Original Article

Effect of Low Level Laser Application at the End of Surgery to Reduce Pain after Tonsillectomy in Adults

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Abstract:

Introduction: Tonsillectomy is among commonest otorhinolaryngologic surgeries. Many methods have been used to control post surgical pain, but despite it, pain is still one of the problems related to this operation. Recently, due to the non invasiveness of low level lasers, this modality has attracted attention. The purpose of this study is to evaluate the effects of low level laser irradiation at the end of surgery on reduction of pain after tonsillectomy in adults.

Methods: In a clinical trial, 60 adult patients, candidates for tonsillectomy were randomly assigned to two groups, A and B, and both groups were anesthetized similarly by the same technique. At the end of surgery, in the case group, the tonsils' bed were irradiated by infrared laser with 980nm wavelength, 100Hz, 4J/cm^2 from the infra mandibular angle. In the control group, the tonsils' bed had laser therapy with a turned off probe.

Following laser treatment, the patients were reversed and extubated and consciousness achieved, pain and odynophagia were assessed at 2, 4, 6, 8, 12 and 24h post surgery based on visual analog scale for pain (VAS) and analgesic consumption.

Results: In the laser group frequency of patients with pain sensation in each evaluated hour was lower than in the control group. The amount of pain decrease and analgesic consumption reduction was significantly higher in patients who received laser (P=0.01).

Conclusion: Based on the results of this study, use of low level lasers is effective in reducing tonsillectomy post surgical pain in adults.

Keywords: low level laser therapy; Pain; otorhinolaryngologic

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Introduction

Tonsillectomy is a common surgery for otorhinolaryngologists. One of the important problems after tonsillectomy in adults is post surgical pain and odynophagia which results in agitation during recovery and even renders nutrition and analgesic pills consumption difficult. It also causes delay in patient discharge[1].

Pain control with opioids is associated with some worries for clinicians due to its eventual irreversible complications such as depressing respiratory system. Local infiltration of bupivacaine and dexamethasone are examples of treatment introduced as part of the appropriate replacement therapies for opioids in reducing post tonsillectomy pain. Recently, use of low level laser has also been recommended in children tonsillectomy[1,2].

Jackson et al. have reported that laser therapy significantly reduce post mastectomy pain[3]. Kreisler

et al with a study on odontologic surgeries showed the effect of low level laser therapy in reducing pain[4]. Also laser therapy on mucositis caused by radiotherapy resulted in reduction of pain episodes from 8/23 to 1/9 [5].

Based on another study, mayofascial pain also decreased with laser therapy[6].

Despite numerous researches stating the efficacy of low level laser after surgery, there are also studies revealing the inefficacy of laser. In a study on third molar teeth dental surgery under general anesthesia, patients received laser therapy prior to teeth extraction, no pain control after surgery was observed[7].

Considering these controversies[8,9] and despite 30 years of research on low level laser therapy analgesic and anti-inflammatory effects, we have only found a limited number of studies on tonsillectomy in children. Therefore we have planned to assess the analgesic effects of laser on tonsillectomy in adults.

Methods

Patients were randomly divided in two groups of 30 subjects by using randomizing software.

Inclusion Criteria:

1- Patients at age between 20-40
2- America Society of Ansthesiologist (ASA I-II)
3- Willing to participate in the study

Exclusion Criteria:

1- Problem of hemostasis during surgery
2- Prolonged operation (More than an hour because of complications)
3- Patient drug addiction
4- Psychopathic patient

In a double blind clinical trial, taking into account α=0/05, power study 80%.To detect a 3 Centimeter difference in mean visual analog scale for pain (VAS) scores, 56 subjects were enrolled. And in order to increase the study value and due to the possibility of loss of subjects, 60 patients were included after getting approval from ethic committee, signature of an informed consent form and having received training on post-surgical pain score attribution by the visual analog scale for pain (VAS) method.

Both groups received premedication with fentanyl (1µg/kg) and midazolam (30µg/kg). Then they underwent induction with propofol (2mg/kg) and atracurium (0.5 mg/kg) and were intubated. The anesthesia continued via Total Intra Venous Anesthesia (TIVA) technique with propofol and remifentanyl and after surgery, hemostasis and opening of the gag device, in the intervention group tonsils' bed was irradiated by infrared laser with 980nm, 100Hz, 4J/cm2 from the mandibular angle. In the control group the tonsils' bed was treated by a turned off laser probe.

