيا الى مجموعتين، المجموعة الأولى شملت على خمسة عشر مريضة استقبلت العلاج بالوخز بالليزر لمدة عشرة أيام عقب الجراحة اما المجموعة الثانية تم علاجها لمدة عشرة أيام بوضع الليزر فوق نقاط الإبر الصينية دون تشغيل الجهاز (إيجاني). تم عمل التقييم قبل العلاج و بعد عشرة أيام و شملت على قياس ورم الوجه ، مستوى و معدل البروتين و الألم . النتائج: اظهرت النتائج وجود فروق ذات دلالة احصائية في انخفاض شدة الألم (66.2% ضد 52.2%) و الورم (50% ضد 43%) و انخفاض معدل البروتين (72.62% ضد 59.7) في مجموعة العلاج بالوخز بالليزر مقارنة بالمجموعة الضابطة. الخلاصة : هذه النتائج تمد المعالج بفرصة استخدام الوخز بالليزر كوسيلة علاجية تساعد على سرعة علاج الألم و الورم في المرضى بعد عمليات تجميل الوجه.