After the end of laser therapy, patients were reversed and extubated, then sent to recovery. When consciousness was achieved, pain severity and odynophagia were evaluated and recorded based on 5 steps VAS (0-4) and the amount of consumption of analgesics depending on doses at 0, 2, 4, 6, 8, 12 and 24 hours.

VAS 0= Painless =0
VAS 1 and 2=Mild pain =1
VAS 3and 4=Moderate pain =2
VAS 5, 6 and 7=Severe pain =3
VAS 8, 9 and 10= Very severe pain =4

Table 1. Male and female frequency in both groups of patients

	Laser group		Non laser group	
	Number	Percentage	Number	Percentage
Female	15	50%	24	80%
Male	15	50%	6	20%
Total	30	100%	30	100%

Mean age of both groups of patients

Group	Number	Mean± Standard Deviation	*P* test	*P* value
Laser group	30	24.15±7.5	1.888	*P*=0.05
Non laser group	30	20.53±6.83		

Mean weight in both groups of patients

Group	Number	Mean ±Standard Deviation	*P* test	*P* value
Laser group	30	61.14±12.2	1.843	*P*=0.05
Non laser group	30	55.55±9.91		

Results

The demographic evaluation of patients wasn't significant (P=0.05).

In point of sex there was 15 female &15male in Laser group, 24 female & 6male in Non laser group

In point of mean age and mean weight there was 24.15± 7.5, 61.14± 12.2 in Laser group & 20.53± 6.83, 55.55± 9.91 in Non laser group respectively (Table 1).

Mean pain severity in recovery was 1.84 for the laser group and 2.76 for the control group (P=0.01).

Mean pain severity at two, four, six, eight, twelve and twenty four hours after surgery were (1.55)-(1.42)-(1.38)- (1.59)- (1.5)- (1.19) for the laser group and (2.7)- (2.41)- (2.2)- (2)-(1.5) – (1.43) for the control group respectively (P=0.01).

Average pain severity for twenty four hours (0-24) after surgery was 1.43 for the laser group and 2.11 for the control group, and T test showed significantly more pain severity in the control group than in the laser group (P=0.01) (Figure 1-3).

28 patients (93.3%) in laser group did not receive any type of analgesic, only 2 patients (6.6%) treated with 50mg of Tramadol (Table 2).

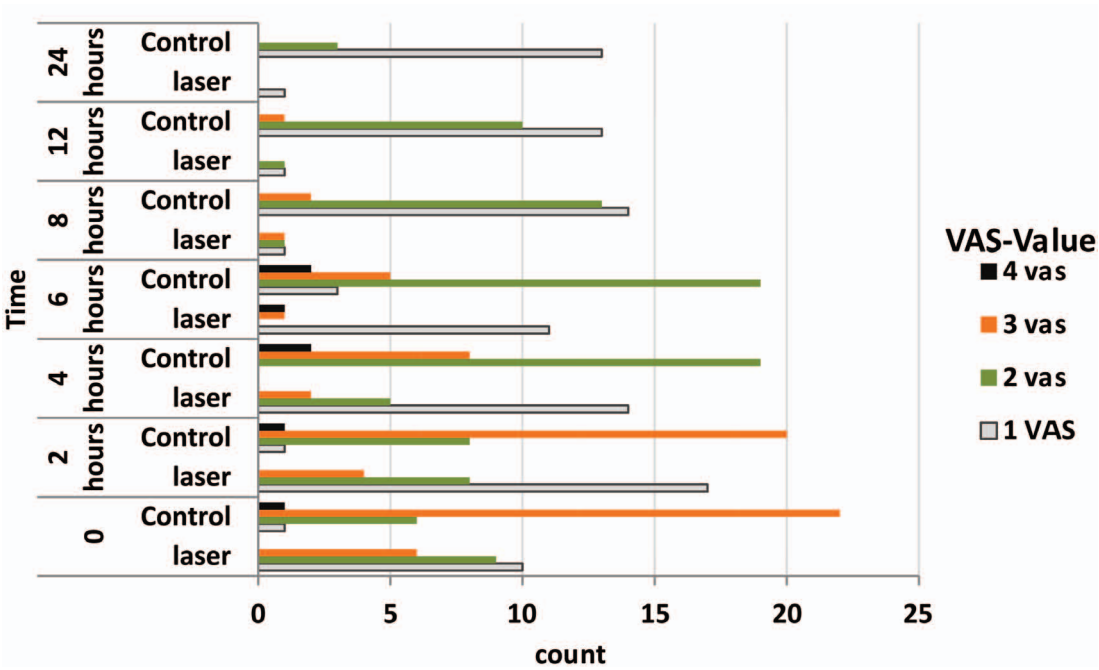

Figure 1. Comparison of numbers of patients in different severities of pain, from the time of surgery to 24h post surgery in both groups.

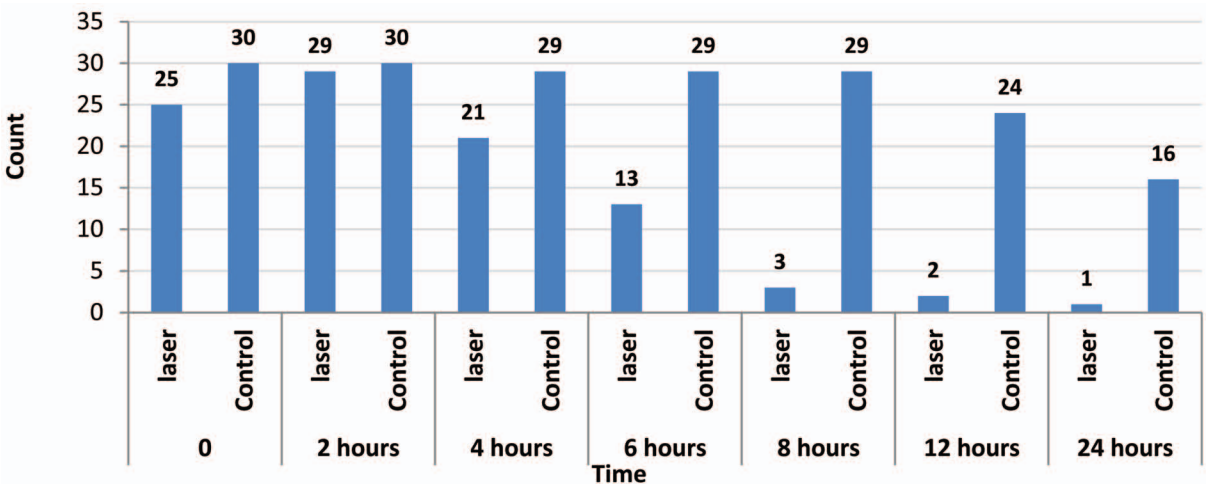

Figure 2. Comparison of numbers of patients with pain sensation, from the time of surgery to 24h post surgery in both groups.

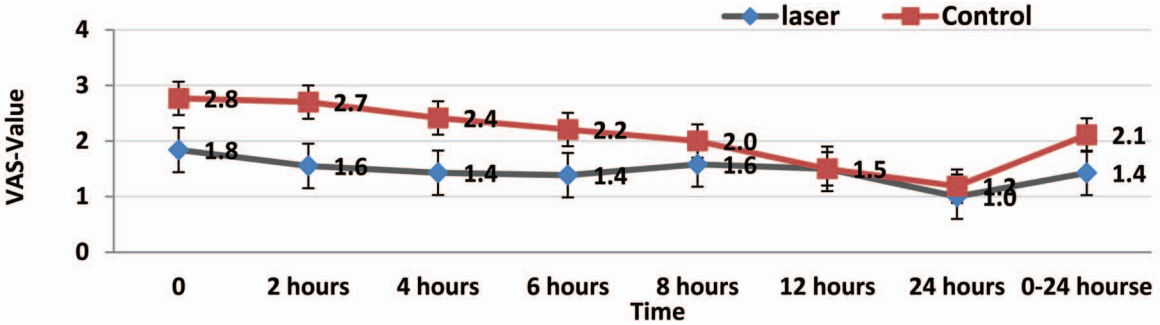

Figure 3. Comparison of mean pain severity from recovery to 24h after surgery in both groups

Table 2. Evaluation of mean pain severity from recovery to 24h after surgery in both groups

Hour	Group	Number	Mean±Standard Deviation	*P* test	*P* value
0	Laser group	25	1.84±0.80	5.01	*P*=0.01
	Non laser group	30	2.77±0.57		
2	Laser group	29	1.55±0.74	-6.6	*P*=0.01
	Non laser group	30	2.70±0.60		
4	Laser group	21	1.43±0.68	-5.3	*P*=0.01
	Non laser group	29	2.41±0.63		
6	Laser group	13	1.38±0.96	-3.07	*P*=0.01
	Non laser group	29	2.21±0.73		
8	Laser group	3	1.59±1.00		
	Non laser group	29	2.00±0.63		
12	Laser group	2	1.50±0.71		
	Non laser group	24	1.50±0.59		
24	Laser group	1	1.00±0.00		
	Non laser group	16	1.19±0.40		
0-24	Laser group	30	1.43±0.51	-5.57	*P*=0.01
	Non laser group	30	2.11±0.43		

In the control group 20 patients (66.6%) did not receive analgesic, but 10 patients (33.3) received analgesic, which was 50mg Tramadol for 6 patients and 1000mg Apotel for 4 patients. analgesic consumption was significantly more in the control group than in the laser group (Table 3).

Mean odynophagia severity in recovery was 1.64 for the laser group and 2.82 for the control group (P=0.01).

Mean odynophagia severity at two, four, six, eight, twelve and twenty four hours after surgery was (1.48)-(1.35)- (1.45)-(1.61)- (1.5)-(1) for the laser group and (2.63) –(2.45)- (2.07)- (1.8)- (1.52)- (1.21) for the control group respectively (P=0.01). (Table 4)

Average odynophagia severity for twenty four hours (0-24) after surgery was 1.35 for the laser group and 2.12 for the control group, and T test showed that odynophagia was significantly more severe in the control group than in the laser group (P=0.01) (Figure 4-6).

- In the laser group the frequency of patients with pain sensation in each evaluated hour was lower than in the control group.
- Also with time, the rate of reduction of patients with pain sensation was higher in the laser group than in control group.

- Mean pain severity in recovery was 1.84 for the laser group and 2.76 for the control group (P=0.01).
- Mean pain severity at two hours after surgery was

Table 3. Comparison of non opioid analgesic consumption in both groups

	Laser group		Non laser group		Chi Square	*P* value
	Number	Percentage	Number	Percentage		
No opioid analgesic consumption	28	93.33%	20	66.67%	6.67	*P*=0.01
Opioid analgesic consumption	2	6.67%	10	33.33%		
Total	30	100%	30	100%		

Table 4. Evaluation of mean odynophagia severity from recovery to 24h after surgery in both groups

Hour	Group	Number	Mean±Standard Deviation	P test	*P* value
0	Laser group	14	1.64±0.74	-6.7	*P*=0.01
	Non laser group	28	2.82±0.39		
2	Laser group	23	1.48±0.67	-6.5	*P*=0.01
	Non laser group	30	2.63±0.61		
4	Laser group	17	1.35±0.61	-5.7	*P*=0.01
	Non laser group	29	2.45±0.63		
6	Laser group	11	1.45±1.04	2.1	*P*=0.01
	Non laser group	29	2.07±0.7		
8	Laser group	5	1.61±1.30		
	Non laser group	28	1.8±0.69		
12	Laser group	2	1.50±0.71		
	Non laser group	23	1.52±0.59		
24	Laser group	1	1.00±1.00		
	Non laser group	14	1.21±0.43		
0-24	Laser group	27	1.35±0.60	-5.58	*P*=0.01
	Non laser group	30	2.12±0.43		

1.55 for the laser group and 2.7 for the control group (P=0.01).

- Mean pain severity at four hours after surgery was 1.42 for the laser group and 2.41 for the control group (P=0.01).
- Mean pain severity at six hours after surgery was 1.38 for the laser group and 2.2 for the control group (P=0.01).
- Mean pain severity at eight hours after surgery was 1.59 for the laser group and 2 for the control group. Mean pain severity at twelve hours after surgery was 1.5 for the laser group and 1.5 for the control group. Mean pain severity at twenty four hours after surgery was 1.19 for the laser group and 1.43 for the control group, due to heterogeneity, comparison of pain severity in this category of groups was not performed.
- Average pain severity for twenty four hours (0-24) after surgery was 1.43 for the laser group and 2.11 for the control group, and T test showed significantly more pain severity in the control group than in the laser group (P=0.01).

Chi square test showed that the frequency of analgesic consumption was significantly more in the

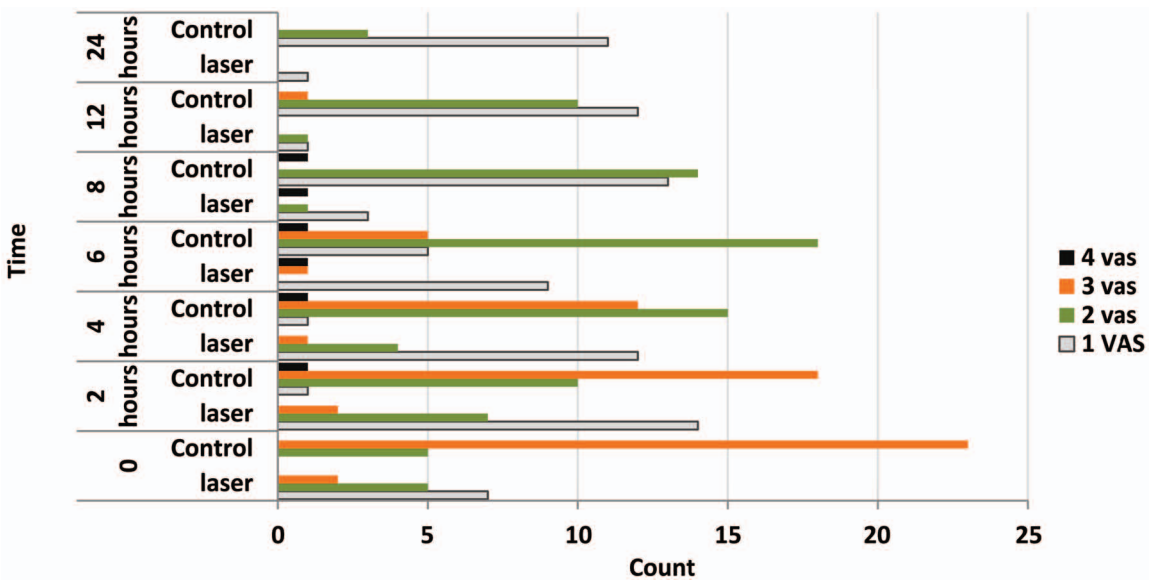

Figure 4. Comparison of numbers of patients in different severities of odynophagia, from the time of surgery to 24h post surgery in both groups.

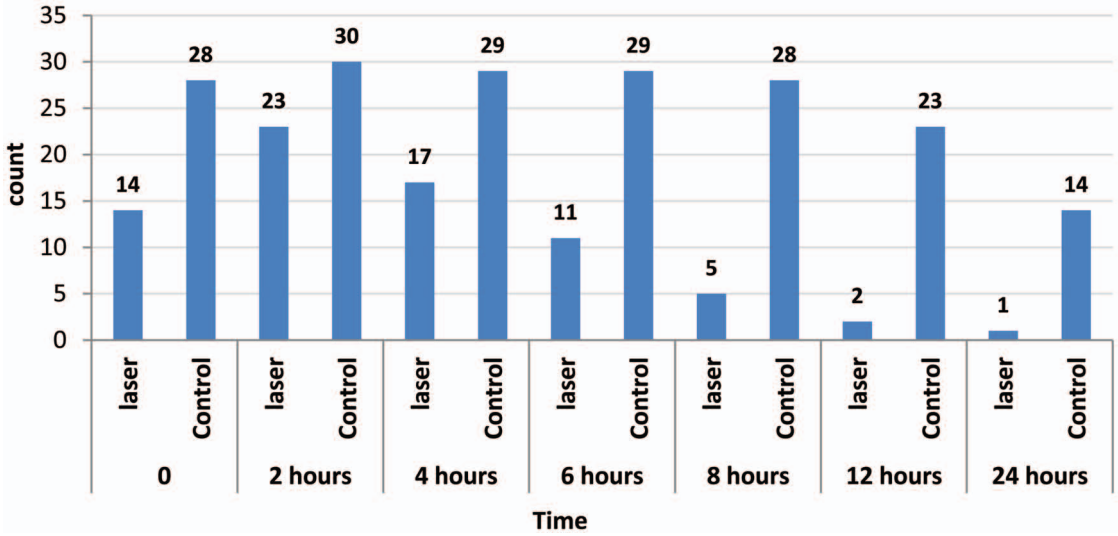

Figure 5. Comparison of numbers of patients with odynophagia, from the time of surgery to 24h post surgery in both groups.

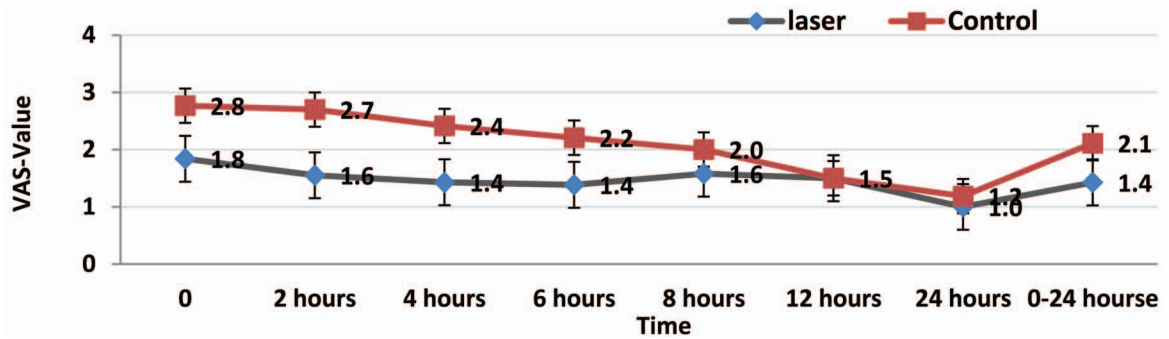

Figure 6. Comparison of mean odynophagia severity from recovery to 24h after surgery in both groups

control group than in the laser group.

- In the laser group the frequency of patients with odynophagia in each evaluated hour was lower than in the control group.
- Also with time, the rate of reduction of patients with odynophagia was higher than in control group.
- Mean odynophagia severity in recovery was 1.64 for the laser group and 2.82 for the control group (P=0.01).
- Mean odynophagia severity at two hours after surgery was 1.48 for the laser group and 2.63 for the control group (P=0.01).
- Mean odynophagia severity at four hours after surgery was 1.35 for the laser group and 2.45 for the control group (P=0.01).
- Mean odynophagia severity at six hours after surgery was 1.45 for the laser group and 2.07 for the control group (P=0.01).
- Mean odynophagia severity at eight hours after surgery was 1.61 for the laser group and 1.8 for the control group. Mean odynophagia severity at twelve hours after surgery was 1.5 for the laser group and 1.52 for the control group. Mean odynophagia severity at twenty four hours after surgery was 1 for the laser group and 1.21 for the control group, due to heterogeneity, comparison of odynophagia severity in this category of groups was not performed
- Average odynophagia severity for twenty four hours (0-24) after surgery was 1.35 for the laser group and 2.12 for the control group, and T test showed that odynophagia was significantly more severe in the control group than in the laser group (P=0.01).

Discussion

Results showed that in the laser group the number of patients with pain sensation in each of the 0,2, 4, 6, 8, 12, 24 hours after surgery was lower than in the control group. Also with time the rate of reduction of patients with pain sensation was higher in the laser

group compared to the control group. From 30 patients evaluated at 8, 12 and 24h after surgery, the number of patients in the laser group with pain sensation respectively decreased by 3, 2 and 1 patients while in the control group after 24h the number of patients with pain sensation was 16 patients. (Figure 1-3 and Table 2)

The mean pain severity in each of the 0, 2, 4 and 6 hours after surgery was significantly lower in the laser group compared to the control group (P=0.01). And at 8, 12 and 24 the number of patients with pain sensation was so low in the laser group to be able to perfom the evaluation of the statistical test in order to compare between both groups(Figure 1-3 and Table 2).

The frequency of opioid analgesic comsumption was significantly higher (P=0.01) in the control group (33.3%) than in the laser group (6.6%), which was mainly 50mg of tremadol and 1000mg Apotel (Paracetamol) (Table 3).

The number of patients with odynophagia in each of 0, 2, 4, 6, 8, 12 and 24h after surgery was lower in the laser group compared to the control group, and mean severity odinophagia at each of the hours after surgery in the laser group was also significantly lower than in the control group (P=0.01) (Figure 4-6 and Table 4).

Since laser therapy is effective on mucositis and pain resulting from radiotherapy[5].

On the other hand this study was a confirmation of the research achieved by Aras of Turkia which was on odontologic surgeries, and low level laser was able to decrease pain[9].

Also Felipe Costa Neiva et al reported a considerable reduction in pain in the children post tonsillectomy stage, and the present study is a confirmation of the application of laser therapy in adult tonsillectomy[1].

According to the recent study which performed by arthoure showed significant pain reduction when low level laser therapy applied for trigeminal neuralgia[10].

Finally this study confirm effectiveness of above mentioned studies.

Conclusion

Low level laser therapy was effective in reducing pain and odynophagia of post tonsillectomy in adults. To achieve more decisive results, field studies with higher sample size, longer-term follow-up, and application of LLLT with different doses are recommended.

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